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Secure Authentication Using Click Draw Based Graphical Password Scheme

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Abstract— *Graphical passwords are an alternative to alphanumeric passwords in which users click on images to authenticate themselves rather than type alphanumeric strings. We have developed one such system, called Secure Authentication using Click Draw Based graphical password scheme, and evaluated it with human users. Secure Authentication using Click Draw Based graphical password scheme, including usability and security evaluations, and implementation considerations. An important usability goal for knowledge-based authentication systems is to support users in selecting passwords of higher security, in the sense of being from an expanded effective security pace. We use the sequence of multiple images along with a dummy image and alsoa pattern on any single image to influence user choice in click draw based graphical passwords, encouraging users to select more random, and hence more difficult to guess patterns.*

Keywords—Click Draw, Cued Click Point, Graphical password, HOTSPOTS, Textual password.

I. INTRODUCTION

Authentication in the computer world refers to the act of confirming the authenticity of the user's digital identity claim. Currently, popular authentication mechanisms are mainly based the following factors: something that the user has (an object), knows (a secret), or uniquely represents him (biometric identifiers). In the simplest form, a system that requires authentication challenges the user for a secret, typically a pair of username and password. The entry of the correct pair grants access on the systems services or resources. Unfortunately, this approach is susceptible to several vulnerabilities and draw-backs. These shortcomings range from user selected weak or easily guessable passwords to more sophisticated threats such as malware and keyboard sniffers. An adversary has an abundance of opportunities to compromise the text-based password authentication mechanisms. For long time the computer industry has been in a quest for better alter-natives but without popular success: most of our current systems still use the primitive text-based authentication schemes. To amend the some of the shortcomings of the textual passwords, researchers turned their attention to passwords that utilize graphical objects. Graphical authentication has been proposed as a user-friendly alternative to password generation and authentication [3].

The main difference to textual passwords is the use if a device with graphical input: the user enters the password by clicking on a set of images, specific pixels of an image, or by drawing a pattern in a pre-defined and secret order. The proposed systems claim to provide a superior space of possible password combinations compared to traditional8-character textual passwords. This property alone renders attacks including dictionary attacks and keyboard sniffers computationally hard increasing our ability to defend against Brute-force attacks. Furthermore, according to Picture Superiority Effect Theory, concepts are more likely to be recognized and remembered if they are presented as pictures rather than as words. Thus, graphical password presumably delivers a higher usability compare to text-based password.

More specifically, two-factor authentication has been with us for a quiet time. Popular examples of two-factor authentication systems are the ATM machines: to complete any transaction, the bank customer has to carry both a bank-issued card (credit or debit card) and her personal identification number (PIN).We proposes a system that leverages both graphical passwords and multi-factor authentication. Our approach overcomes the limitations of the traditional password (either textual or graphical) systems. To that end, we employ graphical password. We propose a system that leverages both graphical passwords and multi-factor authentication. Our approach overcomes the limitations of the traditional password (either textual or graphical) systems.

II. EXISTING SYSTEM

2.1 Pass Point Scheme

S. Wiedenbeck ET al .proposed pass-point graphical password scheme in which on a given image password consists of a sequence of 5 different click points. For password creation user selects any pixel in the image as a click-points and for login the user has to enter the same series of clicks incorrect sequence within a system defined tolerance square of original click-points. The problem with this scheme is the HOTSPOTS(the area of an image where user more likely to select the click-point)and it is easy for attackers to guess the password because user forms certain patterns in order to remember

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the secret code which results pattern formation attacks are easily possible. Thus the pass-point system suffers from these two major disadvantages. To overcome these disadvantages next technique is to be implemented.

Fig. 1: Pass Point Scheme

2.1.2 Cued Click Point

Cued Click Points was designed to reduce patterns and to reduce the usefulness of hotspots for attackers. Instead of five click-points on one image, CCP uses one click-point on five different images [2]. The next image displayed is based on the location of the previously entered click-point; it creates a path through an image set. Creating a new password with different click-points results in a different image sequence. One best feature of Cued Click Point is that the explicit indication of authentication failure is only provided after the final click-point, to protect against incremental guessing attacks. But this technique has several disadvantages like false accept (the incorrect click point can be accept by the system) and false reject (the click-point which is to be correct can be reject by the system).In this system pattern formation attack is reduced but HOTSPOT remains since users are selecting their own click-point.

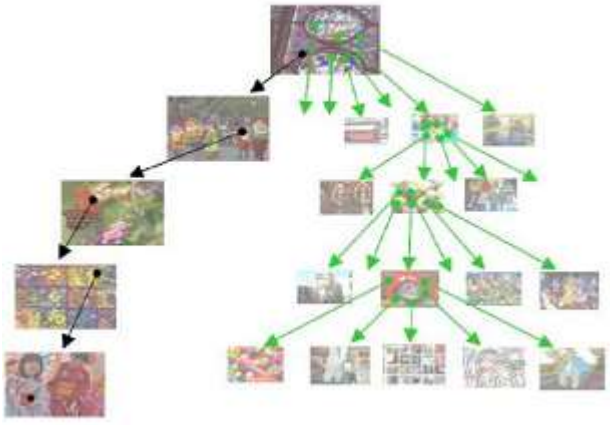

Fig. 2: Cued Click Point Scheme

2.1.3 Persuasive Cued Click Points

For creating Persuasive Cued Click Points persuasive feature is added to CCP. PCCP encourages users to select less predictable passwords. For password creation PCCP uses terms like viewport and shuffle [3]. When users creating a password, the images are slightly shaded except for a viewport as shown in the Fig 3. To avoid known hotspots the viewport is positioned randomly. The most useful advantage of PCCP is attackers have to improve their guesses. Users have to select a click-point within the highlighted viewport and cannot click outside of the viewport unless they press the shuffle button to randomly reposition the viewport.

At the time of password creation users may shuffle as often as desired but it slows the process of password creation. Only at the time of password creation, the viewport and shuffle button appears. After the password creation process images displayed normally without the viewport and shuffle button. Then user has to select correct click on particular image. PCCP is a good technology but has security problems. Fig. shows the password creation process including viewport and shuffle button [4].

Fig.3: Password Creation in PCCP, Highlighted Area is Viewport

III. LIMITATION OF EXISTING SYSTEM

Existing system have following limitations:

1) Random placement of the viewport makes it difficult to remember the click points.

2) User may use the shuffle for selecting the noticeable hotspots that can be guessable and hence prone to attacks.

3) Thus there is again a choice between remembrance and security

IV. PROPOSED SCHEME

The purpose of click-draw based graphical password scheme (CD-GPS) is to enhance the image-based authentication in both security and usability. There are mainly two steps in this scheme:

1. Image selection.
2. Secret drawing.

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4.1 Image selection

In CD-GPS, the first step is the image selection. In this step users have to select several images from an image pool. Suppose there are N1 images in the image pool, then at first users should select n N1 images from the image pool in an order and remember this order of images like a story. Users should further choose k n image from the above selected n images. k is nothing but the single image on which we have to draw secret.

Fig. 4: Image Selection

4.2 Secret drawing

This is the second step comes after the image selection. In this step users can freely click-draw their secrets. For constructing secret drawing users use series of clicks as shown in above fig. the image is divided into a 1616table. Users can use the coordinate numbers for remembering their drawings. In above fig. user draw number 7 as the secret, which consists of coordinates (1, 5), (1, 6), (1, 7), (2, 7), (3, 7), (4, 7) and (5, 7). In this technique there is not necessity to remember the sequence of clicks. During the authentication, users should re-draw their secrets accurately in the correct coordinates on the image.

Fig. 5: Secret Drawing

V. CONCLUSION AND FUTURE WORK

A knowledge based authentication system that uses set of ordered images with pattern drawn on it. It satisfies both conflicting requirements i.e. it is easy to remember and it is hard to guess. By implementing more complex configurations like more number of images with some dummy images, one can achieve more security .It is more difficult to break graphical passwords using the traditional attack methods such as brute force search, dictionary attack or spyware.

In future, we can give the facility of "Change password" for the users through which any user of this system can change the password when he/she want. Also, we can use this secure system for Web based Application. We can create Administrator who handles all the privileges, such as Reset the password, insert new images into the database etc.

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Improving the Voltage Stability and Performance of FACTS Controller in Transmission Line Network

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Abstract— *Conventionally Shunt Compensation is used to increase the transfer capability of a transmission line. By using FACT'S controllers one can manage the variables such as voltage magnitude and phase angle at selected bus and line impedance. Objective of this paper is to recover dynamic voltage control and consequently increasing system load ability for 50 Hz Frequency. Now a day, five well known FACT'S devices generally used for this purpose. These FACT'S devices are (SVC) Static VAR Compensator, (TCSC) Thyristor Controlled Series Capacitor, (STATCOM) Static Synchronous Compensator, and (UPFC) Unified Power Flow Controller and (SSSC) Static Synchronous Series Compensator.*

The voltage drop occurs when a system is loaded beyond its highest load ability point, then many investigation methods have been projected for the study of this difficulty. Mainly of These techniques are based on the classification of system stability. These stable points are typically referred as points of voltage collapse. This paper present modeling and simulation of STATCOM & SVC in Matlab Simulink for dynamic voltage performance of transmission line network.

Keywords— FACTS controllers, dynamic performance of STATCOM & SVC, VAR, Voltage Stability.

I. INTRODUCTION

Power Generation, Transmission and Distribution are difficult process, requiring the working of many components of the power system in cycle to make the most of the output. One of the major components to form a main part is the reactive power in system. It is necessary to sustain the voltage to deliver the active power through the lines. Different types of load required reactive power for their operation. To improve the performance of ac power systems, we need to manage this reactive power in a resourceful way and this is called as reactive power compensation [2-3]. There are two aspects to the trouble of reactive power compensation: load compensation and voltage support. Load compensation consists of improvement in power factor, balancing of actual power drawn from the supply, better voltage regulation, etc. of large variable loads. Voltage support consists of decrease of voltage variation at a given terminal of the transmission line. Series compensation and shunt compensation used to change in parameters of the system to give better-quality VAR compensation. In recent days, static VAR compensators like the STATCOM have been developed [4]. These quite satisfactorily do the job of absorbing or generating reactive power with a faster time response from (FACTS) Flexible AC Transmission system. FACTS devices allows an increase in transmission capability of apparent power through a transmission line and gives much better stability by doing adjustment of parameters that manage the power system. By using FACTS controllers control the variable elements such as voltage magnitude and phase angle at selected bus and line impedance [2]. There are five well known FACTS devices utilized by the utilities for this reason. Each of them has its-own characteristics and limits.

1.1 Troubles in Transmission line Network

There are so many problems happens in Transmission, Distribution and Utilization system they are as follows,

Voltage Sag, Swells, Dynamic stability limit Voltage fall down, Transient stability limit, Reduce circulating reactive power, [3-5].Voltage stability limit, Voltage flicker, Damping and oscillations etc. This paper present modeling and simulation of STATCOM & SVC for 50 Hz Frequency in Matlab Simulink for Impacts of SVC and STATCOM on power system are investigated during fault through and grid disturbance. Lastly Comparison of SVC and STATCOM are carried out for the duration of instability.

1.2 Advantages of Facts Controller

1) Increase the system security through raising the transient stability limit, limiting short circuit currents and over loads, managing cascading black-outs [3].& damping electro-mechanical oscillations of power systems and machines.

2) Provide secure tie-line connections to neighboring utilities and regions thereby decreasing overall generation reserve requirements both sides.

3) Provide upgrade of lines, Reduce the reactive power flow, thus allowing the lines to carry more active power.

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4) Increase utilization of lowest cost generation & Reduce loop flows.

1.3 Types of Facts Controllers

FACTS controllers can be classified into three categories.

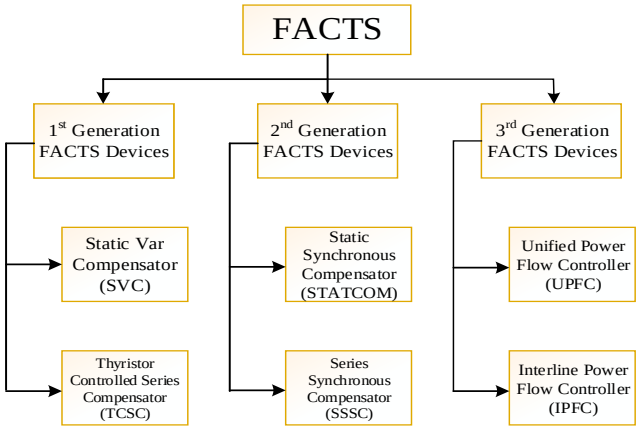

Fig. 1.1: Block diagram of FACTS Controller

A) STATCOM Controller

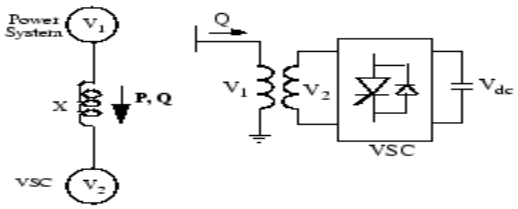

Fig.1.2: Operating Principle of the STATCOM

Fig.1.2 shows that The STATCOM Static Synchronous Compensator is one of the types of FACTS devices. Based on a voltage-sourced converter, the STATCOM regulates system voltage by generating or absorbing reactive power. Opposing to a thyristor-based STATCOM, Static Var Compensator (SVC), output current (inductive or capacitive) can be controlled independent of the AC system voltage. The power grid consists of two 400-kV equivalents (respectively 3000 MVA and 2500 MVA) connected by a 550-km, 50 Hz transmission line. When the STATCOM is not in operation, from bus B1 to B3 the "natural" power flow on the transmission line is 930 MW. The STATCOM is to be [2-5].found at the middle of the line (bus B2) and has a rating of +/- 100MVA. This STATCOM is a phasor model of a representative three-level PWM STATCOM. If you open the STATCOM dialog box and select "Display Power data", you will see that our model represent a STATCOM having a DC link insignificant voltage of 66 kV with an corresponding capacitance of 375 uF. On the AC side, its total corresponding impedance [6].is 0.22 pu on 100 MVA. This impedance represents the transformer leakage reactance and the phase reactor of the IGBT Bridge of an actual PWM STATCOM.

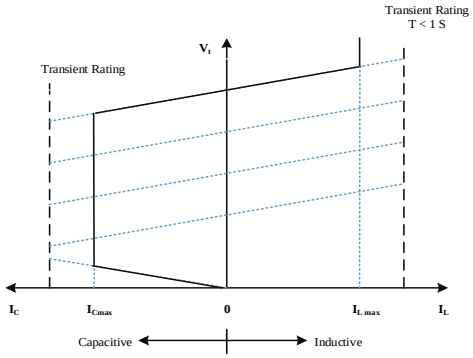

Fig. 1.3: V-I Characteristics of STATCOM

Fig.1.3 shows that Typical V-I characteristic of a STATCOM which operates both the capacitive and the inductive compensation and is capable to competition handle its output current over the rated maximum inductive or capacitive range irrespective of the quantity of ac-system voltage [7]. That is STATCOM can provide full capacitive-reactive power at any system voltage even as low as 0.15pu.

B) SVC Controller

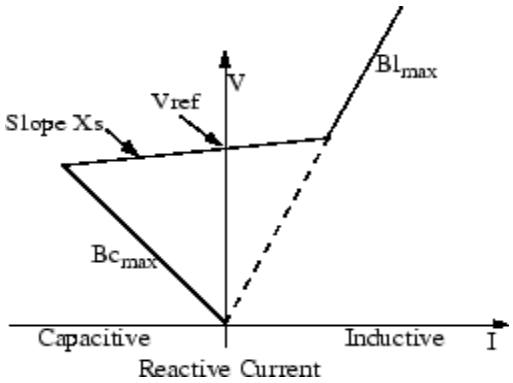

Fig.1.4: SVC V-I Characteristic

Fig.1.4 shows that The V-I Characteristic (SVC) Static Var Compensator is a shunt device of the Flexible AC Transmission Systems (FACTS) family of power electronics to control power flow and get better transient stability on power grids [1]. The SVC Static Var Compensator regulates voltage at its terminals by controlling the amount of reactive power absorbed into or injected from the power system. When system voltage is high, it absorbs reactive power (SVC inductive). When system voltage is low down, the SVC generates reactive power (SVC capacitive). The deviation in reactive power is performed by switching three-phase capacitor banks and inductor banks linked on the secondary side of a coupling transformer. Every capacitor bank is switched on and off by (TSC Thyristor Switched Capacitor) three thyristor switches. Reactors are either switched on-off (TSR Thyristor Switched Reactor) or phase-controlled (TCR Thyristor Controlled Reactor). The SVC can be operated in two special modes: in Var control mode (the SVC Susceptance is kept constant) when the SVC is operated in voltage regulation mode, in voltage regulation

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mode as long as the SVC Susceptance B stays within the minimum and maximum [8].Susceptance values forced by the total reactive power of reactor banks (Bl_{max}), and capacitor banks (Bc_{max}) the voltage is regulated at the reference voltage Vref. Voltage droops (typically between 1% and 4% at maximum reactive power output), and V-I characteristic has the slope indicated in the figure1.4 is described by the following three equations:

$V = V_{Ref} + X_S . I$ if SVC is in Regulation range

$(-B_{c\,max} < B < Blmax)$ (1.1)

$= -\frac{I}{Bc_{max}}$ if SVC is Fully capacitive

$(B = B_{Cmax})$ (1.2)

$= \frac{I}{Bc_{max}}$ if SVC is Fully inductive

$(B = B_{lmax})$ (1.3)

Where

V=Positive Sequence Voltage (pu)

I= Reactive current (pu/Pbase) (I > 0 indicates an Inductive current)

Xs= Gradient or Droop Reactance (pu/Pbase)

Bcmax= Highest Capacitive Susceptance (pu/Pbase) with All TSCs in service, no TCR or TSR

Blmax= Highest Inductive Susceptance (pu/Pbase) with all TSR's in service or no TSC, TCRs at full conduction.

II. SYSTEM MODELLING

The STATCOM consists of a three-phase pulse width modulated (PWM) voltage-source converter (VSC) [8-9] using insulated-gate bipolar transistors (IGBTs), three interface inductors and dc capacitor. The STATCOM injects currents into the point of common coupling in such a way so as to keep up balancing and harmonic elimination in the source currents. The VSI operation is supported by the dc storage capacitor with voltage across it. STATCOM and SVC FACTS Devices are connected in central point of 50 Hz transmission system. In that Simulation model two generators are connected both end regions. The three phase mutual inductance connected in series with the first generator. B1, B2 and B3 are used for measurement of current & voltage of transmission line. Simulink Model consists of the three phase distributed parameter line and three phase PI section line [8]. The three parallel loads are connecting with transmission line network that is l00MW, 2MW, 300MW. For creating fault in transmission line by manually we are also connected fault impedance. Once creating a fault the instability in transmission line can be compensated by STATCOM and SVC FACTS devices.

a) Dynamic Response of STATCOM

The dynamic responses of STATCOM in Matlab-model for 50 Hz that Unlock the STATCOM dialog box and choose "Display Control parameters". Mode of operation is set to be "Voltage regulation" and External control of reference voltage "Vref" also, the "droop" parameter should be set to 0.03 and the "Vac Regulator Gains" to (proportional gain Kp) 5 and (integral gain Ki) 1000. (The red timer block connected to the "Vref" input of [8-9]. the STATCOM) Close the STATCOM dialog block and open the "Step Vref" block. This block should be programmed to modify the voltage reference Vref as follows: Initially Vref is set to 1 pu; at t=0.2 s, Vref is decreased to 0.97 pu; then at t=0.4 s, Vref is increased to 1.03 pu; and finally at 0.6 s, Vref is set back to 1 pu, but make sure that the fault breaker at bus B1will not operates during the Simulation.

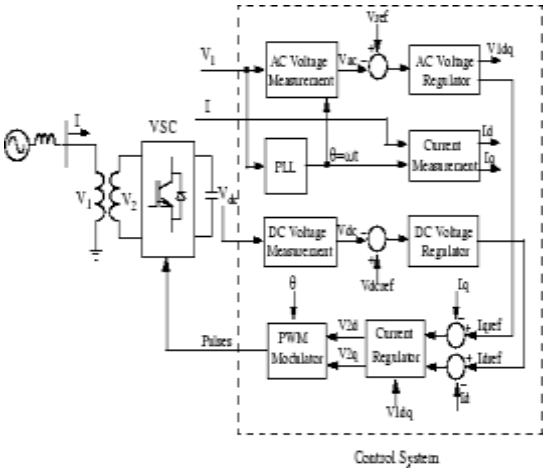

Fig.2.1: control Strategy of STATCOM Controller

Run the Simulation and look at the "VQ_STATCOM" scope. The fig. 3.3 displays the Vref signal (magenta trace) along with the measured positive-sequence voltage Vm [11]. At the STATCOM bus (red trace). The signal Qref (magenta trace) is not relevant to our Simulation because the STATCOM is in "Voltage regulation" and not in "VAR Control" The fig.3.2 displays the reactive power Qm (Blue trace) absorbed (positive value) or generated (negative value) by the STATCOM. The control method consists of a measurement system measuring the positive-sequence voltage to be controlled. A Fourier-based measurement system using a one-cycle operation average is used. A voltage regulator that uses the voltage error (difference between the reference voltage Vref and the measured voltage Vm) to determine the SVC Susceptance B needed to keep the system voltage constant [7].Distribution unit that determine the TSCs (and eventually TSRs) that must be switched ON and OFF and computes the firing angle α of TCRs. A synchronizing system using a PLL Phase-Locked Loop synchronized on the secondary voltages and a pulse generator that gives appropriate pulses to the Thyristors.

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b) Dynamic Response of SVC

When the SVC is operating in voltage regulation mode, its response speed to a vary of system voltage depends on the voltage regulator gains (integral gain Ki and proportional gain Kp), the droop reactance Xs, and (short-circuit level) the system strength. for an integral-type (Kp = 0), voltage regulator if the voltage measurement time constant Tm and the average time delay Td due to valve firing are neglect, the closed-loop[7].system consisting of the SVC and the power system can be approximated by a first-order system having the following closed-loop time constant:

$$T_{C=1/(K_i(X_s+X_n))} \quad (2.1)$$

Where Tc= Closed loop time constant

Ki= comparative gain of the voltage regulator (Pu_B/pu_V/s)

Xs= gradient reactance pu/P base

Xn= Equivalent power system reactance (pu/P base)

This equation demonstrates that we obtain a faster response speed when the system short-circuit level decreases (higher Xn values) or when the regulator gain is increased.

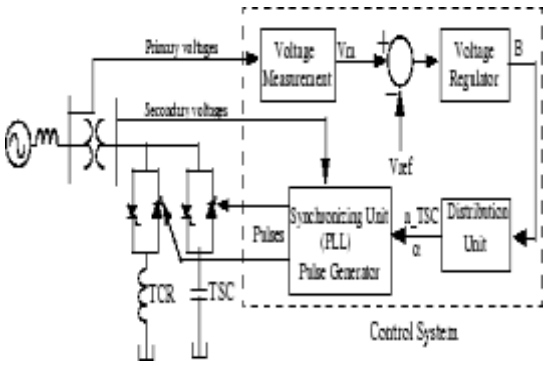

Fig.2.2: Block Diagram of an SVC and Its Control System

The SVC parameters are grouped in two categories: Power Data and Control Parameters. The block of SVC is a phasor model, it can be used in three-phase power systems together with synchronous motors, generators, and dynamic loads to [5-7].execute transient stability studies and examine impact of the SVC on electromechanical oscillations and transmission capability. These systems are approximated relatively by simple transfer functions that defer a correct representation at the system's fundamental frequency.

The (PLL) Phase Lock Loop closed-loop control system, which tracks the frequency and phase of a sinusoidal signal by using an inner frequency oscillator. The system adjusts the inner oscillator frequency to keep the phase's difference zero. The figure 2.3 shows that the internal diagram of the PLL.

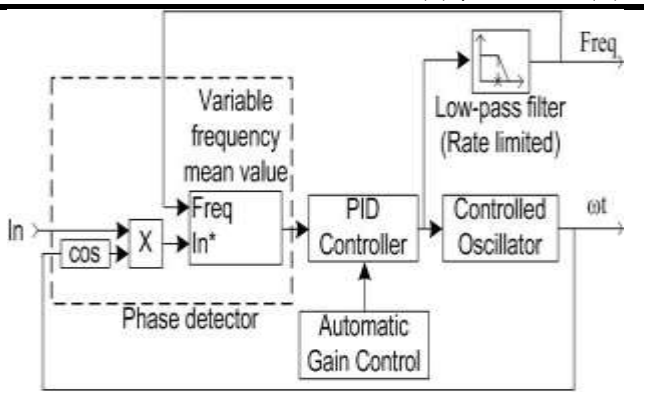

Fig 2.3: Block diagram of Phase Lock Loop (PLL)

The input signal is assorted with an internal oscillator signal. The DC component of the assorted signal (comparative to the phase difference between these two signals) is extracted with an unstable frequency mean value. A (PID) Proportional-Integral-Derivative controller [3].with an optional (AGC) automatic gain control keeps the phase difference to 0 by acting on a controlled oscillator. The PID output, consequent to the angular velocity, is filtered and improved to the frequency in Hz, which is used by the mean value.

The system terminal voltages are given as,

$$V_a = V_m \sin(wt) \quad (2.2)$$

$$V_b = V_m \sin(wt) - \frac{2\pi}{3} \quad (2.3)$$

$$V_c = V_m \sin(wt) + \frac{2\pi}{3} \quad (2.4)$$

Where, Vm is the peak amplitude and *wt* angular frequency, respectively, of the system voltage at the PLL. [5].The amplitude of PLL voltage is calculated as,

$$V_t = \sqrt{\frac{2}{3}\left({V_a}^2 + {V_b}^2 + {V_c}^2\right)} \quad (2.5)$$

a) VSC Based control Strategy: The VSC is designed for compensating a reactive power. There are lots of control schemes are available for control of shunt active compensators [9]. Such as instantaneous reactive power theory, power balance theory, synchronous reference frame theory, symmetrical components based etc. and the synchronous reference frame theory are used for the control of projected STATCOM. The load currents and the point of common coupling (PCC) [10] voltages and dc bus voltage of STATCOM are sensed as feedback signals to form a closed loop system. The load currents from the a-b-c frame are first converted to the a-b-c frame and then to the d-q-o frame as,

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$$\begin{bmatrix} I_{Ld} \\ I_{Lq} \\ I_{Lo} \end{bmatrix} = \frac{2}{3} \begin{bmatrix} \cos\theta & -\sin\theta & \frac{1}{2} \\ \cos\left(\theta - \frac{2\pi}{3}\right) & -\sin(\theta - \frac{2\pi}{3}) & \frac{1}{2} \\ \cos(\theta + \frac{2\pi}{3}) & \sin(\theta + \frac{2\pi}{3}) & \frac{1}{2} \end{bmatrix} \begin{bmatrix} I_{La} \\ I_{Lb} \\ I_{Lc} \end{bmatrix} \quad (2.6)$$

Where, cosϴ, sinϴ are obtained using a three-phase PLL. The d-axis and q-axis currents consist of fundamental and harmonic components as,

$$I_{Ld} = I_{d\,dc} + I_{d\,ac} \quad (2.7)$$

$$I_{Lq} = I_{q\,dc} + I_{q\,ac} \quad (2.8)$$

b) PQ Theory: Using definition of the instantaneous reactive power theory for a balanced three phase three wire system, the quadrature component of the voltage is always zero, the real power (p) and the reactive power (q) [10-11] injected into the system by the STATCOM can be expressed under the d-q reference frame as,

$$p = V_d I_d + V_q I_q \quad (2.9.1)$$

$$q = V_q I_d - V_d I_q \quad (2.9.2)$$

Since Vq=0, Id and Iq completely described the instantaneous value of real and reactive powers produced by the STATCOM when the system voltage remains constant. Therefore the instantaneous three phases current measured which is transformed by abc to dqo transformation. The main advantage of this scheme is that it incorporates a self-supporting dc bus.

III. SIMULATION RESULTS

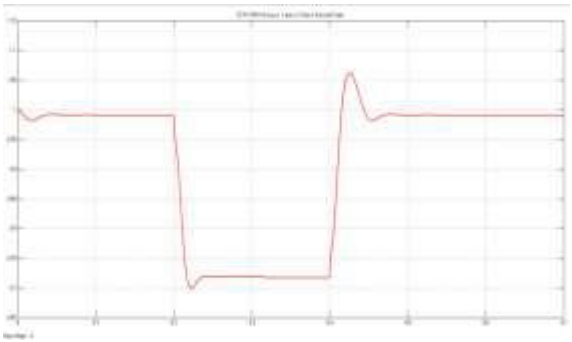

Fig.3.1: Dynamic Response of STATCOM (Vm)

Fig 3.1 shows that the Dynamic Response of STATCOM at initial stage of transmission line is inductive. Because of the inductive load, transmission line voltage decreases to desired value, to maintain the desired voltage level STATCOM act as capacitive (0-0.2 sec.).

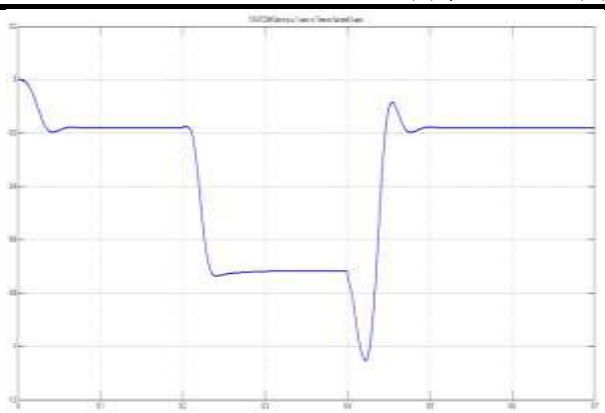

Fig.3.2: Dynamic Response of STATCOM (Qm)

Fig 3.2 shows that the instant 0.2 sec. Z-fault take placed and voltage falls down (0.2sec to 0.4 sec.) at that time STATCOM is operated as more capacitive and goes more negative to regulate voltage. at the instant 0.4 sec. fault is rapidly removed at that time STATCOM capture one overshoot and comes at desired level same as the before fault occur.

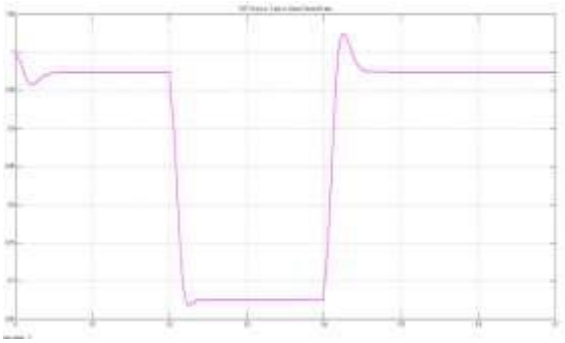

Fig.3.3: Dynamic Response of SVC (Vm)

Fig 3.3 shows that the Dynamic Response of SVC at initial stage of transmission line is inductive. Because of the inductive load, transmission line voltage decreases to desired value, to maintain the desired voltage level SVC act as Capacitive (0-0.2 sec.).

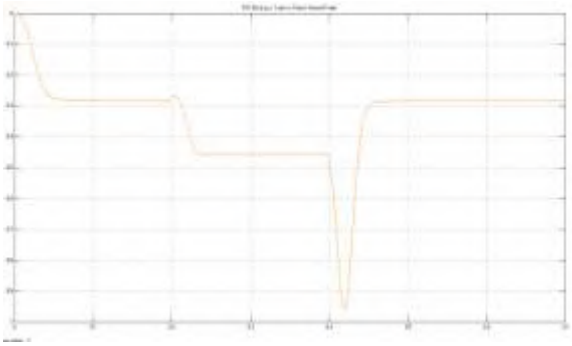

Fig.3.4: Dynamic Response of SVC (Qm)

Fig 3.4 shows that at the instant 0.2 Z-fault take placed and voltage falls down (0.2sec.to 0.4 sec.) at that time SVC is operated as more capacitive and goes more negative to regulate voltage. at the instant 0.4 sec. fault is rapidly

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removed at that time SVC capture one overshoot and comes at desired level same as the before fault occur.

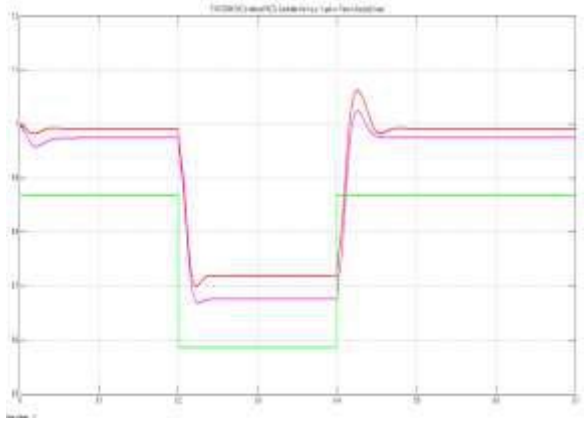

Fig.3.5: Voltage of STATCOM, SVC, without any Facts devices

The fig.3.5 displays the measured voltage Vm on both systems (magenta trace for the SVC), (red trace for STACOM).at some stages in the 10-cycle fault, a key variations between the SVC and the STATCOM can be observed. The reactive power generated by the SVC is -0.48 pu and the reactive power generated by the STATCOM is -0.71 pu.

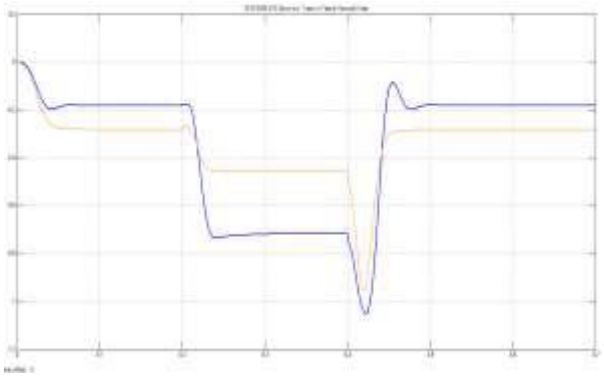

Fig.3.6: Reactive Power of STATCOM and SVC

The fig.3.6 shows that the measured reactive power Qm on both systems (Blue trace for the STATCOM), (Orange trace for SVC).the upper limit capacitive power generated by a SVC is proportional to the square of the system voltage (constant Susceptance) while the upper limit capacitive [6-7].power generated by a STATCOM decreases linearly with voltage decrease (constant current).

Table.1: Comparison between Compensator

Compensator	**TCR-TSC (SVC)**	**STATCOM**
Type	Controlled Impedance	Synchronous Voltage Source
Losses	Low	Medium
Harmonic	Low	Very Low
Maximum Delay	1 Cycle	Withdraw
Transient Behavior Of System	Medium	Good
Maintenance Cost	Medium	Medium
Compensation Cost	Medium	High

IV. CONCLUSION

In proposed method Simulation results shows that without any FACTS device, the system is unstable (showing in Green line in fig 3.5) and after connecting FACTS controllers it becomes stable. Then it is clearly shows that the result of STATCOM is (shown in Red trace) better than SVC (shown in Magenta trace). In addition of FACTS controllers into power systems, to maintain the stability of the power system when the system load-ability is increases STATCOM generates reactive Power (Capacitive Mode) and when the system load-ability is decreases it absorb reactive Power (Inductive Mode). Transient Stability of power System with various load at various Buses improved using SVC Device.

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Exploring Energy Consumption Issues for video Streaming in Mobile Devices: a Review

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Abstract*—The proliferation of high-end mobile devices, such as smart phones, tablets, together have gained the popularity of multimedia streaming among the user. It is found from various studies and survey that at end of 2020 mobile devices will increase drastically and Mobile video streaming will also grow rapidly than overall average mobile traffic. The streaming application in Smartphone heavily depends on the wireless network activities substantially amount of data transfer server to the client. Because of very high energy requirement of data transmitted in wireless interface for video streaming application considered as most energy consuming application. Therefore to optimize the battery usage of mobile device during video streaming it is essential to understand the various video streaming techniques and there energy consumption issues in different environment. In this paper we explore energy consumption in mobile device while experiencing video streaming and examine the solution that has been discussed in various research to improve the energy consumption during video streaming in mobile devices . We classify the investigation on a different layer of internet protocol stack they utilize and also compare them and provide proof of fact that already exist in modern Smartphone as energy saving mechanism.*

Keywords*— *power consumption, video streaming, internet protocol stack .

I. INTRODUCTION

Now a days video content is gradually more consumed by mobile devices [1]. As it shown in below fig. 1 by the end of 2020, the number of such mobile devices will exceed tremendously and Mobile video usage will grow at a CAGR of 62 percent between 2015 and 2020, higher than the overall average mobile traffic CAGR of 53 percent" [1]. Figure 1 shows a growth rate of video usage.At the same time, it is very important to fulfill user expectation in term of playback quality and battery usage in mobile device while streaming the video.

Fig.1

In mobile video streaming, it is essential that user can experience the best quality with optimized energy consumption. There are so many challenges for video streaming services while transmitting the video content to the streaming client for smooth playbacks like clients with the different type of connectivity, initial playback delay, and the bandwidth variation between a server and a client [2]. While playing multimedia streaming content, energy consumption of smartphones is also considered as an important issue and consequently, a significant number of research work focused on reducing the energy consumption of the mobile device.

The major consumption of energy in any mobile devices is due to both display on and decoding the multimedia. Energy consumption due to decode audio or video depends on the computational complexity of algorithm used by the codec and/or compression technique used for encoding.

There is various technique used by streaming services while sending video content to mobile devices, such as rate throttling, buffer adaptive streaming, rate adaptive streaming over HTTP encoding rate streaming, and fast caching. In Encoding rate streaming scheme the content is sent at encoding rate. While in Throttling and fast caching delivering of video content has a higher rate than the encoding rate. Playback buffer status of the client has used in Buffer adaptive mechanisms. In this, the client receives content from the server only when playback buffer exhausted to a specific limit. Initially, whole content has been downloaded in Fast caching technique. while Rate adaptive mechanisms adjust with video quality as per the end-to-end bandwidth between a server and the client. In some research, it analyzes the merits of these streaming techniques from the server performance point of view. For example, it is observed that fast caching minimize start-up

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delay at the client and protect against bandwidth fluctuation, but it also consumes a lot of recourses like memory and CPU at the streaming server [2]. There is a lot of studies made to understand streaming technique but still, some research are required from the perspective of mobile devices and power consumption. Although many studies show the traffic pattern of video streaming with various mobile devices but it is still the part of research to find the different optimal technique in different context. The main aim of these streaming techniques is the smooth delivery of quality video content with reduced energy consumption to the user. It is essential to know what satisfies the user demand before one can design a streaming service in terms of quality of experience and battery life of their Smartphone.

As most of the energy consumption take place in display and decoding and wireless interfaces can equally drain the same amount of energy while running video streaming applications in mobile devices. The main focus of the study is to identify communication energy spent by mobile devices while receiving and playing multimedia content. "It has been observed in a study that Wi-Fi interface requires approximate three times of the energy needed to decode video content [4], [5], whereas 3G interface uses approximately five times of the decoding energy" [2]. The interface has high energy consumption because due to continuous flow of traffic the wireless radio is powered on most of the time during streaming. There are many components involve at the various layer of internet protocol stack like wireless radios operate at the physical layer, at the same time their power consumption highly depends on the wireless interface management or usage at the different technique implemented at higher layers of the Internet protocol suite, such as at link layer, network, transport and application layer . Therefore, all these layers should be included in the minimization of energy consumption.

The classification of the investigation is done according to the Internet protocol layers and research solution is shown Table 1. At physical layer, different modulation schemes are considered. Link layer solutions apply energy-aware traffic scheduling for several wireless clients and manage wireless interface at the mobile devices and. Link layer solutions are divided into standard and non-standard techniques. Cross-layer solutions use a combination of different protocols that operate on various layers or at least use information from different layers while optimizing the behavior of a protocol of another layer. We classify them according to the need of their operational environment (client, server, or proxy). Application layer techniques use scalable video coding (SVC), transcoding and content selection to minimize energy consumption of the mobile devices.

Table.1: Research Solution At Different Layer

Internet Protocol Stack	**Research solution**
Physical layer	Dynamic Modulation Scaling (DMS), Quadrature Amplitude Modulation (QAM), Frequency Shift Keying (FSK)
Link layer[LL]	Wi-Fi Access (IEEE 802.11 Standards), PSM-A ,Enhanced Distributed Channel Access (EDCA) Radio Resource Control protocol
Cross-layer	**Client centric solution** Self-Tuning Power Management Traffic Prediction, Scheduling Traffic among Multiple Wireless Interfaces(cool spot) Cool-Tether Proxy or AP Assisted Solutions Traffic shaping, Scheduling Bursty traffic Server-Assisted Solutions AB-PSM
Application layer	Scalable Video Coding ,Content Selection,HTTP Rate Adaptive Streaming,Media Transcoding

II. VIDEO STREAMING AND TECHNIQUES

Video streaming is the act of transmitting compressed (typically) video across a private or public network (like the Internet, a LAN, satellite, or cable television) to be uncompressed and played on a computing device (such as a TV, smart phone or computer). Now a day's mobile streaming services send content using HTTP over TCP. Smartphone users can access these services using either a native app or a browser. The browser may use a Flash, HTML5 or Microsoft Silverlight player to play the video. There are different quality of played by video services generally referred as p-notation, such as 240p, which refers to the resolution of the video. 240p usually refers to 360x240 resolutions. Different services use also low, standard, and high definition (LD, SD, HD) notations but the resolutions that each one refers to varies between services. For handling video streaming system require video container. The container is a metafile format whose specification describes how different elements of data and metadata coexist in a computer file. A video container formats can support multiple audio and video streams, and various required information of video along with the synchronization information needed to play back the various streams together. For example, container formats exist for optimized, low-quality, internet video streaming which differs from high-quality streaming requirements. The default container for the player is MP4, WebM, and X-FLV. The native apps of Netflix players play are videos.

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WebM and X-FLV are the default containers for the HTML5, and Flash player respectively while YouTube, Dailymotion and Vimeo also play MP4 and 3GPP videos. Table 2 shows the examples of different video services, the types of video players, video qualities, and containers.

Table.2: Different video services, the types of video players, video qualities, and containers

Streaming Services	YouTube, Vimeo, Dailymotion, ShoutCast, Netflix Hulu ESPN Player, BBC iPlayer
Players	Native Application, Flash, and HTML5
Video Quality	High Definition (720-1080p) Standard definition (270-480p), low Defination (240p),
Containers	Ismv, , X-FLV, 3GPP,EVO, MP4, WebM

Modern streaming services apply a number of techniques to deliver multimedia to the streaming clients. The main aim of all streaming service to provide uninterrupted playback while occurrence of bandwidth fluctuation and jitter. To achieve this most of the streaming service first, buffer the video content at the client end. This buffered content is noticeable to the user as start up delay and known as Fast Start. The initially buffered data is downloaded using all the available bandwidth, while the rest of the video is downloaded using one of the following techniques:

i. **Bitrate streaming:**
"Bitrate streaming technique is used to transmit the data at the encoding rate of the stream. A streaming period start with Fast Start and then the player accept data at the encoding rate from the server session. In this case controlling of rate is handled by streaming client"[3] .YouTube players, the Daily motion player use Bitrates streaming technique.

ii. **Throttling:** In this technique service provider purposely slowing of transmission rate. It can be used to vigorously control the user's upload and download rates on video streaming
Throttling also refers to the technique which limit the delivery content rate to a client but which has always higher rate than the encoding rate. The transmission rate is controlled by the server.

iii. **ON-OFF (Buffer Adaptive Streaming):**ON-OFF technique is based on playback buffer status of a player. When the player has enough content to play, it informs the server to stop the sending the data. The server restart data transmission only when the buffer falls beneath a threshold at the client side.

iv. **DASH or (Rate Adaptive Streaming.)**
Above discussed streaming technique, a client player can play a video of a particular quality (i.e HD or SD or LD)during a streaming session. We change the quality by interrupting session. While DASH, allows the player to switch the stream quality on the fly to adjust bandwidth fluctuations. "The Vimeo player in iPhone 4S uses Apple's version of DASH called HTTP Live Streaming (HLS). The player receives content in chunks and each chunk can be requested separately by specifying the quality"[5].

v. **Fast Caching.**
Fast Caching refers to downloading the whole video using the utmost available bandwidth. The client player have to maintain large growing buffer and it decodes content at the encoding rate.

III. LAYER BASED ANALYSIS

Physical layer

When we apply the energy usage optimization concept it would be helpful to all type of application in system. In physical layer, energy depletion is evaluated on the basis of amount of the carrier channel capacity and the transmission distance. Therefore, study shows that rather than utilizing the maximum capacity during a streaming session, solutions it is better to give much emphasis to tune the modulation level to limit the transmission rate according to the actual bit rate of the content dynamically. This is also known as Dynamic Modulation Scaling (DMS). "DMS is applied such that the lower the bit rate, the lower is the modulation level and the lower is energy consumption".[15] It is also observed that , the energy per bit is reduced by increasing the transmission time. At the same time it is not sufficient to change the modulation level, it may not always give the smallest energy consumption because energy consumption also depends on the transmission distance [16]. "Some time, it may also require changing the modulation scheme as well. For example , if the transmission distance is more than a threshold, reducing modulation level does not reduce energy consumption using Quadrature Amplitude Modulation" (QAM), rather energy consumption increases. In such a scenario "Frequency Shift Keying (FSK) is more energy efficient"[.16] However, it is very impractical to change modulation scheme or modulation level dynamically. The reason while doing so negotiation between the transmitter and the receiver is mandatory, the implementation of a such scheme requires careful reconfiguration at the receiver in order to operate with proper modulation scheme or level and hence there is protocol overhead. [15].

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LINK LAYER

To improve the energy efficiency in mobile devices at this layer large number of solution has being proposed .There are different classes of solution for Wi-Fi and Cellular network.

Wi-Fi Access (IEEE 802.11)

"IEEE 802.11 interfaces has default power saving mechanism called power saving mode (PSM)" [17]. Using PSM a mobile device regularly awakes to check whether it has any content to transmit/receive. Otherwise, the interface keep on sleep mode. "When the interface is in sleeping mode , the access point (AP) store the arriving data for the client. When the client wakes up, it retrieves the stored data by sending PS-Poll frame to the AP. PSM helps to optimize the energy consumption only when there is regularity in the distribution of multimedia traffic" [19]. However, modern smartphones use a modified version of PSM called PSM Adaptive (PSM-A). "PSM-A forces the interface to stay in active mode for a few hundred milliseconds after transmitting or receiving packets" [2]. However, still PSM is more better than PSM-A .

When multiple devices compete for the same wireless channel called Channel contention cause lots of energy wastage in mobile devices .To handle this situation the modified version 802.11e called Enhanced Distributed Channel Access (EDCA).In this case when there is bulk of transfer in multimedia traffic EDCA will set channel access priority . "Another version EDCA Unscheduled Automatic Power Save Delivery (UAPSD) which is suitable when exchange traffic is duplex such as VoIP". [4]

Modified Power saving Mechanism

A significant number of studies have done to improve the default behaviour of Power Saving Mechanism. Researcher tries to maximize utilization of inactive period in between data packets to put the Wi-Fi interface in sleep mode without acquiring excessive delay. µPSM tries to take the benefit of small duration between the retransmission of a frame. Although, these solutions are not that much appropriate with multimedia streaming applications since such small idle periods are difficult to measure while exchange of data is very high.

Contention-free Wi-Fi scheduling

When Wi-Fi access points are getting deployed heavily it is very difficult to avoid energy waste due to interference and channel contention. Many solutions suggested to reserve a time slot for each individual connected client [3,4]. All clients have given a reserved time slot for contention free transmission with other clients. These types of novel solutions are very common and thus appropriate to decrease energy consumption for any type of traffic and thus video streaming. These time slicing technique need to update power saving mode and consequently which need to update at both the ends .i.e. client device and the AP which makes them difficult to deploy in practice.

Cellular Network Access (3GPP Standards)

In cellular network interface (3G or LTE) Radio Resource Control protocol is used for state transition and power management of smart.

HSPA/3G

In case of 3G, the Radio Resource Control has four states [16]. The states are CELL_DCH, CELL_FACH, CELL_PCH, IDLE. Every state consists of current consumption state, transitions, inactivity timers. In CELL_DCH state, for optimization of throughput latency a dedicated data channel is assign to mobile device. In CELL_FACH state the channel is used for sharing purpose among the mobile device since it has less data capacity. In CELL_PCH state enables to page a mobile device. IDLE state disconnect from RRC. There is no standard fixed value is given to inactivity time generally operators take the values in some range in seconds. In these inactivity periods, there is no exchange of data and the energy spent is called as tail energy [16, 17]. However, "modern smart phones try to avoid long tail energy using a modified standard called Fast Dormancy (FD) with an inactivity timer of 3-5 seconds [4]. FD enables a mobile device directly to switch from CELL_DCH to CELL_PCH or IDLE state depending on the standard implemented in the smart phone and whether network supports CELL_PCH or not".

LTE

LTE RRC protocol has of only two states: RRC_IDLE and RRC_CONNECTED. In this case there is a RRC inactivity timer which responsible to control the transition from connected to the idle state. "In LTE to enable low power state in mobile device the discontinuous transmission and reception denoted by DTX/DRX. Connected DRX state is known cDRX. The transition of one state to another .i.e. RRC_CONNECTED to RRC_IDLE state occur when the RRC inactivity timer expires and the device enters in the paging monitoring mode"[6]. LTE work on two states it requires less signalling due to which energy consumption is less.

Another way to save the energy by changing or configuring Network parameters in Cellular Networks. Numerous works and solutions are present in this scheme but they were not much energy efficient unless some higher layer solution also being to be consider.

Cross Layer Approaches

Large Number of energy efficient schemes works rigorously above the link layer. Two main concepts being used at this layer one is multimedia traffic shaping or scheduling a Majority of researcher give the alternate

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solution to the states of the wireless network interface at the client which include multimedia traffic management at the server, proxy or at the client.

Client centric

Mostly the client centric solution based on buffer adaptive method that work on idle period mechanism and traffic prediction that find the idle time period between packet . Generally the client centric solutions use buffer adaptive mechanisms to generate idle periods and traffic prediction mechanisms to identify idle periods between packets. Then they entrust on standard power saving mechanisms or implement their own mechanisms to work out the Wireless Network Interface into sleep state during those idle periods to reduce the energy consumption. Following are the few solution apply by the other technique to handle the client server traffic [3]:

1. **Playback Buffer Management**
   Multimedia services always load a huge amount of the player's playback buffer at the beginning of a streaming session to bear bandwidth fluctuations. A number of solutions use this playback buffer information to reduce the energy consumption there are many solutions provided like fuzzy adaptive approach, Self-Tuning Power Management (STPM).
2. **Traffic Prediction**
   Another known technique is to forecast the arrival time of the arriving traffic. This technique has been widely used to model the energy consumption of wireless network interfaces and to manipulate the Wireless Network Interface to save energy.
3. **Exploiting TCP Flow Control**
   There are also solutions which deal with the TCP flow control that make use of transport protocol property to produce busty traffic via uninterrupted data transmission.
4. **Scheduling Traffic**
   Mobile systems have a number of multiple high speed wireless interface. Another solution is to Schedule traffic among Multiple Wireless Interfaces.

Proxy or AP Assisted Solutions

In proxy assisted solution researcher applied number of their techniques in proxy servers, in a Wi-Fi AP or in the cellular network. In this solution playback buffer status will be estimated at the client side and then the solution like traffic shaping or scheduling implemented at the intermediate layer.

Server-Assisted Solutions

Instead of providing solution at client or proxy level some researcher provides solution at server side .i.e. server assisted solution. In a this solution, a server uses supplementary buffer such as AB-PSM and add shape traffic into periodic bursts in it[4]. "Server sent data stored into secondary buffer. During this period, a streaming client can keep its Wireless Network Interface into sleep state. When the secondary buffer is filled, the data is sent to the client in a single burst. After, ABPSM was upgraded to a system wide solution in which the server would also select the bit rate, the client would adjust brightness and volume level according to the present battery level" [6]. There are different methods which a client exclusively request the server to transmit busty traffic or a server instruct the client to switch on/off the wireless interface.

Application layer Mechanisms

As we discussed in previous section the energy efficient technique do not make changes in multimedia content but in application layer mechanism apply content adaptation to improve battery life. The main aim of content adaptation is to provide mobile devices with different computation mechanism or their display properties. The main concern in this layer is to provide efficient energy decoding scheme considering quality of video and battery life. Few techniques are as below:

- **Scalable Video Coding**
  Scalable Video Coding (SVC) "It has the ability to code a single video stream by using the multiple bit rate transmission channel by organizing the compressed data of video bit streams into layered form. So it is also called as layered video coding. It has base layer which deal with the lowest bit rate stream having the minimum quality, frame rate and spatial resolution. The enhancement layers use to increase the quality of the stream by increasing the frame rate and spatial resolution. This technique has capability to reduce network traffic and computational complexity at the mobile devices, due to which power consumption is reduced" [24].
- **Content Selection**
  Another form of adaptive streaming is Content selection that deals with network and device diversity. "Content based selection of multimedia play a vital role to improve the battery other than display size, bandwidth" [20]. Although, for handling content selection require multiple copies of the same stream are need more recourses, which is overhead.
- **HTTP Rate Adaptive Streaming**
  In HTTP Rate Adaptive Streaming case, service provider divides a transmitting video file into a number of chunks. This chunk is applied on the files of every video quality. There are a numerous of rate adaptive multimedia frame are available , such as "HTTP Live Streaming" [19], smooth streaming, and Adobe's adaptive streaming etc .

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- **Media Transcoding**

  Another way to deal with network bandwidth and device diversity for multimedia streaming is transcoding .In this case server contain only one copy of stream and data or content generated as per the need or request of client or receiving end. This mechanism drastically reduces the energy consumption at client side but it require complex computation power which may sometime energy hungry so it is only recommended for mobile device like laptop not for smart phone.

Table.3: Comparative Analysis of Power Consumption in Various Approach

Adaptation Approaches	Wireless Networks	Energy Savings
SVC[2]	Wi-Fi	50%
Content based selection[3]	Wi-Fi	16%
Transcoding[3]	Wi-Fi	75%

IV. COMPARATIVE ANALYSIS OF VIDEO STREAMING AND ENERGY CONSUMPTION ISSUE

In previous section we discussed on internet protocol stack and the energy consumption issues. From the survey it is found that selection of any technique does not depend on wireless interface or network it depends on the player, the video service provider, video quality, and device .in study it was found that video service use streaming tecInique vary from device to device and also depend on container used . The table 4 below shows the Streaming techniques for popular video streaming services to mobile phones of three major platforms.

Table.4: Study of Energy Consumption Issue of Video Streaming On Various Parameters

	Android Devices	**Microsoft Devices**	**Apple Devices**	**Energy Consumption Issue**
Streaming Technique	On-Off (HTML5&app),Throttling ,Bitrate (Flash)	DASH ,Bitrate,(flash) Fast Caching(app)	DASH (app), Throttling	Energy Consumption in decreasing order DASH <On-Off < Throttling < Bitrate
Quality	HD 1080p	HD 1080p	HD 1100p	Most of the case Power consumption Increase as we improve the Quality
Container	3GPP , MPEG-4, MPEG-2 TS	Silverlight	Flash or the FLV container , MP4 container , M2TS container (for Apple HTTP Live Streaming)	Depend on the Quality like 240p 3gpp video requires less energy than that of an x-flv video ,240p x-flv requires more current than a 720p mp4
Streaming Services	Youtube, Daly Motion, Vimeo	YouTube, Daly Motion, Netflix, Vimeo	Youtube, Daly Motion, Amazon Instant ,Netflix	Depend on various characteristics of environment
Video Player	Flash , HTML5 Native application	Flash , HTML5 Native application	Flash , HTML5 Native application	Native (less energy consumption) Flash player (consume significant amount of energy) HTML5 (Consume more energy)

Table 5 shows the layer wise energy saving solution provided by different researcher.

Table.5: The Layer Wise Energy Saving Solution on Different Research Solution

Internet Protocol Stack	**Solution**	**Energy saving**
Physical layer	Dynamic Modulation Scaling (DMS), Quadrature Amplitude Modulation (QAM), Frequency Shift Keying (FSK)	Dependent on transmission distance
Link layer[LL]	PSM	82%
	PSM-A	2%
	µPM	30%
Cross layer	STPM [20]	25%

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	PSM- Throttling	70%
	buffer adaptive [20]	**70%**
	buffer adaptive [21]	31-97%
	history based prediction mechanism [[22]	70%
	CoolSpots [23]	40%
Application layer	Scalable Video Coding ,	50%
	Content based selection	16%
	Transcoding	75%

V. CONCLUSION

In the study we investigated how video streaming effect the power consumption at different layers of the Internet protocol stack, as well as various endpoint of communication path. The researcher gave various solutions to reduce the energy consumption like at physical and link layer solutions in general that is depending on accessing technology. Most of solutions target only multimedia streaming applications. The higher layer solutions, such as traffic scheduling and traffic shaping, can be used. Another way is predict history based traffic and user behaviour, which can be easily implemented in mobile devices. Mobile device vendor or application developer handle the client-centric solution directly. But traffic shaping and scheduling are implemented at the server side or in a proxy. While at Application layer mechanism the energy efficient technique do not make changes in multimedia content but in application layer mechanism apply content adaptation to improve battery life. This will definitely decrease the overhead of sever and network. In study, we also identifies that which feature influence to select the streaming technique Also studied and compare the effect of video qualities, video containers, players, and display types on playback energy consumption on various devices so that selection of streaming technique as per device can be done

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Sustainable Development in Chennai's Construction Industry-An Agenda for the Future

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Abstract— *Sustainable construction is the process for the building and infrastructure to move ahead towards gaining sustainable improvement, taking into consideration on the environmental, socioeconomic and cultural issues. This study presents the construction scenario of Chennai and the development in sustainable construction taking place in the city. It is known that changes in the behaviour of individuals, institutions and organizations are a prerequisite for sustainable development. Sustainable development has been considered as an important issue in the construction industry. The purpose of this study is to investigate and suggest the factors motivating sustainability development in the construction firms. The development that meet the needs of the present without compromising the ability of the future generation to meet their own needs. The factors affecting the implementation of sustainable and the future solution for successful implementation of are discussed. In the conclusion the status of sustainable construction in Chennai is still in its early period. This framework enables all construction companies in Chennai to assess the project sustainability performance in a consistent and acceptable way, thus showing progress through cooperation among all stake holders and real estate development & promoters to attain satisfactory project sustainability performance.*

Keywords — Sustainable Development, criticality index, sustainability performance, agenda for the future.

I. INTRODUCTION

Sustainable construction is a natural common sense, not just an economic solution, Chennai's economic solution and development can be stated by which before people used air conditioners, houses were built in a certain way to provide shade.

The inspiration for sustainable construction in extracted from history and the past green building is one of the most important pillars of green architecture, which enables a leap in sustainable development.The avenue of sustainability is a balance between rights, the environment and economy. Construction industry owners are in eager and getting enthusiastic to get themselves engage in sustainable development practices that will support the government interact to provide adequate & affordable housing solution for all Chennai people. The ultimate aim is to build safe communities capable of withstanding factors such as the effects of climate change. The sustainable housing development as the provision that is in harmony with the environment "cannot build on every given space that is available". Rural development is critical for an integrated approach to sustainability and for reducing poverty. Ensuring wides and inclusive access to public services can reduce rural/urban inequalities, disaster risk and food insecurity, as well as strengthen networks between cities and villages. Building sustainable cities requires investment in renewable energy sources, efficiency in the use of water and electricity, design and implementation of compact cities, retrofitting of buildings and increase of green areas, fact reliable and affordable public transportation and improved waste and recycling system. Cities in poor countries used to support green technology, development has come with a cost on environment and we need to move on with a sustainable life style for the future and next generation.

1.1 PRESENT SCENARIO

The construction sector transparency initiative cost estimates that upwards of 4 million is annually cost through mismanagement, inefficiency and corruption in public infrastructures on average 10 - 30 % of project values. The reason is corruption, a key element in economic underperformance and major obstacle to poverty alleviation and development. The evil phenomenon is found in all countries big and small rich and poor but it is in the developing world that its effects are most destructive. The construction industry now is in the epicentre of world's biggest fight against corruption.

1.2 NEED FOR THE STUDY

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The challenge is about ensuring sustainable development while taking advantage of economic growth that results from rapid urbanisation in the country. For long urbanization has been looked at from the limited perspective of providing basic services. But our contemporary response shall be wide ranging aiming at serving larger macro-economic transformation goals together with meeting local priorities. We need to go for a big push to harness fully the potential of urbanization. High carbon structures – around 1500 coal plants are estimated to already be in construction worldwide, which would lead towards disastrous environment changes. It says that green energy infrastructure will reduce air pollution and provide greater access to energy for people in developing countries not connected to coal fired power grids. The construction sector contributes to about 22%of india's total annual co2 emissions. HUMAN FACTORS - Negative impact on the construction – we're building up and not out, we're using less land and heating denser neighbourhood. Another issue rising is the shortage of land serviced with sewers, water and roads, and ready to build up on. Lack of serviced land restricts the creation of new housing, especially ground related homes, which is dramatically below historic norms. Escalating land pricing are making it more difficult for first time buyers to purchase homes. The act of rising government fees , a large part of which are development charges imposed by local municipalities paid by new home owners, these fees are a means to help offset the capital costs of growth related municipal services such as roads and sewers, parks and recreation and transit.

1.3 AIM & PERSECTIVE

The study aims to look how sustainable construction planning practices can be applied to cities in theory and practice to increase efficiency of land use in relation to transportation systems. The study of this paper is mainly based on literature review of sustainable construction projects and a solution for pushing the industry forward.

1.4 MATERIAL

The study is primarily based on literature studies and scientific reports on sustainable construction. The main sources used for the practical part of the paper are from official website from the city of Chennai.

II. LITERATURE REVIEW

(i) THE IMPACT OF GOVERNMENT'S POILICY ON CONTRACTORS & DEVELOPERS AND PROMOTERS

It is clear that the tamil nadu government is in a different position for framing to have taken the step of instructing authorities to freeze new projects until the top priorities and the sources of financing have been established. The government acutely focusses its efforts on supporting channai contractors. The contractors made a clear confession that they trust the government so it will set clear goals and adopt the right strategies to effectively cushion the impact of this drastic step in Tamilnadu builders association. The members of the association made a clear decisive on that the derivative to the tender board, that no new tenders be awarded by government authorities until the 20/7/18 budget review and the reprioritization of capital projects have been finalised that feasibility studies for capital project to be put on hold. The government is facing budgetary constraints for a number of reasons, which are further aggravated by unforeseeable changes of macro-economic conditions and climatic conditions that increase burden on government funds. The government has also noted that the contractors have ample capacity to develop the much needed infrastructure in the country, and is adamant that local contractor under current circumstances.

(ii) CASHFLOW MANAGEMENT

For effective cash flow management it is critical that government commits itself into a realistic time frame for paying all outstanding debt, as well as payment of future invoices of current projects. This will provide a degree of confidence which is very important for the stabilization of our industry.

(iii) PUSHING THE CONSTRUCTION INDUSTRY FORWARD

By not withstanding any resistance from the construction industry new anti-corruption rules should be created and made stricter in response to the social pressure that arises. Two principles should coincide the action of the construction industry (i) greater transparency in the construction industry's relationship with government and the public sector, (ii) better governance of public investment, or those financed by public funds given the needs to improve their quality and the impact on the population well-being.

III. GUIDING FACTORS FOR SUSTAINABLE BUILT ENVIRONMENT

(i) THE LONG TIME GOAL

Each company must take all reasonable steps to minimise any detrimental impacts its operations may have on the environment and to promote good environment practice.

(ii) PLANNING AND EXECUTION

Ambition without direction is pointless. The company need to embed the environment within our building designs that should be company's direction. The starting point in that every single environment should be met,

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unless we justify that a particular requirement in non-viable.

(iii) BUDGET EVALUATION AND ITS BENEFITS –

The company giving a project a green light should come down to the "evaluation of benefits". But these are often some hidden or unintended – consequences to consider. Every responsible that the company takes needs to stand up on its own access a cost benefit point of view.

(iv) BUSINESS FROM RISK TO PLIABILITY In terms of carbon emission c company should not only improve the regularity landscape, but also the climate proofing should be done. The company need to do a lot more to measure the costs and risks associated with environmental impacts such as flooding and heatwaves. Not only will the ongoing rise in "hottest months" add to ventilation costs and also the flooding can impact sales as well as damaging buildings. The company can also price how much this cost in terms of loss of trade and repair, and then use that value to decide how much they need to invest in reduction.

(v) INTERNAL ALLIANCE

It is claimed that projects are rarely constructed in silo, but rather the people involved would speed across different management areas. This adds the complexity of different teams arriving for different objectives to deliver against different company. It's important to embed sustainability and it removes the chances of variation and uncertainty as each person involved on a project understands what their responsibilities are and how they can influence it.

(vi) EXTERNAL ALLIANCE

Despite the current uncertainty shrouding built environment policies, the owner should constantly be working with government department, membership's bodies and trade associations in an attempt to "steer policies". The owners should collaborate to create a better result in driving sustainable change.

(vii) REVOLUTION IS THE DRIVER

Technology such as lighting and refrigeration in enabling retailers to "stay ahead of the curve" in regards to enhancing the efficiency. We're sitting at the juncture now where date is beginning to transform how we design build and operate.

Building maintenance and operations often an overlooked but crucial part of buildings lifecycle- can tract several data sets such as air quality, lighting, utility data, leasing data, thermal comfort, HVAC, weather, waste and recycling, severity and occupancy. Gathering this kind of information and used effectively, smarter because decisions and if gathered and energy costs in rights gained from building data can reduce energy costs. It's more than automated data collection, and driving innovation and social sensitivity into the built environment. The companies looking to implement new technologies for data tracking to make sure they use a user-friendly approach. Firms should ensure that social and environment responsibility

are core values, as they can make business more competitive.

IV. AGENDA FOR THE FURURE

Stating that cities used to be made efficient, productive, inclusive safe and sustainable, the future plan for the next two decades proposed in the national report will be ensuring economic growth and productivity, improving quality of life and importantly, addressing issues of inductivity, sustainability and climate change. Elaborating on the strategy for transforming urban India, it is believed that it will be achieved through elimination of barriers to the flow of factor of production like capital land, labour development of rural and urban areas in a synergic manner adopting a "regional planning approach" promoting inclusivity by ensuring urban services to all sustainable urban planning, empowering municipalities to improve governance and deal with exclusion issues, housing for all urban poor and ensuring social justice gender equity.

INFLUENTIAL FACTORS FOR BUILDING UP A SUSTAINABLE CITY/ENVIRONMENT

The home building in Chennai construction industry strives to build complete communities where residents can live, work and play. The goal is to create self-sustaining neighbourhood that are environmentally responsible, affordable and meet the housing needs of the 100,000 new residents who arrive in Chennai each year.

(i) CHALLENGING FACTORS

For creating a sustainable environment its becoming more and more difficult to create thriving and sustainable communities because of a series of growing challenges, multi layered government policies, complex regularity frameworks and length approval timelines, escalating land prices, constraints on land supply and growing construction and labour costs are some of the factors that stops reducing our ability to build complete and affordable communities. All the contractors know the importance of being environmentally responsible and employ components such as well-planned green spaces and innovative storm mate's management. These components add to the cost of buildings and it is

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important to alance the choices we make with costs so to not overly impact affordability.

(ii) KEEPERS OF ENVIRONMENT

It's a challenge for the engineers & promoters and developers to play their part to safeguard the environment by instituting remedial measures & safety policies against factors with potentially negative impact for the country. By utilizing alternative sustainable technologies for example construction engineers can mitigate poor pollution and waste water treatment practices and other threats in equality of our environment. These will result in ensuring that housing development are in harmony with natural environment, discourage development in areas prove to natural hazards, and here possible, relocate that already exist; and promote imitativeness supporting environmentally friendly developments, such as the establishment of systems that facilitate proper waste and sewage disposal.

(iii) METHODS TO IMPROVESUSTAINABLE CONSTRUCTION

In the recent past years, the construction industry showed their sustainability efforts through recycling construction and demolition materials, using recycled materials in construction & creating water heat and energy efficient system.

(iv) LEADERSHIP IN ENERGY AND ENVIRONMENTALDESIGN (LEED RATING SYSTEM)

The green building rating system that guides the design, construction operation and maintenance of both new and old building towards sustainability interior construction and renovation.

(v) PROVIDING AN EDUCATION CENTER

The education will remain as a backbone of development – realizing that we cannot transform one world and achieve the other SDG'S – without ensuring that every citizen develops the skill sets needed to pursue sustainable development at an individual connectivity and societal level. The study says more than 60% of the world's greenhouse gases are associated with ageing power plant, roads, buildings, sanitations and other structures.

(vi) REAL ESTATE AS A TOOL FOR DEVELOPMENT

Several stake holders in the real estate say planning is critical if the government is to capitalise on the tremendous opportunities the sector provides for helping to create sustainable economic growth. Real estate can be a pillar of economic growth if we apply planning as an overall objective or strategy.

(vii) CHANGING THE PUBLIC PROCUREMENT SYSTEM

Sustainable public procurement should be a common as an investment process that takes into account the economic, environmental and social impacts of the public spending. Bids should be preceded by appropriate technical studies and engineering projects sums up to a satisfactory level for each type of project. With proper studies public officials would be able to prepare adequate risk amendments and make timely adaptation to projects before any major problems arise public and private owners should envoy innovation and alternative solutions by using performance based specification where appropriate leading to immense efficiency in design, tendering, project management, sppedy resolution of complex design and production problems, less reworking and a lower cost finished product, and improved delivery and environmentally responsible buildings or infrastructures.

(viii) THE CHALLENGE FOR TRANSPARENCY

The process for awarding contracts must be open, clean and defensible and all parties must not engage in collision, hidden commissions and other anti-competitive behaviour.

(ix) GOOD GOVERNANCE

The commitment to better governance should be assured not only by the private sector, but also by the public sector, to ensure that first, planning investment and allocations of funds are consistent with the aim of providing high quality services to the population and a competitive infrastructure for the production sector. No construction work should take place unless the relevant parties have carried out economic, geotechnical & financial feasibility studies, based on a set of plans (from concept to execution), thus ensuring the adequate and cost effective funding sorely lacking in the current system.

(x) FAVOURABLE RESULTS OF THE AGENDA

The outcomes of the new agenda based on sustainable urban planning would include reducing water and electricity use by 50% from that normal use, enabling over 60% of urban travel by public transport, generating half of power from renewable sources, promoting walking and cycling for last mile connectivity, compact and cluster urban development, promoting natural drainage patterns, reducing waste generation of all kind, promoting greenery and public places.

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V. RESEARCH METHODOLOGY

The sample of this study was determined using simple random sampling technique. This type of sample is most suitable where every element in the population has a known and equal chance of being selected as a subject. In other word, each single of element in the list has the same or equal probability of being chosen.

The quantitative research was carried out and the main respondents were the Malaysia's local construction stakeholders. Previous researchers who carried out research in the sustainable development assessment frameworks suggested that the following stakeholders are crucial in attaining construction sustainability which include the Consultants (architects, quantity surveyors and engineers), Contractors (manifesting the design into reality), and the Clients (the ones who drive the sustainability needs of the projects). The numbers of questionnaires received were 94. However, only 88 questionnaires were usable out of the total responds.

DATA ANALYSIS

The level of sustainability performance in Malaysian construction industry is presented in Tables 1.2 and 1.3 below. Each table represent each category of factors which include the financial sustainability and non financial sustainability rated on a scale of 1 to 4. The most agreed for each factor was scored on a scale of 1 to 4 with 1 having the least agreed and 4 having the most agreed. To identify the criticality index for each factor, the factor criticality was defined as in the Table 1.1 below.

Financial Sustainability Performance

The highest mean score for financial sustainability for the whole data set as perceived by the construction stakeholders is 3.2045 where the respondents believed that most of their projects had improved the used of local resources. The minimum scores are 3.0227 where the respondents believed that most of their projects are adaptable within the minimum cost. In term of critically index, all of the items can be categorized at moderate level. Overall mean for the whole data set is 3.1105, which could be considered at moderate level.

Non - Financial Sustainability Performance

The highest mean score for non-financial sustainability performance for the whole data set as perceived by the construction stakeholders was 3.1136 where the respondents believed that most of their project had optimize the land consumption.

The minimum scores were 2.8523 where the respondents believed that most of their project had reduced the greenhouse emissions. In term of critically index, only 2 items be categorized at moderate level. Overall mean for the whole data set is 2.9756 which could be considered at mild level.

Table.1.1: Criticality Assessment Criteria

Mean Factor Score Range	***Criticality Index***	***Criticality Level***
< 2.0	1	Least Agreed
>2.0 – 3.0	2	Mildly Agreed
>3.0 - 3.5	3	Moderately Agreed
>3.5 - 4.0	4	Mostly Agreed

Table.1.2: Mean Analysis for Financial Sustainability Performance

Mean Factor Score Range	***Criticality Index***	***Items***
3.1477	3	Most of our projects are cost effective over time
3.0227	3	Most of our projects are adaptable with minimum cost
3.1519	3	Most of our projects are affordable to apply
3.2045	3	Most of our projects had improved the use of local resources.
3.0568	3	Most of our projects are energy efficient
3.0795	3	Most of our projects are material efficient

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Table.1.3: Mean Analysis for Non-Financial Sustainability Performance

Mean Factor Score Range	Criticality Index	Items
2.8523	2	Most of our projects had reduce greenhouse gas emissions
2.9659	2	Most of our projects had improved the waste management process.
2.8977	2	Most of our projects had improved the use of recycle and reuse resources
3.0455	3	Most of our projects had minimize the pollution (noise, water)
3.1136	3	Most of our projects had optimize the
2.9886	2	Most of our projects protect and enhanced biodiversity

VI. CONCLUSION

General objective was met through the accomplishments of the research. More importantly, the current level of sustainability performances were identified among the Chennai construction stakeholders. The result of this study shows that the performance of financial sustainability is better than non-financial sustainability. From the financial sustainability performances aspect, this study found that all the items can be classified at moderate level. However, for the non-financial sustainability performance aspect, it can be classified at the mild level. Due to the current environment of Chennai's construction industry, a few initiatives need to be taken to improve the current practices. These Initiatives include:

a. Improved process; the waste management
b. Improved the use of recycle and reuse resources;
c. Improved the protection enhancement of biodiversity and;
d. Reduce transportation dependency.

As mentioned earlier, to increase the consideration of sustainability, the construction stakeholders must be willing to change their attitudes and culture in exploring new territory and willing to adopt new ideas and practices especially regarding the environmental issues.

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Design of Low Power Data Preserving Flip Flop Using MTCMOS Technique

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Abstract— *In order to reduce overall power consumption, a well-known technique is to scale supply voltages. However, to maintain performance, device threshold voltages must scale as well, which will cause sub threshold leakage currents to increase exponentially. The sub threshold voltage has to affect the two parameters one is the delay and other one is the sub threshold leakage current. Smaller the threshold voltage smaller will be delay while larger will be the sub threshold current. Controlling sub threshold leakage has been explored significantly in the literature, especially in the context of reducing leakage currents in burst mode type circuits, where the system spends the majority of the time in an idle standby, or sleep, state where no computation is taking place. MTCMOS or multi-threshold CMOS has been proposed as a very effective technique for reducing leakage currents during the standby by state by utilizing high sleep devices to gate the power supplies of a low logic block. Although MTCMOS circuit techniques are effective for controlling leakage currents in combinational logic, a drawback is that it can cause internal nodes to float, and cannot be directly used in standard memory cells without corrupting stored data. As a result, several researchers have explored possible MTCMOS latch designs that can reduce leakage currents yet maintain state during the standby modes.*

In this work a data preserving flip flop with reduced leakage power is designed using MTCMOS technique in 90nm technology with the help of CADENCE tool. The simulation results have shown that the leakage power is reduced by 25.70% compared to CMOS flip flop.

Keywords--Combinational crcuit, flipflop, Leakage power, MTCMOS technique, Sub threshold leakage current.

I. INTRODUCTION

Low power circuit operation is becoming an increasingly important metric for future integrated circuits. As portable battery powered devices such as cell phones, pagers and portable computers become more complex and prevalent; the demand for increased battery life will require designers to seek out new technologies and circuit techniques to maintain high performance and long operational lifetimes.

In modern digital CMOS integrated circuits, power consumption can be attributed to three different components: short circuit, leakage, and dynamic switching power. In modern high performance integrated circuits, more than 40% of the total active mode energy can be dissipated due to the leakage currents. As we are going from one technology generation to the next technology generation, the leakage power component is increasing and in 70 nanometer technology, the leakage power dissipation has overtaken the dynamic power. With more transistors integrated on die, leakage currents will soon dominate the total energy consumption of high performance ICs. The sub threshold leakage current is one of the most dominant leakage current components. It is the drain to source leakage current when the transistor is off, i.e., the applied voltage is less than the threshold voltage.

II. MOTIVATION

High power consumption leads to reduction in the battery life in the case of battery-powered applications and affects reliability, packaging, and cooling costs. So in this presentation we are tried to reduce the leakage power which is the one of the major component in the power considerations.by referring the so many papers from IEEE and from various text books .We use the technique called MTCMOS technique which reduces leakage power in CMOS gate. We applied the same technique to Flip Flop.

III. LEAKAGE POWER CONSUMPTION

The leakage power consumption, consists of two kinds of leakage currents i) the reverse-bias diode leakage at the transistor drains and ii) the sub-threshold current through an turned-off transistor channel. However, these components are technologically-controlled and thus, the designer has a few things to do about their minimization .Diode leakage occurs when a transistor is turned-off, the other ON transistor charges up/down the drain with the respect to the forme's substrate potential. The PMOS transistor with negative bias of gate with respect to substrate. So, the diode

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composed by drain diffusion and substrate is reversely-biased.

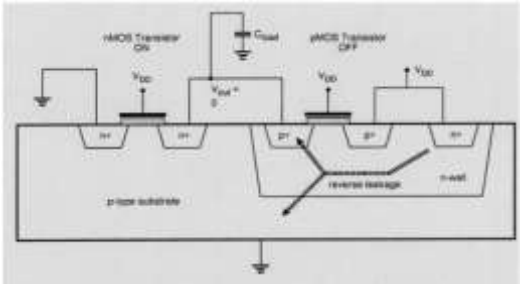

Fig 1: Reverse leakage current path in CMOS inverter

3.1 MTCMOS TECHNIQUE

Multi-threshold CMOS (MTCMOS), which is also known as power/ground gating, is the most commonly used leakage power suppression technique in state-of-the-art integrated circuits. Significant power and ground distribution network noise is produced when an MTCMOS circuit blocks transitions from SLEEP mode to ACTIVE mode. The reliability of the surrounding active circuit blocks is seriously degraded. Power and ground distribution network noise that is produced during mode transitions is the most important reliability concern in MTCMOS circuits. A variety of mode transition noise mitigation techniques that are applicable to MTCMOS circuits are investigated in this dissertation. Novel MTCMOS memory circuits with enhanced speed and suppressed leakage power consumption are proposed in this dissertation.

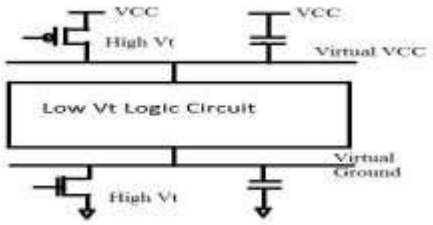

Fig 2: MTCMOS circuit structure showing both polarity sleep devices.

3.2 Data loss in memory elements

The MTCMOS idea is straightforward for combinational logic but there are difficulties with sequential circuits. If the power supply is simply gated during sleep mode, the state of the circuit is loss and cannot be recovered when returning to active mode . The retrieval of the previously stored data for restoring a system to a pre sleep state costs significant energy and timing overheads when the MTCMOS sequential circuits are activated .The sudden surge current also exists in floating node and might violate the reliability of the circuit. One of the problems with sequential circuits that utilize feedback and parallel devices is that sneak leakage paths may exist. Sneak leakage path can arise in MTCMOS circuits whenever the output of an MTCMOS gate is electrically connected to the output of a CMOS gate. In fact, the interfacing between MTCMOS type circuits and CMOS type circuits is what gives rise to potential leakage paths.

IV. MTCMOS BASED FLIP FLOP

A number of methodologies have been reported in the literature to solve the issues that affect the performance of the MTCMOS circuit. Several MTCMOS techniques based on charge recycling between the virtual rails and the sleep signal lines are presented in for suppressing the energy overhead of mode transitions. These techniques require complicated timing control circuitry to enable charge recycling during the mode transitions. These techniques also significantly increase the system wake-up delay, thereby degrading the system performance. In both gated and gated ground techniques are employed in a charge recycling MTCMOS circuit. A pass transistor is placed between the virtual power and virtual ground to allow charge recycling. Another proposed technique is employed a pass transistor for charge recycling between virtual rails and sleep signal lines. The sleep transistor is driven by a tri-state buffer and a high- pass transistor is allowed charge recycling between virtual rail and sleep signal. Sequential MTCMOS circuits require more care since they must hold state in standby mode. The previously published MTCMOS flip flop.

4.1 5Transistor D- Flip Flop using MTCMOS

A Flip Flop is a circuit that has two stable states and can be used to store state information. Different type of Flip Flops signifies the way in which binary information enters a flip-flop, binary state maintained by a flipflop circuit indefinitely(as long as power power is delivered to the circuit) until directed by an input signal to switch states.TSPC stands for True Single Phased Clocked logic in which we only have one clock and do not need an inverted clock.there are several benefits with this technique such as the elimination of skew due to different clock phases and clock signal being separated off chip,which implies significant savings in chip area and power consumption.The below figure is showing the 5T TSPC D flipflop with MTCMOS technique.Two transistors P3 and N4 are used in the circuit.The transistor N4 is supplied with signal SL (sleep) and transistor P3 is supplied with signal SL"(complement of sleep) SL and SL" transistors are

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supplied with high threshold voltages. When SL signal is low SL‟ is high, there will be no current flow in low threshold voltage main circuit. When SL is high and SL‟ is low circuit works in normal mode.

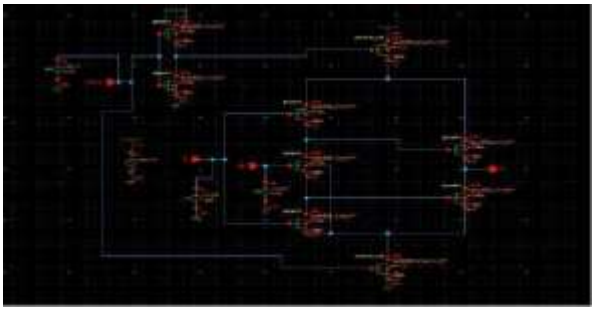

Fig.3: Schematic Diagram of 5T Flip Flop

The output waveform of the flip flop is shown below:

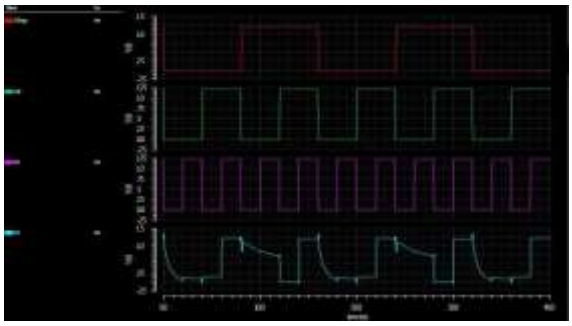

Fig 4: Transient analysis of MTCMOS based 5T Flip Flop

4.2 Problem with 5T Flip Flop

The 5 transistor D-flip flop designed using MTCMOS technique has problem during the sleep mode. The 5 transistor is working normal in the active mode while in the sleep mode the flip flop is not able to retain the data during the standby mode as the low circuit is floating during sleep mode. Therefore the flip flop circuit needs to be modified so that it can preserve data during sleep mode and there should be low leakage path in the circuit.

V. PROPOSED MTCMOS BAESD FLIP FLOP

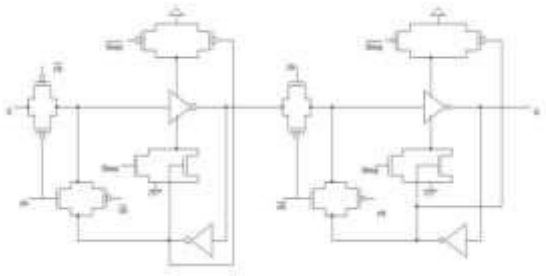

Fig 5: Proposed MTCMOS based Flip Flop

5.1 Operation of the Circuit

The proposed flip-flop utilizes parallel high Vt devices in both the master and slave stages. Both flip flops recirculate data in the master stage and provide CMOS compatible outputs, but the leakage feedback flip flop has better performance characteristics. During the active mode, the leakage feedback flip flop behaves exactly like a standard master slave flip flop, as the helper high Vt devices are only used to retain state during the standby state. When either the master or slave latch is in the holding state, the feedback path is turned on, and the stored value is recycled through cross coupled inverters. During the standby condition, data is stored in the master latch, with the clock held high .The leakage feedback gate switches the appropriate helper high device on such that the previously held data in the master stage is actively maintained.

VI. SIMULATIONS AND RESULTS

Cadence Design Systems is an American electronic design automation (EDA) software and engineering services company, founded in 1988 by the merger of SDA Systems and ECAD, Inc. The company produces software for designing integrated circuits (also known as "chips"), and printed circuit boards. Cadence tools is used to do simulations. Here we used NMOS 1v and PMOS 1v transistors are used to design the circuits.

6.1 D Flip Flop Schematic diagram

The schematic diagram of D-Flip Flop is shown in the fig 6 and transient analysis of this circuit is shown in fig 7. The sizing of the transistor is necessary to work properly of the Sleep transistor. Transient analysis has been done for 50 ns time interval. The input pulse width 2ns and period 4ns with amplitude 1.8V and 1.2V for doing the transient analysis. The pulse width of clock used is 8ns.

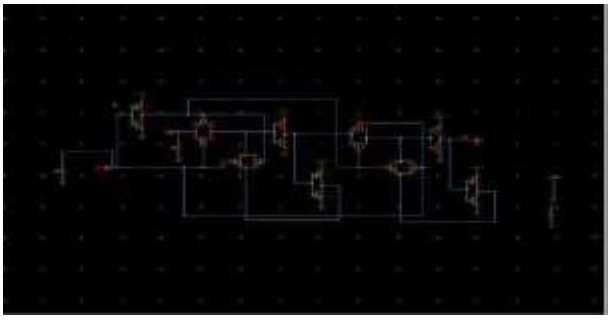

Fig.6: Schematic Diagram of D-Flip Flop

The transient analysis of the circuit is done and the output waveform is shown below. The analysis has been done for 50ns. The output is obtained at the frequency 250 MHz at a supply of 1.2V.

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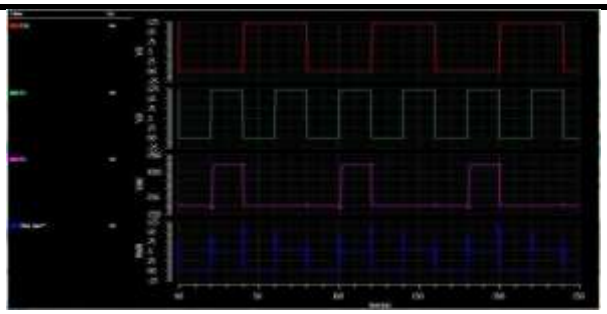

Fig 7: Transient analysis of D-Flip Flop

VII. PROPOSED MTCMOS BASED FLIP FLOP SCHEMATIC DIAGRAM

The schematic diagram of proposed MTCMOS based D-flip flop is shown in the figure 5.4 and transient analysis of this circuit is shown in fig 5.5. The sizing of the sleep transistor is necessary to work properly of the pulse generator. Transient analysis has been done for 50 ns time interval. The input pulse width 4ns and period 4ns with amplitude 1.8V for doing the transient analysis. The input pulse width for the sleep signal is taken as 8ns with period of 16ns.

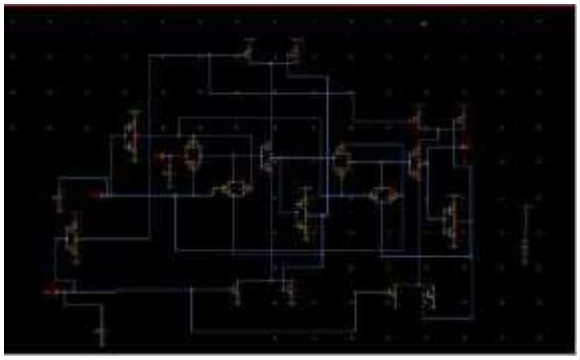

Fig.8: Schematic of MTCMOS based Flip Flop

The transient analysis of the MTCMOS based flip flop is done and the output waveform is shown below at a frequency of 250 MHz

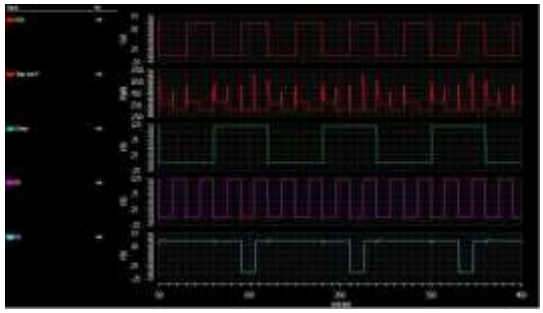

Fig.9: Transient Response of MTCMOS based Flip Flop

VIII. RESULT

The transient power and delay of the both the circuit is calculated at two different supply voltages. The comparison of power and delay is shown in the Table 1.

Table 1: Power and Delay comparison of Flip Flop Design

Data clock	FlipFlop	MTCMOS based flip flop	Power Saving (%)	Avg Power Saving (%)
0 0	188.28 E-9	112.40 E-9	40.30	25.70
0 1	215.32 E-9	173.30 E-9	19.52	
1 0	164.2 E-9	122.80 E-9	25.21	
1 1	200.98 E-9	165.20 E-9	17.80	

The leakage power comparisons in standby mode of various flip-flop is summarized in table II. We applied four test patterns(0,0), (0,1) ,(1,0) and (1,1) by changing clock and data.The leakage power is calculated while keeping the sleep transistors in off state. Since the sleep transistor is off the low Vth circuit is floating as a result the leakage power is minimized. The comparison of leakage power of both the circuit is shown in the Table 2.

Table.2: Leakage Power Comparison in standby mode (nw)

Data clock	FlipFlop	MTCMOS based flip flop	Power Saving (%)	Average Power Saving (%)
0 0	188.28 E-9	112.40 E-9	40.30	25.70
0 1	215.32 E-9	173.30 E-9	19.52	
1 0	164.2 E-9	122.80 E-9	25.21	
1 1	200.98 E-9	165.20 E-9	17.80	

IX. CONCLUSION

With the continuous scaling of CMOS devices, leakage current is becoming a major contributor to the total power

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consumption. In current deep sub-micrometer devices with low threshold voltages, sub-threshold and gate leakage have become dominant sources of leakage. Power gating techniques have become very common in literature and in practice, and MTCMOS implementations in particular have demonstrated significant improvements in standby power consumption. The overall leakage power consumption of proposed flip flop has reduced by 25.70% on average. There is also improvement in overall power consumption as well as in speed of operation.

FUTURE SCOPE

When a conventional sequential MTCMOS circuit transitions from the sleep mode to the active mode, significant bouncing noise is produced on the power and ground distribution networks. The reliability of the surrounding active circuitry is seriously degraded. Therefore the work can be done in reducing the noise in the circuit so that the circuit performance enhances more.

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Recent Demand-Supply and Growth of Oilseeds and Edible Oil in India: an Analytical Approach

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Abstract

Oilseeds play an important role in providing a nutritionally balanced diet. These are the principal source of edible oil and protein in Indian diets. Oilseeds are boot edible oil processing industry, which are the most important industries of agriculture sector in India. India is a leading player in edible oil, with the World's largest importer from Indonesia and Malaysia and third largest consumer. India is the fourth largest oilseeds producing country in the world after Brazil 100 MT, followed by Argentina 66 MT, China 59.6 MT and India 34.6 MT during 2014-15. Oilseeds are the second main sources of protein after cereals in Indian diet. India is the consumer and importer of edible oil. India accounts for 13-15 per cent of oilseed area, 7-8 per cent of oilseeds production, 6-8 per cent of oilseeds production, 4-6 % edible oil production, 12-14 per cent of vegetable oil import and 10-12 percent of the edible oil consumption. Basically the total oilseed area occupied 28.051 million hectares which contributed production 32.75MT during 2013-14. However, the annual compound growth rate of oilseeds 0.31 % area production 3.35% and yield 3.03 % recorded during recent year (2006-07 to 2013-14) however, it was accelerated growth in area 3.70 % production 6.97% and yield 3.15 % recorded during earlier years (1986-87 to 95-96) era of setup Technology mission on oilseeds during 1986 and the negligible growth were recorded in area 0.01 % production 1.08 % and yield 1.07 % during the middle period (1996-97 to 2005-06) due the peter out effect of oilseeds mission. The demand for edible oils in India has shown a steady growth at a CAGR of 4.96% over the period from 2001 to 2015. The growth has been driven by improvement in per capita consumption, which in turn is attributable to rising income levels and improvement of living standards. However, the current per capita consumption levels of India (at 15.91 Kg/year for 2015-16) were lower than global averages (25 kg/year). Furthermore, domestic consumption of edible oil is expected to increase with enhancement in income level and population. Indian agriculture to support oilseeds production to meet the vegetable oil needs of the Indian population has been considered in the context of available sources of oil from oilseed and non-oilseed origins. India needs to produce 17.84 Mt of vegetable oils to meet the nutritional fat needs of projected population of 1685 million by 2050.

Keywords— Oilseeds, edible oil industry, demand-supply, area, production and yield.

INTRODUCTION:

India is the largest producer of oilseeds in the world and oilseed sector occupies an important position in the agricultural economy of the country. Oilseeds are among the major crops that are grown in the country apart from cereals. In terms of acreage, production and economic value, these crops are second after food grains. The edible oil industry is one of the most important industries of agriculture sector in India. India is a leading player in the industry, with the world's largest importer from Indonesia and Malaysia and third largest consumer. India is the fourth largest oilseed-producing country in the world after Brazil 100 MT, followed by Argentina 66 MT, China 59.6 MT and India 34.6 MT during 2014-15.

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Oilseeds are the main source of fat and protein after cereals in Indian diet. India is the largest consumer and importer of edible oils. India accounts for 13-15 per cent of oilseed area contributed 7-8 per cent of oilseeds production, 6-8 per cent of oilseeds production, 4-6 % edible oil production, 12-14 percent of vegetable oil imports and 10-12 percent of the edible oil consumption. Basically the total oilseed area occupied 28.051 million hectares which contributed production 32.75MT during 2013-14. With its rich agro-ecological diversity, India is ideally suited for growing all the major annual oilseed crops.

Among the nine oilseed crops grown in the country, seven are of edible oils (groundnut, rapeseed-mustard, soybean, sunflower, sesame, safflower and Niger) and two are of non-edible oils (castor and linseed). The Recent study by (Hegde et

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al, 2012) the other miner annual oilseed crops and some plantation crops contributing more than 25% of the total vegetable oil consumption in the country, the minor and TBOs have considerable oil potential which needs to be fully tapped. Oil is obtained from rice bran, cotton seed, corn, coconut and oil palm, apart from seeds of underutilized forest plants like Jatropha *(Jatropha curcas)*, Thumba oil *(Citrullaus colocyntis)* , rubber seed oil *(Ficus elastica)*, mango kernel (Mangifera indica), *Neem oil (Azadiracta indica)*, Karanj oil (*Pongami aglabra*), Mahua (*Madhuca indica)*, Kusum (*Schleichera oleosa*, Sal oil *(Shorea robusta)*, **S**imarouba *(Simarouba glauca)*, *jojoba* (*Simmondsia chinenis*), ***C****heura (Diploknema butyracea* Roxb.*)*, wild apricot *(Prunus armeniaca)* and Tung oil (*Aleurites fordii* Hemsl**.)** etc. The current level of vegetable oils production from all these sources (2.767 Mt) could be further stepped up, given their tremendous potential (> 4.4 MT) study. Indian edible industry facing several issue increasing demand, soaring import bills continuously and decreasing the domestic production of oilseeds due to lower productivity and limited adoption improved varieties and technology.

The recent scenario edible oil in India more than14 million tonnes of edible oil were imported with a total value of `64, 396.50 crore during 2014-15. In terms of volumes, crude edible oil contributes about 89% and refined oil contributes about 11% of the total import during 2014-15. The share edible oil of the 89% of imported crude edible oil, palm oil, soybean oil and sunflower oil contributes about 54%, 21% and 11%, respectively. This article analysis sources of oilseeds growth and Changing pattern area production oilseeds in different period from 1986-87 to 2014-15. Analysis demand-supply share edible oil import and solution for self-sufficiency in edible oil in future. Analyses the constraints on inputs growth like quality seeds, irrigation in recent year and growth of minimum support prices of major oilseed.

OBJECTIVES OF STUDY:

1. Analyse present scenario oilseeds crops area distribution, production and yields.
2. Analyses of growth and instability of area production and yield of major oilseeds state wise.
3. State wise share of area, production and yield of major oilseedscropswise.
4. Analysis changing pattern of area production oilseeds crops wise and state wise.
5. Analysis production, demand consumption of edible oil India in recent years.
6. Analyses the constraints of inputs growth like quality seeds, irrigation in recent year.
7. Analysis the growth of minimum support prices of major oilseeds.

RESEARCH METHODOLOGY:

For the purpose of this study, secondary time series data regarding area, production and productivity oilseed crops (both *Kharif* and *Rabi)* i.e. groundnut, rape-seed mustard, soybean, sunflower, sesame, safflower and Niger, and two non-edible oilseed i.e. castor and linseeds total oilseeds of three periods i.e. 1951-52 to 2013-14 entire period further divides two parts, before launching TMO 1951-52 to 1985-86 and after launching TMO 1986-87 to 2013-14. The annual compound growth rate and instability were analyzed all oilseed crops, however the state wise area, production, yielding changing pattern analyses after launching TMO 1986-87 to 2013-14 as per the data available . The demand - supply, availability for consumption of edible oil and import were also analyzed. The availability of input constraints and MSP of various oilseeds were also analyzed.

i. The Annual compound growth rate model for area, production and yield were estimated using the following model.

$Y = ab^t$

Where,

y = area / production/ yield of oilseed crops

a = intercept

b = regression coefficient of Y on time t

ACGR in (%) = antilog (B -1) * 100

ii. The instability was measured for different periods by estimating the co-efficient of variation of area, production and productivity as follows:

$$CV = \frac{SD}{Mean} * 100$$ Where,

C.V. = Co-efficient of variation,

S.D. = Standard Deviation

RESULT AND DISCUSSION;

1.1 Analysis scenario of oilseed situation in India:

In the agricultural economy of India, oilseeds sector plays an important role next only to food grains in terms of area, production and value. The diverse agro-ecological conditions in the country are favourable for growing all the nine annual oilseeds, which include seven edible oilseeds i.e. groundnut, rape-seed mustard, soybean, sunflower, sesame, safflower

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and Niger, and two non-edible oilseeds, viz. Castor and linseed. Apart from annual oilseeds, a wide range of other minor oil-bearing plants of plantation crops,

including in particular coconut and oil palm are cultivated in the country. In addition, substantial quantity of vegetable oils is also obtained from rice bran and cotton seed.

Oilseeds cultivation was undertaken area 11.69 million hectares contributed 5.03 million tons production and yield 430 kg per hectare during 1951-52 and further area 18.62 million hectares contributed 11.27 million tons production and yield 605 kg /ha during 1986-87 which increased to area 28 million hectares and production 32.79 million tons during 2013-14 mainly on marginal lands, of which 72% was confined to rained farming during the three decades. The oilseeds production was very high variability and co-efficient variations were recorded 31% in *Kharif* followed

24.55 percent in both season *Kharif* and Rabi recorded during 1986-87 to 2014-15. The area and production were observed highly fluctuated due to the diverse agro-ecological conditions and dependency of rain fed in the country. The total oilseeds production drastically downfall from 24.75 million during 1998-99 to 14.83 million tons during 2002-03 about 67 %, however the *Kharif* production depends on fully rain fed highly effected down fall from 15.80 million to 8.97 million tons about 76 % during above same period due to severe drought and unfavourable weather condition. The total area of oilseed less variability than the production and coefficient variation below 10 % during 1986-87 to 2014-15 (see Fig. 1).

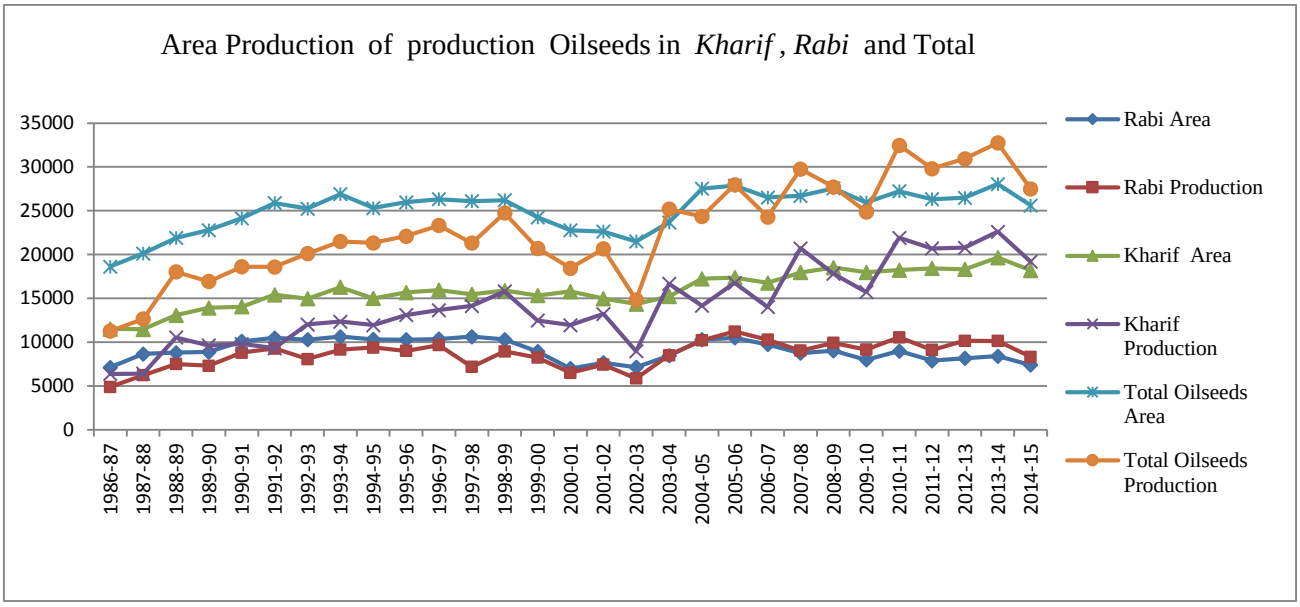

Fig.1: Area Production of production Oilseeds:

Datasource: http://eands.dacnet.nic.in/PDF/Agricultural_Statistics_At_Glance-2015.pdf

1.2 Area and production of oilseed crops:

The area oilseeds of total oilseeds increased dramatically increased 1.7 % after launching the Technology Mission on Oilseeds in 1986-87 to 2013-14 and earlier it was only 1.0% during 1951-52 to 1985-86. The highest annual compound growth rate of area soybean was recorded 7.1 followed by 3.9 in rapeseed mustard and 1.9 % castor while total oilseeds 1.7 % after launching the oilseeds mission in 1986-87 to 2013-14. Soybean was recorded first rank in increasing pattern of area from 1527 thousand hectares to 11716 thousand hectares followed rapeseed mustard are from 3719 thousand hectares to 66.46 thousand hectares and the other oilseeds crops like groundnut area was reduced from 6980 thousand hectares to 5505 thousand hectares followed by sesame from 2164 thousand hectares to 1679 thousand hectares, sunflower area were reduced due to shifted area other competing crops which would have more economic benefits during the period 1986-87 to 2013-14 (see Fig.2).

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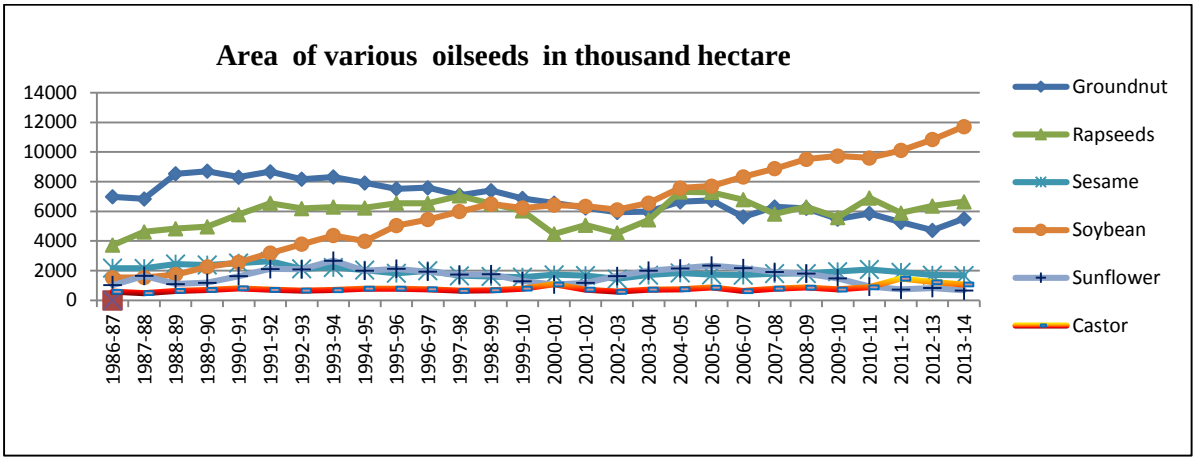

Fig.2: Area of various oilseed crops in thousand

Datasource: http://eands.dacnet.nic.in/PDF/Agricultural_Statistics_At_Glance-2015.pdf

1.3 Share of variousoilseedscrops area and production and changing pattern:

During 1951–2014, the area, production and productivity of annual oilseeds in India showed a compound annual growth rate of 1.57%, 3.01% and 1.42% respectively. Major gain in soybeaninarea as well as production came from third earlier TE 1989 to first position presently and the area increased from 7.92 % to 40.43 %, production increased 7.95 % to 4.1.44 % and the second position rape-seed–mustard area increased from 21.71%to 23.45% and production 24% to 25 % showed stable during the period TE 1989 to TE 2014. The groundnut position was first in area 36.84% to decreased 19.22 % as well as production decreased from 51 % to 22.86 % earlier during TE 1989 to TE 2014. The castor increased both area and production jumped forth position during TE 1989to TE 2014 followed by sesame and sunflower.

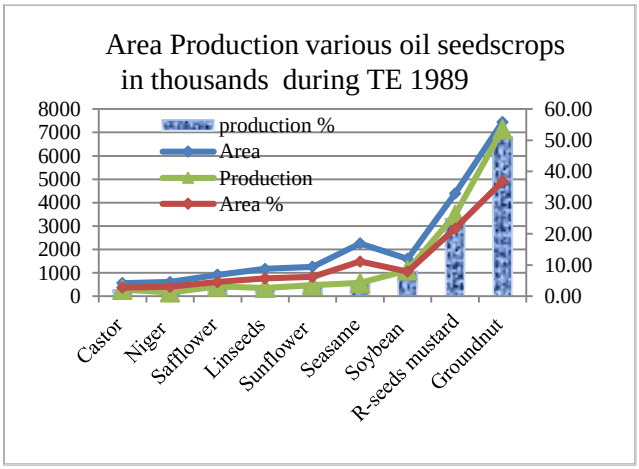

Fig. 3: Area Production during TE 1989

There has been seen large regional variation in area, production and productivity changes during the last two and a half decades. The changing scenario of oilseeds crops due the demand supply and profitability of the meticulous crops. Only a few states like Haryana, Madhya Pradesh, Maharashtra, Rajasthan and West Bengal increased their oilseeds production both through area expansion and productivity improvement. State like Gujarat increased oilseeds production mainly due to productivity improvement. In a state like Punjab, oilseeds production declined mainly in response to a sharp decline in area, whereas in state like Orissa both area and productivity declined sharply leading to large decline in oilseeds production (see Fig. 3 and fig. 4).

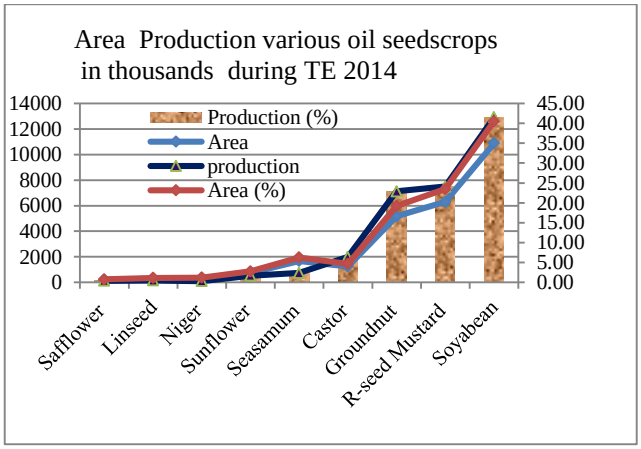

Fig.4: Area Production during TE2014

Data source: http://eands.dacnet.nic.in/PDF/Agricultural Statistics At Glance-2015.pdf

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2. Growth Pattern of oilseeds crops and total oilseeds during three periods:

The Soybean was recorded highest annual compound growth rate were accelerated 32.52 %, 34.28 % in area, production respectively in during the period 1951-52 to 1985-86 compared to 14.33% and 15.94 percent in area and production in during the period 1951-52 to 2013-14 (whole period) and lowest 7.14 % area and 9.00 % production 1985-86 to 2013-14 after the TMO period. The safflower, also recorded the highest growth rate in production 10.24 followed by yield 6.87 % area 3.14 % During 1951-52 to 2013-14 , however the decelerated growth reported during 1951-52 to 2013-14 (whole period) and 1985-86 to 2013-14. The castor non edible oil crop reported sustainable growth rate in area, production and yield and reached forth position during TE 2014 while it was last position during TE 1989. Rape seed Mustard also reported positive growth rate in area, production and yield in all three periods and maintain the second position while lagging behind the third position from first during TE 2014. The some of the crop, i.e. Safflower, Linseeds and Niger were reported the decelerated growth rate in area and production during the period 1985-86 to 2013-14. The annual compound growth rate of total oilseed crops doesn't show the major changes , however the growth rate of area was recorded 0.77 percent minimum during 1985-86 to 2013-14 as compared to the growth rate 1.4 percent in period Ist and IInd all three periods in area, production yield (See table 1).

Table.1:Growth Pattern of oilseeds crops and total oilseeds during three periods

Crops	1951-52 to 2013-14 Period I			1951-52 to 1985-86 Period II			1985-86 to 2013-14 Period II		
	Area	Production	Yield	Area	Production	Yield	Area	Production	Yield
Safflower*	-1.833	0.581	2.460	3.147	10.244	6.876	-5.660	-4.473	1.265
Linseeds	-2.786	-1.656	1.160	0.334	0.512	0.178	-5.389	-3.769	1.708
Niger	-0.696	0.082	0.781	1.348	3.071	1.705	-2.572	-2.575	0.008
Groundnut	0.056	1.033	0.977	1.034	1.545	0.506	-1.729	-0.419	1.337
Sesame	-0.609	0.887	1.506	-0.091	0.314	0.405	-1.140	0.572	1.733
Rapeseeds mustard	1.864	4.013	2.108	1.688	3.267	1.551	0.882	2.589	1.693
Castor	1.244	5.069	3.777	0.112	3.874	3.755	1.865	5.554	3.619
Sunflower*	5.978	6.244	0.248	10.350	6.876	-3.150	-1.390	0.241	1.650
Soybean*	14.330	15.937	1.405	32.523	34.282	1.320	7.143	8.996	1.730
Total oilseeds	1.479	3.070	1.569	1.468	2.290	0.810	0.776	2.709	1.920

Analysed by Author Based on Data source http://eands.dacnet.nic.in/PDF/Agricultural_Statistics_At_Glance-2015.pdf
Data available Safflower* and Soybean* 1970-71 to 2013-14, Sunflower* 1965-66 to 2013-14 for growth analysis.

3.1 State share of oilseeds area and production of Oilseeds:

In India the total oilseed area occupied 28.051 million hectares which contributed production 32.75MT during 2013-14. Madhya Pradesh was recorded first rank 28% area of total area oilseeds and contributed 25 % of total production of oilseeds followed by second Rajasthan 18 % area and 19 % production, third rank Maharashtra area 14 % and 16 % production, fourth rank Gujarat area 11 % and production 16 % which showed higher productivity level 1687 kg per hectare.

The five major oilseed producing states, i.e. Madhya Pradesh, Rajasthan, Maharashtra, Gujarat and Andhra Pradesh were occupied 78 % total area of oilseeds and contributed 81 % total production of oilseeds during TE 2014. The other important oilseeds producing state, i.e. Karnataka, Uttar Pradesh, Tamilnadu and West Bengal and other miner oilseeds producing states, i.e. Assam, Chhattisgarh, Jharkhand and Orissa occupied 6 % area of oilseeds and contributed 4 % production during same period during same period (Fig. 5 and 6).

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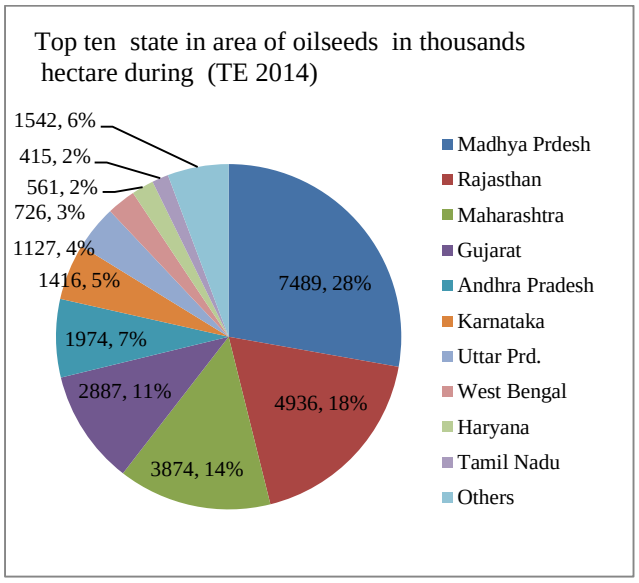

Fig.5

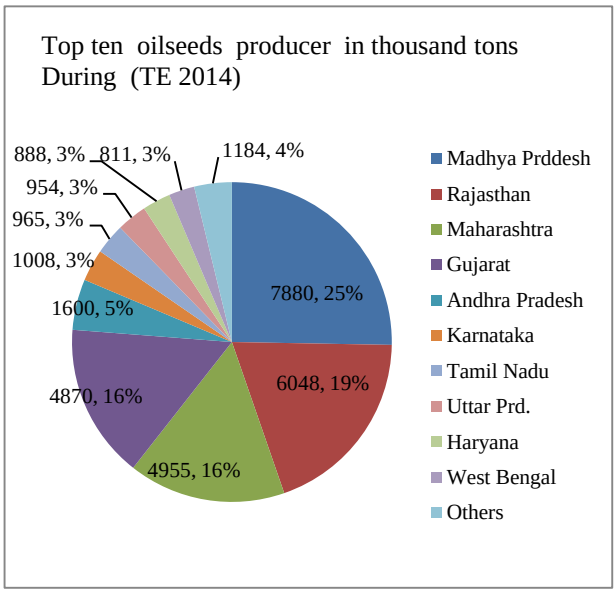

Fig.6

Data source: http://eands.dacnet.nic.in/PDF/Agricultural Statistics_At_Glance-2015.pdf

3.2 State wise pattern of Area, Production of total oilseeds during (TE1988-89 and 2013-14):

Madhya Pradesh is the first rank in the highest oilseed area as well in production and its total oilseed area 2951.90 thousand hectares during TE 1989 and increased to 7489.33 thousand hectares during TE 2014 and produced 1736.43 thousand tons increased to 7879.55 thousand tons during the same period. Madhya Pradesh's leading crop soybean which contributed 41 % share of total oilseeds production and more 50 % share alone of total Soybean. The oilseed area as well in production was increased in the second rank in Rajasthan and its total oilseed area 1904.03 thousand hectares during TE 1989 and increased to 4936.30 thousand hectares during TE 2014 and produced 1352.60 thousand tons and increased to 6047.62 thousand tons during the same period.The leading oilseeds crop in Rajasthan is rape-seed and mustard and 50 % area and 50 % production of rape-seed and mustard.

The oilseeds area as well in production was increased in the Third rank in Maharashtra and its total oilseeds area 2440.93 thousands hectares during TE 1989 which increased to 3873.67 thousands hectares during TE 2014 and contributed the production 1285.80 thousand tons which increased to 4955.23 thousand tons during same period .The oilseeds area as well in production was also increased in the Gujarat and its total oilseeds area 2065.17 thousands hectares during TE 1989 which increased to 2887.33 thousands hectares during TE 2014 which contribute the production 1888.83 thousand tons to increased 4870.14 thousand tons during same period. The leading oilseed crop in Gujarat is groundnut and 31 % area and 26 % production of total groundnut in India. The Haryana is also emerging state where area increased from 338.67 to 560.77 thousands hectares 65.58 percent area and production increased 347.87 to 887.70 thousand tons 155percent, howeverthe All India level area increased from 20218 to 26948 thousands hectares about 33 percent area andproduction increased 13986 to 31162 thousand tons 123 percent during TE 1989 and TE 2014 respectively (see Table 2).

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Table.2:State wise area Production of total oilseeds during (TE1989 and 2013-14)

States	Area in thousands hectares			Production thousands tons		
	TE 1989	TE 2014	Difference %	TE 1989	TE 2014	Difference %
Assam	348.70	293.19	-15.92	168.97	174.21	3.10
Orissa	1078.30	239.14	-77.82	826.55	168.27	-79.64
Karnataka	2398.90	1416.00	-40.97	1385.53	1007.86	-27.26
Andhra Pradesh	2575.60	1973.53	-23.38	1944.20	1600.46	-17.68
Uttar Pradesh	1822.14	1127.33	-38.13	978.77	953.77	-2.55
Madhya Pradesh	2951.90	7489.33	153.71	1736.43	7879.55	353.78
Bihar	218.57	128.11	-41.39	120.73	142.99	18.44
West Bengal	502.33	726.16	44.56	391.28	810.97	107.26
Rajasthan	1904.03	4936.30	159.26	1352.60	6047.62	347.11
Maharashtra	2440.93	3873.67	58.70	1285.80	4955.23	285.38
Punjab	197.63	49.83	-74.78	182.60	67.20	-63.20
Haryana	338.67	560.77	65.58	347.87	887.70	155.18
Gujarat	2065.17	2887.33	39.81	1888.83	4870.14	157.84
Tamil Nadu	1193.77	415.29	-65.21	1261.27	964.95	-23.49
All India	20218.01	26947.71	33.29	13986.10	31162.62	122.81

Data source: http://eands.dacnet.nic.in/PDF/Agricultural_Statistics_At_Glance-2015.pdf

3.3 State wise Productivity difference of total oilseeds during 1988-89 to TE 2013-14:

The annual compound growth rate of productivity of annual oilseeds in India showed 1.57%during 1951-2014 and before TMO AGCR 0.8 during 1951 - 1985 % after launching TMO it increased 1.92%. The productivity of some crops is the important factor of total production, the productivity depends on several factor, i.e. systematically the process of improving agricultural productivity through improved technological progress, optimum level of inputs, assured irrigation, plant protection measures and timely sowing and post-harvest technology and suitable processing ,marketing and storage facilities are very important for improving the productivity of oilseed crops.

The highest total area and production of oilseeds were recorded 153.71% and 353.78% respectively in Madhya Pradesh followed by 159.26 % and 347.11 % in Rajasthan leading in Rajasthan followed by Maharashtra 58.70 %, 285.38% and in Gujarat 39.81 % and 157.84 %, however the National average 33.29 % and 122.81 % respectively during TE 1988-89 to TE 2013-14.

Some of the state showed the down fall area and production of total oilseeds i.e. Orissa -77.82 % and -79.64 %, followed by Punjab -74.78 % and -63.20 % and Tamilnadu - 65.21 % and -23.49 and Karnataka -40.97 % and - 27 % respectively during the same period.

The area is the limited factor and other factors could be increased for the growth of total production. The highest productivity was increased 527 to 1279 kg per ha and 143 % in Maharashtra followed by 1057 to 2324 kg /ha and 120 % in Tamil Nadu followed 552 to 1116 kg / ha and 102% and Gujarat increased yield 915 to 1687 kg /ha 84 %. The other important state like Madhya Pradesh yield 588 to 1052 and 79% kg /ha and Rajasthan yield 710 to 1225 and 72.45 percent. The national average was recorded 692 to 1156kg /ha during TE 1988-89 to 2013-14.

Tamilnadu only state where the area and production were down, falling negatively -65.21 and -23.49 during the same period but increase the productivity 102 %. The area of oilseeds increased some of the states, i.e. Haryana, West Bengal and Uttar Pradesh during TE 1988-89 to TE 2013-14 (see fig 7).

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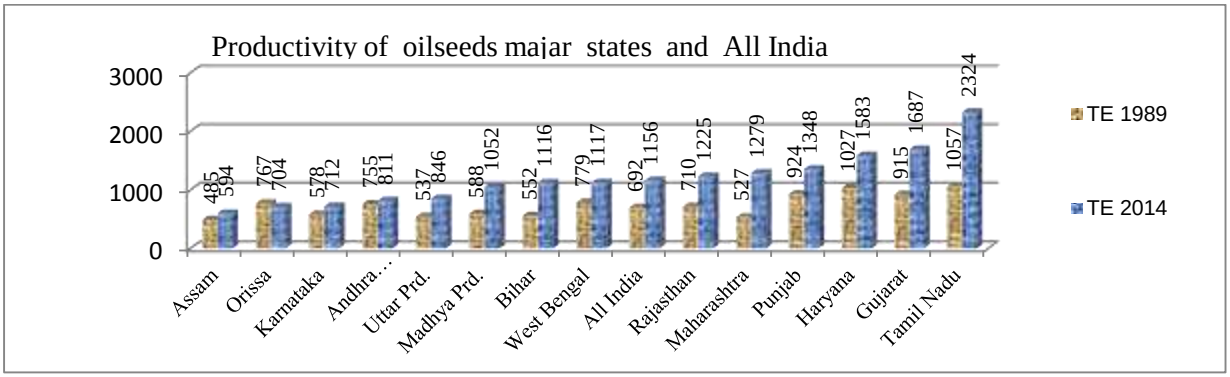

Fig.7: Productivity of total oilseeds during (TE1988-89 and 2013-14)
Data source: http://eands.dacnet.nic.in/PDF/Agricultural_Statistics_At_Glance-2015.pdf

3.4 Improving oilseeds productivity:

Only improving productivity is a better option rather than area because the limited scope to bring the additional area under oilseeds, the bulk of the future increases in oilseed production have to adoption of better technologies, highlighting a combination of high-yielding varieties/ hybrids, balanced and integrated crop nutrition, efficient crop management, protective irrigation, integrated pest management and selective farm mechanization. The post-harvest technology like processing, marketing and proper storage facilities should be assured. It may be achieve an average productivity of about 1.5 t/ha by 2020 and 2.0 t/ha by 2050, if concerted efforts are made for effective dissemination of available improved technologies. The productivity of all oilseeds in India is just 50-60% of the world average and only 15-25% of the productivity observed in the country with the highest productivity, except in case of castor. There is a great opportunity to enhance average productivity of all oilseed crops in the country, which needs concerted efforts in the coming year to increase better seed replacement rate. The improving the highest productivity in groundnut during Rabi- summer recorded 1883 kg/ha and in *Kharif*513 kg/ha, which increased 267 % in Andhra Pradesh followed west Bengal 2393 kg/ha in Rabi and *Kharif* 927 kg/ha increased 158% and Tamilnadu 3509 kg/ha in Rabi and *Kharif* 2102 kg/ha increased 67 % in Rabi summer groundnut crop with the insured irrigation condition. The best option to increase production groundnut, it needs to increase the area of groundnut in *Rabi/Summe*r season. There was untapped potential and scope for increasing productivity of groundnut like in Tamilnadu more 3500 kg / ha and could be achieved in all groundnut producing states in India during Rabi season. There was huge opportunity to occupied rice fallow and early potato harvested area in west Bengal, Orissa and Andhra Pradesh (see fig. 8).

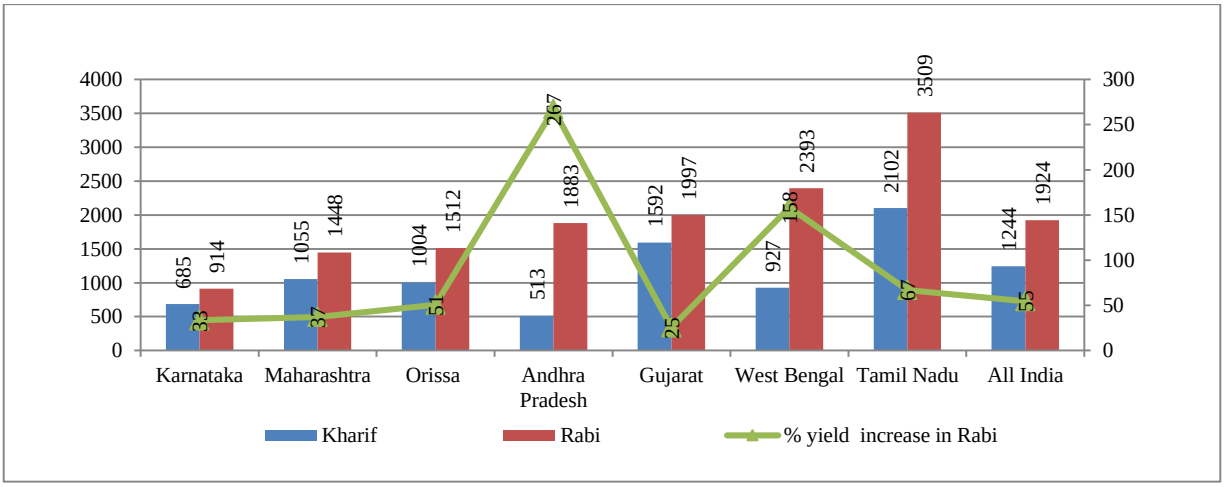

Fig.8: Analysis increase percentage yield in Rabi over the Kharif season
Data source: http://eands.dacnet.nic.in/PDF/Agricultural_Statistics_At_Glance-2015.pdf

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4.1 Changing Area and Production of oilseed crops:

The major gain in production came mostly from soybean, rapeseed-mustard, sunflower and castor after launching Technology Mission on oilseeds during 1986-87. There has also been large regional variation in area, production and productivity changes during the last two and a half decades. Only a few states like Madhya Pradesh, Rajasthan, Maharashtra, Haryana and West Bengal increased their oilseeds production both through area expansion and productivity improvement. State like Gujarat and increased oilseeds production mainly through productivity improvement. In a state like Punjab, oilseeds production declined mainly in response to a sharp decline in the area, whereas in states like Orissa, both area and productivity declined sharply leading to large declines in oilseeds production. The Only Bihar state declined the area 40 % and production increased 18 % due to increase the productivity 102 per cent during the TE1988-89 to TE 2013-14.

The domestic achievements in oilseeds production didn't parallel when we observe that 6.5 times increase in oilseeds production during the period 1950-2014 was achieved under predominantly rain fed (72%) agro-ecological conditions, which is even higher than the production increase in total food grains during this period1950-2014. It is worth recording that 5.20 times increase in production of food grains was achieved with the highest national priorities for this commodity group, and also that such production jump was recorded under relatively much more favourable farming environments, particularly with more than 50 % area irrigated condition, while oilseeds covered only 28 percent under irrigated which was low as compared to rice 60 percent and wheat 90 percent during recent year 2013-14.

4.2 consumption of vegetable oil in India:

The vegetable oil consumption is both income and price-elastic. The per capita consumption of vegetable oils has increased from around 3 kg/year in 1950 to 14.2 kg/year during 2010-11. Increase in per capita income pushes the demand for oil significantly. A similar effect is exercised by the price factor as well. In contrast to the pre-WTO period, the real price of vegetable oils had sharply declined in the subsequent period which enabled consumers to access large quantities that were made possible through liberal imports. There have been dramatic changes in the oilseeds scenario of the country during the last 35 years. India changed from net importer 39 percent of total consumption status in the 1980s to which was downfallen 9.73 percent 1990-91 import of edible downfall which was again reversed 15. 78 percent during 1995-96 and due the drought during 2000-01 edible import was raised 48.68 percent when the country had to spend huge foreign exchange to meet the domestic needs of edible oils. However, as per capita consumption of edible oils has risen significantly.

5.1 Analysis of demand supply gap of edible oil in India:

The total demand in the country has risen at a very high rate and has created a big gap between domestic production 8978 thousand tons, consumption 21709 thousand tons and edible imports increased by 67.33 percent during 2014-15.Demand of edible oil is mainly driven by an increase in per capita consumption of edible oil, rising income levels and improvement of living standards. However, the Indian edible oil market continues to be interpenetrated as current per capita consumption level of India (at 14.4 Kg/year for 2014-15) is much lower than global averages (24 kg/year). Furthermore, domestic consumption of edible oil is expected to increase with enhancement in income level and population (see Fig. 9)

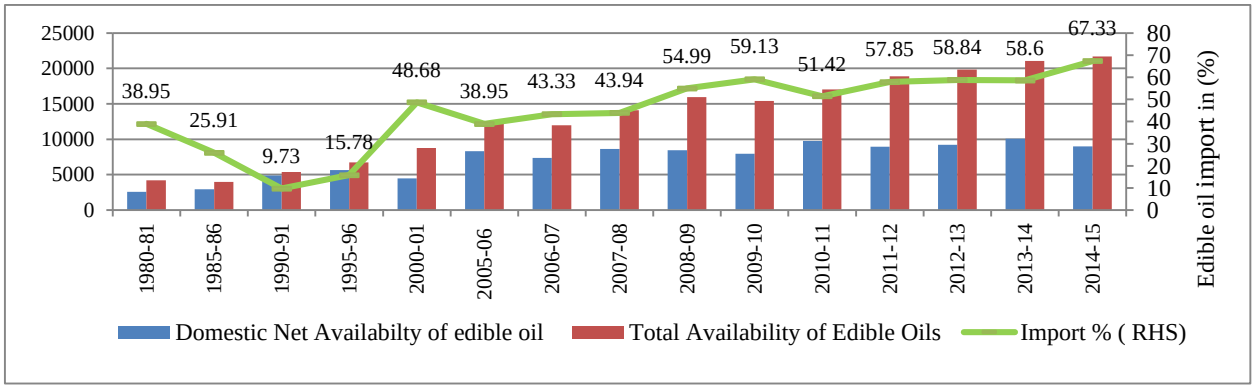

Fig.9: Demand Supply gap and import of edible oil in thousand tons in India

Data source: CMIE 2015-16

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The gap between export earnings and import costs started narrowing down during the last 10 years, and during 2007–08, the oilseeds sector became a net earner of foreign exchange, which however, could not be sustained for long run. During 2010–11, the country imported about 9.2 Mt of vegetable oils costing around `38,0000 millions to increased import whereas export earnings were a little less than just ` 21,0000 millions The recent scenario edible oil import in India more than14 million tonnes of edible oil was imported with a total value of `6,43,965.0 millions during 2014-15 and likely to increase `6,86,300.0 millions during 2015-16.

5.2 Import of edible oil in India:

In terms of volumes, crude edible oil contributes about 89% and refined oil contributes about 11% of the total import during 2014-15. The share edible oil of the 89% of imported crude edible oil, palm oil, soybean oil and sunflower oil contributes about 54%, 21% and 11%, respectively. India is importing edible oil from Indonesia, Malaysia, Argentina and Ukraine, contributing about 36%, 23%, 17% and 13%, respectively, of total imports. The domestic consumption of edible oils has increased substantially and has touched the level of 18.90 million tonnes in 2011-12 and is likely to increase further 21.70 million tonnes during 2014-15. The total import edible oil likely to be estimated for 2015/1614.85 million tons higher 6.6% previous year 2014-15, however crude edible oil 9.6 million tons, soybean oil 3.55 million tons, sunflower 1.45 million tons and rape-seeds mustard 0.25 million (see table 3).

Table.3: Import of edible oil during 2011/12 to 2014/15 and Estimate for 2015/16

(Figures in Lac MT)

Crops	2011/12	2012/13	2013/14	2014/15	2015/16	Increase in 5 Years
Palm Oil	76.70	82.90	79.60	90.40	96.00	**25%**
Soybean	10.80	10.90	19.50	30.10	35.50	**230%**
Sunflower	11.40	9.70	15.10	15.10	14.50	**25%**
Rape seeds	0.90	0.30	2.00	3.70	2.50	--
TOTAL	99.80	103.80	116.20	139.30	148.50	**50%**
Import*	**19.2%**	**4.0%**	**11.9%**	**19.9%**	**6.6%**	

Data Source: Edible oil plus vanaspati

* Percentage higher over the previous year

6. 1 Analysis of constraints of inputs growth:

The oilseed economy of the country faces a host of challenges on technological, institutional and policy fronts. The capability in designing and implementing innovative approaches to adequately address each of these challenges will determine the future of the oilseed economy of India. Oilseed cultivation in India is predominantly dependent on rainfall and this leads to a higher magnitude of instability in the production of oilseeds 58.85 percent, followed by 43.71 percent in rice and 42.80 percent food grain and instability in under irrigated area were recorded in total oilseeds 64 percent, followed by 33 percent in total food grain and 17 percent in rice during the period 1951-52 to 2012-13. In case of under irrigated area, the oilseeds recorded the lowest 28 percent, followed by 51 percent in total food grain, 53 percent in rice and the highest in wheat 93 percent during 2012-13. Often, the marginal lands are earmarked for cultivation of oilseed crops. Such inherent disadvantages ensure that a levelled field is not provided to the oilseed crops even when they are being compared increasingly with their competing crops in terms of production, productivity and profitability were low (see fig. 10).

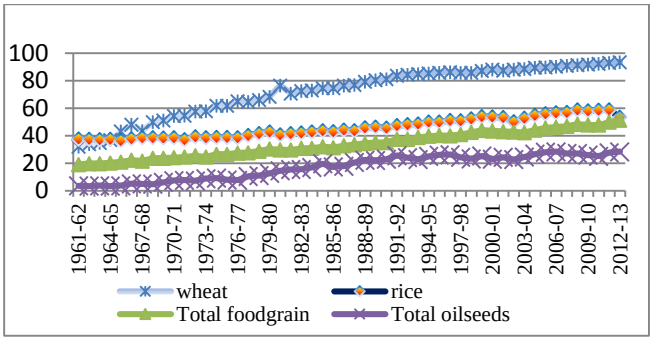

Fig.10: Percent area under irrigation of various crops

Data source:http://eands.dacnet.nic.in/PDF/Agricultural_Statistics_At_Glance-2015.pdf

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6.2 Distribution of certified/quality seeds:

The supply of certified/quality seeds of oilseeds was remains constant from 10 to 13 lakh quintal and growth rate 2 percent during 1991-92 to 2002-03, while cereals seeds almost reaching to double 35 to 67 lakh quintal tons and growth rate 7 percent during the same period. Due to the constant supply of certified/quality a seed of oilseeds the productivity was also remains constant 718 to 702 kg per hectare during the period 1991-92 to 2002-03, but pressure of population created huge demand of edible oil and increase the import. The supply of certified/ quality seeds of oilseeds was increased from 19 to 43 lakh quintal and the growth rate 11 percent during 2003-04 to 2014-15, while cereals seeds almost reaching to tripled 71 to 203 lakh quintal and the growth rate 11 percent during the same period . The supply of certified/ quality seeds of oilseeds had not been reflected in the average productivity of pulses double or triple but it was hovering around 1064 to 1168 kg per hectare during 2003-04 to 2014-15 recently respectively, while the experimental research station claimed yields were 2 to 3 tons per hectare. This revealed that Large-scale demonstrations in farmer's fields need to be conducted with the involvement of extension agencies of ICAR, SAUs, KVKs, etc. These efforts may easily push average productivity slightly higher from 1064 to 1168 kg per hectare during 2003-04 to 2014-15, that's why farmers were not much attracted to increase the area of oilseeds (see figure 11**)**.

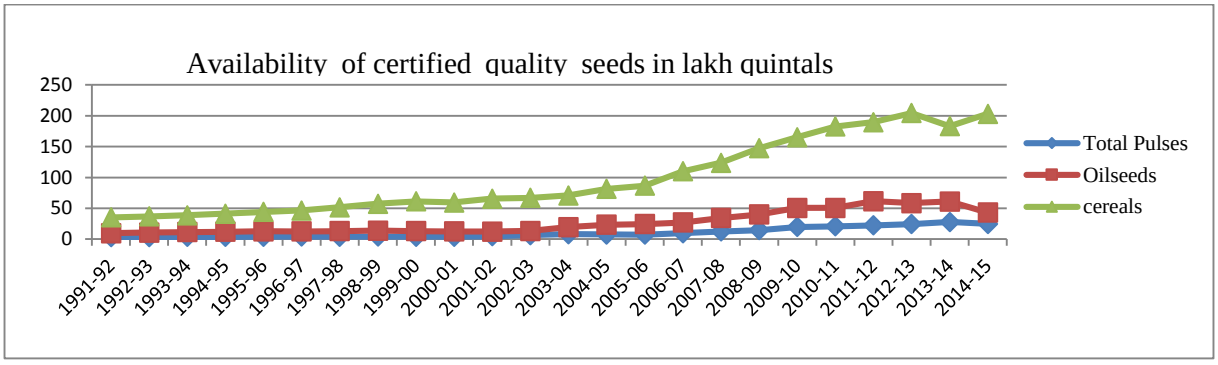

Fig.11: Distribution of certified/quality seeds

Data source: http://eands.dacnet.nic.in/PDF/Agricultural_Statistics_At_Glance-2015.pdf

7.1 Minimum support price of different food grain crops and pulse:

To encourage oilseeds production, the CACP has fixed the minimum support price (MSP) the highest increase in sesame `1300 per quintal during the 2000-01 to hike four times ` 5200 this year 2016-17 followed by groundnut `1220 per quintal to hike of`4320 per quintal and sunflower increased only`1200 per quintal to hike ` 4000 during the same periods while, wheat MSP increase only `610 to 1625during 2000-01 to 2016-17 less than the three times. The cost of production increase substantially over the past few years. The increase in support price should help farmers to offset the production cost increase. This resulted oilseeds production surge less than double18 million tons to 33 million tons during 2000-01 to 2013-14. Increasing the minimum support price not any impact the increase the total production of oilseed crops in the same manner (see fig. 11).

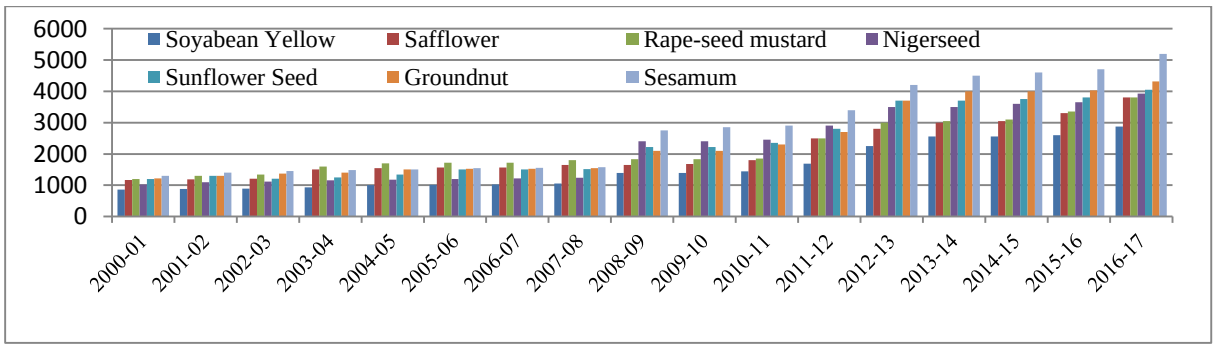

Fig.11: Minimum support price of oilseeds crops:

Data source: http://eands.dacnet.nic.in/PDF/Agricultural_Statistics_At_Glance-2015.pdf

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7.2 Annual compound growth of Minimum support price:

The annual compound growth rate of various oilseeds were recorded the highest 6.86 percent in Niger seed followed by sesame 6.08 percent and the lowest 4.70 percent in soybean as compared to wheat was 7.07 percent during the 2000-01 to 2008 - 09, this the great set back to all oilseeds crops and farmers to leave growing due to the less annual compound growth rate of minimum support price and the market price more than double during the same period due to the increase domestic demand of edible oil while production was stagnated in same period . The farmers have refused to sell soybean to the government agency at a measly MSP of `1000 to 1050 per quintal increase in four years 2004-05 to 2007-08 when regulated marketsare offering them more than double that rate. The traders make their work easier by paying more than the MSP and by lifting the stock from their doorstep itself.

The policy makers awaken after a long time when the edible oil demand surged to 16 percent to 44 percent of total domestic production from during 1995-96 to 2007-08 while MSP increased slightly see figure 11. The domestic prices of oilseeds sudden bursts of high prices increased `80 to 150 almost doubled during 2014-15 the farmers shift to their land to oilseeds, in hope of better returns, despite the high cost of production. The policy decision maker had been increased the MSP of oilseeds increase in very fast track to minimize the import bills. The highest growth rate of MSP was recorded 13.13 percent in groundnut followed by 13.09 percent in Soybean, 12.39 percent in Safflower and rape-seed mustard 11.50 percent in chick and minimum in wheat 5.81 percent during 2009-10 to 1016-17 (see Table 4).

Table.4: Annual compound growth of Minimum support price:

Crops	Wheat	Niger	Sesame	Sun flower Seed	Rapeseed / mustard	Saf flower	Soybean Yellow	Ground-nut
2001-01 to 2008-09	7.07	6.86	6.08	6.03	5.53	5.00	4.70	5.10
2009-10 to 2016-17	5.81	8.21	10.14	10.65	11.49	12.36	13.09	13.13

Data source: http://eands.dacnet.nic.in/PDF/Agricultural_Statistics_At_Glance-2015.pdf

7.3. Marketing processing constraints oilseeds:

All traditional oilseeds are reserved for the small-scale sector with an inefficient processing setup, losing more than one million tonnes of oil. There is a need to decontrol all these oilseeds to enhance efficiency of the processing sector. India has large processing industry with low capacity utilization leading to high processing cost in soybean and mustard. Opening up all oilseeds to modern processing will lead to efficient processing, benefiting both producers and consumers. Indian oilseeds processing sector are fragmented, small scale and suffers from low capacity utilization. The Indian oilseed processing industry includes major processing technologies such as traditional mechanical crushing, or expelling, used for oilseeds with relatively high oil-content; and solvent extraction for processing oilseeds and expeller cake. The Traditional mechanical crushing industry includes small-scale expellers.

The processing industry also includes an oil refining sub-sector, which primarily refines domestic solvent-extracted oils and imported crude and solvent-extracted oils. Recently, Government of India has withdrawn the import duty on crude oils and this has facilitated the increased import of edible oils, viz. Palm oil and also the mixing the palm oil with edible oil to a certain extent have also been made legal by government of India. Import of cheap oils like palm oil in India in comparison to available edible oils (mustard oil) has decreased the demand of mustard oil in the market, which is ultimately affecting the small and medium oil processing sectors. Availability of raw material is not a cause of low demand; it is only due to the low price of imported oils and blended oil.

8 .1 Supplementary sources of other vegetable oils:

Contributing more than 25% of the total vegetable oil consumption in the country, the minor and TBOs have considerable oil potential which needs to be fully tapped. Oil is obtained from rice bran, cotton seed, corn, coconut and oil palm, apart from seeds of underutilized plants like Jatropha, Thumba oil , rubber seed oil , mango kernel, Neem oil, Karanj oil, Mahua, Kusum, Sal oil, **S**imarouba, jojoba, **C**heura, wild apricotand Tung oil etc. The current level of vegetable oils production from all these sources

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(2.767 Mt) could be further stepped up, given their tremendous potential

8.2 Rice bran oil:

Rice bran oil is an important source of vegetable oil, which is not yet to be fully exploited. India is the second largest rice producer in the world, next only to China. The country produced 142.00 Mt of paddy during 2010- 11, which is equivalent to 94.11 Mt of rice, and this could yield 80.00 lakh tonnes of rice bran which has the potential to yield 13.20 lakh tonnes of rice bran oil. However, the country could produce only 8.5 lakh tons of rice bran oil during 2010-11 and 9.0 lakh tons in 2014-15. The annual growth rate of paddy 2.5 percent during the period 2.5 during the period 1951 to 2015 in India, which can make a significant contribution to the vegetable oils basket. At the same time, a large number of high-value by products needs to be recovered during the rice bran oil processing, which will change the economy of the entire process. By 2050, India is expected to produce about 160 Mt of rice, which has the potential to yield 2.244 million tonnes of rice bran oil. Even if 90% of this potential is realized, the country must be able to produce about 2 Mt of rice bran oil.

8.3 Cotton seed oil:

India is one of the major cotton-producing countries of the world. Cotton seed, which forms about two-thirds of the ratio of Seed and cotton, contains an important source of vegetable oil. The cotton seed contains about 18% oil, which is nutritionally good oil. India produced 33.930 million bales of seed cotton yielding 11.40 Mt of cotton seed during 2010-11, and produced 1.199 million tons of oil through traditional processing technology, wherein only 11-12% of oil is recovered (Table 4). Nearly 95% of cotton seed is processed through traditional methods and less than 5% is processed through scientific processing which can recover nearly 17% of the oil. Thus, a huge amount of oil of the order of 0.65 million tonnes is lost, which is worth more than ` 25000 million. In addition, there is also loss of linters, hulls and soap stuck in traditional processing and together with the lost oil, the country is losing about ` 50000 million worth of products, which needs to be pre-vented on priority. By 2025 and 2050, the cotton production in India is projected to increase to 50.0 and 65.0 million bales respectively, which can lead to a marketable surplus of 167.82 and 208.45 lakh tonnes of cotton seed for processing that, can potentially yield 2.853 and 3.544 million tonnes of cotton seed oil respectively. This will be a huge contribution to India's vegetable oils basket, which needs to be fully exploited through scientific processing of cotton seed. There is a need for a policy intervention to make scientific processing of cotton seed mandatory along with certain incentives or one-time grant for switchover from traditional processing in the larger interest of the country.

8.4 Oil palm:

Among the major tree crops, oil palm farms another high-potential prospective and long-term source of edible oil, which is expected to contribute significantly towards meeting the growing edible oil demand in the country. It can yield 4-7 tons of oil/ha compared to less than half a tonne from most of the annual oilseed crops. As against the potential area of 1.0715 million ha spread over 14 states in the country, hardly 1.6 lakh ha was planted up to March 2011, of which almost 30,000 ha was uprooted. The country is currently producing just about 74 thousand tonnes of oil from a barren area of about 40,000 ha. In the years to come, oil palm is likely to play a major role in augmenting the supply of vegetable oil in the country. By 2050 even if an area of 800 thousand ha is covered under oil palm, the country must be able to produce about 3.2 Mt of oil. There is a need for proper policy back-up along with remunerative prices for sustaining the long-term commitment of the farmers to oil palm.

9 Intervention of Government to slow down import of edible oil:

In policy improvement its current (12th) Five-Year Plan (Indian fiscal year 2012/13 to 2016/17), the National Mission on Oilseeds and Oil Palm **(**NMOOP**)** is targeting vegetable oil production to reach 9.51 MMT, a 35 percent increase over the previous Five-Year Plan's average (7.06 MT). This was initiated in response to India's growing reliance on imported palm oil from Southeast Asia. NMOOP claims that India can achieve greater levels of independence in vegetable oils if it can boost production in various oilseeds, oil palm, and tree borne oilseeds.

Government of India is to achieve objectives such as increasing Seed Replacement Ratio (SRR) in oil crops with focus on Varietal Replacement, increasing irrigation coverage under oilseeds from 26% to 36%, diversification of area from low yielding cereals crops to oilseeds crops, inter-cropping of oilseeds with cereals/ pulses/ sugarcane, use of fallow land after paddy/potato cultivation, expansion of cultivation of Oil Palm and tree borne oilseeds in watersheds and wastelands, increasing availability of

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quality planting material enhancing procurement of oilseeds and collection, and processing of tree borne oilseeds. The existing oilseed technologies could be achieved 43 Mt of oilseeds production, which is almost adequate to meet the requirement of vegetable oils in the country. Future needs of vegetable oils to meet the nutritional fat needs, even by 2050 can easily be met if we can increase production of supplementary sources of edible oils along with bridging the yield gap in annual oilseeds. However, unbridled increase in vegetable oils.

The cost of interventions under the mission was in the ratio of 75:25 between central and states. However, for components like seed production, Front Line Demonstration (FLD), mini-kits, adaptive research being implemented through central agencies such as State Agricultural Universities (SAU) and Indian Council of Agricultural Research (ICAR) institute are being funded through 100% central support. There are three mini missions in this scheme viz. Mini-mission-I, II and III. Mini Mission-I focuses on oilseeds, Mini Mission II on oil palm and Mini Mission III on tree-borne oilseed. The mission aims to enhance production of oilseed from 28.93 million tonnes (average of 11th five year plan) to 35.51 million tonnes by 2016-17 and to bring additional area of 1.25 lakh hectare under oil palm cultivation with increase in productivity of Fresh Fruit Bunches (FFB) from 4927 kg/ha to 15,000 kg/ha by end of 12th five year plan.

CONCLUSION:

India is the fourth largest oilseeds producing country in the world after Brazil 100 MT, followed by Argentina 66 MT, China 59.6 MT and India 34.6 MT during 2014-15. Oilseeds are the second main sources of protein after cereals in Indian diet. India is the consumer and importer of edible oil. India accounts for 13-15 per cent of oilseed area, 7-8 per cent of oilseeds production, 6-8 per cent of oilseeds production, 4-6 % edible oil production, 12-14 per cent of vegetable oil import and 10-12 percent of the edible oil consumption. Basically the total oilseed area occupied 28.051 million hectares which contributed production 32.75MT during 2013-14. The demand for edible oils in India has shown a steady growth at a CAGR of 4.96% over the period from 2001 to 2015. The growth has been driven by improvement in per capita consumption, which in turn is attributable to rising income levels and improvement of living standards. However, the current per capita consumption levels 15.91 Kg/year in India for 2015-16.

The Soybean was recorded highest annual compound growth rate were accelerated 32.52 %, 34.28 % in area, production respectively in during the period 1951-52 to 1985-86 compared to 14.33% and 15.94 percent in area and production in during the period 1951-52 to 2013-14 (whole period) and lowest 7.14 % area and 9.00 % production 1985-86 to 2013-14 after the TMO period. The safflower, also recorded the highest growth rate in production 10.24 followed by yield 6.87 % area 3.14 % During 1951-52 to 2013-14. The Major gain in soybean in area as well as production came from third earlier TE 1989 to first position presently and the area increased from 7.92 % to 40.43 %, production increased 7.95 % to 4.1.44 % and the second position rape-seed–mustard area increased from 21.71%to 23.45% and production 24% to 25 % showed stable during the period TE 1989 to TE 2014. The groundnut position was first in area 36.84% to decreased 19.22 % as well as production decreased from 51 % to 22.86 % earlier during TE 1989 to TE 2014.

The strategy to implement the proposed Mission will include increasing Seed Replacement Ratio (SRR) with focus on Varietal Replacement; increasing irrigation coverage under oilseeds from 26% to 36%; diversification of an area of low yielding cereal crops to oilseed crops; inter-cropping of oilseeds with cereals/ pulses. The improved technology packages were also found to be economically attractive. In policy improvement its current (12th) Five-Year Plan (Indian fiscal year 2012/13 to 2016/17), the National Mission on Oilseeds and Oil Palm **(**NMOOP**)** is targeting vegetable oil production to reach 9.51 MMT, a 35 percent increase over the previous Five-Year Plan's average (7.06 MT). This was initiated in response to India's growing reliance on imported palm oil from South East Asia. NMOOP claims that India can achieve greater levels of independence in vegetable oils if it can boost production in various oilseeds, oil palm, and tree borne oilseeds (TBOs).

Government of India needs to carry out major reforms in oilseed cultivation to spur the stagnating growth. This is required for ensuring that the country has self sufficiency in the edible oil segment as the consumption of edible oils will continue to grow due to rising per capita income levels and improvement of living standards and domestic net availability of edible oil growth rate accelerated at 2.19 percent lesser than the **t**otal availability of edible oils including import growth rate accelerated at 7.09 percent during the period during period 2005-06 to 2013-14 , so

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there was difference between all most 5.00 percent deficit the growth rate in of domestic supply , that fulfil through import of edible oil . The government proactive to reduced the import duty on edible oil 80 to 20 percent during 2006 to 2015 due to the cheap supply of palm oil and fulfil the domestic demand and control the prices of domestic edible oil.

Another measure which can be considered is to pay special incentives to farmers to switch from excess cereals cultivation to oilseed cultivation. India, on one hand, has excess of cereals, which have to be exported at cheap rates for want of proper storage facilities, and on the other, imports edible oils which are in short supply in the domestic market. The improving the highest productivity in groundnut during *Rabi- summer* recorded 1883 kg/ha and in *Kharif* 513 kg/ha, which increased 267 % in Andhra Pradesh followed west Bengal 2393 kg/ha in Rabi and *Kharif* 927 kg/ha increased 158% and Tamilnadu 3509 kg/ha in Rabi and *Kharif* 2102 kg/ha increased 67 % in *Rabi summer* groundnut crop with the insured irrigation condition.

The best option to increase production groundnut, it needs to increase the area of groundnut in *Rabi/Summe*r season. There was untapped potential and scope for increasing productivity of groundnut like in Tamilnadu more 3500 kg / ha and could be achieved in all groundnut producing states in India during Rabi season. There was huge opportunity to occupied rice fallow and early potato harvested area in west Bengal, Orissa and Andhra Pradesh.

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Impact of Cycle Time on Potential CTS

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Abstract*— *Upper limb musculoskeletal symptoms and upper-limb musculoskeletal disorders (MSDs) have been found to be common in the working population. Carpal tunnel syndrome (CTS) is the most commonly studied entrapment neuropathy caused by compression of the median nerve as it passes through the carpal tunnel beneath the flexor retinaculum. The present study is conducted among person engaged in connecting rod manufacturing industry to check effect of cycle time of operation on potential CTS symptoms. The study sample consists of 103 workers for data collection. The study was conducted by questionnaire, physical examination, wrist angle evaluation and on job observation. Correlation analysis and Correlation analysis using IBM SPSS 20, it is revealed that Value of Pearson correlation coefficient is found to be -0.930 which is same as the value calculated manually. So analysis by SPSS 20 also confirms that there is very high negative correlation between cycle time and percentage of CTS sufferers.

Keywords*— *Carpal Tunnel Syndrome, Cycle time, Repetitive Strain Injury.

I. INTRODUCTION

Repetitive Strain Injuries (RSIs) are injuries of the musculoskeletal and nervous systems that may be caused by repetitive tasks, forceful exertions, vibrations, mechanical compression (pressing against hard surfaces), or sustained or awkward positions. Repetitive Strain Injury is also called regional musculoskeletal disorder (MSD), repetitive motion disorder (RMD),Occupational Overuse Syndrome (OOS),Repetitive Motion Syndrome (RMS), Repetitive Motion Injuries (PEOSH**,** 2003**)**.

Upper limb musculoskeletal symptoms and upper-limb musculoskeletal disorders (MSDs) have been found to be common in the working population (Roquelaure et al., 2006). Twenty-eight percent of all workplace injuries requiring time away from work that were reported to the Bureau of Labor Statistics were MSDs (BLS, 2010). Also, a high incidence rate of 31.2 cases per 10,000 full-time equivalent workers was found for work-related MSDs in the agriculture industry (BLS, 2009). Previous analyses of workers' compensation data from large herd milking operations in Colorado indicated that nearly 50% of livestock-handling injury claims involved workers performing work tasks in the milking parlor. Nearly 27% of the injuries were to the wrist, hand, and fingers (Douphrate et al., 2009). Previous studies by the National Research Council have suggested that up to 95% of upper-extremity injuries may be attributable to workplace factors (N.R.C. 2001). Because RSI conditions are invisible, the general public tends to be unaware of the pain and distress suffered by those affected. Due to a lack of relevant research and information, many people are unclear as to the origin and treatment of these conditions.

1.1 Carpal Tunnel Syndrome

Carpal tunnel is a closed space between the fibrous band which functions as support for the wrist joint and the wrist bone. Median nerve providing sensations to thumb, index, middle and radial half of ring fingers passes through this tunnel. Carpal tunnel syndrome (CTS) is the most commonly studied entrapment neuropathy caused by compression of the median nerve as it passes through the carpal tunnel beneath the flexor retinaculum. It is a classic example of chronic compression neuropathy of the median nerve within the carpal tunnel at the wrist and a frequently encountered cause of pain, numbness and tingling in the upper extremities (Atroshi et al., 1999). The impairment of the median nerve within the carpal canal is secondary to compression of the median nerve within the carpal tunnel resulting in mechanical compression and local ischemia. CTS is considered as a clinical entity and diagnosis is still based upon symptoms of numbness, tingling and/or burning in the distribution of the median nerve in the hand. Repetitive hand activity may cause thickening of the synovial lining of the tendons that share the carpal tunnel with the median nerve. Usual symptoms include numbness, tingling and pain predominantly in the median nerve distribution of the hand; however, the symptoms can frequently be present in all fingers of the hand or proximally in the forearm. The symptoms may or may not be accompanied by objective changes in sensation and strength of median-innervated structures in the hand (Werner and Andary, 2002).

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The carpal tunnel condition becomes so severe that it cannot let the proper function due to pressure on the median nerve where it passes into the hand via a gap (carpal tunnel) under a ligament at the front of the wrist (Okada et al., 2000). People with CTS experience difficulty in performing tasks such as unscrewing bottle tops, fastening buttons, or turning keys. CTS occur most commonly among age group above 30 (Kumar, 2010).

1.2 Symptoms of CTS

Primary symptoms include numbness and tingling. Secondary symptoms include pain, weakness and difficulty in grasping, all usually in the area of median nerve distribution. Symptoms gradually progress over weeks and months and in some cases over years. Though bilateral CTS is common, dominant hand is affected first and more severely than the other hand (Ashworth, 2005).

1.2.1 Numbness and Tingling

Patients may have numbness and tingling in the thumb, index, middle and radial half of ring fingers. Patients complain that there is dropping of things or things slip from their fingers without notice. Symptoms are intermittent and associated with driving, painting, newspaper reading, etc. Some report parenthesis in the whole hand which can be explained by autonomic fiber involvement (Ashworth, 2005).

1.2.2 Pain

It can be in the form of aching sensation over the anterior aspect of the wrist along with numbness and tingling. Pain or paresthesias can radiate either proximally to the forearm, elbow, and shoulder or distally to the palm or fingers. Proximal radiation can be due to other musculoskeletal disorders with which CTS is commonly associated. In CTS, pain starts at wrist and radiates proximally or wrist flexion exacerbates both proximal and distal radiation and also pain is relieved by rubbing or shaking the hand (Ashworth, 2005).

1.2.3 Weakness and Difficulty in Grasping

It is in the form of loss of power in the hand, particularly for precision grips involving thumb.

II. EXPERIMENTATION

The Present study focuses the identification of risk factors such as cycle time, on potential CTS symptoms such as hand pain, wrist pain, numbness, tingling, weakness and difficulty in grasping. The study sample consists of 103 connecting rod manufacturing workers for data collection. The study was conducted by questionnaire, physical examination, wrist angle evaluation and on job observation. A researcher administered questionnaire was used to obtain information on presenting signs and symptoms and possible risk factors for carpal tunnel syndrome. Health questionnaire form was designed according to the information required like age, height, weight, job experience, potential symptoms severity. Job categorization is then done according to level of repetition, force involved, consulting the concerned industrial experts and also by interviewing the workers. The participant ranges in age from 24 to 60 years with a mean of 42.85 (standard deviation (SD) = 8.72) years. The workers had been performing work for a mean of 14.69 years (SD 7.37). All the values of mean and standard deviation have been calculated by IBM SPSS version 20.

2.1 Correlation analysis

Correlation is often used as descriptive tool in non-experimental research. Two measures are correlated if they have something in common. The intensity of the correlation is expressed by a number called the coefficient of correlation, which is usually denoted by the letter (r)Although usually called the Pearson Coefficient of correlation, it was first introduced by Galton (1886) and later formalized by Karl Pearson (1896) and then by Fisher (1935). The coefficient of correlation is a tool used to evaluate the similarity of two sets of measurements (i.e. two dependent variables) obtained on the same observations. The coefficient of correlation indicates how much information is shared by two variables, or in other words, how much these two variables (x and y) have in common. The value of r (correlation coefficient) is given by

$$\text{r (correlation coefficient)} = \frac{\sum \text{x.y}}{\sqrt{(\sum \text{x}^2 . \sum \text{y}^2}}$$

The following general rules are used in intercepting the value of r (correlation coefficient).

- When r = +1, it means there is perfect positive relationship between the variables.
- When r = -1, it means there is perfect negative relationship between the variables.

When r = 0, it means there is no relationship between the variables i.e. the variables are uncorrelated

The probable error of the coefficient of correlation helps in intercepting its value. With the help of probable error it is possible to determine the reliability of the value of coefficient of correlation. The probable error of the coefficient of correlation is obtained as follows:

$$\text{P. E.} = 0.6745 \ \frac{(1 - \text{r}^2)}{\sqrt{\text{N}}}$$

Where r is the coefficient of correlation and N is the no. of pairs of observations.

- If the value of r is less than the probable error, there is no evidence of correlation, i.e. the value of r is not at all significant.

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- If the value of r is more than six times the probable error, the coefficient of correlation is practically certain i.e. the value of r is significant.

2.2 Analysis of cycle time and potential CTS symptoms by correlation analysis

Exposure to repetition alone has been found to increase the risk of CTS (Chiang et al., 1990; Silverstein et al., 1987). Repetition contributes to the development of CTS by affecting the soft structures of the wrist, resulting in the production of excess synovial fluid from the tendon sheaths located in the wrist, which in turn increases pressure on the median nerve (Colombini1998; Silverstein, 1985). Both passive hand and wrist movements as well as hand and wrist movements requiring the use of grips force, or deviated postures can increase the risk of CTS development (Drury, 1987). In this study, an attempt is made to study the effect of cycle time of operation on potential CTS symptoms by use of correlation analysis.

Data collected by health surveillance questionnaire is categorized into five groups on the basis of cycle time and percentage of CTS sufferers in all the cases as shown in the Table 1.

Table.1: Percentage of CTS sufferers for different groups of cycle time

Cycle time (second)	CTS sufferers	Non-CTS sufferers	Total no. of workers	% of CTS sufferers
0-10 sec	4	3	7	57.14
11-20 sec	14	22	36	38.88
21-30 sec	13	25	38	34.21
31-40 sec	5	11	16	31.25
41-50 sec	1	5	6	16.66

It is observed that as the cycle time increases, the percentage of workers suffering from CTS decreases.

To study the correlation between average cycle time and no. of CTS sufferers, a hypothesis is assumed that the cycle time affects the percentage of CTS sufferers. Here average cycle time is the independent variable (X) and percentage of CTS sufferers is the dependent variable (Y) as shown in the Table 2.

Table2: Survey based data for average cycle time and percentage of CTS sufferers

Cycle time (sec.)	<10	11-20	21-30	31-40	41-50
Average cycle time (sec.) (X)	7	13	25.25	35	43
% of CTS sufferers(Y)	57.1	38.8	34.2	31.2	16.6

The values of $\sum x^2$, $\sum y^2$ and $\sum x^2.y^2$ are calculated from survey based potential CTS symptoms data to get the correlation coefficient (r) as shown in the Table 3.

Table.3: Calculated corresponding values of dependent and independent variables

X	$x = X-\bar{X}$	x^2	Y	$y= Y-\bar{Y}$	y^2	x.y
7	-17.65	311.52	57.1	21.52	463.11	-379.82
13	-11.65	135.72	38.8	3.22	10.36	-37.51
25.25	0.60	0.36	34.2	-1.38	1.90	-0.82
35	10.35	107.12	31.2	-4.38	19.18	-45.33
43	18.35	336.72	16.6	-18.98	360.24	-348.28
$\sum X=$ 123.25	$\sum x=$ 0	$\sum x^2=$ 891.44	$\sum Y=$ 177.9	$\sum y=$ 0	$\sum y^2=$ 854.79	$\sum x.y=$ -811.76

$$\text{where } \bar{X} = \sum X/N = 123.25/5 = 24.65$$

$$\text{and } \bar{Y} = \sum Y/N = 177.9/5 = 35.58$$

$$r \text{ (correlation coefficient)} = \frac{\sum x.y}{\sqrt{(\sum x^2.\sum y^2}} = \frac{\sum x.y}{\sqrt{(\sum x^2.\sum y^2}} = \frac{-811.76}{\sqrt{891.44 x 854.79}} = -0.930$$

Very high negative value of correlation coefficient indicates that there is strong negative correlation between average cycle time and percentage of CTS sufferers i.e. smaller the cycle time, more the chances of occurring CTS.

To check whether the value of r is significant or not, the probable error of the coefficient of correlation is obtained as

$$P.E. = 0.6745 \frac{(1-r^2)}{\sqrt{N}} = 0.6745 \frac{(1-(-0.930)^2)}{\sqrt{5}} = 0.0407$$

As the value of correlation coefficient is found to be more than six times the values of probable error, value of

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correlation coefficient is significant.

2.3 Impact of cycle time on CTS by correlation analysis using IBM SPSS20

SPSS stands for Statistical Package for the Social Sciences and is a comprehensive system for analyzing the data. This package of program is available for both personal and mainframe (or multi-user) computers. SPSS package consists of a set of software tools for data entry, data management, statistical analysis and presentation. SPSS integrates complex data and file management, statistical analysis and reporting function. SPSS can take data from almost any type of file and use them to generate tabulated reports charts and plots of distribution and trends, descriptive statistics and complex statistical analyses.

Features of SPSS:

(i). It is easy to learn and use.

(ii).It includes a full range of data management system and editing tools.

(iii). It provides in depth statistical capabilities.

(iv).It offers complete plotting, reporting and presentation features.

SPSS makes statistical analysis accessible for the casual user and convenient for the experienced user. The data editor offers a simple and efficient spreadsheet like facility for entering data and browsing the working data file. Result of the SPSS has been shown in Table 4.

Table.4: Correlation analysis output from SPSS 20

Correlations

		CT	CTS
CT**	Pearson Correlation	1	-.930*
	Sig. (2-tailed)		.022
	N	5	5
CTS**	Pearson Correlation	-.930*	1
	Sig. (2-tailed)	.022	
	N	5	5

*. Correlation is significant at the 0.05 level (2-tailed).

** CTS: Carpal Tunnel Syndrome

** CT: Cycle Time

Value of Pearson correlation coefficient is found to be -0.930 which is same as the value calculated manually. So analysis by SPSS 20 also confirms that there is very high negative correlation between cycle time and percentage of CTS sufferers.

III. CONCLUSION

In this present study, effect of forceful work, repetitive hand movements, Cycle time, awkward posture and several other risk factors has been studied on industrial workers in terms of potential CTS symptoms. Correlation analysis and IBM SPSS 20 were used to achieve the objectives. Correlation analysis was used to study the relation between cycle time and potential CTS symptoms. A very high negative value of correlation coefficient (r = -0.929) revealed that there is negative correlation between cycle time and potential CTS symptoms i.e. the percentage of CTS sufferers increases with decrease in cycle time. Result obtained by SPSS also confirms the negative correlation between cycle time and percentage of CTS sufferers.

The recommendations for preventing CTS symptoms occurrence among the workers engaged in manufacturing industry are:

- The risk factors analyzed in this study should be kept in mind for reducing the CTS occurrence.
- A preferential job allocation policy can be implemented such as more aged workers can be given less repetitive work and vice versa.
- Job rotation policy can be implemented to minimize the risk of CTS occurrence.

A study is required which can describe which factor is more or less dominating with respect to others factors. It is possible by use of advance statistical tools and statistical software.

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Clean Water Facility as a Communal Space in Fishermen Settlement of Galsesong

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Abstract— *Clean water facilities in fishermen settlement Galesong there were three types, namely public wells, public toilets, and public taps. The drinking water service was one of the main places visited by the surrounding residents. The primary function as a place clean water supply for surrounding residents, and social functions as a communal space, where people conduct social interaction. The impact of these interactions promote tolerance and togetherness communities, as well as improving the security environment. The purpose of the research was to determine the intensity of the interaction of the three types clean water facility, and social interaction distance of communication was established, and its effect on people's social lives. The method used was field exploration of behavioral mapping combined with time activity. That was done to help researchers determine the level and the depth of social interaction. The result was to identify differences in the frequency of social interactions that occur in the third water facilities and social distance that occur based on user age.*

Keywords— Water facilities, a communal space, fishermen settlements.

I. INTRODUCTION

Human as social beings have the urge in him to engage or interact with others, have a need to live in groups with others, and the need to make friends with others who may be constituted by ethnic, occupation, interests, and others. The social needs manifested in communal spaces. In the fishing settlement Galesong there is various communal area used by people to interact, one of which is the clean water facilities. The existence of water facilities such as public wells, public toilets and faucets common for people in rural areas are important, as a source of clean water supply for the water supply needs of surrounding residents, is also a place to meet the needs of MCK (bathing, washing, toilet). People crowded in that location, and this creates a high intensity of the meeting. The meeting of the routines causes interactions between them and the established of communication. The interaction had a positive impact on the environment and society, such as improved security and cooperation.

The research objective is to know how the role of clean water in people's lives related to social life, from the interaction aspect of relation to the frequency of meetings and the interaction level of regard to its effect on communication within society familiarity. The method used is a kind of field exploration behavioral mapping. Three types of clean water supply facilities were studied. Aspects examined included the type, time, the offender, the nature of the activity, and the distance from the facility to house and players within the activities at the venue. It aims to determine the level of interaction and the nature of the interaction.

The results are the findings of the level of interaction of society on the third clean water facilities and other types of communications that take place at the venue.

II. THEORETICAL REVIEWS

2.1. Public space

There are several theories about public space, i.e., Carr, et al (1992) in Idawarni (2013), that the public space is the space of the commons, where people perform functional activities and rituals in a community, both everyday life, and periodic, people do personal activities and groups, a means of communication node and a social binder to create interaction between communities. Madanipour (1996), public space is a space that can be used by many people for various activities and social interactions. Carr et al. (1992) in Madanipour (1996) said that a public space could strengthen relationships in a community. Osmon in the Hall (1966) classifies the space becoming two, namely sociopetal and sociofugal space. Sociopetal space is a space that brings people closer to other humans and encourages social interaction. Sociofugal space is a room that keeps humans from other humans being and inhibits social interaction.

2.2. Social interaction

Maslow in Newmark and Thompson (1977) said that one of the core human needs are social needs, namely the need for social or communicate with other people. Maryono (1993), that human as social beings have a desire to communicate, exchange of experience, waive any errors and tension due to activity all day long, this activity can be done collectively.

2. 3. Field Conditions

In the fishermen settlement Galesong there are three types of clean water supply for the community, namely the deep

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well, public toilets and public taps. The following table shows the activities, users and rushes hour at all the facilities.

Table.1. Performers and Time Activity in Water Utilities

Type of activity	Performers of activities			Time of activities			
	Men	Women	Children	Morning	Day time	Afternoon	Activity Duration
Washing cutlery		Women		8^{00}-10^{00}		4^{00}	30 minute
Washing clothes		Women		8^{00}-10^{00}		4^{00}	60 minute
Washing otorcycle	Men	Women		9^{00}-10^{00}		3^{00}-5^{00}	30 minute
Shower	Men	Women	Children	6,30-9^{00}		4^{00}-5^{00}	10–15 minute
Ablution	Men	Women			12^{00},3^{00} , 6^{00}		2-3 minute
Urinate	Men	Women	Children	Depend on requirement			5-10 minute
Taking water	Men	Women	Children	Depend on requirement			10 minute

Table.2. Frequency of Daily Activities in Clean Water Facilities

User	Monday	Tusday	Wednesday	Thursday	Friday	Saturday	Sunday
Women	2	2	2	2	2	3	3
Men	1	1	1	1	3	2	3
Children	1	1	1	1	1	2	2

Legend: 1. Less , 2. Moderate, 3. High frequency

At certain hours, public wells are visited by citizens, particularly women. The arrival of women in these places, especially in the morning and afternoon. In the early morning hours, that is between 800 to 1000 hours, when the children had gone to school. The frequency of use is highest in the morning than in the afternoon. Washing clothes is an activity that most frequently used compared to other activity. These activities are carried out jointly, while other needs such as urinating, defecating, and bathing are done individually and sometimes limited by room. At the time of washing that occurs active communication between them, they are often also disputing in the well general. Ablutions are done by men in public wells, before the midday prayer, Asr, and Maghrib. Ablution almost never does in public restrooms or public taps. The following picture shows the situation and conditions in clean water facilities Galesong fishing settlement.

Fig.3: Public wells

Public wells that are semi-public space, located between the family homes. The atmosphere around the well shaded by many trees. Public wells functioned for washing, cleaning, and fetching water clean.

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Fig.4: Public taps and public toilets (public toilets)

Left figure a group of teenagers was taking water at public taps, the distance between teens close to each other. The young women are in a small group of 4 people have an almost same age. The right figure, a condition of public toilets was deserted during the day.

Fig.5: Mutual Assistance between daughter and mother in semi-private wells

III. METODOLOGY

The method used is the exploration of the field by the depth observation on the clean water facilities condition and mapping of community activities that take place in it. Conditions observed amenities include elements of support around it and its influence on the work that occurs and the distance from the facility to the user's houses and the user relationship. The average of the user activity mapping is observed types of activities performed and the duration of time required to carry out activities. Clean water facilities were observed conducted on three types of water facilities, i.e., semi-private wells, public toilets (showers, sinks, toilet), and public taps. Gender and age are also studied in these places as the users.

The analysis was done by using a bar chart to determine the frequency of the space use based on age and gender and time doing activities. It also measures the communication distance and inter-personal position to know the Character of Communicate and Content of Message that takes place there. For the validity of the analysis supporting theories used by the discussion.

IV. DISCUSSION

4.1. The Meaning of interaction in water facilities for the fishing community

Rapoport (1977) says that the elements of the environment are the first thing we observe in determining the function of the room. One element in the fishermen's neighborhood is clean water facilities. As a social facility, the facility clean water is one of the factors that affect the comfort of social interactions that occur in society. Water is an attraction for people to visit a place with the main objective to meet the needs of Bath, Wash, latrines, ablution, and take water. Clean water much-needed to meet physical needs. It later became the prevailing custom routine for each. This is a traditional action, Weber (1978) said an action that occurs because of habit and natural. But without knowing the impact of these actions lead to a positive attitude that brings social contacts and communication between them, it is this which then lead to social interaction. It could be argued that such access has the power to bind individuals or groups of people with the same interests, namely fetch clean water. Social interaction is also known as a social process that occurs when there are social contact and communication between the parties involved. Social interaction is a key condition the social activities and the dynamic relationship concerning relationships between individuals, between groups and between individuals and groups (Soekanto 2009). The group has an understanding as a collection of people who have relationships and interact, which in turn can resulting in the growth of shared feelings (Syani, 2002). The feeling shared by the people in the fishing settlement then produces a tolerant attitude, cooperation / mutual assistance which is then applied to the joint activities in the village such as night watch at the guard post, move or lift home. Social relations between relatives in coastal communities are still quite strong. Differences in socioeconomic status are striking between relatives can not be a barrier creation of intimate social relations among them. Weber (1978) said that interaction was deliberately designed to create space and habits, and through that interaction occurs talks that could lead to a variety of things, from social interaction, research ideas, and so on. Similarly, in the fishing settlement, water supply facilities were made deliberately to meet the needs of the community and then bring up the habits to visit the place that gave clean water. From communication between the three forms of water facilities can know the difference in intensity of meeting visitors as follows:

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Table.3: Comparison Characters Between Public Well, Public Toilet, and Public Tap Related to Interaction Rat

No	Characteristics	Public wells	Public toilets		Public taps
1	Character of activity	DaiIy	Daily		4 days - 1 week (periodic)
2	Character of place	Open	Semi open	Closed	Open
3	The length of time	1 hour to 1.5 hours	60 minutes	10-15 minutes	15 minutes
4	Variations of activities	- Wash (clothes and kitchen equipment - Take a bath - Take water - Ablution - Urinate	- Wash (clothes and kitchen equipment - Take water - Ablution	- Take a bath - Urinate - Defecate	Take a water
5	Locations	Cluster family	Neighborhood association		Neighborhood and Citizens Association
6	Ownership	Cland / family	Government		Government
7	Users	All ages and genders	All ages and genders		Generally, teens and adults

According to the table above, it appears that every water facility has a different character. But of these three places, it seems that the well has a high intensity for users to interact, one reason is the fishing settlement is densely populated areas. The condition is consistent with the statement of Hall (1966) that in densely populated settlements, social interaction can have a high intensity. Gehl (1971) also reveal the same thing, that the public space is cramped with the distance between buildings that are closer to one another and can be reached by foot, will make people feel connected and make the room inviting to use (Aisha, 2013).

In public taps facilities, water supply is only used by people for drinking water needs with no other activities such as in toilets and public wells, so that the quantity of the meeting of the users have a limited duration. Besides, people taking large amounts of water (1 cart/*gerobak dorong*) each time to the facility, so that the activity is only done on a regular basis.

Public toilets, the activities carried out in this place is more variation than in wells and public taps, but activities such as bathing and toilet conducted in a more personal and bounded by walls, it reduces the duration of face to face meetings.

Routines and duration of meetings affect the level of community interaction, as expressed by Supratiknya (1999), that face to face communication is carried out repeatedly and alternately can improve the quality of interpersonal communication, can establish contacts for their series of message exchange between two people directly. Face to face communication has a specialization in which the effects and feedback, action and reaction directly visible because of close physical distance between them. Action and response to verbal and nonverbal, everything is clearly visible directly. Therefore, face to face communication is done continuously to develop interpersonal satisfactory, so that communication the two sides become effective communication.

The impact of interpersonal communication that satisfy both and become effective communication, causing more tolerant of people's lives, cooperation and unity also increased. Besides, it can also affect the physical health. As quoted from Chiang (2011) that the results of research conducted consistently noted that social relationships affect physical health. People who are more socially integrated live longer, and are less likely to experience certain diseases, including heart attack and on the upper respiratory tract. Another advantage of the social interaction activity is implicated in controlling people and activities around the room so that the environmental safety can be guaranteed.

3.2. User of the water facilities for the fishing community

When viewed from the user side, it appears that the general who visited the facility public taps are teenagers, when linked to a scheme shown by Shuttle in Rapoport (1977), it is known that their teens have an activity room further away from home than parents and children.

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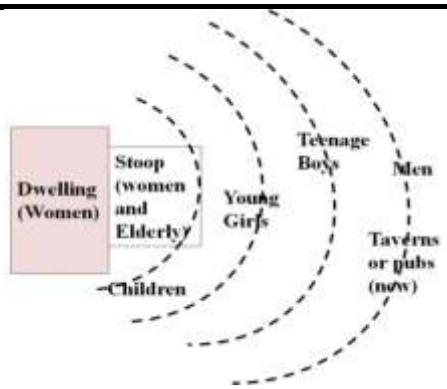

Fig.6: Group Separation Scheme

Separation by age group shows that adult women, the elderly, children and young women are still in the zone nearest the house in activities.

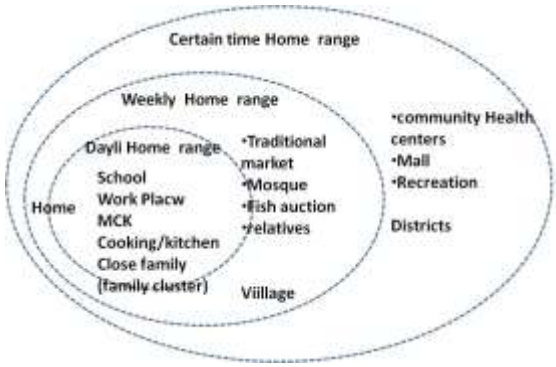

Fig.7: The movement of the population based on fishermen's routines

Figure 7 shows that the space MCK (bathing, washing, and toilet) are in daily home zone, when connecting with figure 6 then these accords that space MCK still in housing zone and in this area, generally users are the elderly, children, and young women.

More specifically regarding the age of the user, Based on Figure 3, 4, and 5 and observed that generally, the use of the facilities clean water (wells) are those who are still young and are rarely seen those aged 60 years and over. This condition is in accordance with that expressed by Pramitasari et al. (2014) that the physical condition of the influence of social interaction. Increasing a person's age, the ability to interact and have a relationship with another person usually will further decline. The elderly parents using existing facilities in house to meet those needs with the help of their children (age under of five).

3.3. The level of interaction relation to the distance between the individual

The level of interaction relation to the distance between the individual. Social interaction has rules, and these rules can be viewed through the dimensions of time and space (Hall, 1966). Hall divide the social interaction room into four distance limitations, that intimate distance, personal distance, social distance, and public distance. In addition to rules about the room, Hall also explains the rules of the time. The dimension of time used by the public can influence the form of interaction.

Table.4: Distance Limitations, Character Communicate and Content of Message

Distance	Name distance	Character	The contents of the message
0-6 inches	Intimate Distance (close phase)	Subtle whisper	Top secret
6-18 inches	Intimate distance (phase away)	Whisper can be heard	Very secret
1,5 – 2,5 foot size	Personal distance (close phase)	Smooth voice	Personal problems
	Personal distance (far phase)	Very low sounds	Personal problems
4-7 foot size	Social distance (close phase)	full voice	No personal information
7-12 foot size	Social distance (far phase)	Full voice but a bit tinny	Public information that can be heard by others
12-25 foot size	Distance public (close phase)	Loud sound that can be heard by the group	Public information that can be heard by others
≥ 25 foot size	Distance public (far phase)	Loud voice	Call

Community in fishermen settlement Galesong using social distances (near and far) and do not touch each other using only voice a little louder to communicate in clean water facilities. It is also justified by Hall in (Suanarto: 2004) that the social distance is a distance people interact with each other can speak naturally but do not touch each other. The women will take a closer distance than the male and between fellow sexes or between men and women.

The following sketch of distance communication of the user in public well as follows:

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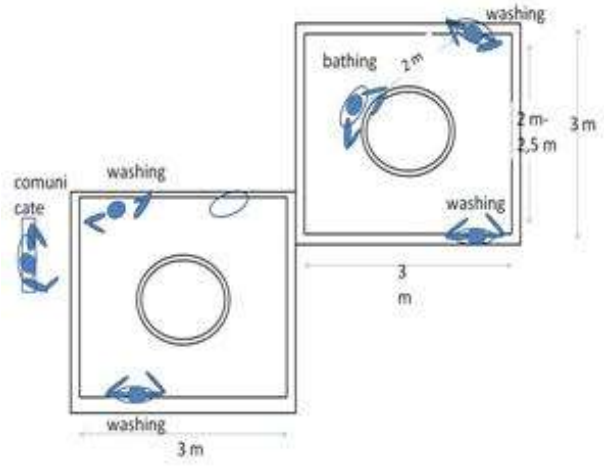
a)



b)

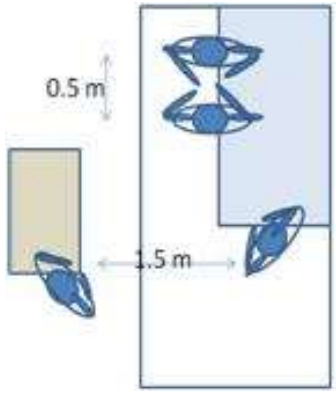


Fig.7: The housewife (a) and teenager (b) communication distance and positions in public wells

Social interactions in people who already know each other can occur with position adjacent or opposite (Stevens 2007). It is also in line with condition which took place in a public well where the mothers were washing and bathing was seen taking the position of standing face to face. Those who visit the public well has the good proximity of the family aspect and location of the house.

Unlike teenagers, they are closer in distance to communicate as seen in the public water taps. This is influenced by the attitude of adolescents, especially girls because generally, they are talking with each other is more personal issues such close friends (boy / girl friend) or sex and they do not want anyone else outside of his friend to know about it. It is also disclosed by Rice (1999) in Sarwono (2011), that in adolescence, emotional needs of individuals switching from parents to peers. At this time, Friends of the same age are also a source of information. No exception in sexual behavior. Peers play a significant role in the lives of teenagers, is no exception in terms of sexuality. By contrast, the theme of mother conversation is more common as television programs (especially soap operas), children, food, and beauty become the subject of warm conversation. Because the topic is more general, it does not require physical proximity.

Besides the age, gender is one factor that influences the interaction between one person and another. Example men will avoid women who are likely to talk about subjects related to women, such as fashion, cooking. Likewise, women will avoid the group of men who discuss issues related to masculine, eg football, etc. (KumRyati. Sociology SMA.). Based on these, it can be said that the age and gender affect the quantity and quality of community interaction.

V. CONCLUTION

Water supply in the settlements of fishermen was one communal space that made the community interact. The level of interaction was affected by the intensity of the meeting, while the quality of interaction was affected by distance communication. The communication distance was affected by age and gender.

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Measuring, Registering and Recording the vectors' characteristics of Induction Machines

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Abstract—*Evolution of power semiconductor devices and power static frequency converters is a key factor in development of advanced applications. Availability of energy sources derived adjustable frequency AC motor allowed to reach a new horizon in research studies and technical applications, completely untapped today.However, the advantages inherent in the operation of adjusting the frequency cannot be fully exploited without adopting a proper control strategy, which is essential in characterizing the parameters and the overall performance of a command system. Control techniques are to ensure a fair and effective command of the operation. During normal operation, the nominal engine and inverter must be secured and the engine order should be placed in area of maximum torque. In case of overloads or faults of another nature, redesigning of installation parts is preferable in order to adopt advanced operating strategies and to determine the parameters.*

Keywords— Scalar control, vector control, estimate parameters, sensors monitoring, coordinate system (α, β), coordinate system (d,q).

I. INTRODUCTION

Issues of control parameters in an electric drive should be considered in a different manner like control systems design engineering. It is suitable to consider a set of black boxes connected in cascade. Each module has a well-defined mathematical model with linear variation. Applications to a command in the AC system are now very complex which can simultaneously control many parameters with linear variation and hardly can be described analytically using a model. Even if it takes a vector control strategy to obtain a similar behavior to that of a DC motor, several problems still remain unresolved due to the particular engine and converter structures and their interaction with load and source.

Torque pulsations, the frequency harmonic content, optimize efficiency, change parameters, response time, are only few of many issues to be resolved. The control strategies presented in this paper will be helpful to solve these challenges.

Another major factor that assisted shareholders AC technology in control issues is the development of microprocessors. Complex microprocessors, and DSP (Digital Signal Processor) have the ability to directly calculate the ignition time of a power semiconductor circuit of a three-phase bridge, by adjusting the power frequency. Besides, it performs other important tasks in industrial automation application as well as startup and shutdown sequencing, self-testing, monitoring deficiencies, diagnosis and determining system operating parameters or dynamic stationary. However, the most important contribution of microprocessor power is that it opens new frontiers for implementing sophisticated control systems for electric drives. These modern techniques of control permit the control of adaptive and intelligent control logic for the expert systems and neural networks diffuse. These achievements are applied to variable frequency drives without major complications for the operation and structure which helps to simplify the above issues, particularly in certain categories of applications such as robotics.

Variable frequency drives can lead to an increase in the efficiency by 20 to 30% compared to constant speed systems. This means a major economic power in a short period, taking into account the additional costs of equipment and force. Such energy savings were so convincing that variable speed drives for pumps and fans are today available in the market for electric drives.

In industrial automation, the need for safe and easy integration of the element of performance (drive) automatic process, found an adequate response in the performance of variable frequency drives. As a result, the automated hydraulic and pneumatic systems are being replaced today by electric drives to ensure speed , higher precision control, a better power / weight, ruggedness and the free and easy maintenance.

The two classes of electric drives have very different control schemes. Variable speed drives presents a constant ratio of voltage / frequency in open loop for shareholders without pretensions to improve energy control. On the other hand, high dynamic performance drives are made with a control complex, usually involving vector control for regulation independent torque and flux, including how to reduce the field of high speed operation.

Simple and cheap method of induction motor speed control by keeping the voltage / frequency ratio constant has been

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studied and applied extensively. The method is derived from the point that at constant flow, the ratio of field amplitude and frequency remain constant, only if the slip is kept constant. Operation at constant torque variable speed is made until it reaches a speed corresponding to the nominal voltage of the machine.

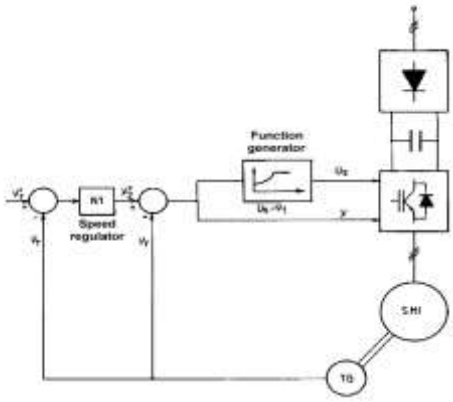

Fig.1: Scalar control in closed loop by speed and slipping adjusting.

In time many improvements have been introduced in the control scheme to overcome some of the most important disadvantages.

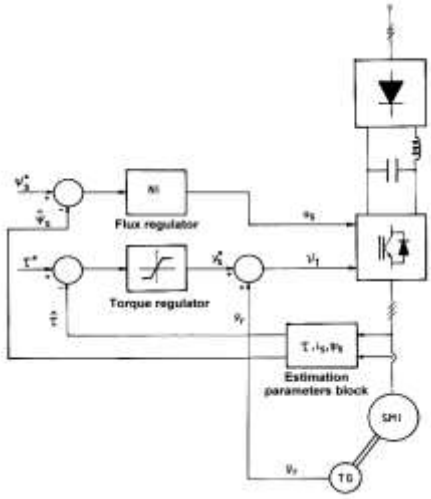

Fig.2: Adjustable flux and torque scalar control with integrated block of operating parameters estimation.

For example, offsetting the fall of voltage on the stator windings can be achieved by implementing a characteristic voltage / frequency. the voltage is amplified and over the face value proportional to frequency. Voltage amplification can be made proportional to the stator current value or (alternatively) to the component of stator current phase. Closed-loop control current during operation was introduced to address the emergence over-current trigger while adjusting the slip frequency is usually added to compensate the speed fall due to load functioning. Although the performance of a drive is improved by the methods suggested, the ratio voltage / frequency remains constant. The process of an inner control of the design is still difficult because it cannot maintain the flux of air-gap same as the desired value, corresponding to operating point value. Changing parameters due to temperature and saturation disrupt response to other operating points. Scalar control was introduced to allow for the installation and to provide performance when needed better dynamic performance .

Such scheme is based on separate control of flux and torque, but both voltages and currents must be measured to calculate the instantaneous measurements of flux and arbor torque.

II. MATHEMATICAL EQUATIONS OF A.C. MACHINES IN DIFFERENT COORDINATE SYSTEMS

Logical extension of the system matrix and the generalized theory of electrical machines can read equations and power flux, the corresponding parameters of the machine, the expressions of electrical power and electromagnetic torque. Stator voltage equation is formulated in a standstill. Voltage space vector can be defined similar to a current space vector [1], [2]:

$$u_s = \frac{2}{3}\left(u_A + a u_B + a^2 u_C\right) \tag{1}$$

Voltage equation of phase B is multiplied by „a", the phase C is multiplied by „a^2" and all three equations are multiplied by 2/3:

$$\left.\begin{aligned} u_A &= i_A R_s + \frac{d\Psi_A}{dt} \\ u_B &= \left(i_B R_s + \frac{d\Psi_B}{dt}\right)\Big|\cdot a \\ u_C &= \left(i_C R_s + \frac{d\Psi_C}{dt}\right)\Big|\cdot a^2 \end{aligned}\right| \cdot \frac{2}{3} \tag{2}$$

Bringing together the three equations is obtained:

$$\begin{aligned} &\frac{2}{3}\left(u_A + a u_B + a^2 u_C\right) = \\ &= \frac{2}{3}\left(i_A + a i_B + a^2 i_C\right)R_s + \\ &+ \frac{d}{dt}\left[\frac{2}{3}\left(\Psi_A + a\Psi_B + a^2\Psi_C\right)\right] \end{aligned} \tag{3}$$

Analogically, equation 1 defining voltages vector, similarly, the Ψ_S vector can be written as:

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$$\Psi_s = \frac{2}{3}\left(\Psi_A + a\Psi_B + a^2\Psi_C\right) \quad (4)$$

So, the space vector of stator voltage is:

$$u_s = i_s R_s + \frac{d\Psi_s}{dt} \quad (5)$$

Analogically, for the rotor is obtained:

$$u_r = i_r R_r + \frac{d\Psi_r}{dt} \quad (6)$$

u_r, i_r şi ψ_r have the same expressions as those of spatial vectors of the stator, the indices A, B, C being replaced by a, b, c.

The same equation can be expressed with Park vectors and can be obtained by designing the two phases α, β. For stator and rotor voltage equations are [1], [2]:

$$u_\alpha = i_\alpha R + \frac{d\Psi_\alpha}{dt},\ u_\beta = i_\beta R + \frac{d\Psi_\beta}{dt} \quad (7)$$

Combining these two equations it obtained:

$$u_\alpha + ju_\beta = \left(i_\alpha + ji_\beta\right)R + \frac{d}{dt}\left(\Psi_\alpha + j\Psi_\beta\right) \quad (8)$$

Which given the transformation expressions from simplified complex equations into instantly, get global equivalent equation:

$$u = iR + \frac{d\Psi}{dt} \quad (9)$$

Similar to the derivation of voltage spatial vector equations and vector spatial flux equations can be derived from the three phases A, B, C or rectangular phases α, β. The most convenient is to use reference system with α, β, therefore, instead of depending on inductance matrices we will consider the following:

$$\begin{array}{c} \\ A \\ B \\ C \end{array}\begin{array}{c} \begin{array}{ccc} A & B & C \end{array} \\ \begin{bmatrix} l_{ss} & l_{ms} & l_{ms} \\ l_{ms} & l_{ss} & l_{ms} \\ l_{ms} & l_{ms} & l_{ss} \end{bmatrix} \end{array} \quad (10)$$

and

$$\begin{array}{c} \\ A \\ B \\ C \end{array}\begin{array}{c} \begin{array}{ccc} a & b & c \end{array} \\ \begin{bmatrix} \cos\alpha & \cos(\alpha+120°) & \cos(\alpha+240°) \\ \cos(\alpha+240°) & \cos\alpha & \cos(\alpha+120°) \\ \cos(\alpha+120^\circ) & \cos(\alpha+240°) & \cos\alpha \end{bmatrix} \end{array} \quad (10)$$

where:

l_{ss} is own stator inductance;

l_{ms} is the mutual inductance of stator;

α is the angle between the stator and rotor corresponding phases.

The inductances matrix is:

$$\begin{array}{c} \\ 0 \\ \alpha \\ \beta \end{array}\begin{array}{c} \begin{array}{ccc} 0 & \alpha & \beta \end{array} \\ \begin{bmatrix} l_{ss}+2l_{ms} & & \\ & l_{ss}-l_{ms} & \\ & & l_{ss}-l_{ms} \end{bmatrix} \end{array} \quad (11)$$

The corresponding inductances of α and β phases are equals and the spatial current vector is: $i = i_\alpha + ji_\beta$. So, for an arbitrary space distribution, the stator inductance is:

$$L_s = l_{ss} - l_{ms} \quad (12)$$

For sinusoidal spatial distribution:

$$l_{ms} = l_{AB} = L_{ms}\cos 120^0 = -\frac{L_{ms}}{2}$$
$$l_{ms} = l_{AC} = L_{ms}\cos 240^0 = -\frac{L_{ms}}{2} \quad (13)$$

l_{ss} inductance is bigger than mutual inductance L_{ms}:

$$l_{ss} - l_{ms} = \left(L_{sI} + L_{ms}\right) - \left(-\frac{L_{ms}}{2}\right) = L_{sI} + \frac{3}{2}L_{ms} \quad (14)$$

Hence, the stator three-phase inductance:

$$L_s = L_{sI} + \frac{3}{2}L_{ms} \quad (15)$$

By considering equations 10, 12 and 13, in case spatial sinusoidal distribution:

$$l_{ss} + 2l_{ms} = L_{sI} + L_{ms} - 2\frac{L_{ms}}{2} = L_{sI} \quad (16)$$

So:

$$L_{s0} = L_{sI} \quad (17)$$

However, this result above needs correction, while the inductance is determined even of space harmonics multiplied by 3 phases and the number of poles. Similarly, the total three-phase rotor own inductance is [5]:

$$L_r = L_{rI} + \frac{3}{2}L_{mr} \quad (18)$$

$$L_{r0} = L_{rI} \quad (19)$$

Considering expression stator-rotor mutual inductance matrix, and making necessary changes to the components α, β, the equation of flux is:

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$$\begin{matrix} & i_0 & i_\alpha & i_\beta \\ & 0 & \alpha & \beta \end{matrix}$$

$$\begin{bmatrix} \Psi_0 \\ \Psi_A \\ \Psi_B \end{bmatrix} = \frac{3}{2} L_{sr} \begin{matrix} 0 \\ A \\ B \end{matrix} \begin{bmatrix} 0 & 0 & 0 \\ 0 & \cos\alpha & -\sin\alpha \\ 0 & \sin\alpha & \cos\alpha \end{bmatrix} \begin{bmatrix} i_0 \\ i_\alpha \\ i_\beta \end{bmatrix} \quad (20)$$

Stator mutual flux losses caused by rotor current:

$$\begin{aligned} &\Psi_{sm} = \Psi_{Am} + j\Psi_{Bm} = \\ &= \frac{3}{2} L_{sr} \left[\left(\cos\alpha \cdot i_\alpha - \sin\alpha \cdot i_\beta \right) + j\left(\sin\alpha \cdot i_\alpha + \cos\alpha \cdot i_\beta \right) \right] = \\ &= \frac{3}{2} L_{sr} \left[i_\alpha \left(\cos\alpha \cdot + j\sin\alpha \right) + j i_\beta \left(\cos\alpha \cdot + j\sin\alpha \right) \right] = \\ &= \frac{3}{2} L_{sr} \left(i_\alpha + j i_\beta \right) e^{j\alpha} = \frac{3}{2} L_{sr} e^{j\alpha} i_r \end{aligned} \quad (21)$$

Hence, stator-rotor mutual inductance is:

$$L_m = \frac{3}{2} L_{sr} \quad (22)$$

and it must be multiplied by the $e^{j\alpha}$ factor due to the relative rotation of two reference systems. Stator-rotor mutual inductance matrix is transposed stator-rotor mutual inductance matrix. The same expression is obtained for the mutual inductance L_m if deemed transposed matrix and instead $e^{j\alpha}$, we obtain $e_{-j\alpha}$ multiplier.

Hence the vector equations of flux in the natural reference system are:

$$\begin{aligned} \Psi_s &= L_s i_s + L_m e^{j\alpha} i_r \\ \Psi_r &= L_m e^{-j\alpha} i_s + L_r i_r \end{aligned} \quad (23)$$

where L_s, L_r, L_m are definite in (15), (18), (22).

The equations become:

$$\begin{aligned} \Psi_{s0} &= L_{s0} i_{s0} \\ \Psi_{r0} &= L_{r0} i_{r0} \end{aligned} \quad (24)$$

III. ELECTRIC POWER AND ELECTROMAGNETIC TORQUE

For symmetrical three-phase systems, instantaneous power can be expressed according to the reference system (α, β) as follows [2], [3]:

$$p = \frac{3}{2} \left(u_\alpha i_\alpha + u_\beta i_\beta \right) + 3u_0 i_0 \quad (25)$$

If, for three-phase vectors, to complex power (ui*) it is applied the simplified complex transformation method, we obtain:

$$\begin{aligned} &ui^* = \left(u_\alpha + j u_\beta \right) \cdot \left(i_\alpha - j i_\beta \right) = \\ &= u_\alpha i_\alpha + u_\beta i_\beta + j\left(u_\beta i\alpha - u_\alpha i_\beta \right) \end{aligned} \quad (26)$$

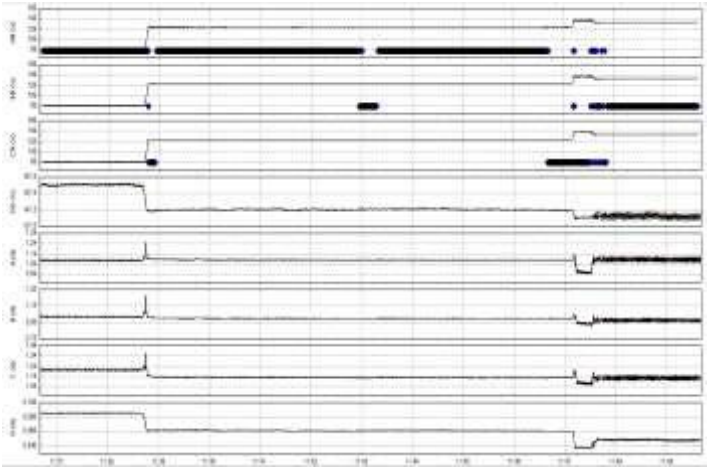
Hence, the instantaneous power is obtained as 3/2 times the real part of this expression - if components are not zero:

$$p = \frac{3}{2} \mathrm{Re}[ui^*] \quad (27)$$

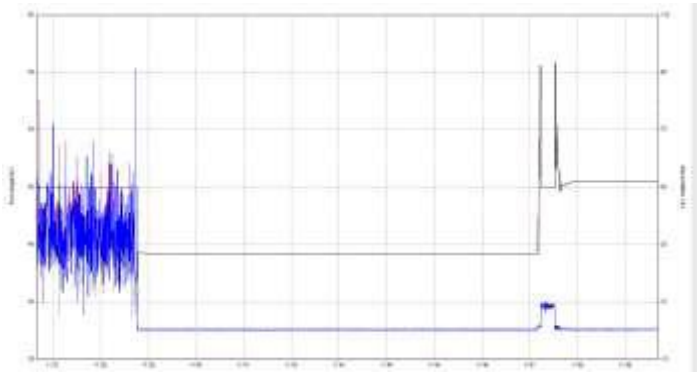
occasionally, power sequence 0: $p_0 = 3u_0 i_0$ (28)

If we add to the instant power of the stator and rotor and if they are calculated separately by applying equation (27):

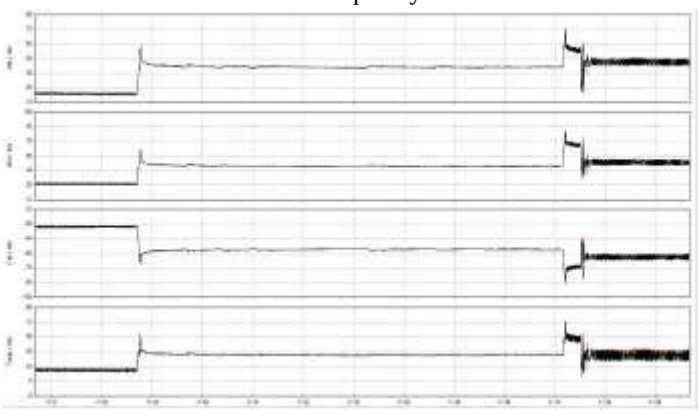
$$p = p_s + p_r = \frac{3}{2} \mathrm{Re}\left[u_s i_s^* + u_r i_r^* \right] \quad (29)$$



a. The voltage and current



b. Frequency



c. Power

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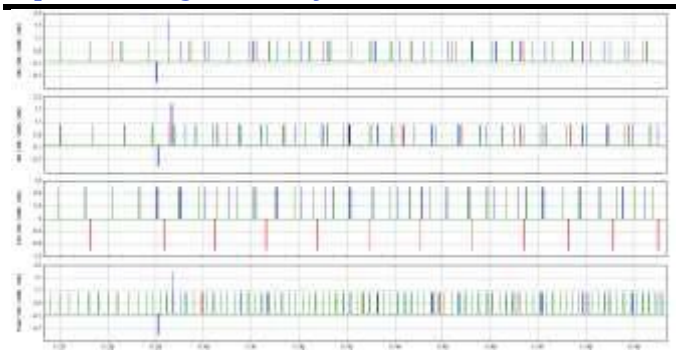

d. Energy

Fig.3: Determination of main parameters of A.C. induction machine

If equation defining voltage and current space vectors are replaced in equation (29) is obtained:

$$\frac{3}{2}\mathrm{Re}\left[\frac{2}{3}\left(u_a + au_b + a^2u_c\right)\cdot\frac{2}{3}\left(i_a + ai_b + a^2i_c\right)\right] = \quad (30)$$
$$= u_a i_a + u_b i_b + u_c i_c$$

The value obtained is equal to an instantaneous value of power. In Fig. 3 are highlighted possibilities for determining and measuring main parameters of A.C. induction machine for a low power three-phase A.C. machine.

To obtain the appropriate electromagnetic torque relationship can use in a similar fashion to those described above, coordinate system (α, β), but the most convenient way to get this relationship is using common reference for the stator and rotor (System Reference (d, q)).

Expression in the reference torque (d, q) for a synchronous machine is:

$$\tau = -i_D L_{dD} i_q + i_Q L_{qQ} i_d - i_d i_q \left(L_d - L_q\right) \quad (31)$$

Rotor flux and space current vectors can be expressed in the reference system (d, q) as follows:

$$\Psi_r = \Psi_d + j\Psi_q = L_d i_d + L_{dD} i_D + j\left(L_q i_q + L_{qQ} i_Q\right)$$
$$i_r = i_d + j i_q \quad (32)$$

If the complex conjugate vector space of flux rotor is multiplied by the current space vector of rotor get:

$$\Psi_r^* i_r = L_d i_d^2 + L_{dD} i_D i_d + L_q i_q^2 + L_{qQ} i_Q i_q +$$
$$+ j\left(-L_q i_q i_d - L_{qQ} i_Q i_d + L_d i_d i_q + L_{dD} i_D i_q\right) \quad (33)$$

and: $\tau = -\frac{3}{2}\mathrm{Im}\left[\Psi_r^* i_r\right]$ (34)

Apply the multiplier 3/2 and introduce the term derivative of torque, the expression becomes equivalent to equations with two-pole machine, and for a multi-pole machine, mathematical expression should be multiplied by the number of poles P.

Equation 34 can be written in the following form by considering the angle β between the 2 vectors:

$$\tau = -\frac{3}{2}\left|\Psi_r\right|\left|i_r\right|\sin\beta \quad (35)$$

By considering the interpretation of a product of vectors, torque is described by a vector that is perpendicular to the plane defined by ψ_r and i_r with a value equal to 3/2 times the area of the parallelogram in Fig. 2, as follows:

$$\tau = -\frac{3}{2}\Psi_r \times i_r = \frac{3}{2}\Psi_s \times i_s \quad (36)$$

Torque expression obtained has not only spatial distribution but also a sinusoidal temporal variation arbitrary. In a multi-pole machine, it must be multiplied by the number of pole pair's "p" [3], [4].

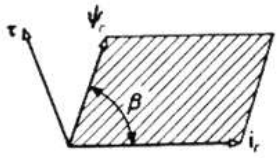

Fig.4: Torque vector result of flux and current vectors

IV. DISPLAYING AND RECORDING THE THREE PHASE VECTORS

The phase vectors can be displayed on an oscilloscope screen or within a LabVIEW application. Since the deflection plates act in orthogonal directions, voltages expressed in a rectangular system have to be considered. For the current vectors, appropriate voltages may be obtained by using shunt resistances, Fig. 5,a and b.

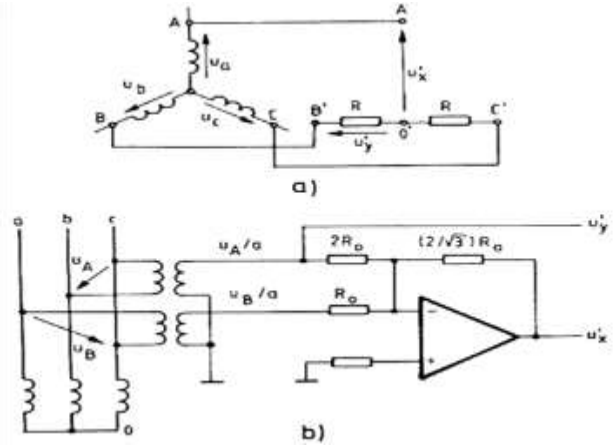

Fig.5 Determination of voltages at the terminals of a three-phase consumer
a)Vector diagram. b) Practical realization

The results displayed on the oscilloscope can be photographed using special devices which make it possible to assess the size and elaborate the results [8].

4.1. Display the voltage vectors

Display of voltage vectors is quite simple using the circuit of Fig. 3.a, where A, B and C are the terminals of the three

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phases, and 0 is the neutral point of the star on which the electric machine is tested. The neutral point is not actually necessary in this situation, so that the same configuration can be used for the connection triangle. The common point of two resistors 0 must to be connected to the common mass of amplifiers and oscilloscope, while the voltages u_x' and u_y' are applied to the inputs of the horizontal and vertical amplifiers [10].

The

$$u_y^{'} = \frac{1}{2}(u_b - u_c)$$
$$u_x^{'} = u_y^{'} - u_b + u_a = -\frac{1}{2}(u_b + u_c) + u_a \quad (37)$$

Comparing these expressions with the real and imaginary parts of the voltage vector:

$$\mathrm{Re}[u] = \frac{2}{3}u_a - \frac{1}{3}(u_b + u_c) + u_x$$
$$\mathrm{Im}[u]\frac{1}{\sqrt{3}}(u_b - u_c) = u_y \quad (38)$$

one obtains:

$$u_x^{'} = \frac{3}{2}u_x; \qquad u_y^{'} = \frac{\sqrt{3}}{2}u_y \quad (39)$$

The input voltage is indeed proportional to the volt vector coordinates considering a $\sqrt{3}$ scale factor.

This can be taken into account by setting the gain of amplifiers (Fig. 3b). The above equations are valid also for the phase voltages of star connections with zero sequence components, but in this case the projection vector on axis is not apparent in phase quantities. Care should be taken not to apply excessive loads on voltage ux', because in this case the load will also contain u'y component. If the load cannot be reduced, the circuit configuration must be modified to eliminate unwanted interactions. The load is connected to terminals O'B (at u'y) and another identical load will restore the balance circuit terminals O'C.

In practice, an indirect measurement scheme is normally used, in which the voltage transformer is connected to the line terminals of the test machine.

If there is no zero sequence component, $u_a + u_b + u_c = 0$, equation (38) can be written in a simpler form:

$$u_x = u_a - (u_b + u_c)$$
$$u_y = \frac{1}{\sqrt{3}}(u_b - u_c) \quad (40)$$

The x and y components of the voltage vector u can be obtained from two line voltage using the following equations:

$$\sqrt{3}u_x = -\frac{1}{\sqrt{3}}u_A - \frac{2}{\sqrt{3}}u_B$$
$$\sqrt{3}u_y = u_A \quad (41)$$

The scheme of Fig. 3b includes two power transformers and an operational amplifier. From this scheme. The signals are proportional to the voltage vector components that can be displayed on the oscilloscope:

$$u_x^{'} = \frac{\sqrt{3}}{a}u_x; \quad u_y^{'} = \frac{\sqrt{3}}{a}u_y$$

(42) These signals must be applied directly to horizontal and vertical oscilloscope inputs.

4.2. Display the current vectors

In order to show the current vectors on the oscilloscope screen, the resulting voltages are proportional to the two components of the current vector and should be applied to the inputs of the oscilloscope deflection plates, Fig 6.

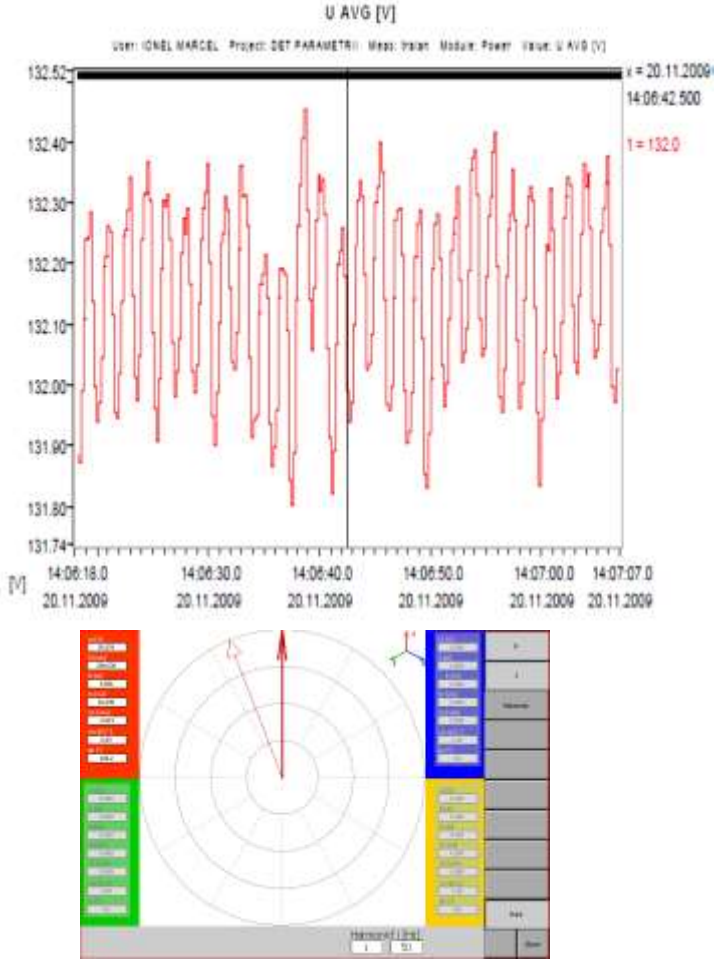

Fig.6. Displaying voltage vectors at the terminals of an induction motor at low frequency.
a) Sinusoidal diagram, b) Vector diagram

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Equations (38) or (40) can be used to calculate the vector components. When only three terminals of the machine windings are available, current transformers may be used. When 6 terminals are available, the current transformers can be omitted from the measurements.

Three current transformers are needed if the current system is unbalanced, that is, when there is zero sequence current on the neutral line. In practice, however, $i_0 = 0$ in most cases [19]. When using current transformers, the secondary currents i_b and i_c flow through identical resistors (as in Fig. 7). Care should be taken to the polarization of each winding. As the sum of the three currents is zero, the voltage drop between points C and B i_s i_{aR}. Hence, the three phase voltage system shown in points A, B and C will be proportional to the current system, so the current vectors can be displayed in the same way as the voltage vectors. Unfortunately, in most cases, the standard current transformers do not produce a sufficiently high voltage in the secondary for a small primary current [11].

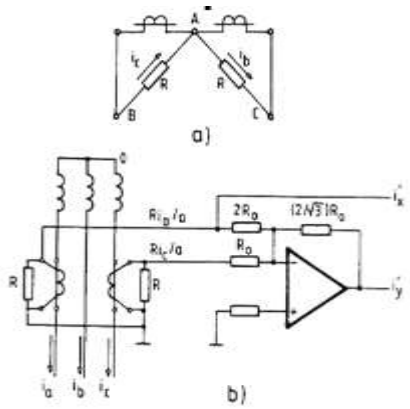


Fig.7: Determination of current at the terminals of a three-phase consumer
a) Vector diagram. b) Practical realization

In practice, the scheme of Fig. 7.b, can be used, with a general operational amplifier to display the current vectors. Since $i_x = i_a$, the only problem is to generate iy. For instance, equation (38) shows that:

$$i_y = -\frac{1}{\sqrt{3}} i_a - \frac{2}{\sqrt{3}} i_c \qquad (43)$$

Another way to generate the y component of the current vector i is analytical. This expression can be represented by the circuit configuration shown in Fig. 7b. Taking into account the transformation ratio of the current transformers and the voltage drop on the resistors of value R, the signals are proportional to the components x and y, of the vector current:

$$i_x^{'} = \frac{R}{a} i_x; \quad i_y^{'} = \frac{R}{a} i_y \qquad (44)$$

Current transformers can be replaced by other current sensors, Hall elements or optic-couplers. Current transformers cannot be used when accurate measurements of DC components transient phenomena are important for signal recording, or when the frequency is too low. In such cases other devices have to be installed (e.g., shunt resistors), Fig. 8.

V. HARMONIC ANALYSIS OF THREE-PHASE VECTORS

In steady state, the voltage vector u(t), the current i(t) and the flux Φ(t) along a closed curve have a sinusoidal variation in time. In the sequel, how to determine the harmonic components from the curves is presented. This method is analyzed in a particular case, with a stable state of circuit and systems, or when the motor is controlled in steady state.

Let us consider a periodic function of period T, expressed in the form y(t) = y(t+T). By calculating the Fourier series:

$$y(t) = \sum_{v=-\infty}^{\infty} Y_v e^{jv\omega_1 t} \qquad (45)$$

where $\omega_1 = 2\pi / T$ and v is the harmonic order.

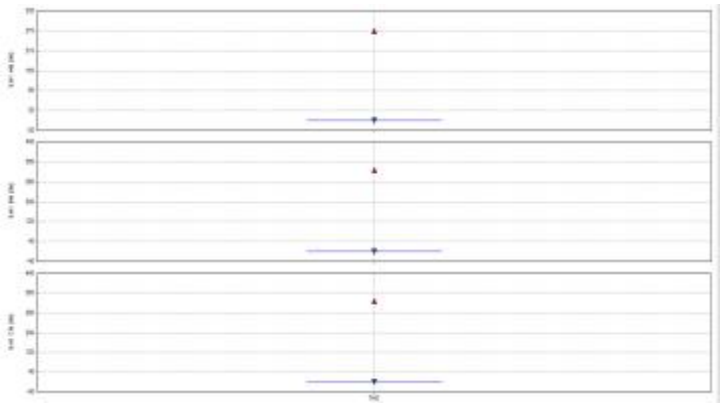
After several complete rotations, a complete value of three-phase simmetrical sinusoid can be represented. The Fourier coefficients can be determined as follows:

$$Y_v = \frac{1}{T} \int_0^T y(t) \cdot e^{-jv\omega_1 t} dt \qquad (46)$$

If y(t) is determined by sampling the waveform, the integral is replaced by a sum. For γ = 1, equation (46) represents the fundamental frequency:

$$Y_1 = \frac{1}{T} \int_0^T y(t) \cdot e^{-j\omega_1 t} dt \qquad (47)$$

Fig.8 shows the diagrams of frequency parameters for the case of a small power induction motor commanded by a frequency converter.



a. Superior harmonics

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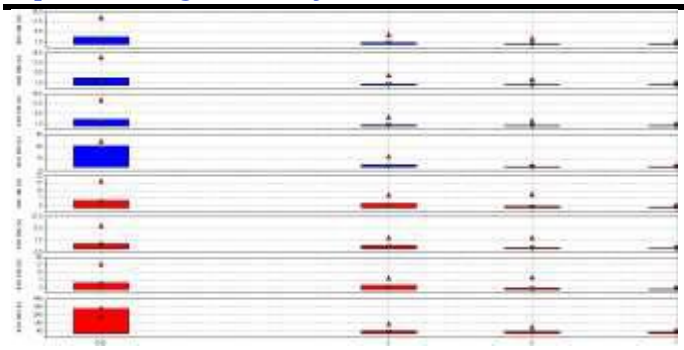

b. Power and harmonics

Fig.8. Diagrams of frequency parameters at the terminals of a three-phase consumer balanced in dynamic system

By recalculating the expression of equation (46) transforming the coordinate reference system, one can see that the value of the function to be integrated is not greater than the fundamental component in a fixed coordinate system (synchronous rotation):

$\omega_1 t = x_c, \omega_1 = \omega_c$.

From this expression we observe that the fundamental component is higher than the component represented in the synchronous rotation system.

VI. CONCLUDING REMARKS

Today, thanks use semiconductor circuits and electronic devices , electromagnetic techniques were replaced with efficient techniques and high control accuracy. Electromagnetic converters performance was gradually improved , allowing to obtain any desired mechanical characteristics to any type of motor.

The introduction of the electric machines controlled by static converters leads to the need of identifying stationary and dynamic parameters, simultaneously with the identification of dynamic phenomena and waveform distortion introduced by them. However, this does not mean that all types of motors are equal in terms of price, performance control, efficiency, optimal weight, etc. The electromagnetic structure and operating principle can be the other crucial aspects affecting the effectiveness of the energy system [12].

The structure of the machines with static converter control is often built especially to provide electronic control and create specific converters used in mechatronics. Electronic control system performance has improved not only the energy startegies, but has also changed the general philosophy of design and complete development of new types of machinery. For further progress in this area it is necessary to consider simultaneously the electronic circuit supply and the electromagnetic field structure [12], [13], [14].

A conventional electronic control (with pulse modulation - PWM) has some typical disadvantages, such as high bandwidth of the fundamental harmonic voltage, pulses of torque, the influence of asymmetry in the structure especially at low angular speed, the need for additional external cooling at low speed, radio interference and energy provision with relatively low efficiency of the machines.

To determine the design of the control circuits define first , precise movements of the car to try to define specifications and rules with sufficient precision, so the circuit is well known. Until now, electric cars all started with the final configuration methods and evaluation of geometric and after repeated analysis is to find the optimal solution . How to do research to find solutions to real machine parameters highlights the degree to which it defines as optimal solution is highly variable.

Users of software dedicated to the left first attempt to make the determination of optimized parameters of different configurations of electric machines and, on the other hand, processing of the results obtained. Also, by the method of multiple search procedure can be done to define objectives, and later to realize automatic filling of the problem by choosing solutions without user intervention.

Final configuration, starting from the initial state of the machine makes it impossible to determine the broader parameters, typical for early definition of the choice of type of motor (usually the winding coils, cold rolled electromagnetic materials etc.). The procedures for choosing the type of motor and drive are certainly not enter into detailed projections of the motor without prior specifications.

In this study are highlighted the computer methods used for automated search optimization and determination of parameters. The basis for these methods is to define a single objective function that can be determined with minimal effort. In this study , attention was directed to seek new methods for determining operating parameters involving and choosing the right control.

Compared with uniform harmonic content networks DC, AC drives generate harmonics unitary additional harmonic band called marginal (tape edge) . Compared to other AC units currently used , frequency converters generate significant levels of higher order harmonics .

To assess if a converter can disrupt its command or other tasks, a system study must be completed before installing such a converter. The drive is larger and more complex, with both increases and importance of the study to be conducted.

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Image Restoration Using Group-based Sparse Representation Technique

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Abstract— *This paper presents an efficient algorithm for solving restoration problem in the frame-based image restoration. In image restoration, the patch-based approach has been used for better results without degrading the image. Our proposed procedure for solving the stable optimal problem is based on a patched group strategy method. In this paper GSR (Group Based Sparse Representation) algorithm is proposed which is based on concept that group of patches are constructed which maintains the relationship among various patches of images and it is implemented for three image restoration problems i.e. DE noising, DE blurring and Image enhancement. Various parameters are taken into account like PSNR, SSIM, speed and time. The simulation experiments have been conducted in MATLAB and the results have been compared with existing scheme i.e. patch based sparse representation. Both standard and real time images have been included in simulation. It has been observed that after the reconstruction of an image values of parameters are increased which are more than existing scheme.*

Keywords—Analysis-based approach, Group-based patches, Image enhancement, Image Restoration, Patch method.

I. INTRODUCTION

Image restoration may be declared as method within which the prime quality image is fixed up from the degraded caliber image. It is an associate degree operation within which a corrupt/noisy image is taken and also the clean, original image is calculated. Corruption could take several forms like camera miscues, part turbulence and camera or object motion etc. In image restoration the transpose operations of activity is done which produces blur in the image to get the original image back. The information that is corrupted due to blurring can be get back with the help of Point Spread Function (PSF).

Image restoration and image improvement each area unit completely different in sense that the latter is meant to emphasize varied options of the image so as to supply the additional pleasing image to the observer.

Noise will effectively be removed by ignoring some resolution in image improvement. However this can be not acceptable in several applications like during a visible radiation magnifier, resolution within the z-direction is dangerous. Image restoration techniques are area unit enforced with objective of reducing noise and convalescent resolution loss. These techniques area unit performed in 2 domains either within the image domain or the frequency domain. In American state convolution technique noise is absent which the blurring method is shift-invariant and therefore it introduces additional subtle techniques to manage the various varieties of noises and blurring functions.

Applications of Image restoration

- Denoising and artifacts removal
- Sharpness, contrast and resolution enhancement
- In medical images (CT, MRI, ultrasound, etc.)
- HD/3D/mobile displays, web-scale data, legacy materials etc.

DE noising Techniques

When the only degradation present in an image is noise, then equation becomes

$$g(x, y) = f(x, y) + \eta(x, y) \quad (1)$$

$$\text{And, } G(u, v) = F(u, v) + N(u, v) \quad (2)$$

DE noising techniques exist in each spatial domain in addition as frequency domain.

Spatial Filtering: Spatial filtering is most popular once solely additive noise is gift. The different categories of filtering techniques exist in spatial domain filtering. During this technique, the center pixel worth of the filter window is replaced with the first moment of all the pixel values among the filter window. Noise is reduced as results of this smoothening however edges among the image get blurred.

Median Filter: Median filter belongs to the category of order-statistics filters. The ordering of pixels contained within the filter window is that the response of those filters. Median filter replaces the worth of a pixel by the median of the grey levels among the filter window.

Adaptive Filter: For the removal of impulse noise from an image the adaptive filtering uses the gray and color space. Gray and color space is the base for the whole processing in adaptive filtering. Best noise prevention results can be provided by it and better preserve thin lines, the image edges and the image details. As compared to other filters it provides better image quality.

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II. PREVIOUS FINDINGS

Guo and An [1] have presented a brand new restoration algorithmic rule that implements the filling of broken region with morphological erosion and propagates structure/texture options of the best-known region into the broken region with exemplar-based texture synthesis. The strategy will retain the continuity of image isopods between the best-known region and therefore, the repaired broken region, and output an entire, natural looking image. Through comparative experiments with some existing ways, we tend to demonstrate the effectiveness of the algorithmic rule in removing giant objects similarly as skinny scratches.

Zhang et al. [2] have proposed fuzzy genetic algorithmic rule (FGA) on the premise of genetic algorithmic rule. Uncertainty issues may be resolved within the method of image process by constructing fuzzy characteristic matrix and fuzzy fitness perform, and victimization fuzzy genetic improvement technique. Huan et al. [3] have proposed Associate in Nursing economical image in painting algorithmic rule by introducing vital aspects and enhancements admire the filling order of the pixels within the target region and texture synthesis in an exceedingly dynamic looking vary. The algorithmic rule is easy to implement and restores the target regions with visually plausible quality *i.e.* higher than many existing ways with a lower execution price.

Wang et al. [4] have presented a unique image super-resolution technique supported learning the distributed association between input image patches and therefore, the example image patches. We tend to improve Associate in Nursing existing distributed-coding algorithmic rule to search out sparse association between image patches. Dharmarajan and Kannan [5] have designed an algorithm for the hypergraph (HG) representation of an image, subsequent detection of Salt and Pepper (SP) noise in the image and finally the restoration of the image from this noise. The proposed algorithm exhibits superiority over traditional algorithms and recently proposed ones in terms of visual quality, Peak Signal to Noise Ratio (PSNR) and Mean Absolute Error (MAE).

Yang et al. [6] have introduced the concept of examples-aided redundant dictionary learning into the single-image super-resolution reconstruction, and have proposed multiple dictionaries learning scheme inspired by multitask learning, in order to avoid a large training patches database and obtain more accurate recovery of HR images. Chen et al. [7] have designed a new sparsity-based algorithm for the classification of hyper spectral imagery. The proposed algorithm relies on the observation that a hyper spectral pixel can be sparsely represented by a linear combination of a few training samples from a structured dictionary. Giannoula et al.[8] have proposed, the blind restoration of a scene, when multiple degraded (blurred and noisy) acquisitions are available. An adaptive filtering technique is proposed, where the distorted images are filtered, classified and then fused based upon the classification decisions.

III. PROPOSED WORK

The objective of image restoration technique is to scale back noise and recover resolution loss. Image processing techniques are performed either within the image domain or the frequency domain. The most common and simple technique for image restoration is DE Convolution, that is performed within the frequency domains. DE convolution technique because of its direct inversion of PSF amplifies noise and creates the resulting image which is imperfectly deblurred. Therefore, additional subtle techniques are developed to recover the various forms of noises and blurring functions.

Image processing uses various kinds of filtering techniques like Median filtering, Linear Filtering and adaptation Filtering etc to view a picture to its original forms.

Operations on original images

Now for restoring the image which is approximately similar to original image from the degraded image we have to perform following operations on degraded image.

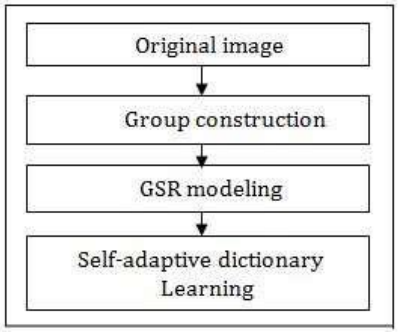

Fig.1: Operations on original image

1. Group Construction

The group construction is carried out by following the steps described below:

Step 1: Divide the image x with size N into n overlapped patches of size $\sqrt{B_s} \times \sqrt{B_s}$ and each patch is denoted by the vector $x_k \in \mathbb{R}^{B_s}$ i.e., where k = 1, 2 …, n.

Step 2: For each patch x_k within the training window of size $L \times L$, search its c best matched patches which contain the set S_{x_k}. Euclidian distance is used to find out the similarity between the different patches.

Step 3: All the patches in the set S_{x_k} are put into a matrix of size$B_s \times c$, denoted by $x_{G_k} \in \mathbb{R}^{B_s \times c}$, which includes every patch in S_{x_k} as its columns, i.e., x_{G_k} =

$\{x_{G_k\otimes 1}, x_{G_k\otimes 2,\ldots}, x_{G_k\otimes c}\}$. The matrix x_{G_k} is called as group. This can be represented by equation as:

$$x_{G_k} = R_{G_k}(x) \quad (3)$$

Where, $R_{G_k}(.)$ is the operator which is used to extract the group x_{G_k} from x, and its transpose, $R^T{}_{G_k}(.)$, can put back a group into its kth position in the reconstructed image, padded with zeros elsewhere. Thus one can recover whole image x from $\{x_{G_k}\}$ become:

$$x = \sum_{k=1}^{n} R_{G_k}^T (x_{G_k})./ \sum_{k=1}^{n} R_{G_k}^T (1_{B_S\times C}) \quad (4)$$

Where, ./ represents element-wise division of the two vectors and $1_{B_S\times C}$ represents matrix of size $B_s \times c$ with all element being 1.

2. Group-Based Sparse Representation Modeling

The GSR model assumes that by using few atoms of the self-adaptive learning dictionary D_{G_k} each group x_{G_k} can be represented accurately. Thus,

$D_{G_k} = \{d_{G_k\otimes 1}, d_{G_k\otimes 2},.., d_{G_k\otimes m}\}$ is supposed to be known. D_{G_k} is of size $(B_s \times c) \times m$, that is, $D_{G_k} \in \mathbb{R}^{(B_s\times c)\times m}$. The rationale behind the sparse coding process of every group is to seek sparse vector $\alpha_{G_k} = [\alpha_{G_{k\otimes 1}}, \alpha_{G_{k\otimes 2}} \ldots\ldots, \alpha_{G_{k\otimes m}}]$,

such that, $x_{G_k} = \sum_{i=1}^{m} \alpha_{G_{k\otimes i}} d_{G_{k\otimes i}}$. For simplicity here $D_{G_k}\alpha_{G_k}$ is used to represents $\sum_{i=1}^{m} \alpha_{G_{k\otimes i}} d_{G_{k\otimes i}}$.

After this, the whole image can be sparsely represented by the $\{\alpha_{G_k}\}$ that is the set of the sparse codes. Thus, x can be constructed from $\{\alpha_{G_k}\}$ which can be represented by

$$x = D_G{}^{\circ}\alpha_G \overset{\text{def}}{=} \sum_{k=1}^{n} R_{G_k}^T (D_{G_k}\alpha_{G_k})./ \sum_{k=1}^{n} R_{G_k}^T (1_{B_S\times C}) \quad (5)$$

Where D_G denotes the concatenation of all D_{G_k}, and α_G denotes the concatenation of all α_{G_k}.

3. Self-Adaptive Group Dictionary Learning

While learning the dictionary for each group following points must be considered.

1) Computational cost must be minimized.

2) The learnt dictionary must be adaptive for a group that is all the groups$\{x_{G_k}\}$are represented by the same dictionary D_{G_k}.

3) It must consider the characteristics of each group x_{G_k}, containing the patches with similar patterns.

The adaptive dictionary for each group is directly learnt from its estimate r_{Gk}which is naturally selected in the process of optimization. After obtaining r_{Gk}, apply SVD. This can be formulated as follows:

$$r_{G_k} = U_{G_K} \sum_{G_k} V_{G_k}^T = \sum_{i=1}^{m} \gamma r_{G_{k\otimes i}} \left(U_{G_{k\otimes i}} U_{G_k\otimes i}^T\right) \quad (6)$$

Where, $\gamma_{r_{G_k}} = [\gamma_{r_{G_{k\otimes 1}}}; \gamma_{r_{G_{k\otimes 2}}}; \ldots; \gamma_{r_{G_{k\otimes m}}}] \sum_{G_k} = diag(\gamma_{r_{G_k}})$ is a diagonal matrix with elements on its main diagonal and $u_{G_{k\otimes i}}$, $v_{G_{k\otimes i}}$ are the columns of U_{G_K} and V_{G_K}.

For the group x_{G_k}, each atom in dictionary D_{G_k} is defined as,

$$d_{G_k\otimes i} = u_{G_{K\otimes i}} v_{G_{k\otimes i,}}^T \qquad i = 1, 2.\ldots, m, \quad (7)$$

Where, $d_{G_k\otimes i} \in \mathbb{R}^{B_s\times c}$. Thus, the learned dictionary for the group x_{G_k} is given by:

$$D_{G_k} = [d_{G_k\otimes 1}, d_{G_k\otimes 2},.., d_{G_k\otimes m}] \quad (8)$$

Operations on degraded image

Now for restoring the image which is approximately similar to original image from the degraded image we have to perform following operations on degraded image.

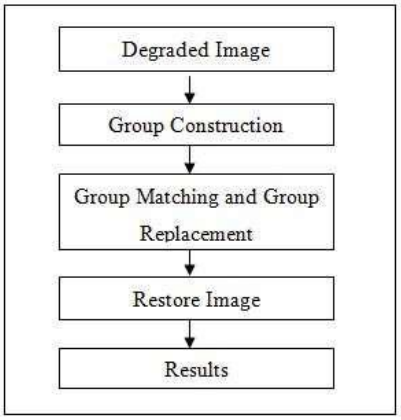

Fig.2: Operations on degraded image

1. Group Construction

Similar procedure which we applied on original image for group construction is carried out on degraded images too and the groups are constructed.

2. Group Matching and Group Replacement

In group matching the constructed group of degraded image is compared and matched with the constructed group of original image. After the group is matched the group of degraded image is replaced with the group of original image.

3. Restored Image

After replacing all the groups of the degraded image we get the restored image which is approximately similar to the original image.

IV. EXPERIMENATL RESULTS

The datasets has been obtained from controlled forms. The controlled dataset has been obtained on the similar background, which may offer the utmost accuracy. The information collected within the ideal conditions has well-tried to be the foremost economical information in terms of accuracy. The controlled information has been collected from the assorted objects (persons).

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Fig.3: Test Images (a) House (b) Cameraman (c) Vegetables

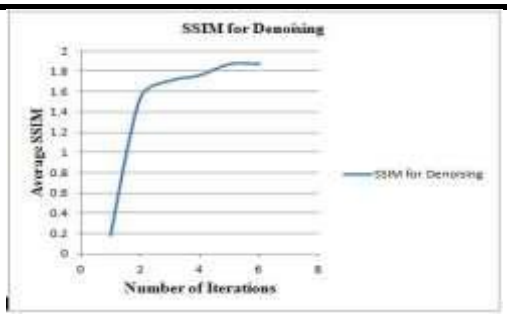

Fig.4: SSIM values on a graph for no. of iterations

Performance Evaluation Parameters

SSIM: SSIM is used for measuring the similarity between two images. Structural information is the idea that the pixels have strong inter-dependencies especially when they are spatially close. These dependencies carry important information about the structure of the objects in the visual scene.

PSNR: Peak signal-to-noise ratio is an engineering term for the ratio between the maximum possible power of a signal and the power of corrupting noise that affects the fidelity of its representation. Because many signals have a very wide dynamic range, PSNR is usually expressed in terms of the logarithmic decibel scale. Although a higher PSNR generally indicates that the reconstruction is of higher quality, in some cases it may not.

MSE: In statistics, the mean squared error (MSE) or mean squared deviation (MSD) of an estimator measures the average of the squares of the errors or deviations, that is, the difference between the estimator and what is estimated.

Evaluation measures for Denoising

(a)SSIM

De-noising has been tested for 12 Images from standard dataset used in existing scheme. The average SSIM value has been taken from all 12 images. Final Values are shown with the line increasing upwards.

Table.1: SSIM measures

Sr.	SSIM
1	0.1787
2	1.5416
3	1.7087
4	1.7644
5	1.8754
6	1.8773

(b) PSNR

PSNR values are evaluated for both existing method and proposed method. Average values are obtained with different sigma values.

Table.2: PSNR values in MS-EPLL

Sigma	MS-EPLL
15	29.01
25	28.23
50	30.16
100	23.8

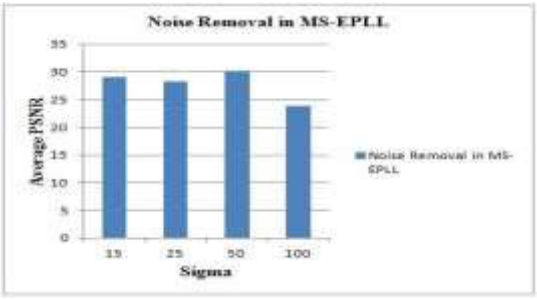

Figure.5 Different values of PSNR for different values of sigma.

De-noising has been tested for 12 Images from standard dataset used in existing scheme. The average PSNR value has been taken from all 12 images. This graph shows the average PSNR values for corresponding values of sigma.

Table.3: PSNR values in GSR

Sigma	GSR
15	34
25	32
50	28
100	25.6

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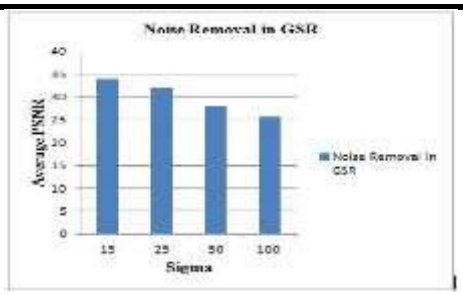

Fig.6: Different values of PSNR for different values of sigma.

De-noising has been tested for 12 Images from standard dataset used in existing scheme. The average PSNR value has been taken from all 12 images. This graph shows the average PSNR values for corresponding values of sigma.

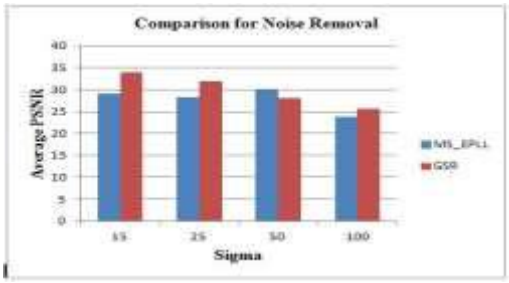

Fig.7: comparison of PSNR values for existing and proposed method

There is comparison between results of existing and proposed algorithm namely, GSR and MS-EPLL for average PSNR in De-noising process with different sigma values. De-noising has been tested for 12 Images from standard dataset used in existing scheme. The average PSNR value has been taken from all 12 images. Final Values has been compared with existing scheme. Proposed model shows the better results in comparison of existing scheme.

(C) SPEED

This graph shows how much speed is measured while implementing GSR algorithm during noise removal.

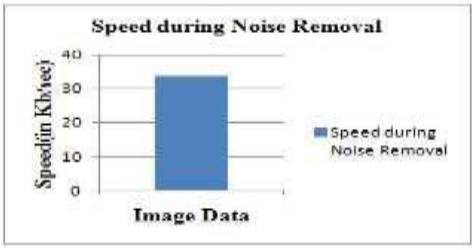

Fig.8: Average Speed for different images

(d) TIME

The graph below sows time taken while implementing GSR algorithm for Noise removal.

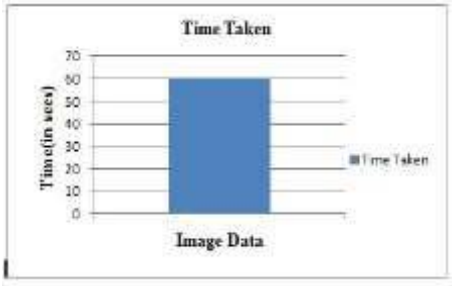

Fig.9: Time taken for different images

Evaluation Measures for Image Enhancement

Image Enhancement has been tested on 12 Images from standard dataset used in existing scheme. The average PSNR value has been taken from all 12 images. Final Values has been compared with existing scheme. Proposed model shows the better results in comparison of existing scheme.

(a) PSNR

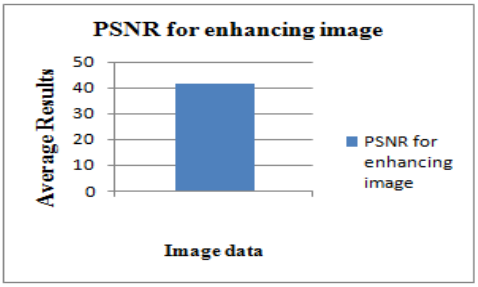

Fig.10: Average PSNR for different images

This graph shows the average PSNR value while enhancing image for different images selected from standard dataset.

(b) MSE

Image Enhancement has been tested on 12 Images from standard dataset used in existing scheme. The average MSE value has been taken from all 12 images. It shows better results in proposed algorithm.

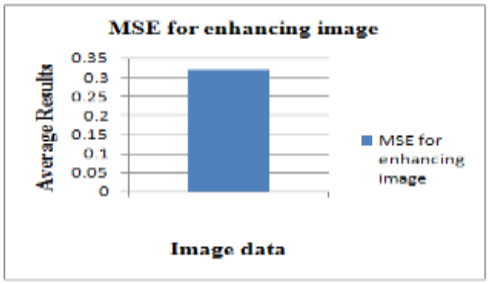

Fig.11: Average MSE for different images

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(C) SPEED

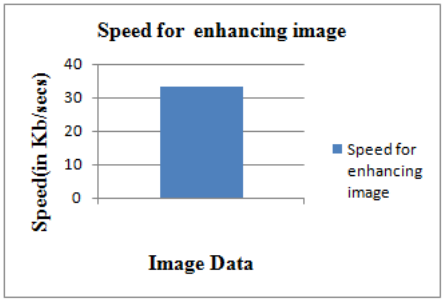

Fig.12: Average speed for different images

This graph shows how much speed is measured while implementing GSR algorithm for image enhancement.

(d) TIME

Fig.13: Average speed for different images

This graph shows the time taken for processing an image during image enhancement and it shows better results.

Evaluation Measures for Deblurring

(a) PSNR

PSNR is usually expressed in terms of the logarithmic decibel scale. The signal in this case is the original data, and the noise is the error introduced by compression.

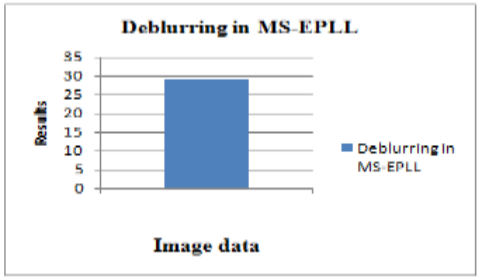

Fig.14: Average PSNR values for different images in existing system

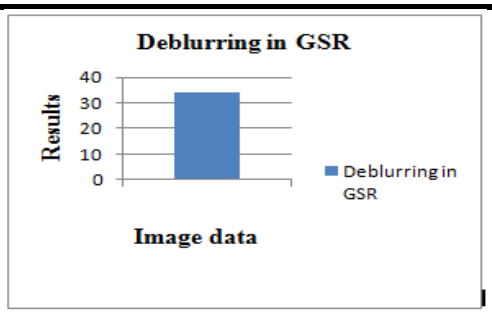

Fig.15: Average PSNR values for different images in proposed system

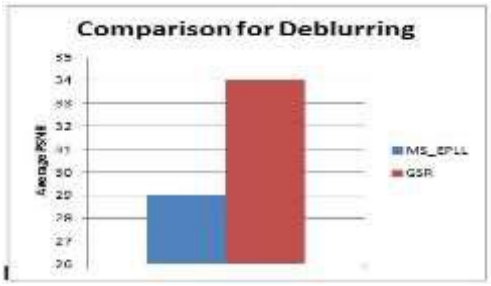

Fig.16: Comparison between existing system and proposed system on the basis of PSNR values

Deblurring has been tested for 12 Images from standard dataset used in existing scheme. The average PSNR value has been taken from all 12 images. Final Values has been compared with existing scheme. Proposed model shows the better results in comparison of existing scheme.

(C) SPEED

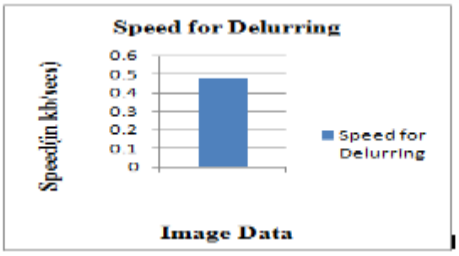

Fig.17: Average speed for different images

This graph shows how much speed is measured while implementing GSR algorithm for image enhancement.

(d) TIME

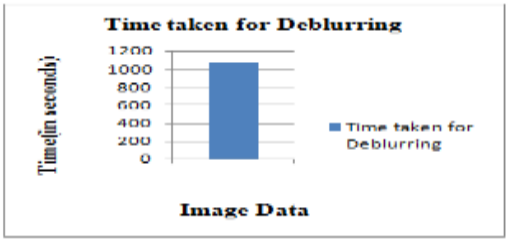

Fig.18: Time taken for different images

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This graph shows the time taken for processing an image during image enhancement and it shows better results.

V. CONCLUSION & FUTURE WORK

In this paper GSR (Group Based Sparse Representation) algorithm is proposed which is based on concept that group of patches are constructed which maintains the relationship among various patches of images and it is implemented for three image restoration problems *i.e.* DE noising, DE blurring and Image enhancement. Various parameters are taken into account like PSNR, SSIM, speed and time. In Future, this research could be improved for fasten the results. Working upon speed for the system could further enhance this research/ technique. Also this research could be further implemented on various applications for image restoration. Now the GSR technique has very slow rate for image restoration, which takes lots of time to produce the results. This technique could also be designed without taking the original image for restoration.

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Design and Development of Garlic Peeling Machine by Human Powered Flywheel Motor Concept for Rural Dwellers Development

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Abstract— *This invention is a new proposed model of peeling the garlic skins with mechanical functionality. Working with the simple and basic mechanism, this is utilising to peel the skin of garlic cloves. This device consists of components like flywheel, process unitand peeler. It reduces the time consumption and protects the hand fingers from the welfare issues like irritation in fingers and nail breakings.*

Keywords—Peddling unit, transmission unit (gears, etc.), bicycle mechanism, garlic peeler.

I. INTRODUCTION

The garlic is the basic ingredient for cooking, pickle industries, hotels, wedding halls, and also for some medical purposes etc. Removing of garlic peel is a tedious process in today's daily life. It takes more time when it comes in cooking. Though, large quantities of garlic time consumption for removing the peels is much more and creates some health issues like irritation in fingers and breakings of nails in the kitchen. The breaking of nails creates pain in the fingers and disturbs other works too. To address these problems and to peel the skins of the garlic, we are invented a new mechanical device to peeled out the garlic skins. It ensures that reduction in time consumption and protects the fingers from the health issues like irritation in fingers and nail breakings.

Garlic is valued for its flavour and commands an extensive commercial importance because of its wide medicinal value and application in food, pharmaceutical and laboratory preparations. It has been cultivated for centuries all over the world on account of its culinary and medicinal properties.

Fig 1: Garlic

II. CONCEPT OF FLYWHEEL MOTOR

On an average, the power produced by a man is approximately 75W (0.10hp), if he works continuously.Therefore human power may be used for a process if the power requirement is maximum near about 75Watt. If process power requirement is more than 75W and if the process can be of an intermittent nature without affecting the end product, a machine system can be developed that stored the energy.

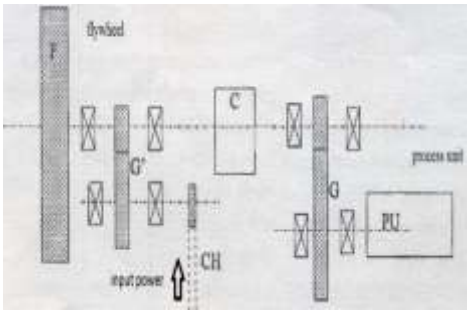

Fig 2: Schematic Conceptual Diagram

III. PAST REVIEW ON HUMAN POWERED MACHINE

1] J.P.Modak, In this paper, a human powered bricks making machine has been designed and development. The machine uses the human operated flywheel motor as power energy source and they said that this concept can be adopted for human powered process unit needing more than 2 KW

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short term power and which could have intermittent operation without affecting the end product. Essentially machine consist of three sub system i.e. 1. Energy Unit, 2. Appropriate transmission 3. Process Unit. They have used gear pair for torque increment and other one for speed increasing while connected with spiral jaw clutch.

2] K.S.Zakiuddin Stated the importance of humanenergizing power from the earliest time to the present and its necessity to different machine with future scope. They classified human powered Machine with its different examples according to its varioustypes withprovided information about Dynapods. Finally, this paper explains the Human Powered Flywheel Motor concept with line diagram which contain Bicycle.

3] Praveen Kiran Mali, stated human powered of flywheel is applied for maize threshing process which finds suitable and variable and reduces human effort compared to hand operated machine as hand operated machine requires two operators whereas new machine requires only one. This machine provides comfort for seating arrangement for different position depending upon ergonomics.

IV. ESTIMATION OF DEMAND POWER AND DESIGN OF PARTS

i) Estimation of demand power: - A systematic and suitable procedure is needed for good design. For design of any machine, firstly a demand power for the proposed machine is being calculated. This rated power is became an elevated centre for the estimation of dimensions of components used in present machine. This is in a methodical manner presented in forthcoming articles. Forcerequired to peel the garlic is given by, Where: F = centripetal force; m = mass of discs; w = angular velocity; r = max disc radius. The angular velocity (Ш) is given by Ш =27.89 rad/sec.Therefore peeling force is given by F =105.131 N. Hence, the power needed to drive the shaft at 266.4 rpm is calculated from P = F * V=263.58 watt, Approx. 264 watt, Where V = w * r =2.512 m/s, Now, to calculate power = 0.35 HP, Torque developed at shaft is given by,

T = F * r = 9.45 N-m. Thus this torque is applied to processing shaft. Thus from above calculations, it is somehow confirmed that the demand power for peeling of garlic is equal to 0.3 hp. However, at present the torque due to pairs of gears and frictional torque due to used bearings are not considered too much more. Hence, it is assumed that to reduce this torques and overload conditions it may further demand for 0.2 hp. That's why the totally power supplied to the machine will be approx.(0.3+0.2) = 0.5 hp.

Design of Machine Components:Flywheel design, Chain design, Spur gear design, Antifriction design, Shaft design

1] Chain Design:

Design Power: Pd = PR * KL…..KL= 1.4 (FOR Heavy Loads Minm 10 hrs / day)

Pitch circle diameter: $D_p = p*\eta/s*(1/T)$

Pitch line velocity: $Vp = \pi Dp.Np/6*1$

Power capacity / strand: P

$=P^2 * \{(V_p/1)-(V^{1.4}/\delta)*(26-2\delta\cos(1/1)*-K_c$

Length of chain in pitches: (Lp)

$= \{(Tg+Tp/2) + (2L/p) + (P\ (Tg-Tp)/4C)\}$

Recommended wear load:

$Fw = 0.35*P^2 = 56.451$ N

Maximum permissible bored

$d < (Tp - \delta/4) * P < 340d < (Td<(Tp-5/4) * P < 34092 =$

Hence design is safe.

2. Flywheel Design:

Calculate the mass of flywheel= $\rho*w*h*\pi*D$,

Calculate the kinetic energy, K.E.= $\frac{1}{2}* I*\omega^2$

Moment of inertia= $mK^2 = D/2$: K=D/2,

Power= kinetic energy/ time=0.5 hp,

Let the rim cross section be $Am^2 \cdot m = p*w*h*d$

We know b =2h, A = 2h *h, h= 0.029 =29mm ,

b=2h= 2*29= 58mm

Now find out stresses in flywheel, Assume

$V_s < 1600$m/m. $V_s = \pi D_0 N /60 = 6.69$ m/s

Calculate stresses:

Centrifugal stresses $\sigma_1 = \rho* V_s^2 = 0.0482$N-mm^2

Stresses due to bending of rim,

$\sigma 2 = \rho* V_s^2*\pi^2* (D_0 / \iota^2*\eta)$

Hence, design is safe.

3. Spur Gear Design:

Design power (Pd): Pd = PR * KL …. K= 1.80 =0.50*180=1hp=746watt

Tooth load, $F_t = (Pd/v_p)$, $V_p = \pi D_p.N_p/60 = 0.278$m/s

Calculate actual value, $F_t = 7/(0.2*3) = 894$ N

PCD of pinion $D_p = m * T_p = 3*85 = 255$mm

$D_g = m*T_g = 3*87 = 261$mm

$V_p = 0.278*m = 0.9$m/s, Dynamic load,$F_d =$

$F_d = \{Ft + (2V_p*C_e*b+ F_t)/ 2Vp+\sqrt{C_e*b+ F_t}$

$C = 5900$ (20^0 full depth)

$F_d = 2102.738$ N $F_d > F_b$ ….Hence design is safe.

4. Design of Shaft:

$T_d = 6*P1*K_L / 2\pi N$……..$K_L=2$,

$T_d = 6*3*2/2*\pi*24 = 24.60$ N-mm.

Resultant bending moment for the point B , C, and D are as follows ;

Resultant BM at B=

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$\sqrt{(M_B^2)} + (M_B{}^2)$ =53.38 N, BM at C = $\sqrt{(M_C^2)} + (M_C^2)$ = 97.94 N

Resultant BM at D = $\sqrt{(M_D^2)+(M_D^2)}$= 68.40 N.

Equivalent twisting moment,

$T_e = \sqrt{(K_m * M)^2 + (K_t * T)^2}$

Now calculating the shaft diameter

$T_e = (\pi/l)*\zeta*d^3$: $66.90*10^3$; d= 20.09mm

Selecting standard diameter, d = 25 mm

5. Design Of Antifriction Bearing:

There are two antifriction bearings C_1 and C_2 used in the experimental setup. The maximum reaction developed at bearing C_2i.e. = 667.33 N is considered for designing the bearing.

1. Equivalent load coming on bearing, Fe, N

$Fe = (XF_r + YF_a)\ K_s K_o K_p\ K_r, F_r$= 667.33 N, F_a= 0,

$N_e = F_a/F_r$, e = 0

Selecting self-aligning ball bearing = 1, Y = 2.3 K_p = 1 (no preloaded bearing), Kr = 1(outer race fixed inner race rotating)

K_s = 2 (moderate shock load), $Fe = (XFr + YF_a)\ KsK_oK_pK_r$ = (1x 667.33 + 0) x 1 x 1 x 1 x 2= 1334.66 N

Bearing Life, L(revolutionsin Millions= $(C/Fe)^n\ K_{ret}$,.K_{ret} = 1 (reliability = 90%), C = (500)(1/3) x Fe, C = 10818.148 N.

Dimension d = 25 mm, D = 52 mm, B = 15 mm.

V. PROPOSED MODELLING OF GARRLIC PEELING MACHINE HUMAN POWER:

The fabrication of any machine demands sufficient and proper planning while selection of systematic process. Normally, the fabrication is carried out after the design process. Once the required dimension obtained then the only work remains and that is to convert the calculated dimensions into real fabricated model. It is the common that any new idea which is being evolved it needs to be verified to check its performed physical parameters. For the testing purpose the garlic is used.

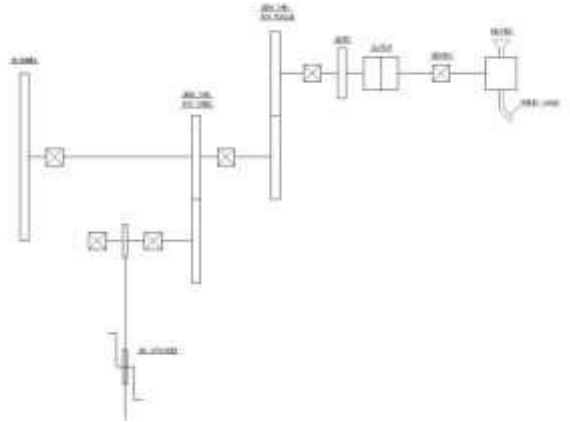

Fig.3: Proposed Model of Machine

VI. CONCLUSION

The traditional peeling machines of garlic are more time consuming, laborious and expensiveness than the power operated garlic peeler developed in the present study.Thesavingincost and peeling time per kg of garlic with the use of the developed peeler is found.

The garlic peel from the mixture of peeled, unpeeled and damaged garlic is separated with the help of air blower.

The machine helps to achieve greater productivity, is energy efficient.

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Green Approach for Next Generation Computing: A Survey

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Abstract— *In the past few years, the Information and Communication Technology sector have made a significant advancement in Cloud Computing technology. The world wide acceptance of Cloud technology can be credited to the various benefits a Cloud offers to its users. The Cloud technology helps in preventing resource wastage to a much greater extent. The authors of this paper wish to explore the concept behind cloud computing, its strategy, and benefits. This paper presents some facts and figures related to cloud and green computing which will help in obtaining the gist of Cloud Computing and in understanding the need of going green in computing.*

Keywords— Cloud, Iaas, Paas, Software Quality Assurance, Computing.

I. INTRODUCTION

With the significant advances in Information and Communications Technology (ICT) over the last half century, there is an increasingly perceived vision that computing will one day be the 5th utility (after water, electricity, gas, and telephony). This computing utility, like all other four existing utilities, will provide the basic level of computing service that is considered essential to meet the everyday needs of the general community [1].

II. CLOUD COMPUTING

Cloud computing is a computational model for ubiquitous and on-demand network access to as hared pool of computing resources (e.g., Web server, file server, network resources, data storage, services and applications) which can be quickly provided and released with minimum service provider interaction [2]. This cloud model is composed of five essential characteristics, three service models, and four deployment models. In order to support the maximum number of user and elastic service with the minimum resource, the Internet service provider invented the cloud computing.

A. CLOUD COMPUTING STRATEGY

Within the past few years, the emerging cloud computing technology has become the hottest technology. There are various reasons for the rapid growth and acceptance of this technology. Some of the reasons [3] behind this include the following essential characteristics of cloud computing:

i) On-demand self-service. Users can unilaterally avail the computing capabilities, such as server time and network storage, as and when needed, automatically without requiring human interaction with each service provider.

ii) Broad network access. Capabilities available over the network can be accessed easily through standard mechanisms that promote their use through a heterogeneous thin client or thick client platforms (e.g., mobile phones, laptops, tablets, and workstations).

iii) Resource pooling. The various computing resources of service providers are pooled in a cloud to serve multiple users using a multi-tenant model, having different physical and virtual resources that are dynamically assigned and reassigned according to the user demand. It involves a sense of location independence as the customer generally has no control or knowledge about the exact location of the resources provided but may be able to specify location at a higher level of abstraction (e.g., country, state, or datacenter). Resources may include memory, storage, processing, network bandwidth, etc.

iv) Rapid elasticity. Resources and services can be elastically acquired and released, in some cases automatically, to scale rapidly inward and outward corresponding with the demand. For any user, the resources available for provisioning often appear to be unlimited and can be acquired in any quantity at any time.

v) Measured service. Cloud technology provides automatic control and optimization of resources used by leveraging a metering capability at some level of abstraction appropriate to the type of service (e.g., storage, processing, bandwidth, and active user accounts). Resource usage can be controlled, monitored, and reported, providing transparency for both the provider and the user of the availed service.

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B. PRELIMINARIES

Virtualization: - Virtualization has become a fundamental and important element of Cloud computing. Virtualization can be applied to a variety of resources such as hardware, runtime environments, storage, and networking, etc. Cloud computing systems utilize hardware and programming language virtualization, server consolidation and virtual machine migration techniques. Hardware virtualization is applied for solutions in the Infrastructure-as-a-Service (IaaS) market segment. Programming language virtualization is a technology used in Platform-as-a-Service (PaaS).Virtualization is one of the most effective tools for more cost-effective, greener-energy efficient computing where each server is divided into multiple virtual machines that run different applications and in this way companies can increase their server utilization rates. This approach is so energy friendly that California utility PG&E offers rebates of $300 to $600 for each server that companies eliminates using Sun or VMware virtualization products, with a maximum rebate of $4 million or 50% of the project's cost, whichever is less [4].

Desktop virtualization: It involves running two or more logical computers on just one set of physical hardware. Besides saving the cost of multiple computers, this technology also reduces carbon footprint generated because of the manufacturing and usage of multiple computer systems. In virtualization, one physical server hosts multiple virtual servers. Virtualization enables data centers to strengthen their physical server infrastructure by hosting multiple virtual servers on a smaller number of more powerful servers, which consume less amount of electricity and thus simplifying the data center. Along with getting much better hardware usage, virtualization also reduces data center floor space, thus making better use of computing power, and greatly reducing the data center's energy demands [5].

Data center:-The significant amount of energy usage in data centers is a big issue for IT professionals. Keeping in view the environmental, financial and operational perspectives, it is important to find a way of reducing the amount of electricity consumed in data centers without compromising the performance. If some appropriate measures are not taken, then the carbon footprint and the IT bill will explode and the energy suppliers may find it difficult to satisfy the increasing demand in energy for data centers [6]. Recommendations have been made by the European Union in a document named "Code of Conduct on Data centers Energy Efficiency" which is a good reference for data centers operators and owners [7].

Also, the Green Grid consortium is a remarkable initiative. The Green Grid is a global consortium of companies dedicated towards developing and promoting standards, measurement methods, processes and new technologies that lead to energy efficiency in data centers [8].

C. GREEN COMPUTING

The current computing is not very environment-friendly. It is assumed that by switching from paper to electronic mode of communications, we are going green‖, and that in doing so we have saved paper and thus done a bit to save the environment and also generate less Carbon Dioxide. But the fact is not as truer as we are led to believe [9]. Each computer requires approximately 1.8 ton of water, chemicals and fossil fuels for its manufacturing. According to a research, computers generate an estimated 35 million ton of carbon dioxide into the atmosphere each year. The CO_2 emissions generated by computers account for 2 percent of world's total CO_2 emissions, almost equal to that contributed by the aviation industry [10].

Manufacturing computers and their various electronic and non-electronic components consume electricity, raw materials, chemicals, and water, and generate hazardous waste. All these directly or indirectly increase carbon dioxide emissions and impact the environment. Each PC in use generates about a ton of carbon dioxide every year [11].

Green Computing, or Green IT, is the practice of implementing policies and procedures that improve the efficiency of computing resources in such a way as to reduce the energy consumption and environmental impact of their utilization [12].

The three main reasons that made us realize the need for going green are [13]:

1. The release of harmful gasses from electronics.
2. More utilization of power and money.
3. The increase of E-waste and improper standalone pc's disposals.

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Fig.1: Landfills due improper disposal of computers.

Green Computing is beneficial as it will [14]:-

- Reduce energy consumption of computing resources during peak operation
- Save energy during idle operation
- Use eco-friendly sources of energy
- Reduce harmful effects of computing resources
- Reduce computing wastes

The following table shows the various Green IT initiatives adopted by three organizations and the benefits they have realized by using them.

Table.1: Few Green IT initiatives and benefits (Source: Infosys Research [15])

Name of the organization	**Green IT initiatives**	**Benefits realized**
CSC	NightWatchman software to automatically power off desktop PCs during non-working hours	• 25 million KWHs of electricity saved per year • 23 kilo-tons of CO_2 emissions eliminated
VistaPrint	Used virtual servers to reduce servers' energy consumption	• Replacing blade servers in data centers with virtual servers' resulted in 75% reduction in energy usage • Saving of 450k USD annually
Huntsville Hospital	VMware virtual desktop Infrastructure for desktop PC manageability	• Virtual desktop-based infrastructure helped to secure HIPAA-regulated patient information in a hosted data center • 72% reduction in power costs to run desktop environment due to thin client architecture • Desktop provisioning time reduced to 15 minutes

PUE, CUE:-Power usage effectiveness (PUE) is a metric used to determine the energy efficiency of a data center. PUE is determined by dividing the amount of power entering a data center by the power used to run the computer infrastructure within it. PUE is therefore expressed as a ratio, with overall efficiency improving as the quotient decreases toward [1]. PUE was created by members of the Green Grid, an industry group focused on data center energy efficiency. An ideal PUE is 1.0 although a typical data center probably has an average PUE of 2.5 (meaning that, for every 2.5 watts of power supplied to the facility, only one watt is delivered to the ICT load).

Carbon usage effectiveness (CUE) is a metric for measuring the carbon gas a data center emits on a daily basis. This metric was also developed by the non-profit consortium, the larger data center managers can calculate CUE by dividing

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the total carbon dioxide emission equivalents (CO_2eq) of the facility's energy consumption by the total IT energy consumption. The output is measured in kilograms of carbon dioxide per kilowatt-hour. The perfect CUE score is 0.0, meaning that no carbon use is associated with the data center's operations.

The rising cost of energy, in addition to environmental concerns, has inspired organizations to seek ways to lower their greenhouse gas (GHG) emissions and carbon gas emissions in particular. In addition to helping an organization make informed decisions about changes that affect global warming, knowing the carbon usage effectiveness metric can help an organization qualify for green computing financial incentives in some industries.

III. CLOUD-SERVICES ARCHITECTURE

The cloud deployments are mainly categorized into three types:

Public clouds:-In public clouds, the services are available to anyone on the internet and they can avail the services of such clouds in a pay-as-you-go manner. It is the most common deployment model of a cloud. A public cloud can offer the following three services:-

i) **IaaS (Infrastructure as a Service):-**Infrastructure as a service means taking the hardware and going completely virtual (e.g. all servers, networks, storage, and system management, exist in the cloud). In other words, businesses pay a fee (monthly or annually) to run virtual servers, networks, storage from the cloud. This will mitigate the need for a data center, heating, cooling, and maintain hardware at the local level.[6]

ii) **PaaS (Platform as a Service):-**Platform as a service is a cloud computing service, which provides the users with application platforms and databases as a service. [3] Is equivalent to middleware in the traditional (non-cloud computing) delivery of application platforms and databases.

iii) **SaaS (Software as a Service):-**The software-as-a-service (SaaS) service-model involves the cloud provider installing and maintaining software in the cloud and users running the software on their cloud clients over the Internet (or Intranet). The users' client machines require no installation of any application-specific software - cloud applications run on the server (in the cloud) [17].

Private clouds:-A private cloud is deployed within an organization's premise in order to provide IT services to its users only. Private clouds impose some limitations on end user applications such as the inability to scale elastically on-demand, greater control over the infrastructure in order to improve security and service resilience due to restricted access.

Hybrid clouds:-Hybrid clouds are deployed by the organizations to provide the advantages of both public and private clouds. In this model, organizations outsource non-critical data and processing to the public cloud, while keeping the critical services and data under their control in their private cloud.

(i) Scheduling in cloud:- Cloud computing has a variety of characteristics such as commercialization, Virtualization, Shared infrastructure, Dynamic Provisioning, Network access, Managed Metering, Self-service based usage mode, self-managed platform, Consumption-based billing, Resource pooling, Rapid elasticity and Multi Tenacity [18]. As Cloud computing is in the developing stage, researchers are interested in areas of Resource allocation and scheduling.

(ii) Types of Scheduling:-[19] The following types of scheduling have been known to exist in clouds. The on-demand service of cloud calls for the need of new scheduling strategies combined with the existing scheduling concepts having some new scheduling parameters in order to provide more efficient scheduling.

a) *QoS based Scheduling*
b) *Online Scheduling*
c) *Resource Scheduling*
d) *Cost-effective scheduling*
e) *Workflow scheduling*
f) *Load balancing*
g) *Capacity planning*
h) *Bandwidth-aware scheduling*
i) *Energy-aware scheduling*
j) *Gang scheduling*

IV. CONCLUSION

The economic and social benefits provided by cloud computing are bound to make it the basis for next generation computing environment. The paper has illustrated the essential characteristics and preliminaries involved in cloud computing. It is also evident that green computing is an integral part of cloud computing, although there is more scope of implementing green approaches to a cloud environment. The stats available regarding the resource wastage and carbon dioxide emission emphasize the need of greening our computing techniques. As they say

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every bright thing has a dark side too. If technology has proved to be a boon for mankind then it might become a curse for the environment we live in.

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Effects of Temperature on *Mucuna solannie* Water-Based Mud Properties

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Abstract— *Water-based mud formulated from Mucuna solannie seeds, a leguminous plant, has been proved to be efficient and cost effective. Hence, the effects of temperature on the properties of the mud formulated from Mucuna solannie have been shown to follow similar trend as other mud formulations-water or oil based. Properties at temperatures of 95°F, 120°F and 180°F gave decreased values of Plastic Viscosity, Yield Point, Low Shear Rate Yield Point and Apparent Viscosity with increase in temperature, while an increase in Fluid Loss was recorded with temperature increase for both unweighted and weighted muds. Mud properties at temperature up to 212°F and above should not be found without a corresponding increase in mud pressure to prevent boiling.*

Keywords— Fluid Loss, Mucuna solannie, Plastic Viscosity, Temperature, Yield Point,

I. INTRODUCTION

A drilling fluid is any fluid (gas or liquid) used in rotary drilling that is circulated from the surface down the drillstring, through the drill bit and up the annulus to the surface, and performs several functions as it completes the circuit. One critical function the drilling fluid performs is to minimize cuttings concentration around the bit and throughout all the sections in the annular space. Mud is a drilling fluid (oil or water), which is often a dirty mixture of water and clay or polymers. Drilling mud circulation brought efficiency to the rotary drilling system by floating cuttings to the surface which was not obtainable from the cable tool drilling system. Hence, the circulating system became a major component of the rig – a device for drilling, casing and cementing of oil, gas and water wells.

Physical properties of materials such as the phase (liquid, solid, gaseous and plasma), density, solubility, vapor pressure, and electrical conductivity depend on temperature. Similarly, the rate and extent of chemical reactions all depend on temperature. Hence, the effect of temperature on fluids (drilling mud) cannot be overemphasized.

II. LITERATURE REVIEW

Several researches have been carried out on the use of local materials as additives for viscosity and fluid loss control in water based drilling muds in Nigeria. These are all geared towards the local content drive of the Federal Government of Nigeria.

It has been reported that local polymers have the ability to be used as substitutes for imported samples to control viscosity [2]. In their work, cassava starch was used to formulate a water based mud where it served as a viscosifier. Though their formulation showed lower viscosity value compared with drilling fluid formulated from/with conventional materials, they stressed on the importance of proper quality control efforts of the local samples, for them to be used as substitutes for imported materials.

A mud was also formulated from local materials, which included *Detarium microcarpum, Brachystegia eurycoma* and *Pleurotus* [4]. The *Detarium microcarpum* was used as a viscosifier, while the Brachystegia e. and Pleurotus were used as fluid loss control agents with slight viscosifying effects. They summarized the composition of *Detarium microcarpum* as 42% of carbohydrate and 7% of oil with 72% of potassium ions for shale inhibition. He analyzed the composition of *Brachystegia eurycoma* based on previous works which includes oil, protein and carbohydrate, with potassium and iron in significant amounts. He also pointed out that *Pleurotus* contains high concentration of fiber which is the main source of the fluid loss control. Though the *Brachystegia eurycoma* afforded both fluid loss and viscosifier functions, the fluid losses recorded at ambient temperature, 120°F, 150°F and 180°F were observed to be higher than the values from a conventional mud at the specified temperature values. He recorded the same trend for the unweighted mud, low solids mud and the weighted mud. Good hole cleaning results based on cuttings transport efficiency and cuttings concentration were observed in the 8 ½-in hole section. His economic evaluation showed that the extra expenditure in the use of the conventional PAC/XCD polymer mud is not worth it, since the cheaper biomaterials

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mud could be preferentially selected in terms of cost effectiveness.

It has also been proved that the locally sourced material, Irvingia gabonensis, when used in combination with pre-hydrated bentonite could produce a water based drilling fluid with understandable shear thinning characteristics [9]. In their work, starch was included in the formulation with Irvingia gabonensis, which was not used earlier [2]. That proved the notion that combinations of local materials could result in a useable mud, but the cost implication should matter since local materials differ in prices [4].

Another work reported higher yield stress for a mud formulation from Irvingia gabonensis when compared with a conventional mud [5]. The conventional mud was used as a control test, while different combinations of local materials were prepared, tested and the results compared with the conventional mud. He based his work on a temperature range of 60^{o}F to 120^{o}F. In the work, it was highlighted that the biopolymer exhibited good transport ratio, an indicator for good wellbore cleaning capability of muds. He concluded that the mud formulation would be most suitable for shallow wells because of the temperature range on which the experiments were carried out. Though the work did not show the value of the yield of Irvingia gabonensis, he suggested the need to refine the biopolymer in order to have equal measure with the conventional polymer, and its suitability in high temperature high pressure drilling.

2.1 Properties of the Drilling Mud

Two important properties are needed for mud to performs all its functions [10];

- **Viscosity**- oil and water have viscosities around 1 cP; hence a component is needed to increase their viscosities. *The viscosifiers could be clay and polymers.*
- **Density**- oil and water have densities of around 50.5 lb/ft^3 and 62.4 lb/ft^3 respectively; hence a density giver is needed to increase their densities. They include Barite ($BaSO_4$) and soluble salts (brines).

However, different mud properties may affect a particular mud function. Similarly, a change in one mud property may affect more than one mud function.

Mud properties should be recognized for their influence on all functions and the relative importance of each function [6]. Tradeoffs are required in treating and maintaining the properties needed to accomplish the required functions. A high mud viscosity might improve borehole cleaning, yet lowers hydraulic efficiency and ROP, and increase drill solids retention.

Field experience indicates that temperature affects the properties of water and oil based muds. Also, mud properties at surface conditions are greatly different from those at conditions prevailing in the hole. For example, the viscosity of a particular lignosulfonate mud decreased by a factor of two when the temperature was increased from 80^{o}F to 140^{o}F [3]. This decrease is much more than is commonly thought to occur with such a change in temperature.

It has been shown that barite does not have the tendency to perform adequately under high temperature. Also, high temperature has been shown to cause higher fluid losses in a Niger Delta formation [8].

The filtration rate of muds increases with temperature because the viscosity of the filtrate is reduced [1]. If the mud temperature would increase to 212^{o}F, the pressure must be increased to prevent boiling.

Mucuna is a genus of around one hundred accepted species of climbing vines and shrubs of the family fabaceae, found worldwide in the woodlands of tropical areas [7] in several countries of Asia and Africa. Mucuna plants bear pods, and the seed pods are protected by velvety hairs. Pods are produced on long, rope-like stems that hang from the forest canopy. At maturity, each pod produces several hard, marble like seeds. *Mucuna* seeds are toasted before grinding and flouring to serve as thickener in soup or sauce. The Igbo of South-East Nigeria use it as part of main dish as thickener for soup, beverages and other food items. *Mucuna solannie* consists of high protein, high carbohydrates, low lipids, high fibre, adequate minerals, and meet the requirement of essential amino acids.

Brachystegia eurycoma are grown in South East, Nigeria, of rain forest vegetation and in other African and Asian countries. Their seeds are used in making soup as thickener. An analysis indicated that the oil content was 5.87±0.30mg/100g. The seeds are rich in protein and carbohydrate. The protein content ranges from 11.82 $\pm$ 0.25mg/100g dry matter.

Pleurotus contains high concentration of fiber which could be the main source of the fluid loss control in muds.

III. METHODOLOGY

3.1 The lists of some laboratory equipment/materials are presented in TABLE 3.1.

Table.3.1: Laboratory Equipment used

• Six-speed viscometer
• Hamilton Beach Blender

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• Hamilton Beach Mixer
• Water bath
• No. 200 sieve
• Moisture Analyzer
• API Filter press
• Mud balance

3.2 The unweighted and weighted Mucuna solannie mud compositions are given in TABLE 3.2.

Table.3.2: Unweighted and Weighted mud Compositions

Mud Compositions	
Unweighted *Mucuna solannie* Mud	Weighted *Mucuna solannie* Mud
Fresh Water 1 BBL	Fresh Water 1 BBL
Caustic soda 0.25 ppb	Caustic soda 0.25 ppb
Mucuna solannie 3 ppb	*Mucuna solannie* 6 ppb
Brachystegia e. 3 ppb	Brachystegia e. 6 ppb
Pleurotus 3 ppb	*Pleurotus* 8 ppb
XCD polymer 0.75 ppb	*Potassium chloride* 20 ppb
	XCD Polymer 1 ppb
	Barite 75.4 ppb

3.3 Experimental Procedures

The unweighted and weighted muds were prepared based on 6 ppb concentration. The unweighted mud was formulated by mixing Fresh Water (1 BBL) with 0.25ppb Caustic soda, 3ppb *Mucuna solannie*, 3ppb Brachystegia e., 3ppb *Pleurotus* and 0.75ppb XCD polymer.

The weighted mud was prepared with 1 BBL Fresh Water, 0.25ppb Caustic soda, 6ppb *Mucuna solannie*, 6ppb Brachystegia e, 8ppb *Pleurotus*, 20ppb *Potassium Chloride*, 1ppb XCD Polymer and 75.4ppb *Barite*. The mud formulations were left for about 10 hours to age.

Hamilton Beach Mixer was used to mix the muds in a cup. The required temperature conditions of 120ºF and 180ºF were achieved by the use of a water bath, and the Fann six-speed Model 35A viscometer was used to take readings at 600 rpm, 300 rpm, 200 rpm, 100 rpm, 6 rpm and 3 rpm using the API guidelines. The 10sec and 10 minutes Gel Strengths were also measured with the viscometer. The Filter Press was used to measure the 30 minutes static fluid loss properties of the unweighted and weighted muds at the temperatures given, following the API procedures.

IV. RESULTS AND DISCUSSION

4.1 The viscometric readings are given in TABLE 4.1. Given also are the 10 seconds and 10 minutes get strengths, and the fluid losses.

Table4.1: Viscometric Readings and Fluid Loss for Unweighted and Weighted muds

Mud Composition	**Ambient Temperature 95ºF**	**120ºF**	**180ºF**
Unweighted *Mucuna solannie* Mud **Fresh Water 1 BBL** **Caustic soda 0.25 ppb** ***Mucuna solannie* 3 ppb** **Brachystegia e. 3 ppb** ***Pleurotus* 3 ppb** **XCD Polymer 0.75 ppb**	Fann Readings 44,37,33,27, 7,5 10s/10mins Gel=5/5 30mins F/L =17ml	Fann Readings 33,26,20,14, 3,3 10s/10mins Gel =3/3 30mins F/L =17ml	Fann Readings 29,23,17,13, 2,2 10s/10mins Gel = 3/2 30mins F/L =19.5ml
Weighted *Mucuna solannie* Mud **Fresh Water 1 BBL** **Caustic soda 0.25 ppb** ***Mucuna solannie* 6 ppb** **Brachystegia e. 6 ppb** ***Pleurotus* 8 ppb** ***Potassium chloride* 20 ppb** **XCD Polymer 1 ppb** ***Barite* 75.4 ppb**	Fann Readings 68, 56 ,50, 38, 6, 5 10s/10mins Gel=5/6 Fluid Loss=8.8ml	Fann Readings 72, 61, 53, 40 ,4, 3 10s/10mins Gel=4/5 Fluid Loss=10.4ml	Fann Readings 35, 26 , 20, 13 , 4, 3 10s/10mins Gel=2/2 Fluid Loss=13.5ml

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4.2 Effects of Temperature on Mud Properties

Fig. 4.1A, Fig. 4.2A, Fig. 4.3A, Fig. 4.4A and Fig. 4.5A show the effect of temperature on plastic viscosity, yield point, low shear rate yield point, fluid loss and apparent viscosity respectively for the unweighted mud and Fig. 4.6B, Fig. 4.7B, Fig. 4.8B, Fig. 4.9B and Fig. 4.10B for plastic viscosity, yield point, low shear rate yield point, fluid loss and apparent viscosity respectively for weighted mud.

For the unweighted mud, as the temperature increased from 95°F to180°F;

- the plastic viscosity **decreased**,
- the yield point **decreased**,
- low shear rate yield point **decreased**,
- fluid loss **increased** and
- apparent viscosity **decreased**

For the weighted muds, as the temperature increased from 95°F to180°F;

- the plastic viscosity, yield point, low shear rate yield point and apparent viscosity **decreased**, while
- the fluid loss **increased**

Generally, the fluid losses recorded in unweighted mud were higher than weighted mud.

4.2.1 Effect of Temperature on Mud Properties (Unweighted mud)

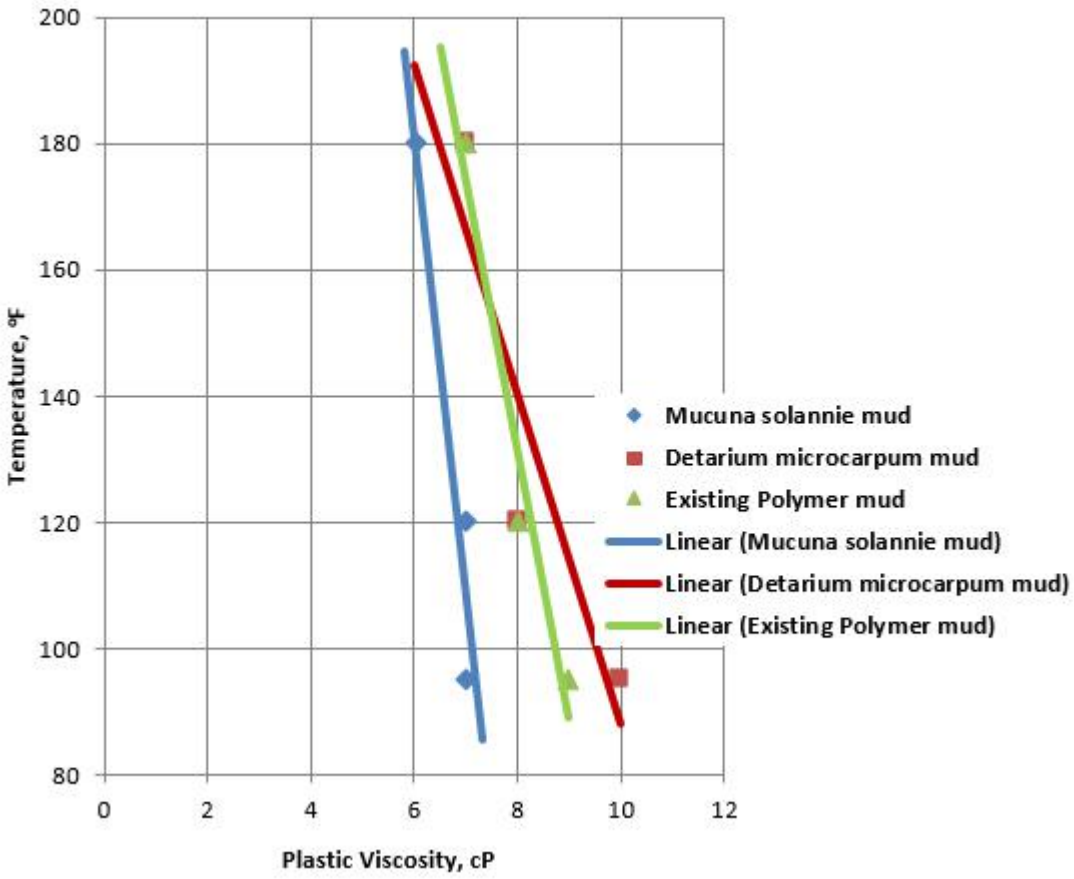

Fig. 4.1A: The Effect of Temperature on Plastic Viscosity for Unweighted mud

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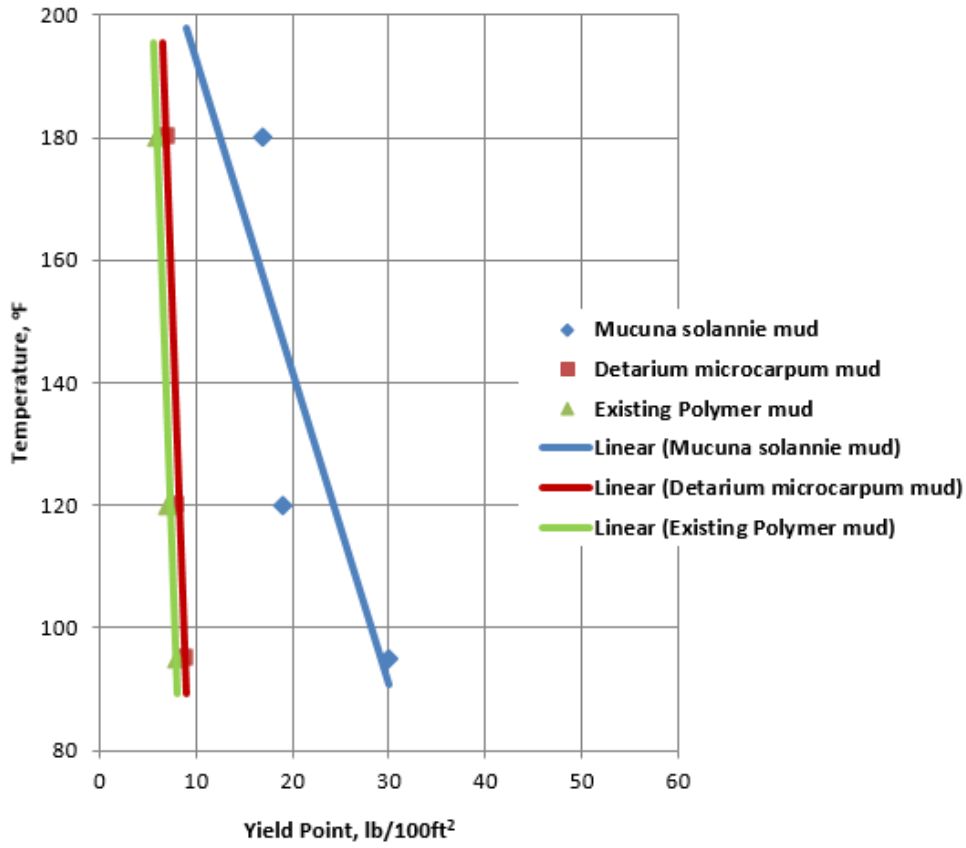

Fig. 4.2A: The Effect of Temperature on Yield Point for Unweighted mud

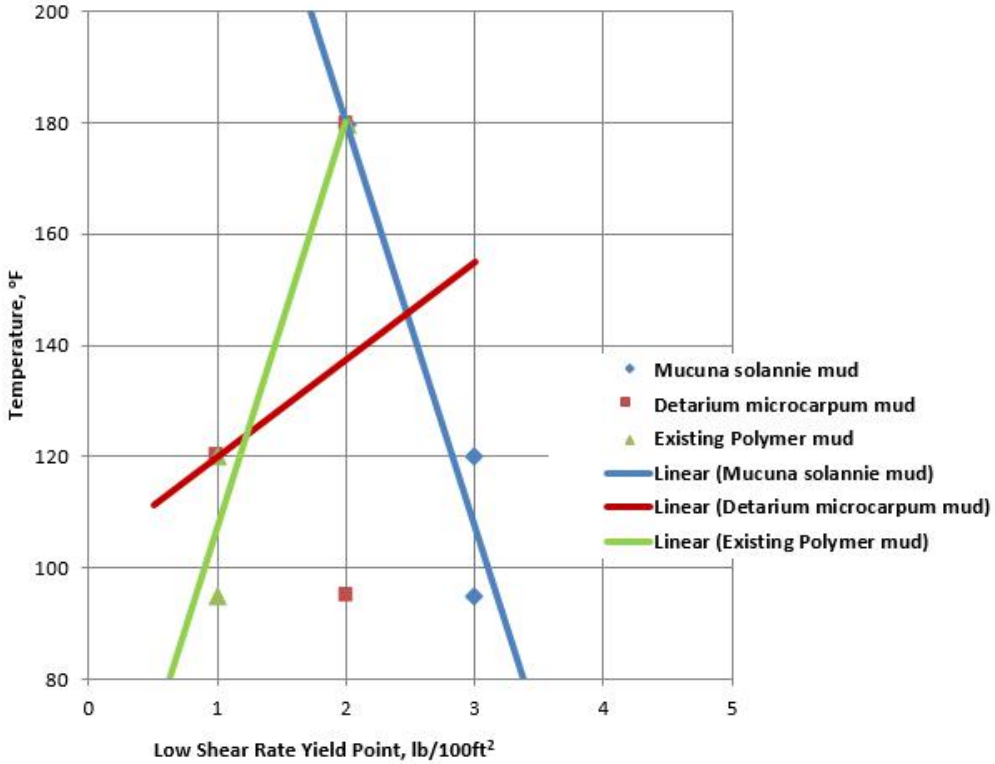

Fig. 4.3A: The Effect of Temperature on Low Shear Rate Yeild Point for Unweighted mud

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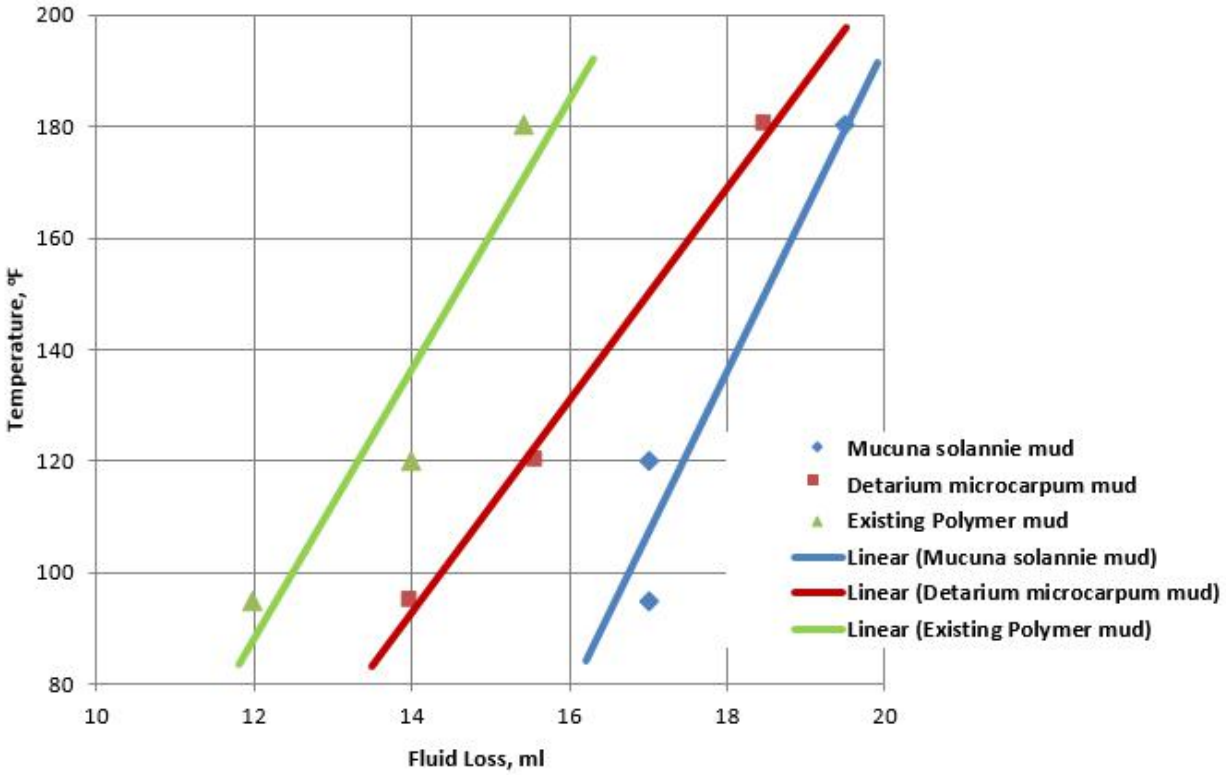

Fig. 4.4A: The Effect of Temperature on Fluid Loss for Unweighted mud

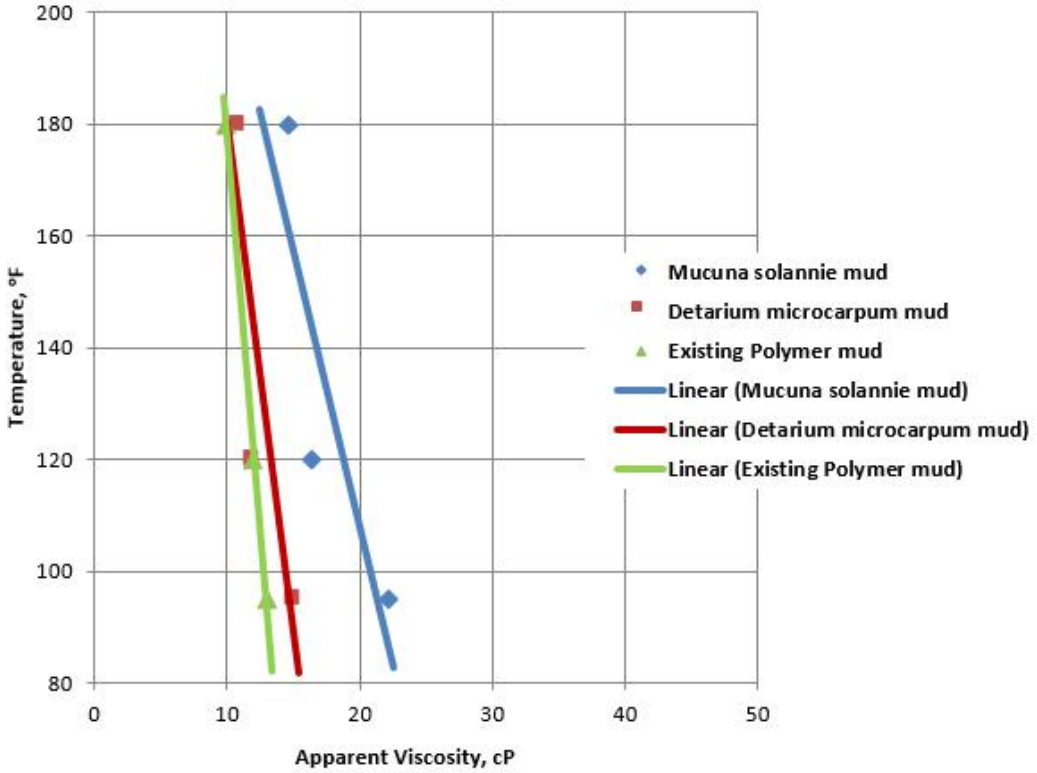

Fig. 4.5A: The Effect of Temperature on Apparent Viscosity for Unweighted mud

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4.2.2 Effect of Temperature on Mud Properties (Weighted mud)

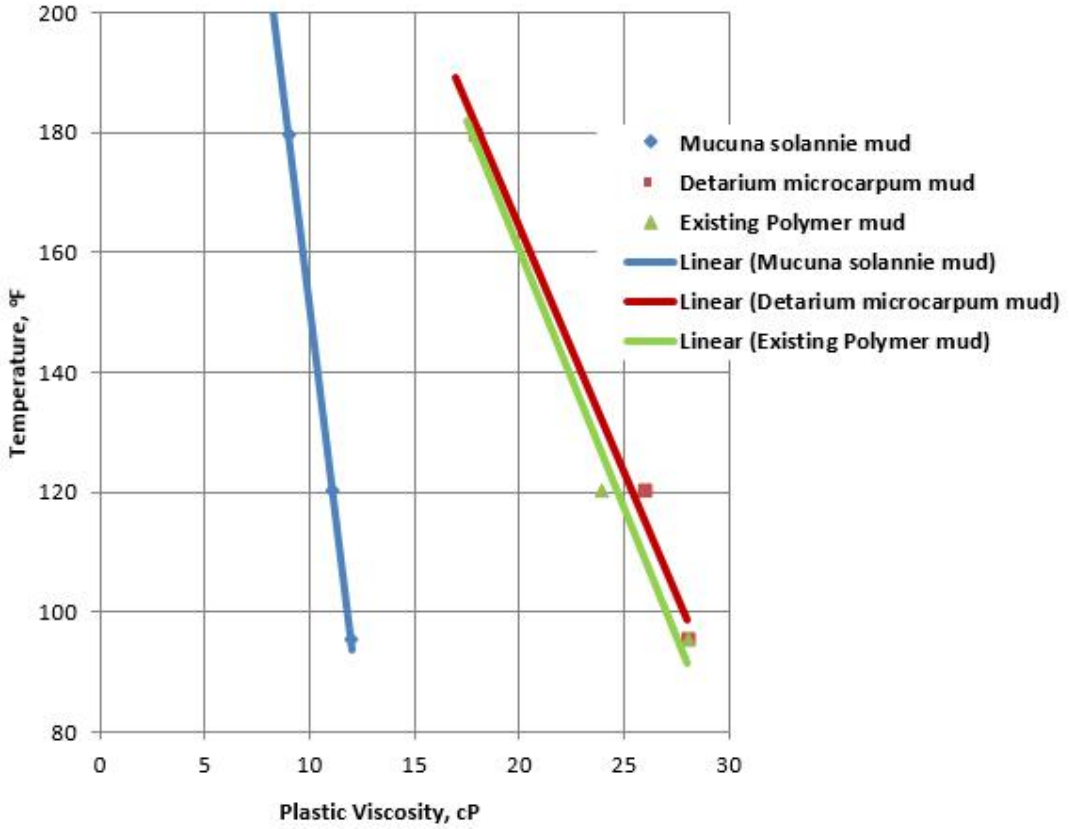

Fig. 4.6B: The Effect of Temperature on Plastic Viscosity for Weighted mud

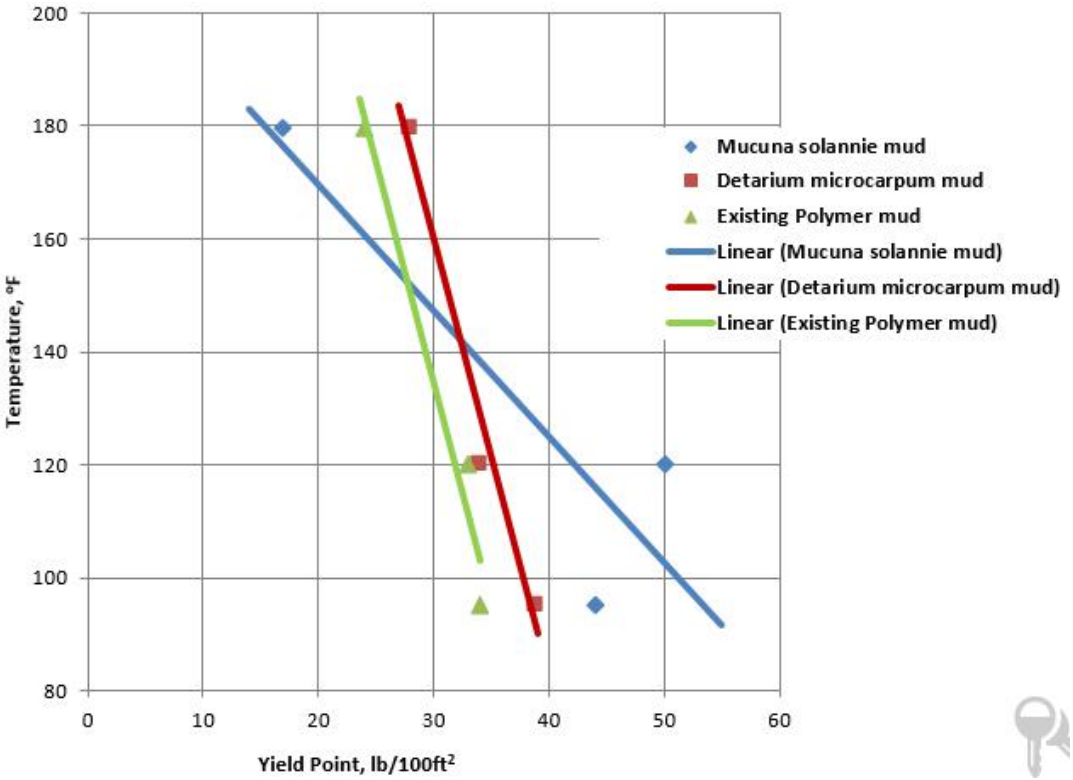

Fig. 4.7B: The Effect of Temperature on Yield Point for Weighted mud

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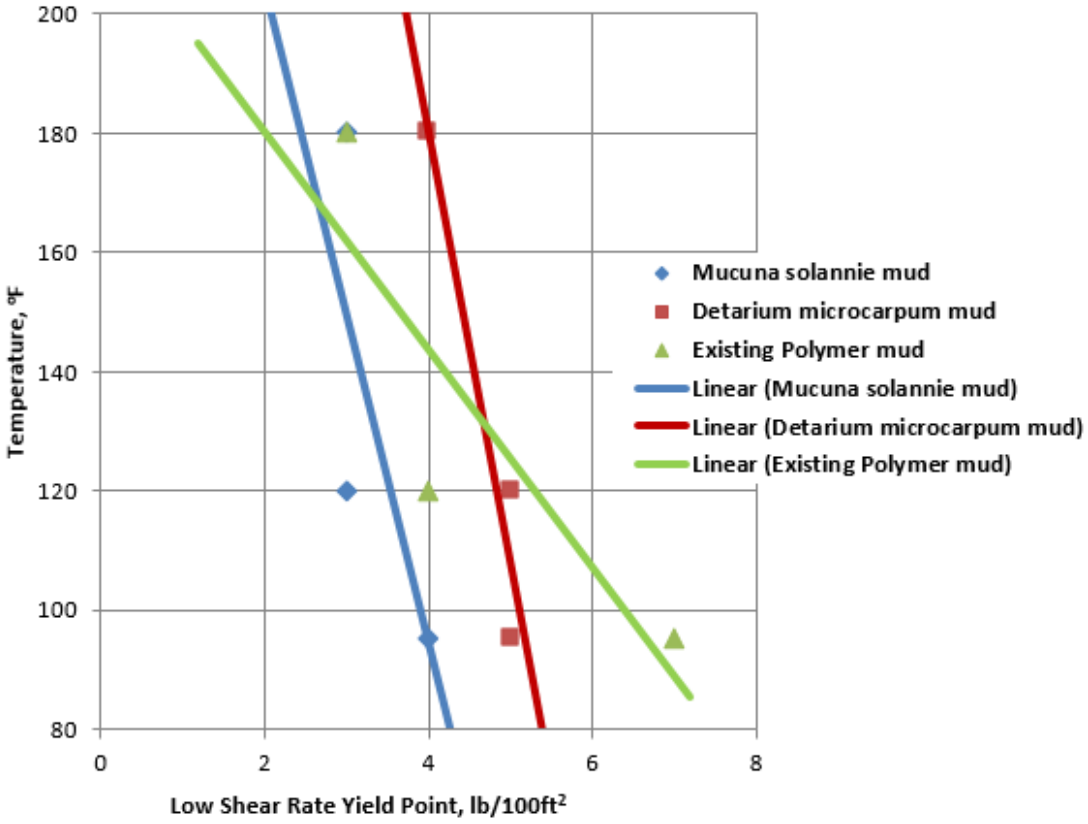

Fig. 4.8B: The Effect of Temperature on Low Shear Rate Yield Point for Weighted mud

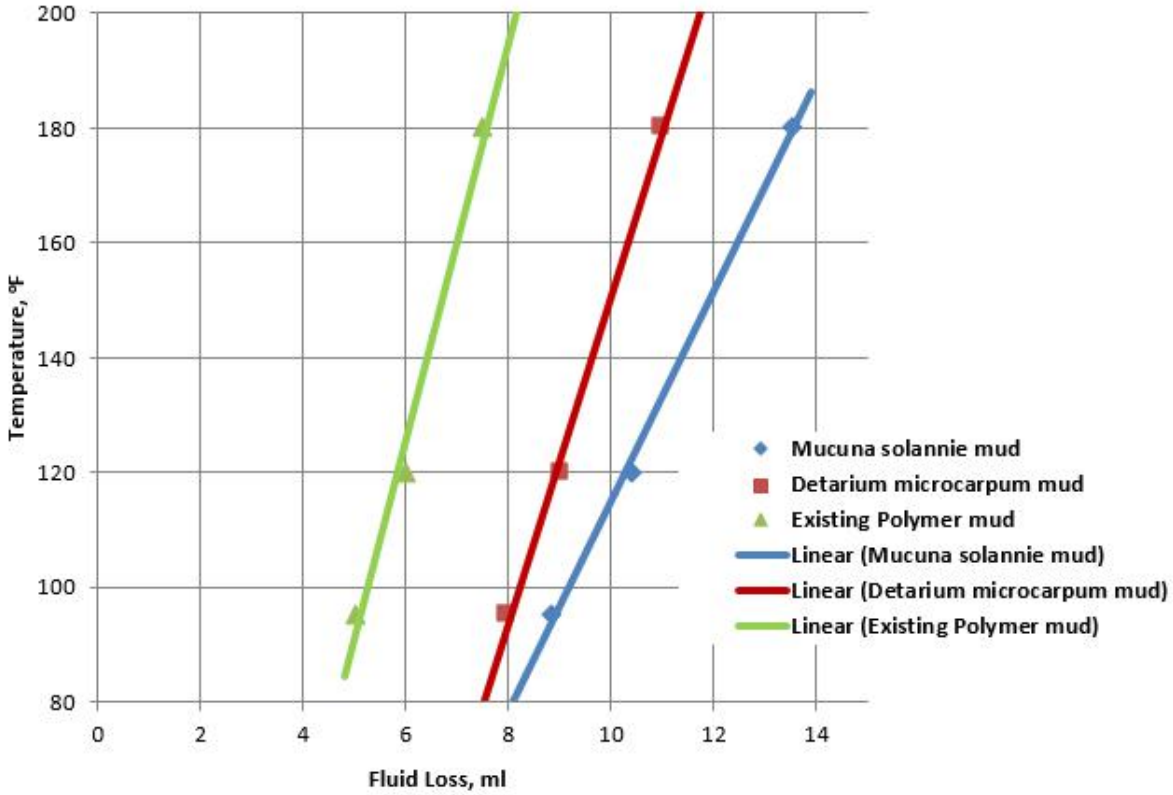

Fig. 4.9B: The Effect of Temperature on Fluid Loss for Weighted mud

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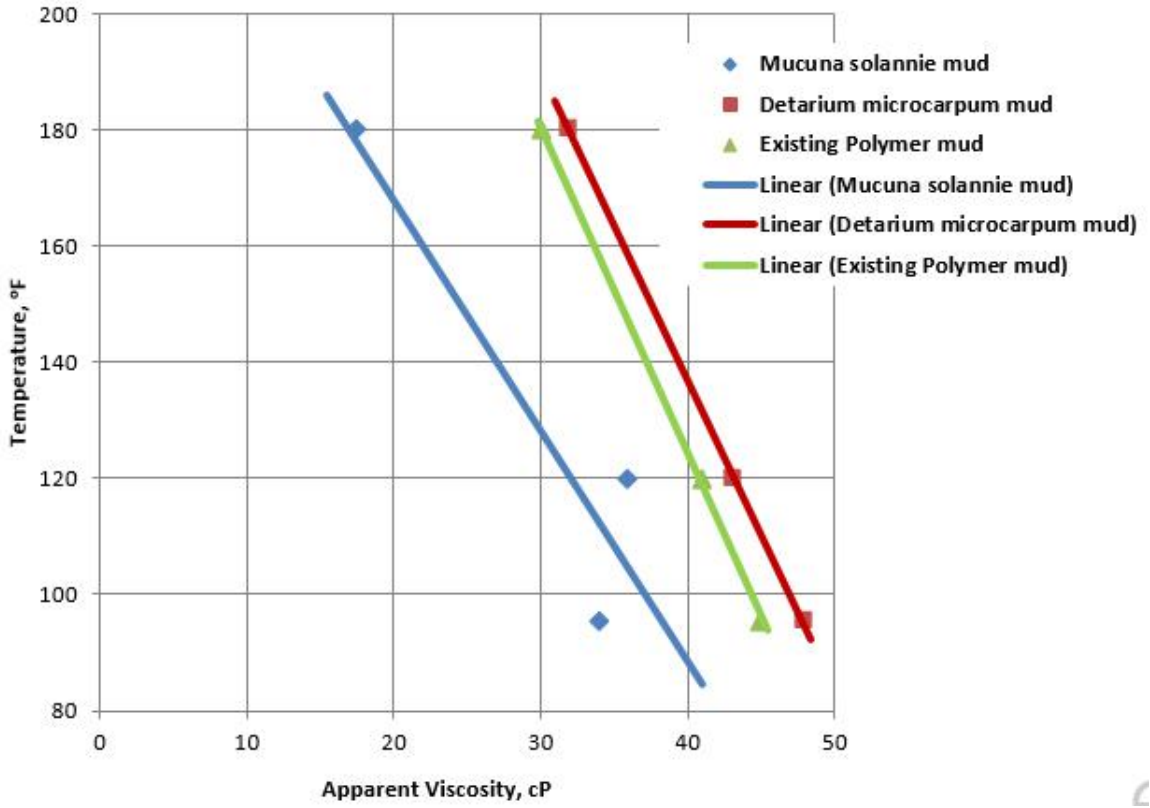

Fig. 4.10B: The Effect of Temperature on Apparent Viscosity for Weighted mud

4.2.3 Effect of Temperature on Density of Muds

Given in TABLE 4.2 are the densities of the unweighted and weighted muds measured.

Table.4.1: Effects of Temperature on Density of Unweighted and Weighted muds

	Density, ppg		
Mud Composition	**Ambient Temperature, 95ºF**	**120ºF**	**180ºF**
Unweighted *Mucuna solannie* Mud	6.4	6.4	6.4
Weighted *Mucuna solannie* Mud	8.6	8.6	8.6

V. CONCLUSIONS

1. It has been shown that temperature affects the water-based mud formulated out of *Mucuna solannie*, like it affects other muds.
2. Particularly, Plastic Viscosity, Yield Point, Low Shear Rate Yield Point and Apparent Viscosity decrease with temperature, while Fluid Loss increases with increase in temperature for both unweighted and weighted muds.
3. Temperature did not have an effect on the density of the muds.

NOMENCLATURE

ppb pounds per barrel
ppg pounds per gallon
XCD Xanthan Gum

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New Trend in Enhancement Quality and Pour Point of Waxy Gas Oil by Nanoemulsions Part-1

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Abstract— *Hydrocarbons are organic compounds consisting of hydrogen and carbon. There are many sub-groups: paraffins, such as alkanes, alkenes, alkynes, naphthenes, such as cycloalkanes, and aromatics, such as xylene and benzene, as well as many other related compounds consisting of hydrogen, carbon, nitrogen and sulphur. A wide variety of hydrocarbon components are blended together to make fuels according to the specifications appropriate for cars. In this research, nanoemulsions are prebared , with droplet size on the order of 100 nm. A typical nanoemulsion contains oil, water and an emulsifier prepared by phase transfere catalysts. The addition of an emulsifier is critical for the creation of small sized droplets as it decreases the interfacial tension i.e., the surface energy per unit area, between the oil and water phases of the emulsion. The emulsifier also plays a role in stabilizing nanoemulsions through repulsive electrostatic interactions and steric hindrance. This research focus has been on preparing nanoemulsions through phase transfer catalysts .The physic chemical characteristics were studied. The adsorption isotherm behavior of these emulsifiers was investigated by measuring the surface tension and interfacial tension as function of concentration. It is found that there is a good relation between surface properties and quality of gas oil. Also, the results indicating that more stable emulsion can improve pour point and high quality of gas oil. The results are discussed according the surface properties and thermodynamic parameters of emulsifiers and nano emulsion. The author suggests new mechanism foe enhancement gas oil instead mild visbreaking gas oil in presence of hydrogen gas. This method has many advandage in compare with visbreakig methods.*

Keywords— Synthetic fuels, Nanoemulsions, Phase transfere catalysts.

I. INTRODUCTION

Microemulsions are stable emulsions are stable emulsions of hydrocarbons and water in the presence of surfactants and co-surfactants. They are characterized by spontaneous formation, low interfacial tension, and thermodynamic stability. They have high solublization capacity for both hydrophilic and lipophlic compounds. Surfactants used are petroleum sulphonates and ethoxylated alcohol sulphates, The degree of interfacial tension lowering depends on the phase behaviour of the oil/water/surfactant mixture (1-4).

Some ester is widely used as lubricants and high performance industrial fluids. They are characterized by good biodegradability, low volatility, good lubricity, good thermal stability and low pour points. Ester oils are now used in many applications including automotive engine oils, hydraulic fluids, and compressor oils. The structure of the sorbiton palmitate (SPT) was confirmed by I.R spectrum, NMR, and by mass spectroscopy and studied elsewhere (5,6). The molecular weight was depicted and confirmed by mass spectroscopy(4). On the other hand the physical properties of the mixed system of anionic/ nonionic surfactant and its efficiency in pour point depression were studied early (3). The modification of the lyophobic and lyophilic groups, in the structure of the surfactant, may become necessary to maintain surface activity at a suitable level. Action mechanism of sorbitan palmitate as multifunction additive (4). The efficiency of this additive depends on its critical micelle concentration. The properties of aqueous solution of single component surfactant can be modified by mixing with another compatible one. The adsorption behavior of these surfactants at oil/air interface was investigated by measuring the surface tension and interfacial tension as function of concentration. Surface properties, in particular the critical micelle concentration (CMC), the maximum surface excess (Γ_{CMC}) and the minimum surface area (A_{MIN}) were measured. It is found the surface and thermodynamic properties of the prepared

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surfactants depend on their hydrocarbon chain length. Also it is found that there is a good relation between surface properties of the additive and their efficiency in depressing the pour point (6). The structure of the mixed micelles is expected to be identical to that of single component micelles. Hence, critical micelle concentration of the mixed system can be deduced theoretically based on the initial composition of each component (7,8).The mechanism of the depressants action have been suggested according the micelle of each additives. Adsorption of the additive on the surface of the wax particles inhibits their growth and alters the crystal habits through micelle core. As the results the surface and thermodynamic parameters confirm the suggested mechanism and the decreasing of pour point. This is resulted in a multilayer, more isotropic wax crystal, and thus only a fixed amount of wax separates at any given temperatures. The results were discussed in terms of adsorption isotherm

The aim of this work is evaluate the mixture of sodium salt of poly alkylated diphenyl ether sulphonat as anionic surfactants (ANS) and nonyl phenol ethoxylate with a mean of 10 ethoxy units per nonyl (ETH) which prepared elswhere as wax / water emulsifier (4,9,10).These emulsions act pour point depression for base oil. The author study the effect of different mole fractions of the additives on degree of pour point depression, and suggest the field of action mechanism of the additives according to micelles.

II. EXPERIMENTAL

The diphenyl ethers was alkylated by the Friedel-Crafts reaction from diphenyl ether and 1- bromododecane in the presence aluminum chloride and 0.1 gram of tetraehylammonium bromide as phase transfer catalyst. Then, the product was sulphonated and neutralized to produce sodium salt of poly alkylated diphenyl ether sulphonat according Omar et al (9,10). It was found that their physical properties were varied by changing the lengths and number of alkyl groups added to the aromatic rings .The degree of purity about 98% with following chemical formula:

C_{12} $H_{25}C_6H_3(SO3Na)$ OC_{12} $H_{25}C_6H_3(SO3Na)$.The nonyl phenol ethoxylate with a mean of 12 ethoxy units per nonyl (ETH) was prepared by reaction of nonyl phenol and ethylene oxide (9,10). Into several 100 ml beakers, portion of a given concentration of (ANO) solution (0.01 mol/L) were placed, followed by addition of a given concentration of (ETH) solution (0.01 mol/L). The mixtures were diluted stepwise with water. These mixtures were stirred for 30 minutes in a thermostat at 30^0C in order to establish their equilibration. The surface tension of aqueous solution of single and/or mixed surfactant system were measured at 30 ^{0}C using Du Nouy tensiometer (KRUSS Type 8451).

Nanemulsion were prepared in two step: firstly, a pre-emulsion was prepared by addition of water in different percentage (2, 4, 6,8,10 and 12 wt%) to a mixture of ANS and ETH compounds. with constant stirring at 600 rpm. In second step, the prepared pre-emulsion were stirred at high 1000 rpm for 15 min. All experiments were run at 30 C^0.

The physicochemical properties of the base oil are listed in the following table:

Properties	Base oil	Test
Denisty (g/ml) at 15.5 C	0.8958	D. 1298
Refactive index nD^{20}	1.4955	D. 1218
ASTM colour	4.5	D. 1500
Kinematic viscosity cSt at 40 C at 100 C	16.56 28.15	D. 445 D. 455
Pour point C	18	ASTM D 97
Molecular weight	520	GPC
Total paraffinic content , wr%	22.353	Urea adduction
Carbon residue contenty, wt%	1.9	ASTM D524
Ash content, wt%	0.0511	ASTM D482

Pour point depression performance of compound ANS and ETH was evaluated with gas oil by pour point according to ASTM-D 97.

III. RESULTS AND DISCUSSIONS

The variation of surface tension of the air/solution interface as a function of concentration of prepared compounds ANS and ETH is given in Table 1 and Fig. 1. It is clear that the surface tension decreases more with increasing the compound concentrations. The difference between them is attributed to functional group of each molecule (hydrophilic group). Using the Gibbs relation, the action of additive including the maximum adsorption density at the air/ solution interface and area occupied/ molecule can be calculated (11,12). Comparing the data in Fig. 1 shows that the CMC value for the compound (ANS) was higher than that of the compound (ETH), which indicates that the former ETH favors micellization processes at a lower concentration than the latter compound. Studying the results in Table 1, shows that, the synthesized surfactants ANS has large values of surface excess and minimum surface area, indicating the ANS is the most efficient and gives a greater lowering in surface tension of oil with more emulsion stable. Thus the change in hydrophilic group of

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(hydrophobic part) affects of degree of micellization and emulsion stability. Also table (2) shows the emulsion stability of ETH and ANS in seconds at 30C. The results confirm the compound ANS is more efficient than compound ETH at different volume of water. Increasing the sulphonate group increase the emulsifying power. This is due the ANS adsorbs at the interface and lower surface tension between oil and water. Therefore, when mixed ANS and ETH that have different solubility in water. The critical micelle of mixtures decrease according to the mole fraction of addition (Table 3) and surface tension decrease as shown in Fig 2. This is compatible with published elsewhere by Omar (13). This means that the two compounds ANS and ETH arrange with more stable micelle at the interface and decrease repulsion force between the micro emulsions particles.

Thermodynamic parameters of micellization (standard free energy, ΔG_{mic} , standard entropy change, ΔS_{mic} , and standard enthalpy change, ΔH_{mic} of the prepared surfactants were calculated according Omar et al (11,12) as shown in table 4. These parameters enhance micellization processes and adsorption of additives at the interface. As the results the stability of emulsion increases and the mixture of ANS/ETH prefer of forming stable emulsion due to decrease the interfacial tension between oil and water (Fig.2). These results is combatable with published elsewhere (6,7) . These parameters confirm that the stability of emulsion depend on thermodynamic parameters and value of critical micelle concentration. These value of cmc depend on degree of mixing ANS/ETH (mole fraction). From Table 3 increase mole fraction of ANS/ETH from 0 to 0.7 lead to minimum cmc, then stat to increase with increasing percentage of ETH. These results compatible wih published elsewhere (6,7). ΔG_{mic} values are negative indicating that the processes of micellization processes is a spontaneousity depend mainly on the hydrophilic sulphonate or ethoxylate group, while ΔS_{mic} are positive reflect degree of random On the other hand ΔH_{mic} values are positive due to the endothermic process of anionic or non ionic surfactants in micellization processes. This indicates that the adsorption processes of surfactant molecules is more energetically favored and these molecules act as free before micellization which compatible with published elsewhere by authour (6, 7)

A the results, we predict the activity of these surfactant reach maximum at CMC at mole fraction 0.7 ANS/ETH. This value has the critical surface tension (Fig 2). Furthermore,. So below CMC the surface tension represent the critical value for adsorption and it activity of free molecules of surfactants (Table 3).

It can be conclude that, the activity of the additive in oil phase enhances by mixing of ANS with ETH and the values of CMC. This is due to the fact the micellization processes increase and act as core or trap for fine particles of oil.

The investigation of the ability of additives as pour point depressant in Table 5,6 . It is clear that, the pour point is improved by increasing the additive concentration. The optimum value for reduction pour point obtained at 0.0008mole/L. It is represented the critical micelle concentration. The addition of ANS to ETH forms a mixture exhibiting better performance in reducing pour point as shown in table 6 . As discussed early, addition of non ionic ETH surfactant to anionic ANS lead to lowers the cmc and critical surface tension. These results are compatible with surface properties of additive; i.e. Surface excess concentration of mixture increase with increasing of mole fraction , until 0.7 of ANS/ETH. The author suggests the sulphonate group solublize the wax while the ethoxylate group act as shelding between wax particles. As the results, disperse wax crystal lattice to small sizes, consequently the pour point decrease.

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Table.1: Surface properties of additives at 30C^0

Additives	**CMCmol/L.10^4**	**Surface excess concentrations Γ_{max} x 107 mol/m2**	**Area occupied per molecule nm^2**
ANS	5.2	7.5	0.66
ETH	3.8	5.6	0.45

Table.2: Effect of water percentage % on stability of microemulsions at 30C^{0}by ETH and ANS

% of water in nanoemulsions	**ANS Stability, Time , Sec.**	**ETH Stability, Time , Sec.**
2	150	140
4	160	150
6	200	200
8	260	230
10	220	210
12	180	170

Table.3: Surface properties of additives at different mole fractions ANS/ETH

Mole fraction	**CMCmol/L.10^6**	**Surface tension at CMC mN/m**	**Area occupied per molecule nm^2**
0.2	3.8	22	3.5
0.4	3.1	20	3.8
0.6	2.5	18	5.5
0.7	1.5	12	8.6
0.8	2.5	15	5.5

Table.4: Thermodynamic parameters of additives at 30 C

Compound	**T, C^0**	**ΔG_{mic} KJ/MOL**	**ΔS_{mic} KJ/MOL**	**ΔH_{mic} KJ/MOL**	**ΔG_{ads} KJ/MOL**	**ΔS_{ads} KJ/MOL**	**ΔH_{ads} KJ/MOL**
ETH	30	-15.1	0.06	5.9	-16.76	0.02	5.8
ANS	30	-20.5	0.07	-8.72	-18.9	0.01	10.5

Table.5: Effect of different additives on pour point at different concentrations

Adittive	**Conc mollL**	**Pour point , C**
ANS	0.00005	**10**
	0.00008	**7**
	0.00009	**5**
	0.0005	**1**
	0.0008	**4**
ETH	0.00005	**12**
	0.00008	**9**
	0.00009	**9**
	0.0005	**7**
	0.0008	**5**

Table.6: Effect of different mole fractions of ANS/ETH on pour point 1% of water in nanoemulsions.

Adittive	**Mole fraction**	**Pour point , C**
ANS/ETH 5% of water in nanoemulsions	0.2	8
	0.4	5
	0.5	4
	0.7	-1
	0.8	4
ANS/ETH 8% of water in nanoemulsions	0.2	9
	0.4	7
	0.5	6
	0.7	1

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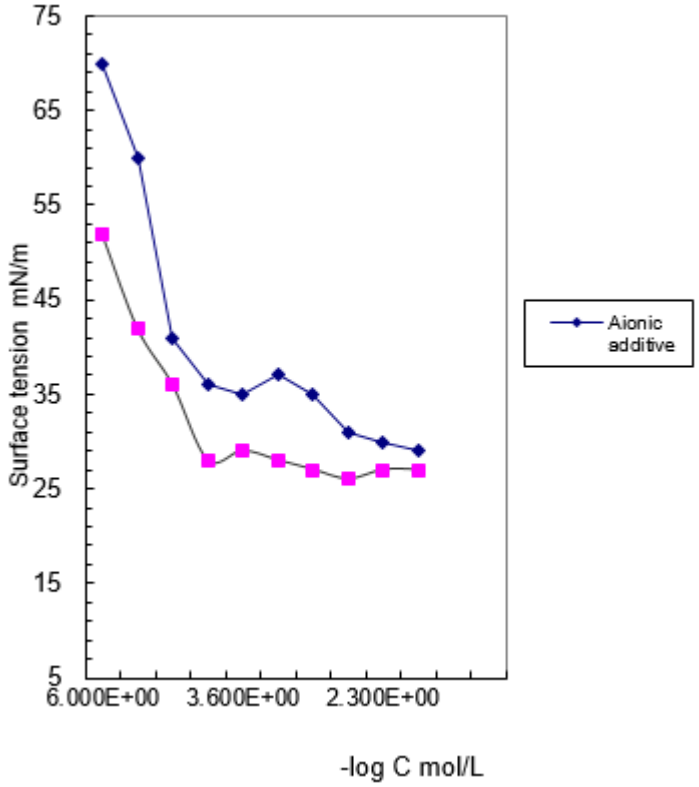

Fig.1: Effect of additive concentrations on surface tensions.

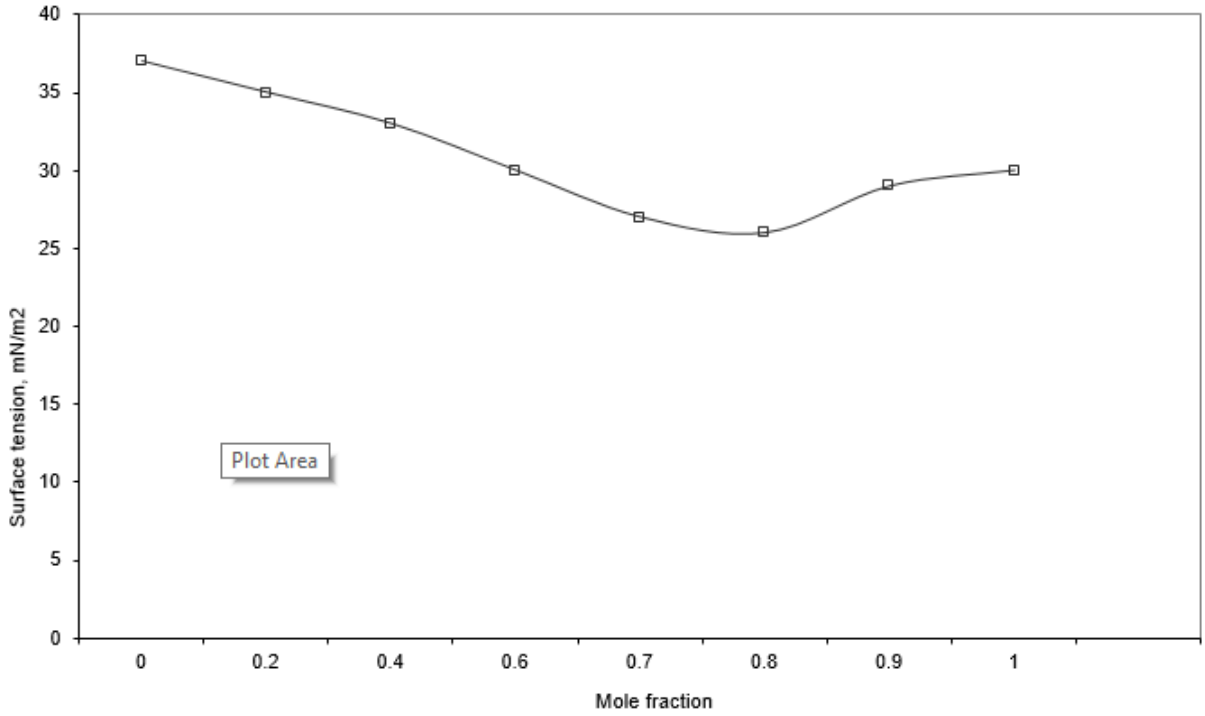

Fig.2: Effect of different mole fractions of the prepared additive on surface tension at solution/ air interface

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FIR High pass Filter for Improving performance Characteristics of Various Windows

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Abstract— *Digital filters can be classified two types finite impulse response and infinite impulse response filters.FIR low pass filter design using Kaiser window is presented. FIR low pass filter digital filter design using Kaiser window for given specifications is compare. Digital Signal Processing is used in many areas where analogue method was difficult. Filters are used to separate or combine different frequencies. FIR high pass filter has been designed and simulated using different windows techniques. Hamming, Hanning, Kaiser and Bartlett Windows techniques are used along with Rectangular window technique for the design analysis by using Matlab.Beta is increase then main lobe width is increase.*

Keywords— FIR Filters, High pass filters, Window Function, MATLAB, Simulink, Hamming, Kaiser, Rectangular, Hanning and Bartlett windows.

I. INTRODUCTION

Filter removes unwanted signal and passes useful information. Filters used in communications systems and signal processing applications such as noise reduction biomedical, audio processing, video processing. Digital signal processing is used in spectral analysis, image processing, sonar processing, speech analysis; data communication DSP has many advantages such as accuracy, perfect reproducibility, and greater flexibility. The signal used in DSP is derived from analog signal which have sampled at certain interval to convert into digital signal [1]. Digital filters are important class of Linear time invariant DSP system designed to modify the frequency characteristics of the input signal x (n) to meet certain specific design requirements. Digital filters have for removing noise, and minimizing inter-symbol Interference (ISI) in communication architectures [2]. Digital filters have been classified into Finite Impulse response (FIR) and Infinite Impulse Response (IIR) filters. The FIR has an impulse response h (n) of finite duration, defined over the interval $0 \le m \le M$ has finite number of terms,

$$\mathbf{y\,(n)} = \sum_{m=0}^{M} \mathbf{h(m).x(n-M)} \qquad \mathbf{(1)}$$

Infinite impulse response (IIR) filter has impulse response h (n) of infinite duration, infinite interval $0 \le n \le \infty$, now infinite number of terms,

$$\mathbf{y\,(n)} = \sum_{m=0}^{\infty} \mathbf{h(m).x(n-M)} \qquad \mathbf{(2)}$$

II. FIR FILTER DESIGN METHODS BY VARIOUS WINDOW TECHNIQUES

FIR Filter design method is simplest method is called window method. Window method is begins with an ideal desired frequency response which is represented as

$$\mathbf{H}_d\,(w) = \sum_{n=0}^{\infty} \mathbf{h}_d\,(\mathbf{n})\mathbf{e}^{-jwn} \qquad \mathbf{(2a)}$$

Where

$$\boldsymbol{h_d}\,\mathbf{(n)} = \frac{1}{2\pi}\int_{-\pi}^{\pi} \boldsymbol{H}_d\,\mathbf{(w)}\,\mathbf{e}^{jwn}\ \mathbf{dw} \qquad \mathbf{(2b)}$$

Commonly used windows are Bohman window, Blackman window, Blackman-Haris window, Gaussian window, Chebyshev window, Hamming window,Hanning window,Nutall window, Rectangular window, Kaiser window, Triangular window and Taylor window.

2.1 Hamming Window:

To eliminate the some pass band and stop band ripples, Hamming window technique is used [3]. The coefficients of a Hamming window are computed from the equation (5)

$$\mathbf{w\,[n]} = 0.54 - 0.46\cos\left(2\pi\frac{n}{N}\right),\ 0 \le n \le N \qquad \mathbf{(2.1a)}$$

2.2 Kaiser Window:

Kaiser window has an adjustable shape parameter that allows the window to achieve any desired value of ripple or attenuation.Kaiser window is minimizing the side lobe energy of the window as well as having the simplest implementation [4]. The equation of Kaiser Window is expressed in below equation which is depending on two parameter α and N.

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$$w(n) = \frac{I_0\left(\alpha\sqrt{1-(n-M)^2/M^2}\right)}{I_0(\alpha)} \quad \textbf{(2.2b)}$$

Kaiser window is also defined in terms of β, where β is the Kaiser Window parameter that affects the side lobe attenuation of the Fourier transform of the window [5]. The Kaiser window that design an FIR filter with side lobe attenuation of α and β is expressed as

$$\beta\begin{cases} 0.1102(\alpha-8.7), & \alpha > 50 \\ 0.5842(\alpha-21)^{0.4}) & \\ +0.07886(\alpha-21), & 50 \geq \alpha \geq 21 \\ 0, & \alpha < 21 \end{cases} \quad \textbf{(2.2c)}$$

2.3 Hanning Window:

Hanning Window is raised cosine window .Equation of Hanning window is written as [5].

$$\mathbf{W}_{hn}\ \mathbf{(n)} = \begin{cases} 0.5 - 0.5cos\frac{2\pi n}{N-1} \\ 0;\ other\ n \end{cases} \quad \textbf{; for n=0 to N-1}$$

(2.3)

Where N=Number of samples of window.

2.4 Bartlett Window:

Description:

Bartlett suggested a more gradual transition in the form of a triangular window is given below:

$$\mathbf{w(n)}=\begin{cases} \frac{2n-1}{M-1}, & 0 \leq n \leq \frac{M-1}{2} \\ 2-\frac{2n}{M-1}, & \frac{M-1}{2} \leq n \leq M-1 \\ 0, & otherwise \end{cases} \quad \textbf{(2.4a)}$$

Bartlett window is given by:

$$\mathbf{w(n)=1-\left|\frac{n-\frac{N-1}{2}}{\frac{L}{2}}\right|} \quad \textbf{(2.4b)}$$

Where L can be N, N-1 or N+1. This window also known as triangular window.

2.5 Rectangular Window:

Description:

The weighting function for the Rectangular window is to be defined [6] by

$$\mathbf{w}_R\ \mathbf{(n)=1,\ for} |n| \leq \frac{M-1}{2} \quad \textbf{(2.5a)}$$

$$\mathbf{w}_R\ \mathbf{(n)=0,\ otherwise} \quad \textbf{(2.5b)}$$

This function is provided for completeness; a rectangular window .This is the simplest window function but provides the worst performance from the viewpoint of stop band attenuation. It is defined by:

$$w(n) = \begin{cases} 1, & 0 \leq n \leq M-1 \\ 0, & elsewhere \end{cases} \quad \textbf{(2.5c)}$$

III. FILTER DESIGN SIMULATIONS

Table.1: Parameter Specification

Parameters	**Values**
Sampling Frequency	48000 Hz
Cut off Frequency	10800 Hz
Order	60
β	β =0.5,2,4,6 (for Kaiser window**)**

Interpretation of above Table: Table 1 show parameter specification of windows designing of low pass filter using hamming, rectangular window, Kaiser Window, Hanning window and Bartlett window. Sampling frequency is 48000 Hz and cut off frequency is 10800 Hz.Filter order is 60. Kaiser window parameter beta value is take 0.5,2,4,6.

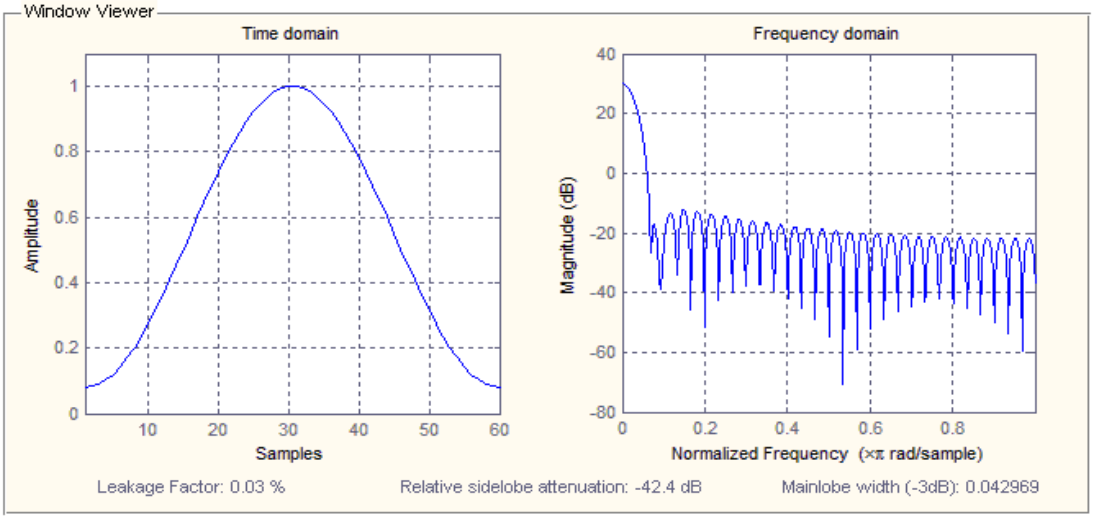

Fig.3: (a) Amplitude and Magnitude response of Hamming window function at N=60 (FIR HPF)

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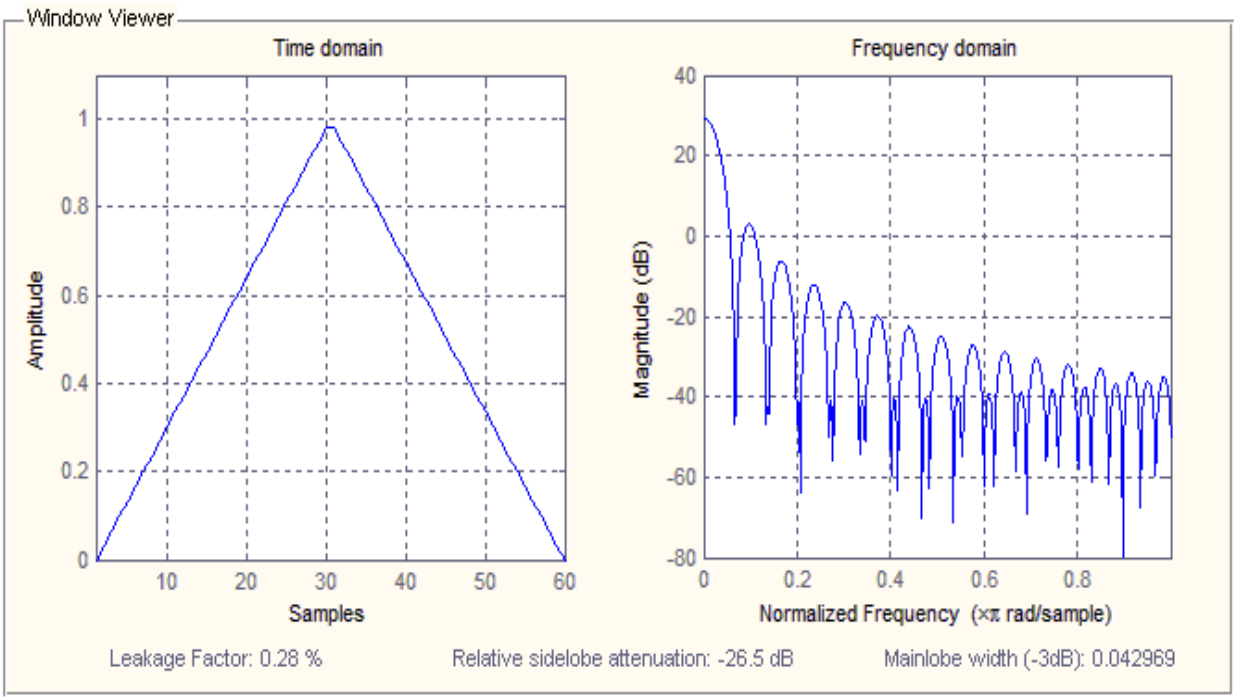

Fig.3: (b) Amplitude and Magnitude response of Bartlett window function at N=60 (FIR HPF)

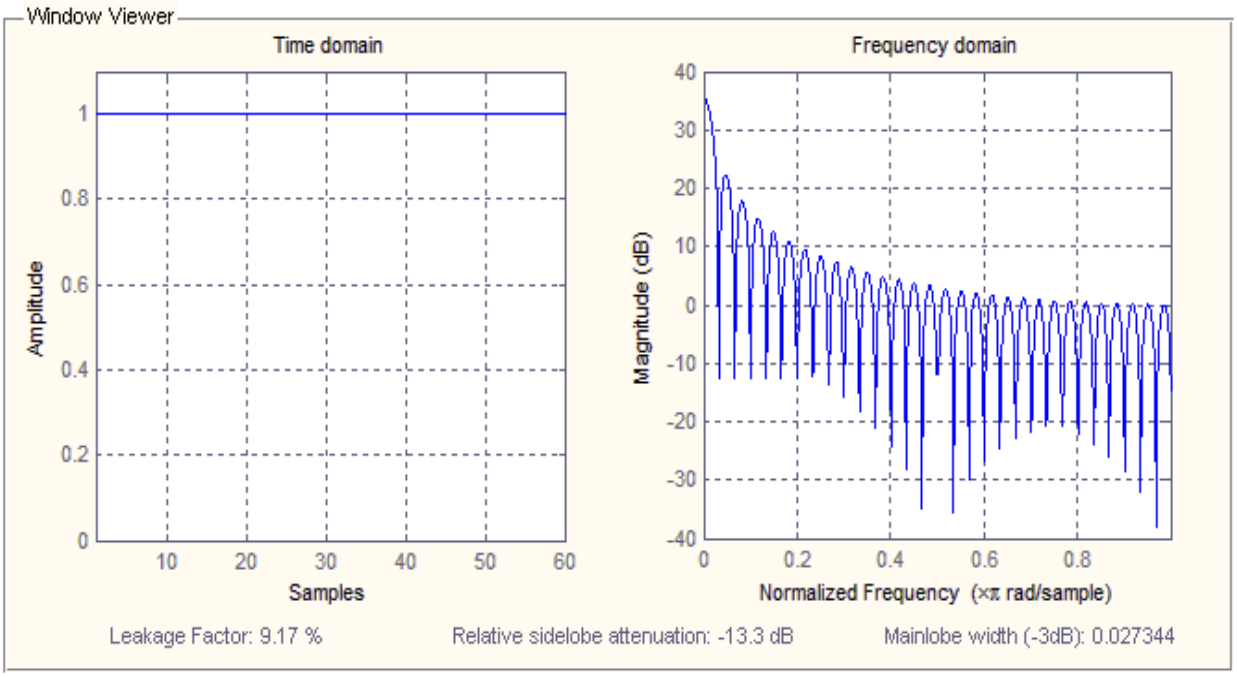

Fig.3: (c) Amplitude and Magnitude response of Rectangular window function at N=60 (FIR HPF)

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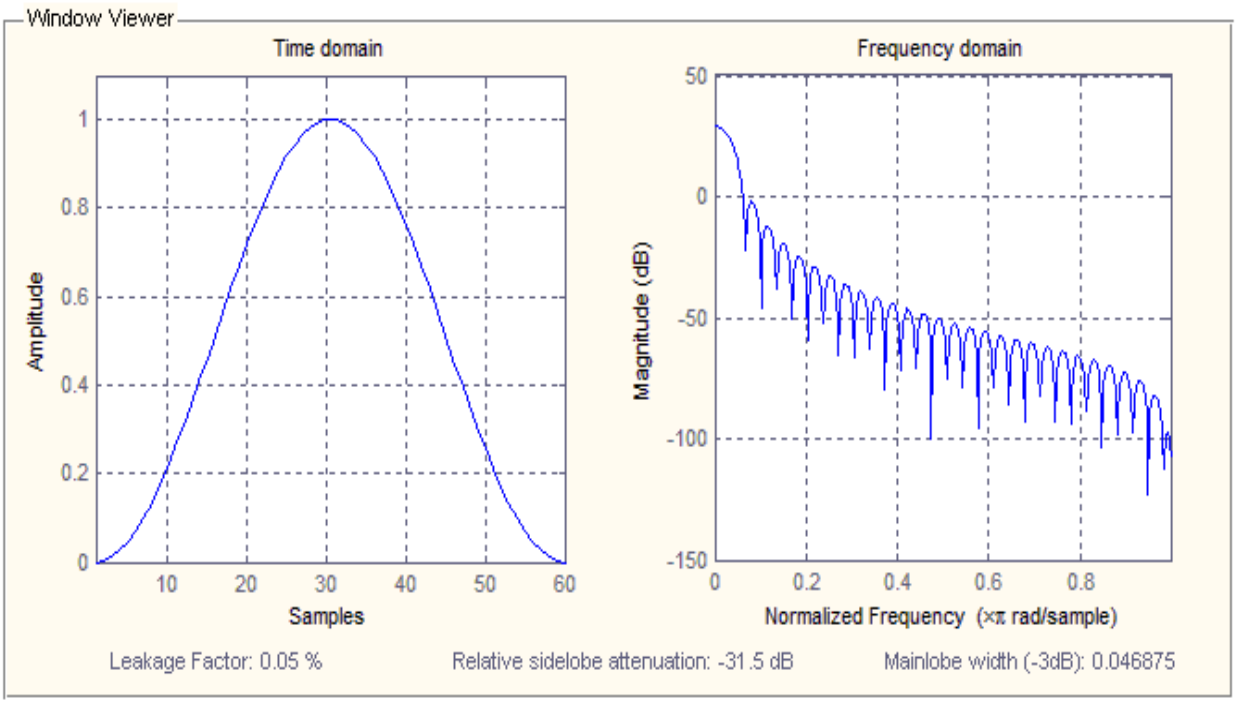

Fig.3: (d) Amplitude and Magnitude response of Hanning window function at N=60 (FIR HPF)

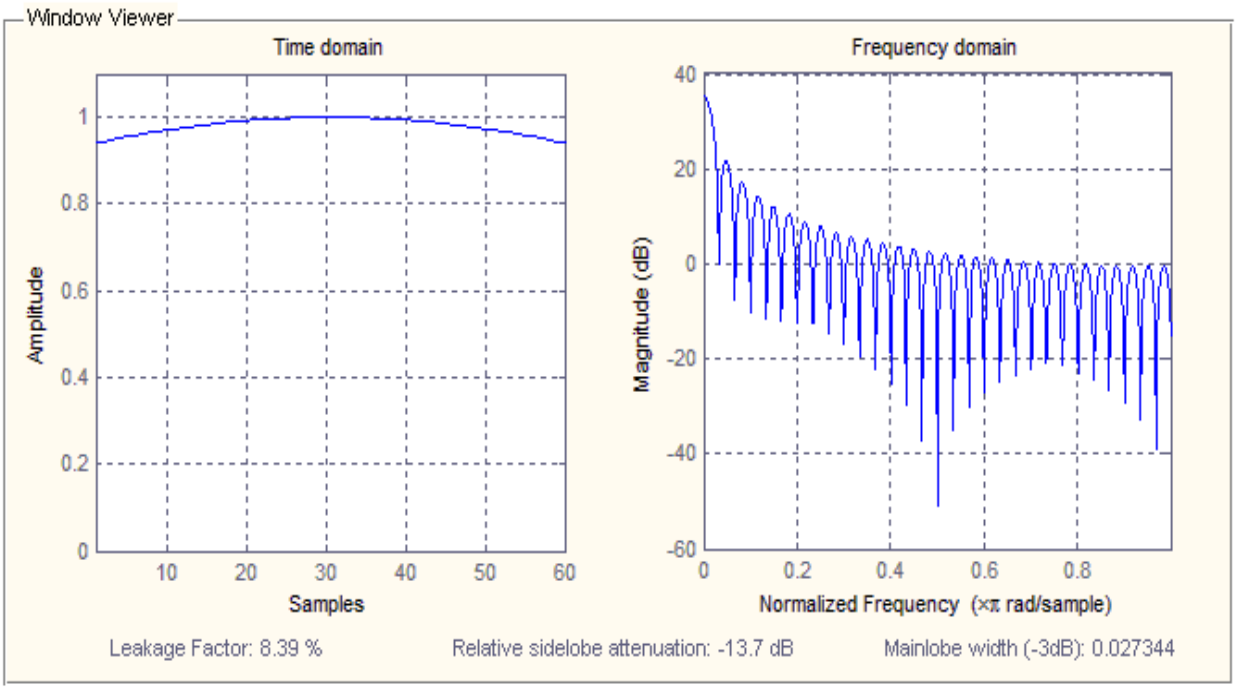

Fig.3: (e) Amplitude & Magnitude response High pass FIR filter using Kaiser Window (Beta=0.5)

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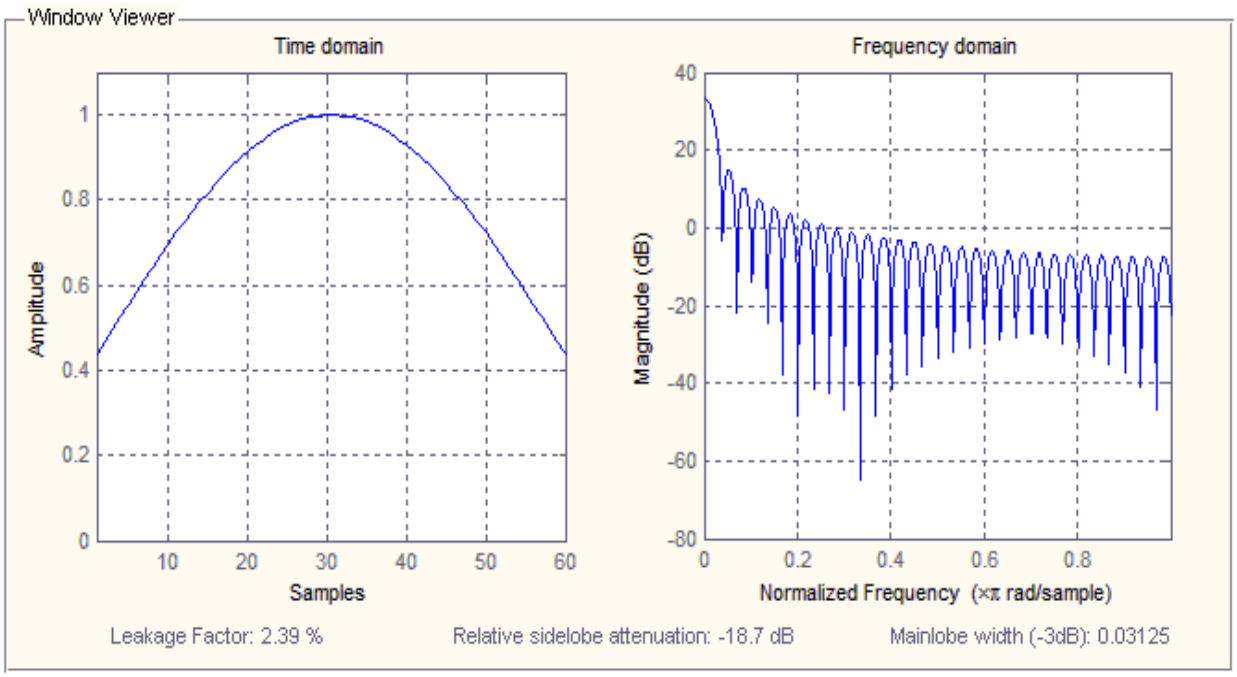

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Fig.3: (f) Amplitude &Magnitude response high pass FIR filter using Kaiser Window (Beta=2)

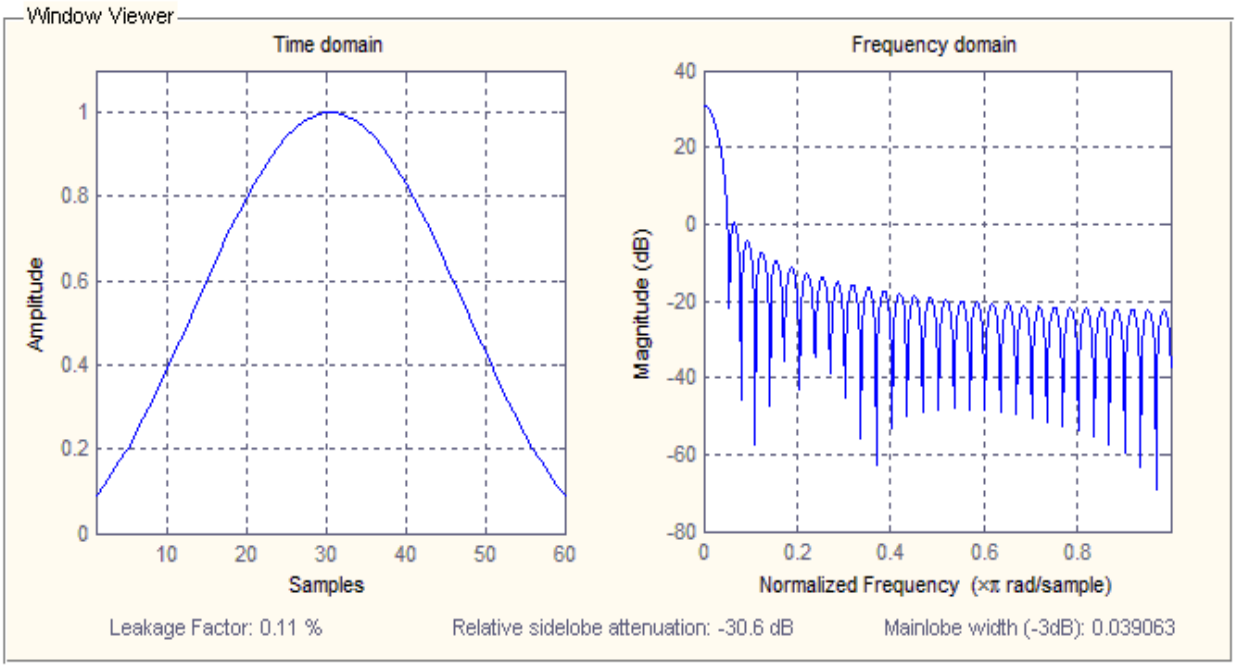

Fig.3: (g) Amplitude &Magnitude response high pass FIR filter using Kaiser Window (Beta=4)

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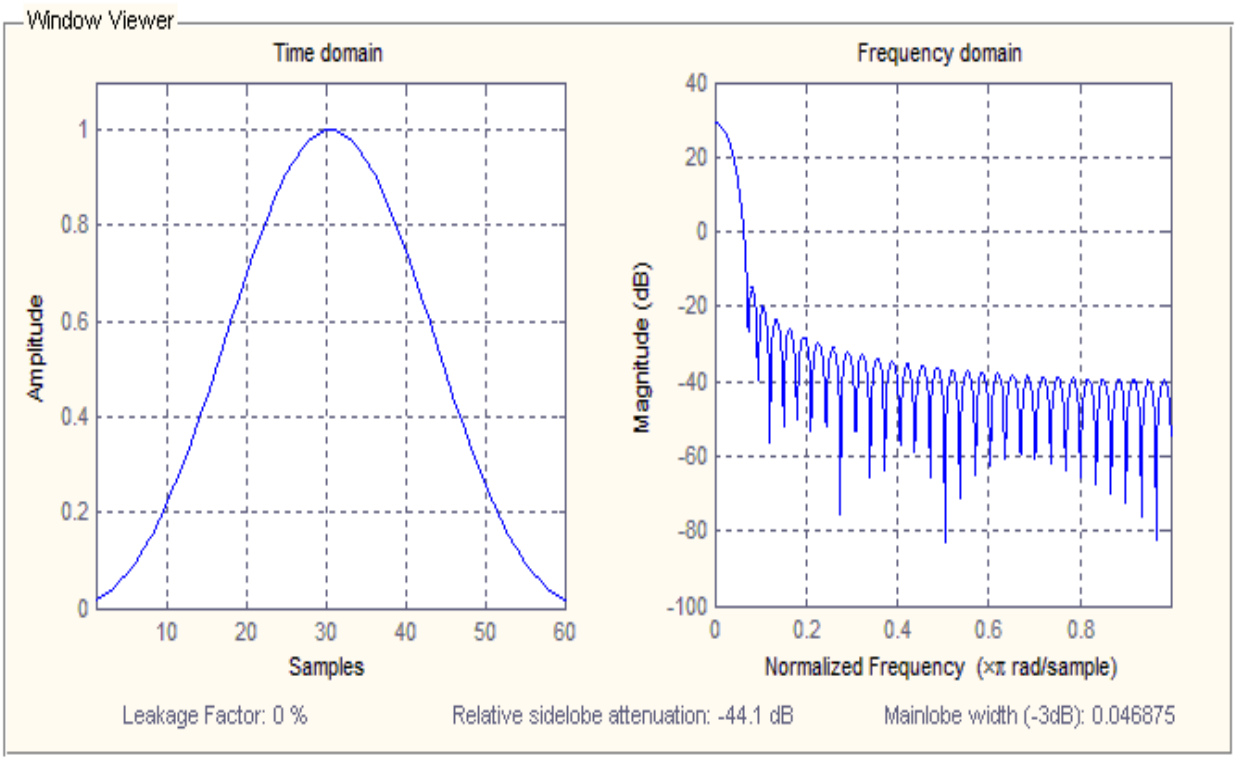

Fig.3: (h) Amplitude &Magnitude response high pass FIR filter using Kaiser Window (Beta=6)

3.1 Interpretation of Above Result:

In **Fig:3 (a)** Hamming window has amplitude in time domain is 1.Main lobe width of Hamming window is 0.042969 and filter order is 60.Hamming window has relative side lobe attenuation is -42.4 dB and leakage factor is 0.03% .

In **Fig: 3(b)** Bartlett window has amplitude is 1 in time domain. Relative side lobe attenuation of Bartlett window is -26.5 dB and its leakage factor is 0.28%.

In **fig. 3 (c)** Rectangular window has less main lobe width (0.027344).Rectangular window has highest leakage factor (9.17%) to other windows.

In **fig. 3(d)** Hanning window has amplitude is 1 in time domain.

In fig. 3 (e) Kaiser Window beta value is less so main lobe width is less.

In **fig. 3 (f)** Kaiser Window beta value is increase so main lobe width is increase.

In **fig. 3 (g)** Kaiser Window beta value is higher so main lobe width is higher.

In **fig. 3 (h)** Kaiser Window beta value is higher so main lobe width is higher.

IV. COMPARATIVE ANALYSIS OF VARIOUS WINDOWS

Hamming and Kaiser Windows techniques are used along with Rectangular window for design analysis and compared these five windows. Table 2 shows the comparison of these five windows in terms of leakage factor, relative side lobe attenuation and main lobe width. The leakage factor is minimum and main lobe width is maximum of Kaiser Window than the Hamming window. When beta is increase then main lobe width is increase but leakage factor is decrease.

Table.2: Matlab Simulated result of Rectangular, Hamming, Kaiser Window& Other windows

Windows	Leakage Factor	Relative Side-Lobe Attenuation	Main-Lobe width (-3 dB)
Hamming	0.03%	-42.4 dB	0.042969
Bartlett	0.28%	-26.5 dB	0.042969
Rectangular	9.17%	-13.3 dB	0.027344

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Hanning	0.05%	-31.5 dB	0.046875
Kaiser (β=0.5)	8.39%	-13.7 dB	0.027344
Kaiser (β=2)	2.39%	-18.7 dB	0.03125
Kaiser (β=4)	0.11%	-30.6 dB	0.039063
Kaiser (β=6)	0%	-44.1 dB	0.046875

4.1 Interpretation of Above Table 2:

In Kaiser Window beta value is increase then main lobe width is increases but leakage factor is decreases. When leakage factor is 0% in Kaiser Window then wider main lobe width (0.046875)

V. DISCUSSIONS

The low pass FIR filter design with sampling frequency =48000 Hz, cut off frequency =10800 Hz, based on Kaiser window design with three value of beta (0.5,2,4,6) and specify order is 60.These filters remove high frequency noise from ECG signal. The design of FIR high pass filter based on adjustable window design method implementing by using filter design and analysis tool (**FDATool**) from MATLAB (R2010a) programs. **Table 2** shows various windows simulated results of Hamming, Bartlett, Rectangular, Hanning and Kaiser Windows.

Leakage factor is equal to ratio of power in side lobes to total window power. Side lobe attenuation is equal to difference in height from main lobe peak to the highest side lobe peak. Main lobe width (-3 dB) is equal to the width of main lobe at 3 dB below the main lobe peak.

VI. CONCLUSIONS

In this paper FIR high pass filter has been designed and simulated using Rectangular, Hamming and Kaiser Windows techniques. FIR Low pass filter has been designed for the different value of Kaiser Window parameter β. It has been compared leakage factor, main lobe width and relative side lobe attenuation of the three windows from the simulated result.Kaiser Window parameter β widens then main lobe width is increase and decreases the amplitude of side lobes that is increases the attenuation. Kaiser window main lobe width (-3dB) is 0.046875 at sampling frequency 48000 Hz, cut off frequency 10800 Hz and order 60 and beta is 6. Kaiser window has greater main lobe width and less leakage factor in comparison of Hamming window.

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An Extensive Proposal for Vertical Handoff Technique in WLAN

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Abstract— *Vertical handoff is the one of the most powerful hidden weapon of the wireless network scenario. As the whole world of digital electronics is moving towards internet of things as result of this vertical handoff becomes a much needed seamless connectivity tool to enhance the paradigm. Now a days many of the digital electronic devices are been inventing to boost the smaller networks like in office, universities and companies. So an inverse arise of need for vertical handoff in the WLAN is on much priority like never before. Many of the systems are existed to provide vertical handoff without degrading or interrupting the data access facility in WLAN. In most of the vertical handoff mechanism the load is put on the mobile nodes to look over the data flow mechanism in the established WLAN. This may add some contribution to increase the delay in the delivery of the data in the established network. So as an efficient answer to this, this paper put forwards an idea of vertical handoff mechanism using the pool manger in the network and put the burden on the mangers to take care of the handoff process, so that the data delivery rate can be increased. This process is designed based on the tile (i.e. time) in the said pool (pool tile vertical handoff – PTVHO) which is catalyzed by fuzzy logic to measure the handoff parameters efficiently.*

Keywords— Pool , Vertical handoff, Avanche effect , WLAN, Fuzzy logic.

I. INTRODUCTION

The WLAN is having high infiltration of IEEE 802.11n and the blast in the quantity of cell phones, tablets and portable workstations. In later a long time, alongside the movement from open air to indoor use is making different difficulties for system administrators who wish to oblige client needs, for example, higher throughput, an extensive variety of utilization activity sorts and broad indoor scope. Most web access designs depend on the Wireless Local Area Network (WLAN) innovation as the "last-bounce", however this is making a bottleneck in the generally speaking framework. WLAN innovation characterized by the IEEE 802.11 standard family conveys regularly expanding information rates with each new standard. Case in point, 802.11n with channel holding, most astounding Modulation and Coding Scheme (MCS), 400 ns monitor interim, Multiple Input Multiple Output (MIMO) Orthogonal Recurrence Division Multiplexing (OFDM) is fit for advertising up to 600 Mbit/s physical layer information rates, while the more up to date standard 802.11ac will present to 7Gbit/s for the 5GHz band. As of now, 802.11n stays to be the standard with the most astounding entrance rate in the business sector, including Access Point (AP)s and end-gadgets. Our preparatory results are assembled for 802.11n, yet the exhibited mechanized setup is not constrained to a specific standard.

As the WLAN deployed across wide area it gains a lots of attention of device, vendors, network operators and many more entities for evaluating the quality of experience criterion of network. Basically quality of service is an application layer concept, but it ranges up to the lower layer and associated with the various parameters such as strength of received signal, delay, rate of data, jitter and so on. The individual performance of access point plays a crucial role in evaluation of QoE. Access points having same configuration might be behave differently for different chipsets, firmware, power management, position of antina placement etc.

The 2-stage submits (2PC) is a distributed technique of deciding whether to commit the transaction or not in a distributed environment. In this way, through 2PC a consistent choice is come to and implemented among various servers whether to submit or prematurely end a given exchange, thus to ensure the atomicity. The protocol continues in two stages, i.e. voting and choice stage, which clarifies the convention's name. The convention is executed by a facilitator process, while the partaking servers are called members. At the point when the exchange's initiator issues a solicitation to confer the exchange, the facilitator begins the principal period of the 2PC convention by questioning by means of get ready messages all members whether to prematurely end or to confer the exchange. On the off chance that all members vote to submit then in the second stage the facilitator illuminates all members to confer their offer of the exchange by sending a confer message. Something else, the organizer trains all members to prematurely end their offer of the exchange by sending a prematurely end message. Proper log passages are composed by organizer and additionally members to empower restart methods in the event of disappointments.

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The 2PC convention assumes that single and distributed transaction makes use of different resources hosted by various asset directors (e.g., database frameworks, record frameworks, informing frameworks, relentless programming situations), which live on potentially distinctive hubs of a system and are called members of the convention. For each exchange one facilitator process, normally running on the hub of that member where the exchange was started, expect obligation regarding executing the 2PC convention. The states through which facilitator and members move over the span of the convention are outlined in Fig. 1 and Fig. 2, resp., what's more, clarified in the accompanying. Such state charts speak to limited state automata, where ovals indicate states, marked curves signify state exchanges, and circular segment names of the structure "precondition/activity" demonstrate that (a) the state move is just empowered if the precondition is fulfilled and (b) the given activity is executed when the state is changed.

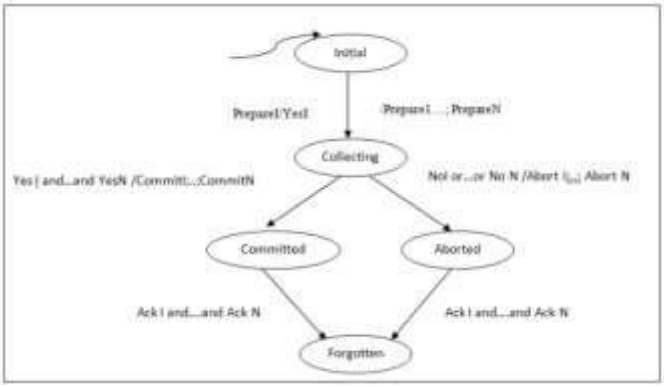

Fig.1: State Chart for Coordinator (Given N participant)

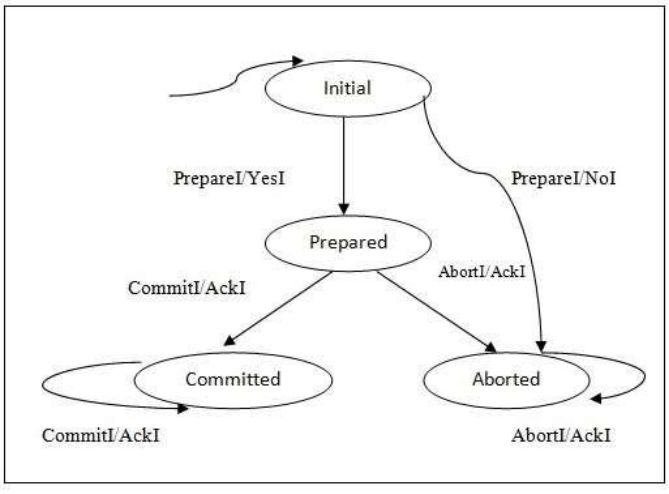

Fig.2: State Chart of Participant I

The basic working pattern of two phase commit protocol can be depicted in figure 3.

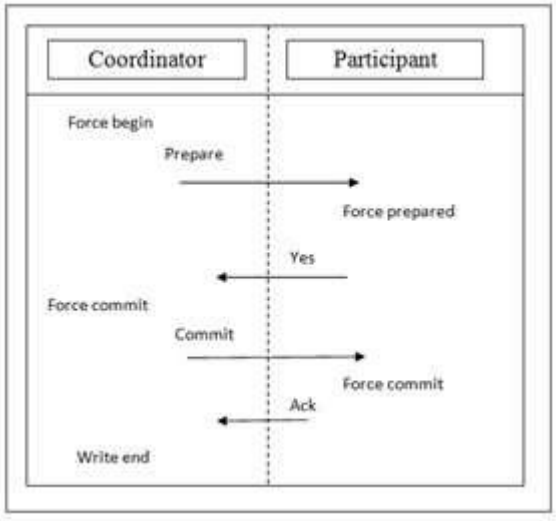

Fig.3: Action of transaction commit in the basic protocol

Number of areas is there which makes use of 2 pc protocols, it used in all such applications where the nature of data is decentralized and need to share across the multiple clients along with the guarantee of transactions. E.g. ecommerce, E-science etc. more precisely it is worth to say that two pc protocol s best suit for the database systems, transaction processing monitors, and the queued message systems.

It is theorized that the 4G system will be a brought together system that will incorporate various existing remote systems. The heterogeneous remote access systems will be interconnected with each other by means of an Internet Protocol (IP) system spine and the web. The primary idea and thoughts that drives the 4G systems are:

- All-IP system foundation move
- Support for various wireless access technologies such as WPANs, WLAN, and UTRAN etc.
- support of consistent handovers crosswise over both heterogeneous and homogeneous remote systems

A handover is viewed as consistent when it gives both i.e., smooth (no or next to no bundle misfortune) and quick (low dormancy) exchanging of dynamic association between the heterogeneous access systems. The trending research studies shows that the two crucial wireless techniques i.e. WLAN and UMTS gained lots of attention. 53.6% research focused on the issue of next generation network system i.e. consistent versatility feasibility over the coordinated UMTS and WLAN system.

The rest of the paper is organized as follows. Section 2 discusses some related work and section 3 presents the purposed methodology. The details of the results and some discussions we have conducted on this approach are presented in section 4 as Results and Discussions. A section 5 concludes this paper with our approach.

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II. RELATED WORK

SuKyoung Lee et al have developed a vertical handoff decision algorithm that enables a wireless access network to not only balance the overall load among the attachment points(e.g. Base Station(BSs) and Access Points(APs)) but also to maximize the collective battery lifetime mobile nodes(MNs). They devised a route selection algorithm to forward data packets to the most appropriate attachment point in order to maximize the collective battery lifetime as well as maintain load balancing. But still a mechanism is required for controlling variations in bandwidth when mobile node goes from low to high or high to low bandwidth network .also required to improve energy efficiency then consider network cost function while switching of network. it also consider user preference during handoff decision. Then network security is also important [1].

R.Tawil et al have proposed a vertical handoff decision scheme to enhance the service mobility using the Simple Additive Weighting (SAW) method in a distributed manner, under heterogeneous environments. Their goal is to reduce the overload and the processing-delay in the mobile terminal, by delegating the calculation of handoff metrics for network selection to the Target Visiting Networks. It mainly focus on to reduce overload and processing delay. It need to consider network cost, power consumption factor along with bandwidth, velocity etc [2].

Shengdong Xie et al have proposed a new vertical handoff decision algorithm to minimize the cost of the heterogeneous wireless networks. They calculated the block probability of new calls and the drop probability of handoff calls in cellular network and WLAN under the channel-guard call admission method, and proposed a cost function which is based on the block probability and drop probability. Then they obtained the radius of WLAN by simulated annealing (SA) method to minimize the cost .here required to consider other factors like data rates, bandwidth, power efficiency, latency etc for effective handoff. [3].

Wireless LAN technology i.e. WLAN defined by IEEE 802.1 standard delivers a high proportion of raw data rates with each new standard. In reality this raw data problem will not going to reflect real word performance of end users. For calculation of performance measurements of WLAN for access points [4] elaborates the technique which makes use of network performance parameters. The main intention of the paper is to define a simple line for benchmarking to find the best suit of devices. As per the author this set up is capable of calculating the different parameters such as data rate, RSSI and jitter in WLAN uplink and downlink. In this paper, author proposed a robotized setup for assessing the system execution of WLAN APs. He considered reasonable use-cases and tried the end gadgets as they are expected to be used by the end clients. The examination of the DUTs utilizing dependable and repeatable convention for execution assessment yields a chance to make a pattern. The setup proposed is likewise effortlessly versatile to diverse situations. His estimations demonstrate that the gadgets report the RSSI esteem with abnormal state of accuracy. In this way, the RSSI qualities could be viewed as a decent contender for crowdsourcing. Our future work is prone to concentrate on breaking down.

[5] Discussed a technique which makes use of LAN and WLAN for setup of dynamic local power dispatch system. Today, raising fuel costs has further exasperated the' worldwide worry about the developing energy emergency. Numerous vitality scientists of today center after finding new courses in sparing vitality and more viable techniques for force control and dispatch. This paper discusses Artificial Intelligence (AI) ideology and utilizing advanced Two-way remote RF signals through Neighborhood (LAN) and wide Area Network (WAN) associations with setup a Dynamic Local Area Power Dispatch System (LAPDS). The LAPDS won't just effectively dispatch the heap stream yet its fused AI ideas will decrease the force request amid top periods in light of an arrangement of value rebate for various times of the day. At the end part authors conclude that the system factory energy loss can be reduced up to 14 %.

For maintaining the scalability of metadata service [6] illustrates the one phase commit protocol having low atomic overhead. The main focus of the paper is to manage the distributed operations such as Create, Delete, and Rename. We propose a one stage commit protocol that is custom-made to the utilization for common between metadata messages. We depend on a quick, exceptionally accessible shared stockpiling for metadata with a specific end goal to minimize composes, messages, coordination overhead and recuperation time in instance of coming up short metadata servers. We exhibit a formal portrayal of the new convention, a hypothetical investigation of its abilities, a proof of accuracy and the assessment of the convention in a reenacted environment that renders the convention to be quick and dependable. In recreations the convention accomplished more than half better execution contrasted and the two stage responsibility convention.

As discussed transaction management plays a vital role in any database management system. This paper makes use of 2 pc commit protocol as a base of their study. It considers the bottleneck of 2pc and proposed a new commit protocol known as 3 pc commit protocol.

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In 2PC, we watched that if two side exchange will perform in 2PC (i.e., one side called sender and other side called a beneficiary). At the point when sender side speaks with the recipient side through performing introductory qualities plan for submit or prematurely end message. The have the a few potential outcomes both sides that are, case 1-if the sender side sends the confer information to collector side
that might submit both sides. Case 2-if the sender side sends the information however information will prematurely end to the sender side and the collector side likewise information will prematurely end. Case 3-if the sender side sends the confer information to collector side yet beneficiary side information will prematurely end. Case 4-if the sender side sends the confer information however collector side, won't guarantee that data will commit or not.
By and large, as indicated by all potential outcomes, we have four cases which are connected. We researched that information is not certain from both side (sender side and collector side). In this paper we likewise watched that on the off chance that 3PC will utilize such kind of cases then it will abstain from blocking issues, in light of the fact that after prematurely end/fizzled the information of2PC convention. Information is blocked and lessened the blocking issue through 3PC systems [7]. It has one dynamic information for reinforcement; if fizzled/prematurely end the information to both sides. It has put away and includes different destinations for choice pays for conferring not for prematurely end. It is called pre-submit choice process and record of the information are put away in different destinations (i.e., K destinations), and we additionally actualized 3PC Algorithm in this paper.
[8] Talks about the most prevalent portability administration convention for the incorporated heterogeneous remote systems i.e., MIP. From the writing overview it can be watched that the MIP is not a proper decision to accomplish the consistent portability. The reason is the high number of flagging and hub process cost amid handoff which can't be minimized by executing the hard handoff strategy.
In his examination article, an exhaustive dialog on the parallel movement transmission idea has been exhibited. Also, with a specific end goal to diminish the flagging and hub preparing cost for the consistent portability administration, the proposed MSVHOP convention executes parallel flagging transmission. On account of parallel flagging transmission amid the handoff, the productive VHO is performed by sending the greater part of the VHOs flagging messages to the objective system in parallel with the officially settled information session with the past system. In this way, just few flagging messages impact the general VHO execution. Moreover, the relationship of transient lost data with the distinctive VoIP codec has been talked about and introduced. Our future research concentrates on the examination of vertical handoff convention by contrasting the proposed convention and the contemporary internetworking conventions, for example, MIPv4, MIPv6, and SIP and so on.
[9] Proposed a revised algorithm of vertical handoff for WWAN's and WLAN overlay networks. After the implementation of the technique author concludes the following points Heterogeneous portable systems, for example, WLAN and WWAN require productive handoff systems to ensure consistent network. A productive consistent vertical handoff calculation for portable stations was proposed to control the vertical handoff operations in the interworking systems to give constantly best associated administration. The situations actualized with the distinctive interworking models were looked at and the outcomes demonstrated that the interworking design at SGSN level gives better reaction time and low idleness to give a consistent handoff. The recreation result demonstrates that the proposed calculation empowers the versatile client to get benefit persistently with least bundle misfortune and delay. As a major aspect of future work handoff with LTE can be executed.

III. PROPOSED METHODOLOGY

In this section, we describe our framework for PTVHO in WLAN scenario with the below mentioned steps as shown in figure 4.

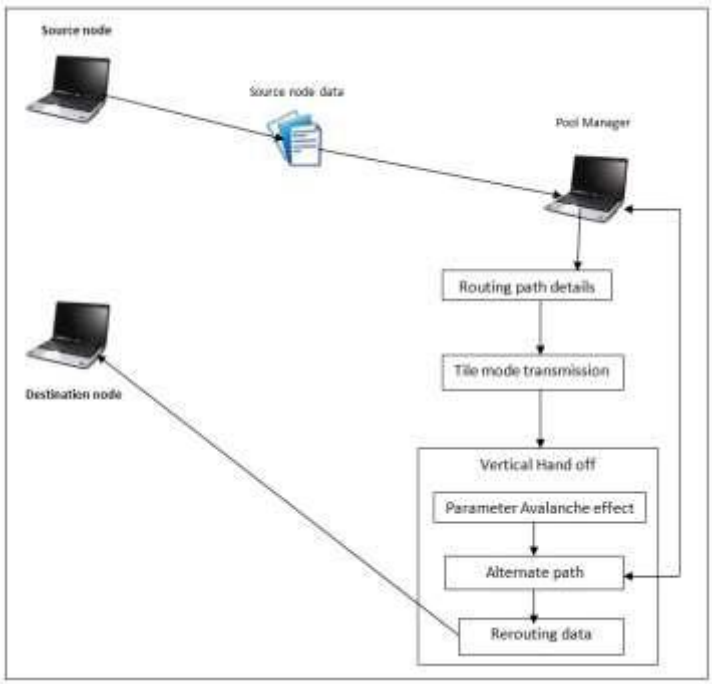

Fig.4: Overview of the proposed work

Step 1: Here in this step a WLAN is been setup for our experiment using the standard configuration of the machines

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using in today's scenario with D-Link 300 Mbps ADSL wireless router. Then some nodes are given the role of the managers and they called as pool managers. Many nodes are been named under a head node or pool manager which leads to create a perfect pool of nodes with a pool manager. Fig 5 and Fig 6 respectively demonstrate the setup process of WLAN and WLAN pools with pool managers.

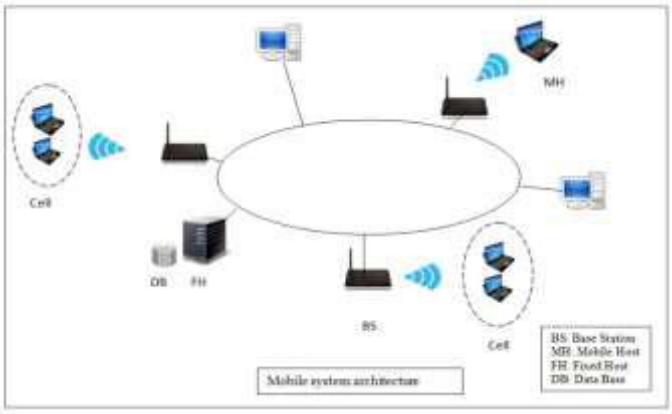

Fig.5: WLAN Setup

Fig.6: WLAN POOL with pool managers

Step 2: Here In this step data transfer mode is been maintained using efficient two phase commit protocol with the help of pool managers. Where every pool managers are powered to hold the routing details of the data from sources node 'S' to destination node 'D'. Every pool managers are having the resources of complete WLAN with all details; this eventually breaks the vast WLAN into numerous blocks as referred as pool in our scenario. So handoff will be taken place when data jumps from one pool to another pool that may belong to different node setup.

Step 3: To show the effective vertical handoff procedure our approach uses the pool tile method. As the data transfers from one node to another data is been carrying in between a given tile (That is time t).

The node which forwarded the data which carries the data referred as previous data and node which receives the data refer as current data labeled by 'p' and 'c' respectively.

And every time as the data transfers the trace of the previous and present data are been recorded by the pool manager in the form of an extensive hash key. As this hash key is on the prone to the change an avalanche effect is been recorded by the pool manager to sense a changing of the pool or network.

Then immediately it insists the instance source node which carries the current data which is been rerouted to the new set of path as directed by the pool manager to carry on effective vertical handoff. The complete process of the vertical handoff can be depicted in the below flowchart.

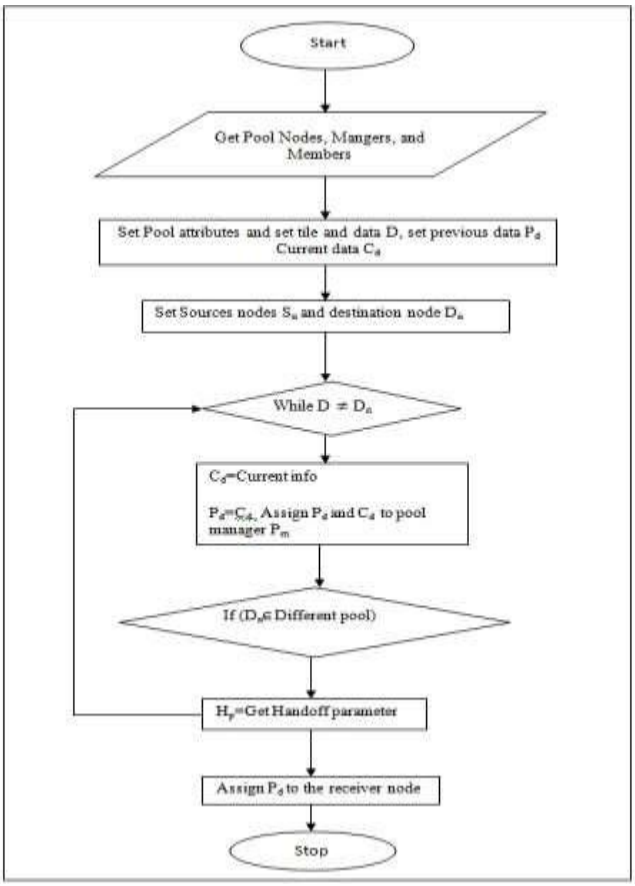

Fig.7: Flowchart for vertical Handoff

Blank call Identification process through Vertical handoff-

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As an extended arm of our approach, the proposed idea is capable of identification of blank calls whenever vertical handoff is happened from one pool of network to another pool; each time pool managers are record the data flow size and check for the threshold. That means if someone is talking then more data will be transferred over the network. On the other hand if someone is called to destination and only keep mum over the phone then amount of data that is been transferred is minimum over the network.

Pool managers will record this drop of data flow and keep a record of the source node.

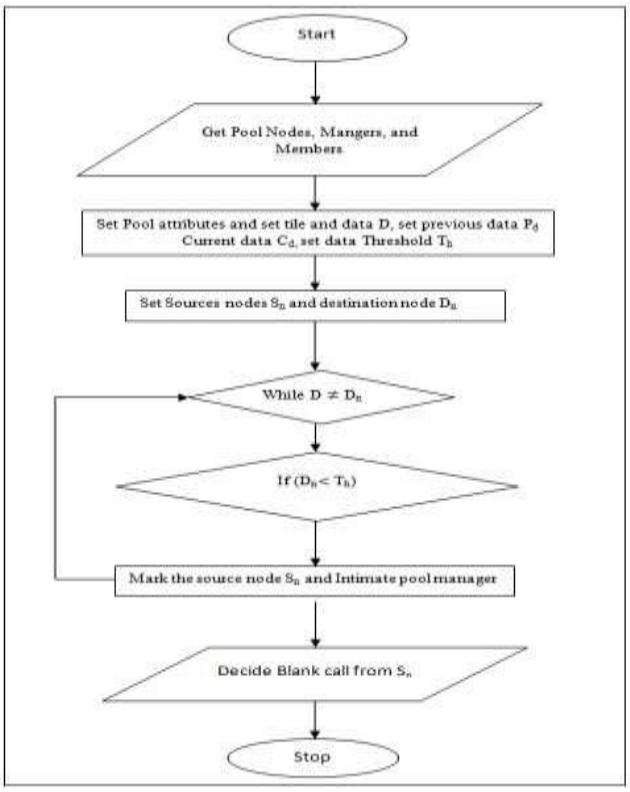

Fig.8: Flowchart for Black Call Identification

IV. RESULTS AND DISCUSSIONS

Unlike many systems that are developed vertical handoff mechanism of for a simulated environment our approach is complete opposite to this, as our system is developing in real WLAN which enables us to help reduce the complexities of the virtualization process when they have to deploy in real.

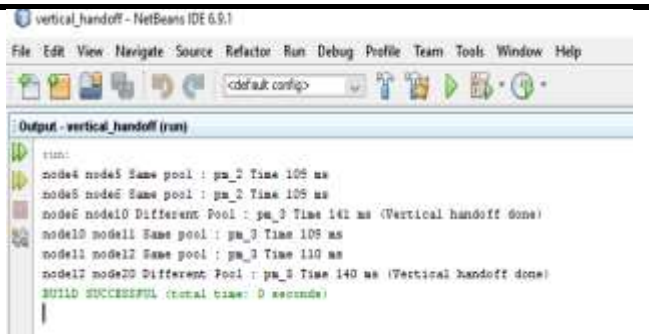

Fig.9: Simulated Output

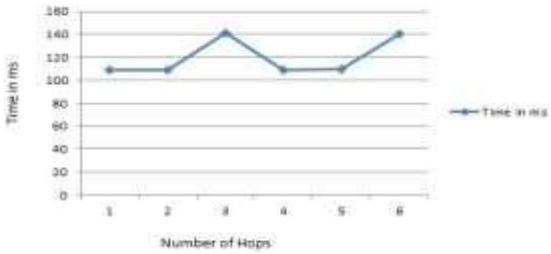

Fig.10: Performance Graph

The above plot indicates time taken by the pool managers to change the pools from one to another when the source node and the destination nodes belong to different pools. The recorded time can be shown in below table.

Time in ms	Pool status
109	same
109	same
141	Different
109	same
110	same
140	Different

The table and the plot together indicate when the node belongs to different pools then there will be a slight increase in the timing. This indicates a sign of good vertical handoff frame.

For experimental setup system is considering D-Link 300 mbps ADSL double antenna router with the standard computer configuration with minimum of core i3 processor with 4 GB of primary memory. Number of the computers are involved in the experiment is based on the number of WLAN pools that we are going to setup. System is developed on java based machines with Net beans as IDE.

We first verify that the proposed system of PTVHO can reduce the unnecessary burden on the mobile nodes for vertical handoff in WLAN effectively.

When our method of vertical handoff of pool tile method (PTVHO) is compared with that of vertical handoff based on the movement – aware of the nodes [100] in WLAN for

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the changing of the network along with the time constraint. We found a plot as shown in figure 7, which clearly depicts that vertical handoff of our approach PTVHO uses less number of handoff than of [100].

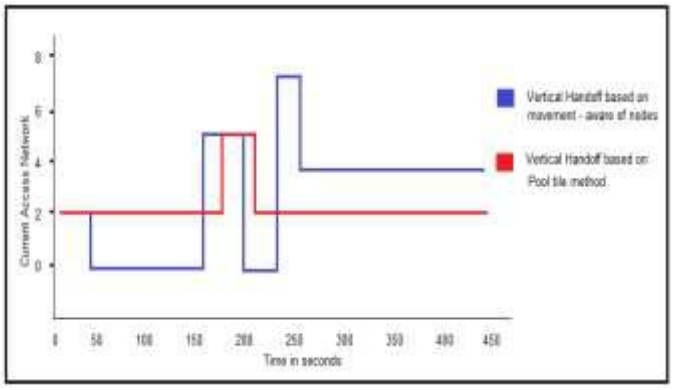

Fig.11: Comparison for number of Handoffs

This shows system will over performs in reducing the redundancy of the mobile nodes as they are less equipped with the desired resources and whereas the PTVHO system uses the pool managers which are rich in resources can take efficient decision of handoff by considering all possibilities.

V. CONCLUSION

The proposed method of PTVHO efficiently uses the pool managers for taking the decision of handoff effectively as most number of mobile nodes are not equipped with the high resources. Introduction of pool managers raises the efforts of handoff techniques in WLAN as there are many small and medium level devices are there which are insufficient of taking the decision due to lack of resources. So we can say that our idea of PTVHO will definitely put some contribution to improve handoff techniques in WLAN.

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E-waste Management-Suggested Solutions

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Abstract**—** *Electronic waste has been identified as discarded computers, old television sets, electronic equipment, entertainment devices, mobile phones, and refrigerators. This definition mostly include used electronics. Because loads of surplus electronics are frequently not eliminated including goods, recyclable, and non-recyclable so several people apply the term "e-waste" broadly to all surplus electronics. Rapid changes in technology, changes in media, falling prices, and planned obsolescence have resulted in a fast-growing surplus of electronic waste around the globe. This paper has an objective to present an overview of the problem and tries to advocate some concrete solutions to tackle the issue.*

Keywords**— e-waste, media, electronics, computer.**

I. INTRODUCTION

Electronic waste may be defined as discarded computers, office electronic equipment, entertainment device electronics, mobile phones, television sets and refrigerators.e-wastes are considered dangerous, as certain components of some electronic products contain materials that are hazardous, depending on their condition and density [3].E-waste is a popular, informal name for electronic products nearing the end of theiruseful life. Anything that runs on electricity/battery or has wire and completed its life is e-waste [1][2]. The hazardous content of these materials pose a threat to human health and environment. Discarded computers, televisions, VCRs, stereos, copiers, fax machines, electric lamps, cell phones, audio equipment and batteries if improperly disposed can leach lead and other substances into soil and groundwater. Electronic waste, e-waste, e-scrap, or Waste Electrical and Electronic Equipment (W.E.E.E) [7]describes discarded electrical or electronic devices. There is a lack of consensus as to whether the term should apply to resale, reuse, and refurbishing industries, or only to product that cannot be used for its intended purpose.

In most part of the world, underground water is not drinkable directly. Long ago, people simply used to draw up water from wells and drink it. But now, you have to use some sort of filter to purify the water and make it drinkable. It is just one of the many problems and hazards of **E-waste**. The electronic devices, dead cells and batteries you throw away with other garbage contain lead that easily mixes with underground water, making it unfit for direct consumption. That is just the tip of the iceberg – the problems of e-waste disposal. [13]

Informal processing of electronic waste causes serious health and pollution problems. Some of categories include: Mobile Phones, Computers, Servers, Telecom, TV, Calculators, Audio, Scanners, Printers, Air Conditioner, Microwave, Washing Machine, Cartridges, Military electronic, Mother board, Alarm, Sirens, Automobile Catalytic Converter, Sensor, CD, Security Device etc.

The technical prowess acquired during the last century has posed a new challenge in the management of wastes. For example, personal computers (PCs) contain certain components, which are highly toxic, such as chlorinated and brominated substances, toxic gases, toxic metals, biologically active materials, acids, plastics and plastic additives. The hazardous contents[6] of these materials pose an environmental and health threat. Thus proper management is necessary while disposing or recycling e--wastes. The paper highlights these issues.

II. RECENT STUDIES

our environment will be 3x more congested with e-waste by end of 2017. The reason why e-waste is increasing, is that technology is growing fast and in an attempt to get better devices, we casually get rid of old electronics – the best examples being that of smartphones.Debate continues over the distinction between "commodity" and "waste" electronics definitions [9]. Some major points worth mentioning are [3]:

- An estimated 50 million tons of E-waste are produced each year. [4]
- The United States is the world leader in producing electronic waste, tossing away about 3 million tons each year [8]
- China already produces about 2.3 million tons (2010 estimate) domestically, second only to the United States[10].
- USA discards 30 million computers each year and 100 million phones are disposed of in Europe each year [5]
- The Environmental Protection Agency estimates that only 15-20% of e-waste is recycled, the rest of these electronics go directly into landfills and incinerators [5]
- Legal framework, proper collection system missing.

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- Imports regularly coming to the recycling markets.

III. INDIAN SCENARIO

IT and telecom are two fastest growing industries in the country.India, by 2016 has achieved 246 per 1000 compared to 2011 PC penetration of **95 per 1000** from the 14 per 1000 in 2008. At present, India has 95 million One of the most threatening substances is lead, of which only 5 percent is recycled in India [12].Indians will not junk their mobiles, but pass them on to a new low-end user who will, in turn, junk them in the flea market from where the instruments make their way to the Kabadiwallas.Major issues related to Indian scenario are:

- India's hospitals to see patients with 10 times the expected level of lead in their blood
- In India, a water sample revealed levels of lead 190 times as high as the drinking water standard set by the World Health Organization.
- Thousands of children throughout the India are attending schools that were built on or near toxic waste sites, with increased risk of developing asthma, cancer, learning disorders and other diseases linked to environmental pollutants.
- 1-20 kg per person/p.a and growing at 3 times faster than the municipal waste
- Over 200 million current mobile users
- Preliminary estimates suggest that total WEEE generation in India is approximately 1,46,000tonnes per year.
- 20 million electronic household appliances including TV, washing machines, PCs etc) and 70 million cell phones reach end-of-life every year .Memory devices, MP3 players, iPods, ipads etc. are the newer additions.
- About 70% of the heavy metals (mercury and cadmium) and 40% lead, in landfills in India come from e-waste
- 22% of the yearly world consumption of mercury is used in electronics manufacture
- More of acid content flow into the land contaminating the soil and land value.
- About 70 percent, of heavy metals in India landfills comes from E-Waste.
- World's 80% population live in areas of cell phone reception
- Indians upgrade or exchange their cell phones every 18 months, meaning there are approximately 16 million unused mobile phones stashed away at home or in the office
- Average working life of a mobile phone is 7 years but worldwide the average consumer changes their mobile every 11 months

e-waste is exported to India because of major reasons as:

1. Cheap labour : rates are approximately
   US - $ 30/ computer
   India - $ 2/ computer
   Saving - $ 28/ computer
2. Weak environmental laws
3. Excess dumping of CRT tubes due to the ramp walk of flat screen monitors
4. Driven by the potential for corporate profits

IV. E-WASTE HEALTH PROBLEMS AND MANAGEMENT

E-waste is very valuable as it (a) recover precious metals (b) recover plastic etc. Three categories of WEEE account for almost 90% of the generation:

Large Household appliances:	42.1%
Information and communications: technology equipment	33.9%
Consumer Electronics:	13.7%

Inhalation of open fire emissions can trigger asthma attacks, respiratory infections, and cause other problems such as coughing, wheezing, chest pain, and eye irritation [11]. example : burning PVC releases hydrogen chloride, which on inhalation mixes with water in the lungs to form hydrochloric acid. This can lead to corrosion of the lung tissues, and several respiratory complications. Table 1 gives a view of e-waste health hazardous.

Table I: Effects of E-Waste constituent on health

Source of e-wastes	**Constituent**	**Health effects**
Solder in printed circuit boards, glass panels and gaskets in computer monitors	Lead (PB)	• Damage to central and peripheral nervous systems, blood systems and kidney damage. • Affects brain development of children.
Chip resistors and semiconductors	Cadmium (CD)	• Toxic irreversible effects on human health. • Accumulates in kidney and liver. • Causes neural damage. • Teratogenic.
Relays and switches, printed circuit boards	Mercury (Hg)	• Chronic damage to the brain. • Respiratory and skin disorders due to bioaccumulation in fishes.

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Corrosion protection of untreated and galvanized steel plates, decorator or hardner for steel housings	Hexavalent chromium (Cr) VI	• Asthmatic bronchitis. • DNA damage.
Cabling and computer housing	Plastics including PVC	Burning produces dioxin. It causes • Reproductive and developmental problems; • Immune system damage; • Interfere with regulatory hormones
Plastic housing of electronic equipments and circuit boards.	Brominated flame retardants (BFR)	• Disrupts endocrine system functions
Front panel of CRTs	Barium (Ba)	Short term exposure causes: • Muscle weakness; • Damage to heart, liver and spleen.
Motherboard	Beryllium (Be)	• Carcinogenic (lung cancer) • Inhalation of fumes and dust. Causes chronic beryllium disease or beryllicosis. • Skin diseases such as warts.

Av PC of Appx 31 kg wt contains		Two million obsolete Pcs would mean
7.24 kg	Plastics	14,427,000 kg
1.98 Kg	Lead	3.962,700 kg
0.693 g	Mercury	1,386 kg
0.4095 g	Arsenic	819 kg
2.961 g	Cadmium	5,922 kg
1.98 g	Chromium	3,969 kg
9.92 g	Barium	19,845 kg
4.94 g	Beryllium	9, 891 kg

V. PROPOSED SOLUTIONS

As of now, there are no proper methods being implemented even in the first world to eliminate the problem of e-waste. The general methods for proper treatment of e-waste are **recycling** and **refurbishing**.

For recycling, there may be products that cannot be recycled completely. PVC layers, for example, stay as such for ages and cannot be recycled. It would be better if the manufacturers use recyclable material so that the e-waste is converted into something that can be used again without harming the planet and its inhabitants. Thus, one of the major factors in treating e-waste is to compel manufacturers to use green elements.

A number of websites offers links to recycling centers:

• International Association of Electronics Recyclers
• Electronic Industries Alliance
• Electronics Recycling Initiative

If electronics are refurbished, they can be sold again at a lower price. Thus, both the society and environment will benefit. Instead of simply dumping your old TV into the garbage bin, you might want to think about calling the vendor and ask him where to present the item for refurbishing. Other solutions can be

1. Donate : Give an operable computer to a local family, friend, school, or nonprofit such as Goodwill or Technology Training Foundation.[14]

2. Involve businesses : The IBM PC Recycling Service allows consumers and businesses to recycle any computer for a small fee, including shipping. Hewlett Packard offers a similar service. Or businesses can consult with a company such as Newtech Recycling, which provides equipment resale, donations, or recycling.

• www.ibm.com/ibm/environment/products
• www.hp.com/hpinfo/globalcitizenship/environment
• www.newtechrecycling.com

- Ban on total imports of e- waste.
- Domestic legal framework to address these gaps in import of E Waste
- Need to address safe disposal of domestic waste.
- Tie recycling in with take-back product
- The Framework should address the issue of E waste imports for reuse and recycling.
- Attract investment in this sector
- Link up activities of informal sector with formal sector
- Provide for appropriate framework for processes
- Promote adequate ESM technologies for recycling
- Incorporate precautionary principles and polluter pays
- Adopt Consultative process
- Picked over Junk, Obsolete and burnt
- Insist on domestic processing
- Then make sure the company you select has capacity to handle either type of E-Scrap.
- Promote recycling units to ease process and to encourage generators to have proper e-waste disposal

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- Impart training to generators on e-waste handling
- Awareness program on recycling
- Fix duties and responsibilities to recyclers
- Tax incentives for scrap dealers
- Reward and reprimand schemes for performance and non-compliance of e-waste management
- To make recycling business viable one
- Government should encroach legal import of e-waste
- Should subsidize recycling and disposal industry
- Incentive schemes for garbage collectors, general public
- Disposal fee from manufacturers and consumers

Some organizations already helping the cause are:

- mineralpolicy.org, mpi.org.au, USGS.gov, moles.org, ban.org, copper.org
- www.antigraymarket.org, other links www.retroworks.com
- Over 1,000 parts requests per day via internet parts exchangewww10.tradeloop.com
- Contact with over 200 international repair shops via exporters.com.sg, alibaba.com, globalrecycle.net, recycle.net, etc. www.exporters.com/sg
- Sales of parts and refurbishment on ebay.com ,www.ebay.com
- Scrap copper, alum, plastic sold directly to end users www.globalrecycle.net

Also some more points that can be consideredwhile buying electronic products are:

- are made with fewer toxic constituents
- use recycled content
- are energy efficient
- are designed for easy upgrading or disassembly
- utilize minimal packaging
- offer leasing or take back options
- have been certified by regulatory authorities. Customers should opt for upgrading their computers or other electronic items to the latest versions rather than buying new equipments.

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Studies on Friction Stir Welding of Dissimilar Materials

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Abstract— *Recently many reports on Friction Stir Welding (FSW) of various dissimilar systems such as Aluminium to Copper, Aluminium to Brass and Aluminium to Aluminium been reported.FSW of Aluminium, Copper and Brass has captured important attention from manufacturing industries, such as Shipbuilding, Automotive, Railway and Aircraft production. In FSW process, a so-called welding-head pin rotating at speeds usually in excess of a few hundred rpm, travels down the length of contacting metal plates, creating a highly plastically deformed zone through the associated force and frictional heating. Brass materials are widely used as engineering materials in industry because of their high electrical and thermal conductivity, high strength, and high corrosion resistance. Copper and its alloys are widely used in industrial applications due to their excellent electrical & thermal conductivities, good strength, corrosion & fatigue resistance. The aim of present study was analogy of the microstructures and mechanical properties of friction stir welded joint of Aluminium to Copper, Aluminium to Brass and Aluminium to Aluminium platesin 4mm thickness.*

Keywords— Aluminium 6061, Pure Copper, Brass(CuZn30), Materials, Microstructure, Micro hardness and Mechanical Properties, FSW.

I. INTRODUCTION

Friction Stir Welding (FSW) is a unique welding method and new invention for the welding technology world. FSW will not change the microstructure of the metal diverse unlike the conventional welding. It also can reduce the cost if compared to the conventional welding cost. It involves the joining of metals without fusion or filler materials. It is used already in routine, as well as critical applications, for the joining of structural components made of Aluminium, Copper and Brass. Since FSW is essentially solid-state, i.e. without melting high quality weld can generally be fabricated with absence of solidification cracking, porosity, oxidation and other defects typical to traditional fusion welding. Friction stir welding was used to control properties in structural metals including aluminium and the other nonferrous alloys. The pin may have a diameter one-third of the tapered tool shoulder.

In friction stir welding process a non consumable rotating tool with tapered pin and shoulder is inserted into abutting edges of plates.A non-consumable spinning tool bit is inserted into a work piece. The rotation of the tool creates friction that heats the material to a plastic state. As the tool traverses the weld joint, it extrudes material in a distinctive flow pattern and forges the material in its wake. The resulting solid phase bond joins the two pieces into one.

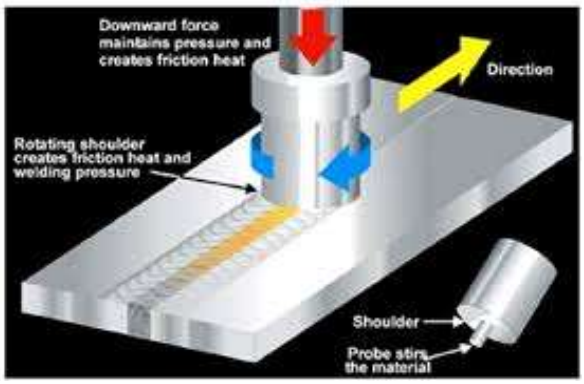

Fig.1: A Schematic Friction Stir Welding

II. EXPERIMENTAL PROCEDURE

Vertical milling machine of 7Kw is used to join the dissimilar plates .The plate size of Al and pure copper are having 100mm length, 70mm width and 4mm thickness. Aluminium to Brass with dimensions (100mm x 70mm x 4mm) and Aluminium to Aluminium(100mmx 70mm x 4mm).In the present work H13 tool is used. The tool is having tapered shoulder and pin. For micro structural evaluation samples prepared by RAGHAVENDRA SPECTRO METALLRGICAL LABORATORY, Hyd and microstructure were measured on Optical Metallurgical Microscope (MET SCOPE-1).The micrographs were taken at 100x magnification. The Vickers micro hardness was measured by using HARDWOOD HWMMT-X7 micro hardness tester.

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Table.1: H13 tool dimensions

Shoulder diameter(SD)	Pin diameter(PD)	Pin length (PL)
25mm	6mm	3.6mm

Table: 2 Chemical composition of 6061 Aluminium, Pure Copperand Brass (ZnCu30)

6061 Al	Si 0.80 Fe 0.70 Cu 0.40 Mn 0.15 Mg1.2 Cr 0.35 Zn 0.25 Ti 0.15 Al balance
Brass Zn 30	Cu rest
Copper	Bi 0.001 O 0.04 Pb0.0005 Cu rest

Table.3: Process parameters

	Unit	Experiment 1	Experiment 2
Rotation Speed	Rpm	710 ,1120	710,1120
Transverse speed	mm/min	10-60	10-60
Offset	mm	1	1
Plunge depth	mm	3	3

After welding the specimens were prepared by using Wire EDM to test the mechanical properties such as ultimate tensile strength, yield strength, % elongation and Hardness.Tilt angle as 1 degree, offset were kept constant.

Input Data

Material	Dissimilar and Similar
Thickness	4mm
Length	100mm
Width	70mm
Rotational Speed	710, and 1120 rpm
Feed	15-30 mm/min

Experiment 1	Aluminium to Copper
Experiment 2	Aluminium to Brass
Experiment 3	Aluminium to Aluminium

III. RESULTS AND DISCUSSIONS

The following results were obtained after conducting the mechanical tests on FSW of Aluminium – Copper, Aluminium – Brass and Aluminium – Aluminium metals

3.1 Output Data for Experiment 1 (710, & 1120 rpm)

For 710 rpm	Ultimate Tensile strength	37.69 N/mm²
	Yield Strength	29.808 N/mm²
	% Elongation	0.42%
For 1120 rpm	Ultimate Tensile strength	76.80 N/mm²
	Yield Strength	60.6 N/mm²
	% Elongation	0.81%

Output Data for Experiment 2 (710, & 1120 rpm)

For 710 rpm	Ultimate Tensile strength	73.15 N/mm²
	Yield Strength	55.118 N/mm²
	% Elongation	0.64%
For 1120 rpm	Ultimate Tensile strength	108.56 N/mm²
	Yield Strength	89.9 N/mm²
	% Elongation	0.98%

Output Data for Experiment 3 (710, & 1120 rpm)

For 710 rpm	ltimate Tensile strength	140.46N/mm²
	Yield Strength	115.32N/mm²
	% Elongation	1.04 %
For 1120 rpm	Ultimate Tensile strength	240. 78 N/mm²
	Yield Strength	215.54 N/mm²
	% Elongation	1.80 %

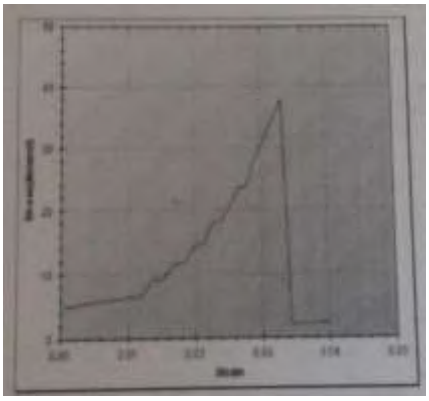

Fig.2: Graph for Al-Cu at 710rpm

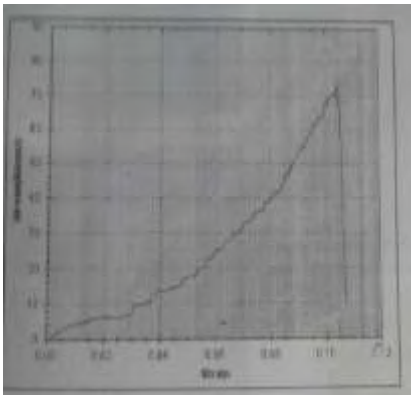

Fig.3: Graph for Al-Brass at 710 rpm

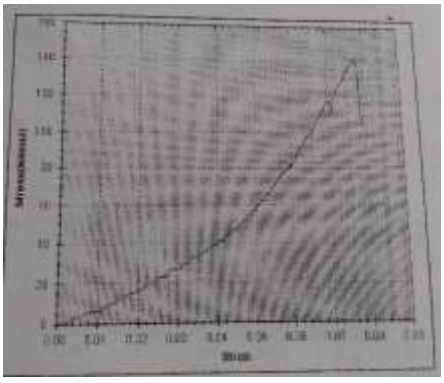

Fig.4: Graph for Al- Al at 710 rpm

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3.2 Microstructure Analysis:

For Experiment 1: Microstructure of weld taken at centre of weld with or without filler materials. At the centre of weld a line mix region of aluminium and copper were found. Microstructure consists of uniformly distributed fine intermetallic particles in a matrix of aluminium solid solution. Cracks and porosity are seen. Lack of fusion more a length of the root.

Fig:4: Microstructure Distribution at centre of Weld at 100x for 710rpm

For Experiment 2: The 100x magnification has been carried out at Centre of weld dendrites of brass solid solutions with fine particles of grains are seen. Blow holes and cracks are observed.

Fig.5: Microstructure Distribution at Center of Weld at 100x for 710 rpm

For Experiment 3:

Dendrites of Aluminium solid solution with fine intermetallic particles and grains are seen. No blow holes and cracks observed at weld.

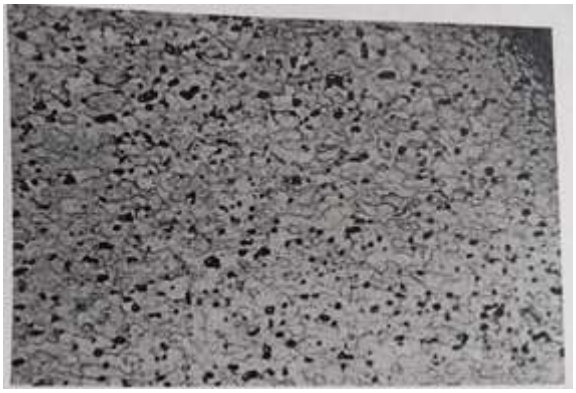

Fig.6: Microstructure Distribution Weld at 100x for 710 rpm

3.3 Microhardness:

The samples were polished using different size of emery paper and cloth polished also the Vicker's hardness of the final polished samples were measured by indentation test, with square base diamond base indenter which under the application of 5kg load with a dwell time of 10 sec. Then the diagonals of the indent formed on the material surface (Similar and Dissimilar) were measured.

For Experiment 1:

For 710 rpm 370HV
For 1120 rpm 440HV

For Experiment 2:

For 710 rpm 400HV
For 1120 rpm 510HV

For Experiment 3:

For 710 rpm 380HV
For 1120 rpm 490HV

IV. CONCLUSION

Friction Stir Welding is performed to join 4mm thick plates of 6061 Aluminium to Pure Copper , Aluminium to brass (CuZn30) and Aluminium to Aluminium with varied parameters (like, tool rotation speed (rpm), welding speed (mm/min) and the joining conditions are characterized. All welds were defect free. Microstructure of weld and Microhardness were shown at centre of weld. Tensile strength was good. Aluminium - Aluminium has more strength comparative to Aluminium - Brass has high strength rather than Aluminium – copper.

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Development of Fish Hydrolysate (Bind-Add$^+$) incorporated extruded pellets and its performance in Tilapia (*Oreochromis niloticus*) feeding trial

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Abstract*—Fish hydrolysate (FH) based Bind-Add$^+$ is a emulsion type feed binder cum additive which contains un-denatured proteins and calcium is capable of reasonable level of gelatinization and contribute to the binding properties which is seen from water absorptive capacity, buoyancy, bulk density and water stability characteristics during extrusion pellet production..*

Bind-Add$^+$ has good amount of bio-available primary nutrients, secondary nutrients, micro nutrients, anti-oxidants and pro-biotic in a soluble liquid form and most suitable as additive or feed supplement.

Tilapia (Oreochromis niloticus) feeding trial indicate that growth rate and feed utilization efficiency in Bind-Add$^+$ incorporated diets increases significantly in comparison to controlled diet.

Keywords—Fish hydrolysate, Binder, Additive, Oreochromis niloticus, Extrusion Engineering and mechanical properties of pellet, Floating extruded pellet.

I. INTRODUCTION

The extrusion technology is gaining popularity day by day for production of floating feed for fish. It improves nutrient digestibility, palatability, pellet durability, water stability and pellet storage life (Barrows and Hardy, 2001). It also increases the digestibility of dry matter and digestibility of energy as measured in vivo using rainbow trout (Cheng and Hardy, 2003) and high physical and nutritional quality of the fish feed is maintained by this technique (Hilton et al. 1981). Extrusion technology provides a number of major benefits over the traditional pellet milling. It provides a control over "cooking" and product density; which finally results in floating or sinking characteristics ([1]Autin, 1997, [2]Ammar et Al., 2008 and [3]Paoluci et al., 2008).Since the material through the extruder is subjected to high temperature and pressure for a very limited period of time, it is argued that extrusion causes less damage to nutrients like amino acids resulting in a finished product of higher biological valve (Sorensen et al., 2016). Cost effective floating feed could be produced by inclusion of locally available ingredients (Das, 2016).

Binders are used in aquaculture feeds to improve the quality and to reduce wastage by producing water stable diet. Binders reduce void spaces resulting in a more compact and desirable pellet. It also acts as adhesive by sticking particles together. Binders stabilize feed pellets and ensure minimum nutrient leaching and disintegration (Sinha et al., 2011).Fish protein hydrolysates (FPH) are products of hydrolysis reaction on peptide bonds in proteins and result in shorter peptides or amino acids which are easy for animal to absorb. Fish hydrolysate belongs to binders of protein origin and have carbohydrate source. Fish processing wastes are grounded into liquid phase where cleavage of natural bonds may be enacted through various biological processes like natural fermentation, enzyme action and bacterial inoculation. Cold and natural fermentation or fish water slurries with molasses and starter culture produce acids and alcohol which lower the pH of product up to 4.5. Molasses based fish hydrolysate have good binding properties in formulated feed and contribute in obtaining feed pellets with desired strengths (Kristinsson and Rasco, 2008 and Sahu, et al., 2014). The fish hydrolysate fed fish showed increased leucocrit and lower haematocrit level. Innate cellular responses were increased after feeding fish by-product and fish hydrolysate (Murray et. al., 2003, Refstie et al., 2004 and Dauksas et al., 2004) reported partial dietary replacement of fish meal by a novel feeding stimulant in Atlantic salmon was highly digestible and well utilized for growth. Dauksas et al. (2004) reported that enzymatic hydrolysis process for recovery of protein from underutilized fish biomass often creates bitter taste or the product. The bitterness restricts the practical use of the hydrolysate. Fish processing wastes are potentially

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valuable sources of nutrients (Swanson, 2004). The disposals of fish processing wastes have become restrictive. This is adding to the problem and costs associated with discarding these materials and consequently recycling techniques are becoming more and more viable.

Fish hydrolysate from its low end used as animal, fish feed or as a fish based organic fertilizer for agriculture, horticulture and aquaculture (Sahu et. al., 2014, Sahu et. al., 2016, Stone and Hardy, 1986).

The rest of the paper is organized as follows. Materials and Methods are explained in section II. Results and Discussion are presented in section III followed by conclusion in section IV.

II. MATERIALS AND METHODS

Fish feed was formulated using fish feed ingredients i.e. maize, soya bean meal, groundnut oil cake (GOC) and de-oiled rice bran(DORB) with minerals and vitamin mixture. Tilapia grow out feeds were produced in the Feed Mill of ICAR-CIFA, Bhubaneswar, India by using fish hydrolysate at a level of 2% with extrusion temperatures of 130^0c and moisture of 20 percentage maintaining constant pressure (10 kg/cm2). Few other processing parameters as maintained during production of the experimental feed were screw speed 90 rpm, barrel screw speed 430 rmp, culter speed 1100 rpm and die hole diameter 2 mm. The feed ingredients were grinded, mixed and fed to the pilot twin screw extruders for production of floating pellets replacing 2% water with FH (CIFA-BIND ADD$^+$) (Fig. 1.). Similar extruded floating feed was also produced in the feed mill without inclusion of fish hydrolysate. The feed so produced with and without fish hydrolysate (FH) (Sahu et al., 2014; Sahu et al., 2015) were then analyzed for physical and chemical characteristics to ascertain the quality (Fig. 2.). A feeding experiment of three months duration was also conducted in Nile Tilapia to know the overall performance of the feed. Fish Hydrolysate (Sahu et al., 2015; Salu et al., 2016) was conducted in the laboratory of ICAR-CIFA, Kausalyaganga, Bhubaneswar. Floating extruded pellets (Ciflysate forte) were prepared in the feed mill of ICAR-CIFA. (Fig. 3.)

2.1 Physical Evaluation of Fish Feed –

Physical, mechanical and engineering properties of the extruded feed pellets were conducted as follows (Fig 5. and Fig 6.)

2.1.1 Water stability:

Feed samples of 5g each in duplicate were placed in wire net container immersed the 2L beaker containing water. The beaker was kept in a magnetic stirrer to simulate mild water flowing condition for period or 0.5, 1,2,4,6,8,10 and 12. Aftereach time interval, the feed samples from containers were collected by draining water and dried at 600C till complete drying.

Water Stability was calculated from the following formula.

$$\text{Water Stability \%} = \frac{\text{Dry weight of pellet after immersion}}{\text{Dry weight of pellets before immersion}} \times 100 \ldots\ldots.(1)$$

2.1.2 Water absorption rate:

Feed samples of 5g each in duplicates were placed in wire net container and immersed in 2L beaker. Containing water at room temperature for period of 1, 3, 5 and 10 minutes. After each specified time period the feed samples were removed and allowed to drain for one minute followed by weighing. The water absorption rate was calculated by water absorption.

$$\text{Water absorption (\%)} = \frac{Dry\ weight\ of\ pellet\ after\ immersion}{Dry\ weight\ of\ pellets\ before\ immersion} \times 100 \ldots\ldots.. (2)$$

2.1.3. Expansion ratio:

Expansion ratio (%) was calculated as described by Oliveria et al., 1992. The average pellet a diameter was determined by Vernier Caliper. The expansion ratio was calculated as increase in the pellet cross sectional area compared to the die cross sectional area as follows.

Expansion ratio (%) = $\{(^D\text{Pellet})^2/(^D\text{die})^2 - 1\} \times 100$

Where

^{D}Pellet = Pellet diameter

^{D}die = diameter of die

2.1.4 Bulk density:

The cylinder has inner diameter of 7 cm and was made or plastic. Three replication or each feed were prepared by pouring the material through a funnel. The excess feed was gently trimmed by passing a serape, one time on the edge of the cylinder. The pellets in cylinder were weighed. Bulk density of pellet were calculated as follows

$$\text{Bulk Density (g/cm3)} = \frac{M}{A \times L} \ldots\ldots\ldots\ldots (3)$$

Where

M = Mass (g) of pellet

L = Length (cm) or the pellet

A = Cross sectional area (cm)2 of the pellet.

2.2 Chemical Evaluation of Fish Feed and Fish

2.2.1 Hydrolysate:

The chemical evaluation of fish feed and Fish Hydrolysate i.e. Dry Matter (DM), Crude Protein (CP), Ether Extract (EE), Crude Fibre (CF), Nitrogen Free extract (NFE) and Total ash (TA) were done as per AOAC (1990). Crude Protein(CP)of the feed was determined using micro-kjeldhalapparatus where as crude fiber(CF)and Ether Extract(EE) in fish feed were

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determined by using Fiber tech (Model: M- 1017, Tecator) and Soxtec system (Model: ST2, 1045, Tecator) respectively (AOAC, 1980; APHA, 1992).

2.2.2 Feeding Experiment

A feeding experiment of three months duration was carried out in 20 liter glass pool (30cm × 45cm) at Central Institute of Freshwater Aquaculture, Kausalyaganga, Bhubaneswar. The water from pond was filled in eight nos of tanks to maintain the water column. Five number of fingerlings of tilapia (*Oeochromis niloticus*) were stocked in each tank and one dietary treatment (with and without FH incorporated floating feed) was allocated randomly to four jars. Aerators were used in each tank to provide sufficient oxygen and half of water was changed daily. Water quality parameters were also checked and found to be optimum. The bio-mass in each tank was recorded weekly interval and feed intake was recorded daily. Finally the FCR and cost of three floating feeds was calculated based on the ingredients cost purchased from the local market. (Fig. 4)

III. RESULTS AND DISCUSSION

3.1 Physico-Chemical and nutrition properties of FH:

Fish Hydrolysate was analyzed for chemical composition and is presented in Table 1. The bio available protein was found to be 9.2 % and it is a good source of many trace minerals like Iron, Manganese, Copper and Zinc. Fish hydrolysate contains the full spectrum of nutrients. Liquid fish contain significant quality or protein nitrogen, as well as a healthy balance of all 18 nutrients known to be significant for plant, animal and fish growth.

Table.1: Chemical composition of Fish Hydrolysate (FH, on DM basis)

Sl. No.	Parameters	Composition
1	Bioavailable Protein (%)	9.47 ± 0.23
2	Bioavailable Phosphrus (%)	0.52 ± 0.11
3	Bioavailable Potassium (%)	0.40 ± 0.15
4	Iron (ppm)	240.5 ± 32.2
5	Manganese (ppm)	6.2 ± 0.3
6	Copper (ppm)	3.5 ± 0.5
7	Zinc (ppm)	1.8 ± 0.3
8	Organic Carbon (%)	2.2 ± 0.2
9	Available nitrogen (mg/100ml)	392 ± 0.21
10	C/N ratio	1.5
11	Carbohydrate (molases)	45 brix

Table.2: Elements of bio-available nutrients of Bind-Add$^+$ in water soluble liquid form

1.	Amino acids	9.	Beta Carotene
2.	Fatty acids	10.	Vitamin A
3.	Peptides	11.	Chitosan
4.	Hormones	12.	Chito lipo ligo saccharides
5.	Taurine	13.	Chitin deacetylases
6.	Antioxidant	14.	Lactic acid bacteria
7.	Trace minerals	15.	Photo synthetic bacteria
8.	Astaxanthine	16.	Yeast

Extruded floating feed prepared with Maize, Soyabean meal, Ground nut oil cake (GOC), de-oiled rice bran (DORB), minerals and vitamin mixture with incorporation of liquid fish Hydrolysate (FH). The formulation of the fish feed is given in Table 3.

3.2 Feed Formulation:

Table.3: The Formulation of Fish feed during the experiment.

Ingredients	**Extruded Pellets**
Maize	23.0%
Soya bean meal	40.0%
Groundnut oil cake (GOC)	25.0%
De-oiled rice bran (DORB)	10.0%
Liquid fish Hydrolysate	2.0%
Minerals and vitamin	2.0%

Control: - without fish hydrolysate
Treatment: with 2% liquid fish hydrolysate (Bind-Add$^+$)

Extruded pellets produced after incorporation of liquid fish Hydrolysate (FH) by replacing from the total amount of water required during extrusion cooking and were analyzed for chemical composition (Table 4.) (AOAC, 1980; APHA, 1992)

Table.4: Chemical composition of experimental feed (% on DM basis)

Sl. No.	Parameters	Extruded Pellets
1	Crude proteins	35.0
2	Ether Extract	8.0
3	Crude fiber	7.0

3.3 Physical and mechanical evaluation of fish feed

3.3.1 Water Stability:

The water stability of the feed pellets after incorporation of fish hydrolysate is presented in Table 5. The water stability of experimental feed was higher than the control feed. Water stability in FH incorporated feed was highest within half an hour of water contact and stability was not reduced significantly within 2 hours of water contact. This indicated that, there was fairly good water stability of the FH 2% incorporated pellets with normal processing conditions.

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Table.5: Water Stability (%) of control and fish hydrolysate incorporated extruded pellet.

Sl. No.	Time Interval (h)	Water Stability (%)	
		Control	5% FH
1	0.5	90.15	98.05
2	1.0	88.12	96.50
3	2.0	86.12	95.01
4	4.0	79.12	87.15
5	6.0	74.12	83.13
6	8.0	70.12	80.15
7	10.0	69.05	75.01
8	12.0	68.01	71.50

3.3.2 Water Absorption Capacity:

The water absorption capacity as measured after production of extruded pellets is given in Table 6. Water absorption was better in FH incorporated feed compared to control feed.

Table.6: Water Absorption (%) of control and fish hydrolysate incorporated extruded pellet.

Sl. No.	Time Interval (h)	Water absorption pellets (%)	
		Control	2% FH
1	1	30.83	32.15
2	3	42.18	44.12
3	5	53.15	55.12
4	10	64.87	66.18

3.3.3 Bulk Density:

The bulk density of control and experimental feed is presented in Table 6. The bulk density of 2%FH incorporates extruded pellets (3 mm size) was reported to be 550 gm/L and was having good buoyancy. There was expansion of the pellet as pellets leave the die from high pressure inside extruder to outside atmospheric pressure. The control samples produced partial floating pellets and bulk density above 650g/L produced sinking pellets (Sorensen et al., 2009). Addition of 2% FH has produced floating pellet of bulk density 500g/L.

Table.7: Bulk density (gm/L) of 55 FH incorporated and control pellets

Sl. No.	Trait	Control pellets	2% FH incorporated pellets
1	Bulk density (gm/L)	550.5	500.0

3.3.4 Growth performance of tilapia (*Oreochromis niloticus*) in the feeding trial

A 150 days (5 months) feeding trial was conducted in square glass jars of 20 liters capacity to evaluate the effect of fish hydrolysate incorporation on growth performance in tilapia (*Oreochromis niloticus*) fingerling. Five fingerlings in each jar were fed with iso-nitrogenous extruded pellets with or without 5% FH incorporation. Fingerlings of initial average weight of 23.2 gram were fed daily with fish hydrolysate incorporated diet at 3% of the fish biomass. Result indicated that growth rate and feed utilization efficiency of Nile tilapia increased significantly with administration of 2% FH incorporated extruded pelleted feed compared to non- incorporated feed. The average body weight of Tilapia (*Oreochromis niloticus*) during experimental period is given in Table 8.

Table.8: The average body weight of Tilapia (Oreochromis niloticus) during experimental period

Items	Expt. Period	Control	Treatment(FH incorporated)
0 day	Weeks	23.5 ± 1.24	23.2 ± 1.25
15d	2	37.9 ± 3.2	38.2 ± 2.1
30	4	55.0 ± 5.1	58.0 ± 3.5
45	6	69.2 ± 5.17	73.5 ± 5.1
60	8	85.0 ± 6.53	90.0 ± 5.3
75	10	100.5 ± 6.93	105.5 ± 7.5
90	12	117.8 ± 7.04	123.8 ± 6.9
105	14	135.0 ± 7.15	142.5 ± 8.2
120	16	150.5 ± 8.15	165.6 ± 7.7
135	18	185.0 ± 11.2	198.1 ± 8.4
150	20	215.0 ± 12.8	232.2 ± 11.4

Table.9: Performance of tilapia (Oreochromis niloticus) during feeding final with control extruded pellets and F H 2% in corporated pellets n = 5 in glass pool in triplicate.[*]

Parameter	Control	Treatment(FH incorporated)
Average initial body weight (g)	23.5	23.2
Average final body weight (g/ fish)	215.0^{a}	232.2^{b}
Weight gain (g/fish)	191.5^{a}	209.0^{b}
Total weight gain (kg)	2.873^{a}	3.135^{b}
Total production (kg)	3.225^{a}	3.483^{b}
Total feed consumed (kg)	4.735	4.791
Feed Conversion Ratio (FCR)	1.47^{a}	1.38^{b}

[*]Different superscript in a row differ significantly ($P<0.05$)

Improved growth performance in FH incorporated feed was because of high nutrition in treatment fish feed compared to control fish feed. Fish hydrolysate contains more than 60 trace minerals which have positive effects on animal cells, plant cell, chlorophyll and plankton health. Again, Fish hydrolysate can be rapidly assimilated when applied as feed supplement, fertilizer, animal fish and plant feeding as foliar spray. Water quality in the glass jar experiment revealed that water quality was

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maintained better in FH incorporated feed. It also produced good quality plankton. (Sahu et al., 2014; Sahu et al., 2016)

3.3.5 Bind-add+ role as binder, additive as feed supplement in feed technology

Fish is rich in taurine especially in fish processing byproducts. Taurine is a sulphoric acid found in high concentration in animal tissue. Taurine is involved in bile salt formation, membrane stability, immune modulation, anti-oxidation, mitochondrial function and calcium signaling. Dietary taurine supplementation increased buoyancy, fertilization and hatching rate in fish. The role of taurine in fish embryonic and larval development has been reported. Taurine deficiency in fish leads to green liver syndrome (Saize and Davis, 2015). In addition to that, nutrients in FH do not leach due to oils and collagen. All of these nutrients are in protein chelated form and emulsion resistant to leaching. FH feed containing trace minerals and taurine with higher binding capacity might be responsible for higher growth performance in Tilapia. (Rhodes and Davis, 2011)

Till now, fish meal has been a major ingredient and primary source of proteins in most fish diets. However, increase cost of fish meal in the market, are forcing the farmers and feed mill entrepreneurs to replace the fish meal with other sources. Commercial fish feed manufacturer are trying to substitute fish meal by alternate protein sources from plants and animals like soy bean, feather meal, blood meal, bone meal or sea products (Sorensen et al., 2009). However, such alternate ingredients are often devoid or contain very low concentration of taurine compared to fish meal (El-Sayad, 2013). It has been reported that taurine play an important role in production and reproduction behavior of the species (Gaylord et al., 2014).

3.3.6 FH (BIND-ADD$^+$) extruded pellet quality

Bind-Add$^+$ belongs to binder of protein origin and carbohydrate source. Fish hydrolysate contains well balanced protein, fatty acids, amino acids, macro and micro minerals. FH is a natural product, biodegradable and renewable and this may be advantageous from environmental and economic point of view. Fish hydrolysate has reduced void space in extrusion process resulting is compact and desirable pellet. It has worked as adhesive agent in sticking the particles together. They exert a chemical coating on the ingredients resulting in more durable and water resistant pellet and ease in feed manufacture. Molasses based fish hydrolysate have good binding properties and Bind-Add$^+$ extruded pellets nutritive quality makes it a good feed additive. It also helps in obtaining feed pellets with desired strengths (Sorensen et al., 2010). (Fig. 7 and Fig. 8)

Extrusion processed and fish hydrolysate incorporated fish feed has been shown to meet criterion like resistant to mechanical strength during transportation, texture and size that can facilitate high feed utilization (Hardy and Barows, 2000, Arvanitogannis et al., 2008), efficient digestion by fish (Sinha et al., 2011), water stability as well as bulk density in order to control sinking velocity and buoyancy. Tilapia feeding experiment has showed that extruded pellets are durable and remain in one piece until eaten by fish and small fractures of feed are not ingested and result in poor feed conversion efficiency. It has also been observed that fish does not physically disrupt the feed in the oral cavity but gulp the prey whole. Samuelsen and Oterhols (2015) used water soluble fish protein for fish feed processing industry. Serving multiple purposes as nutrient, plasticizer and binder, water soluble fish protein has a significant effect on the fish feed extrusion process. Extruded pellets with and without 2% FH were prepared and were evaluated for water stability and water absorption test. The extruded pellets were water stable up to 5 hrs. The diameter of the pellet is negatively co-related to bulk density. FH incorporated floating pellets expanded at least 50% more than the die opening which was only 40% in case of the control pellets. The degree of expansion has been positively affected by the level of fat and protein in FH in feed formulation. High temperature and short time extrusion cooking produced positive effect on feed durability. Water soluble fish protein, starch and fat has significant influence on fish feed extrusion process, gelatinization and physical pellet quality (Samuelsen and Oterhols, 2015).The length of the pellet is negativity allocated with the diameter of the pellet. They have a plasticizing effect and increased floatability and cooking efficiency.

IV. CONCLUSION

Fish meal is the major ingredient and primary source of protein in most fish and poultry diets. Fish meal can be replaced by *Bind-Add*$^+$, binder cum additive by commercial feed manufacturer. *Bind-Add*$^+$ contain well balanced protein, fatty acid, amino acids, macro, micro and trace minerals and is advantageous from environmental and economic point of view.

Bind-Add$^+$ incorporation at 2% level improves gelatinization and binding properties which is reflected in water absorption capacity, buoyancy, bulk density and water stability characteristics in extruded feed pellets.

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Fig.1: CIFA BIND-ADD+ Binder cum additive in feed extrusion

Fig.2: 2% replacement of water with CIFA BIND-ADD+ during extrusion cooking

Fig. 3: Floating extruded pellets with Bimd-Add+

Fig. 4: Oreochromis niloticus during the feeding trial in glass pool

Fig. 5: 6 mm extruded floating pellets

Fig. 6: 3 mm extruded floating pellets

Fig. 7: Fish hydrolysate emulsion incorporated feed (CIFLYSATE FORTE)

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Operations Research - Contemporary Role in Managerial Decision Making

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Abstract— *As the global environment turns out to be furiously focused, Operations Research has picked up criticalness in applications like world-class Manufacturing systems (WCM), Lean generation, and Six-sigma quality administration, Bench marking, Just-in-time (JIT) inventory techniques. The development of worldwide markets and the subsequent increment in rivalry have highlighted the requirement for Operation Research. To survive and lead the todays very focused and request driven market, weight is on administration to settle on conservative choices. One of the key administrative aptitudes is capacity to distribute and use assets fittingly in the endeavors of accomplishing the ideal execution productively. Now and again, for example, little scale low many-sided quality environment; choice in light of instinct with insignificant quantitative premise might be sensibly satisfactory and viable in accomplishing the objective of the association. Be that as it may, for a substantial scale framework, both quantitative and subjective (i.e. instinct, experience, sound judgment) investigations are required to settle on the most practical choices. Utilizing Operations Research techniques including Linear Programming, Discrete Event Simulation and Queuing Theory, association pioneers can settle on top notch choices. Present paper is an endeavor to study the importance of Operation research and different techniques used to improve the operational efficiency of the association.*

Keywords— Operations Research, Contemporary, Managerial, Decision Making, techniques, growth, increase, decision, performance, organization, Linear Programming, importance.

I. INTRODUCTION

Operations Research (OR) is one of the prevalent administrative decision science instruments utilized by benefit and nonprofit organizations. As the worldwide environment turns out to be furiously focused, Operations Research has picked up essentialness in applications like world-class Manufacturing systems (WCM), Lean generation, Six-sigma quality administration, Benchmarking, Just-in-time (JIT) inventory techniques. The growth of global markets and the subsequent increment in rivalry have highlighted the requirement for Operation Research [1-4]. Keeping in mind the end goal to be aggressive, organizations must meet the difficulties present in a global market by offering items and administrations that offer good value to their customers. Good value is a blend of ease, astounding, fast accessibility and constant data on these. Keeping in mind the end goal to upgrade the part of operational research and velocity up the process of different partners, they ought to work intently and supplement each other's exertion. In this process, the academicians ought to lead the pack in the outline, improvement and showing of supportable operational research models [5]. Industry ought to bolster this activity and quicken the transmission. This would guarantee riches creation in the short term, and practical improvement in the long haul. The administration ought to empower this activity by embracing improved reactions. Thusly, optimized policy responses and its usage would realize positive changes in the socio political and monetary environment. Accordingly, managed utilization of operational research would be a customary element in the decision making process of the administration, business and the general public [6]. Such a wide utilization of operational research models by the administration, business and academicians would add to the control as well as would add to the enhanced quality of life in India. The present paper is an attempt to highlight the significance of operation research, different techniques used and its application in business and industry.

II. EVOLUTION OF OPERATION RESEARCH AS AN ACADEMIC DISCIPLINE

Because of this historical legacy, operational research was acknowledged as a legitimate management tool in protection research establishments and accordingly for productive resource planning and allocation by Government departments. Business supported the accelerated growth of this order by subsidizing genuine and potential applications. Over timeframe, a harmonious relationship between government, business and the scholarly world guaranteed the development and extension of the control for their shared

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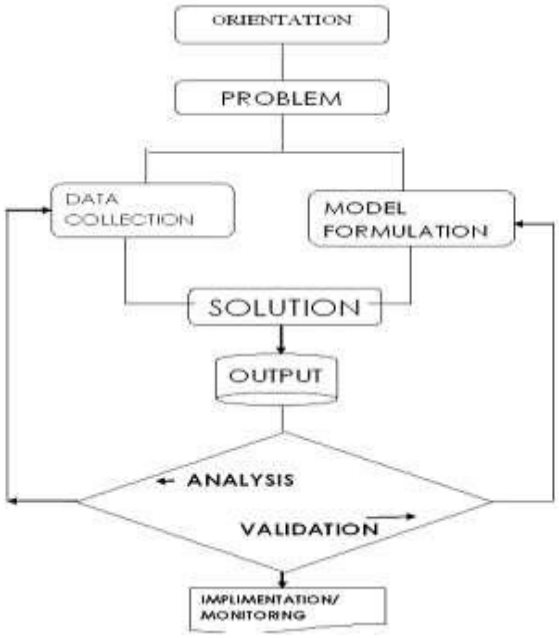
advantage. During the last 50years, operational research has developed as a multidisciplinary capacity including financial aspects, arithmetic, insights, mechanical designing and administration. Extensively, operational research as an order can be classified into three distinct set of categories [7]. Blending models, optimized distribution system, portfolio optimization of assets would extensively speak to case under the category of models. Operational research strategy would include project management systems, multi criteria optimization, game theory, reproduction approach, information envelopment examination, undertaking asset arranging frameworks and strife resolution methods [8]. The instruments, models and technique of operational research have found an assortment of utilizations in various connections. Likewise, a few remarkable academicians have contributed to the development of this discipline.

III. OPERATIONS RESEARCH APPROACH

Given that O.R. represents an integrated framework to help make decisions, it is important to have a clear understanding of this framework so that it can be applied to a generic problem. To achieve this, the so-called O.R. approach is now detailed. This approach comprises the following seven sequential steps: (1) Orientation, (2) Problem Definition, (3) Data Collection, (4) Model Formulation, (5) Solution, (6) Model Validation and Output Analysis, and (7) Implementation and Monitoring. This is illustrated in the Flow Diagram:



To illustrate how the means may be connected, consider a common situation where an assembling organization is arranging creation for the forthcoming month. The organization makes utilization of various assets, (for example, work, creation hardware, crude materials, capital, information preparing, storage room, and material taking care of gear) to make various distinctive items which go after these assets. The items have contrasting overall revenues and require diverse measures of every asset. A number of the assets are restricted in their accessibility. Moreover, there are other entangling elements, for example, instability in the interest for the items, irregular machine breakdowns, and union understandings that confine how the labor force can be utilized. As a representation of how one may direct an operations research study to address this circumstance, consider a profoundly streamlined case of a generation arranging issue where there are two fundamental product offerings. Every item requires shifting measures of each of the resources and the organization acquires different costs (labor, raw materials etc.) in making the items and acknowledges distinctive incomes when they are sold. The goal of the O.R. undertaking is to apportion there sources to the two products in an optimal fashion.

IV. TECHNIQUES USED IN OPERATION RESEARCH

Decision Analysis: Decision analysis refers to a set of quantitative methods for analyzing decisions that use expected utility as the criterion for identifying the preferred alternative. Decision analysis provides tools for quantitatively analyzing decisions with uncertainty and/or multiple conflicting objectives, and these tools can be especially useful when there is limited directly relevant data so that expert judgment plays a significant role in the decision making process. It provides a systematic quantitative approach to making better decisions, rather than a description of how unaided decisions are made. A general decision making process can be divided into the following steps: 1. Define the problem 2. Determine the requirements 3. Establish Goals 4. Identify alternatives 5. Define criteria 6. Select a decision making tool 7. Evaluate alternatives against criteria 8. Validate solutions against problem statement

The above steps are illustrated through a Flow Diagram as given below:

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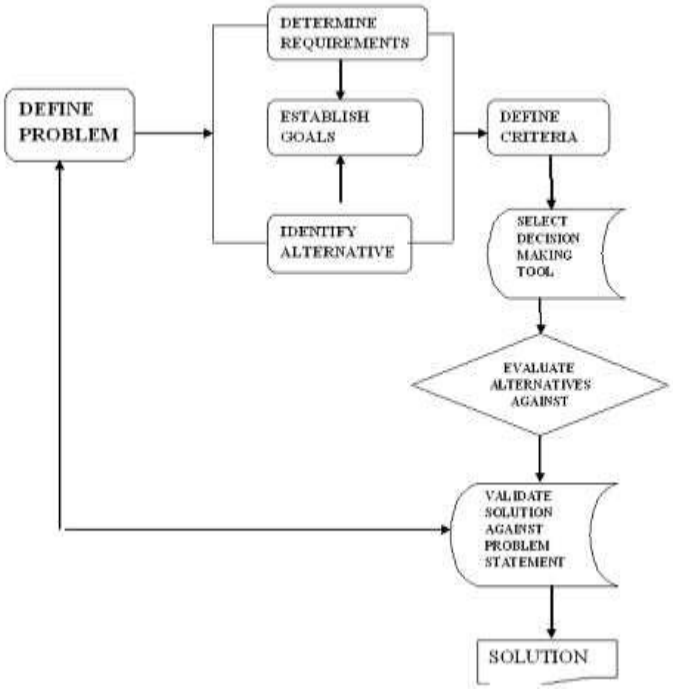


Linear programming: arose as a mathematical model developed during Second World War to plan expenditures and returns in order to reduce costs to the army and increase losses to the enemy. In Operation Research optimization means to find out the maximum profit and minimum loss[11] in any deal which we can done in Quantitative Techniques, in this we can narrowing our choices to the very best when there are virtually immeasurable feasible options. This is a constrained optimization technique, which optimize some criterion within some constraints. In Linear programming the objective function (profit, loss or return on investment) and constraints are linear.

Standard form of describing a linear programming problem consists of the following three parts:

- A linear function to be maximized

e.g. maximize $c_1x_1 + c_2x_2$

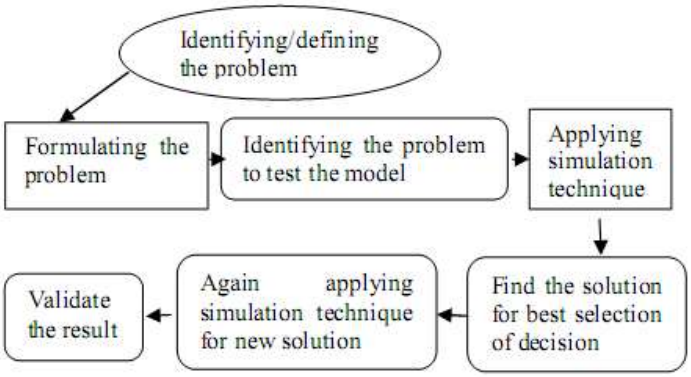
- Problem constraints of the following form

e.g. $a_{11}x_1 + a_{12}x_2 \leq b_1$
$a_{21}x_1 + a_{22}x_2 \leq b_2$
$a_{31}x_1 + a_{32}x_2 \leq b_3$

- Non-negative variables

e.g. $x_1 \geq 0$
$x_2 \geq 0$

Simulation Technique: Simulation provides the alternative solution of the problem and provides choices to the decision maker to select the best solution for the problem. Thus by applying this technique, one can study the effects of environmental changes on the operation of a system by making model of the system and finding the effect of these changes on the system's behavior. Simulation process for solving problem -



Simulation is a quantitative technique developed for studying alternative course of action by building a model of that system and then conducting a series of repeated trial and error experiments to predict the behavior of the system over a period of time [9].

Role of Computers in Solving Operation Research Problems: The Operation Research problems are time consuming and involve tedious computations. Indeed, even a simple problem with couple of variables take quite a while to solve manually and even by a hand calculator. The appearance of computers accelerated the wide utilization of Operation Research techniques for solving complex business problems confronted by supervisors and executives in business and government [10]. The automation of computational calculation permits leaders to focus on problem's formulation and the elucidation of the solutions. Significant computer manufacturers and merchant have created software packages for the different computer systems giving computational backing to problems to be solved by the use of Operation Research techniques [9]. Some scholastic offices in various colleges have likewise created software packages for solving different Operation Research problems. Computer manufacturers like IBM, CDC, Honeywell, UNIVAC, ICL, and so forth have put significant sum in developing software programs for solving the optimizing, scheduling, inventory, simulation and different Operation Research problems. Likewise huge scale simulations are conceivable just through computers by utilizing GPSS software packages.

Growth of Operation Research in Different Sectors: The type of industries in which these techniques were applied includes Steel, Heavy Engineering, Chemical and Fertilizers, Textiles, Transportation & Distribution, and Electronics. The terminology "Operations Research" is somewhat misleading, since it is not only concerned with operations, but has

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applications involving research in different areas and fields [11]. Operations Research is the discipline of applying advanced analytical methods to help make better decisions. By using techniques such as mathematical modeling to analyze complex situations, operations research gives executives the power to make more effective decisions and build more productive systems. The role of operational research in the Indian context is clear. It is not only important, it is even critical, given the size and magnitude of the tasks ahead to transform India as a developed nation. In order to achieve this goals, we need a responsive and accountable government to promote a positive environment of OR applications [12]. It is hoped that the Indian democracy would lead to this. It is believed that the globalization would further accelerate this transition.

Typical Applications of Operations: • Research Capital budgeting. • Asset allocation. • Portfolio selection. • Fraud prevention, Anti-Money Laundering. • Benchmarking. • Marketing channel optimization, Customer segmentation. • Direct marketing campaigns, Predicting customer response, and Campaign optimization. • Supply Chain Planning. • Distribution, Routing, Scheduling, Traffic flow optimization. • Resource allocation, Staff allocation. • Inventory planning. • Retail planning, Merchandize optimization. • Product mix and blending, Industrial waste reduction.

Challenges in Operations Research: Due to vast quantities of information and calculation, solving optimization problems is challenging and time-consuming. In this way, such approach towards performance improvement could possibly be financially practical for some organizations. Various studies are led on improvement of more powerful and productive heuristic and definite calculations that can illuminate extensive scale optimization problems [11]. On the other hand is quantitative problem solving technique; thus, information plays important, if not the most important, part in delivering high caliber and executable solutions. With an organization that has information promptly accessible utilizing information system, for example, MRP and ERP ought to have the capacity to utilize the required data with certain level of honesty. Nonetheless, for a framework that is exceedingly manual, information driven decision science techniques presented her could conceivably be the appropriate approach. With organizations moving towards overseeing business with some type of vast information system; Linear Programming, Discrete Event Simulation and Queuing Theory will be most reasonable and proper decision tools. Respectability of information relies on upon numerous elements. Information system that requires manual contribution of information, flimsy network systems, precarious projects and faulty equipment are a portion of the variables. The most important factor that decides high information respectability is human mistake while contributing information. Human mistakes can be minimized through instruction consolidated with hands-on preparing, for example, at work preparing. Tragically, numerous associations tend to concentrate vigorously on physical system implementation and give practically no consideration on instruction and preparing. In any case, workers are regularly denounced for not entering the information accurately and the nature of hardware and/or software is addressed for poor information respectability. Sustainment is as critical usage. An association can execute the world's most prominent database; however in the event that the staff in charge of operating and sustaining the system lacks knowledge of achieving and actualizing the world's greatest system is meaningless.

V. CONCLUSION

Operations Research is fundamentally a science of decision-making. Decision-making turns into a problem when the availability of alternatives is numerous. Operations Research techniques are of incredible backing to improve and suitable decisions since all the methods are logical and precise. To survive and lead the today's very aggressive and interest driven business sector, weight is on administration to make economical decisions. One of the crucial administrative aptitudes is capacity to distribute and use resources appropriately in the endeavors of accomplishing the optimal performance efficiently. In some cases, for example, little scale low complexity environment, decision based on instinct with minimal quantitative premise might be reasonably acceptable and practical in accomplishing the goal of the organization. In any case, for a substantial scale system, both quantitative and qualitative (i.e. intuition, experience, common sense) examinations are required to make the most economical decisions. Utilizing Operations Research techniques including Linear Programming, Discrete Event Simulation and Queuing Theory, association pioneers can make high quality decisions. Operations managers are not anticipated that would be specialists in any decision science tools; be that as it may, he or she should have key information of such tools to secure right assets and to make the most economically sounding decisions for the company as a whole.

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Anomalous Effects from Dipole-Environment Quantum Entanglement

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Abstract— *In this work, we analyze anomalous effects observed in the operation of two different technological devices: a magnetic core and a parallel plate (symmetrical or asymmetrical) capacitor. From experimental measurements on both devices, we detected small raised anomalous forces that cannot be explained by known interactions in the traditional theories. So, we verify that magnetic cores also exhibits an effect similar to BB effect in capacitors. As the variations of device inertia have not been completely understood by means of current theories, we here propose a theoretical framework in which the anomalous effects can consistently be explained by a preexisting state of quantum entanglement between the external environment and either magnetic dipoles of magnetic cores or electric dipoles of capacitors, so that the effects would be manifested by the application of a strong magnetic field on the former or an intense electric field on the latter. The values of the macroscopic observables calculated in such a theoretical framework revealed good agreement with the experimental measurements performed in both cases, so that the non-locality hypothesis based on the generalized quantum correlation between dipoles and environment is consistent as explanation for the anomalous effects observed. The control and enhancement of the effect can allow the future viability of a new technology based on electric propulsion of rockets and aircrafts.*

Keywords— BB effect, anomalous forces, magnetic cores, capacitors, Clausius-Mossotti relation.

I. INTRODUCTION

We have studied a lot of very interesting and intriguing experimental results reported in several works [1-12] concerning to anomalous effects mainly associated with the operation of traditional high energy capacitor devices. The anomaly occurs in inertia measurements and it presents a more intense magnitude of the raised force in experiments involving asymmetric capacitor devices [13-16] when they are subjected to high voltage. Such an anomaly was named as Biefeld-Brown effect (BB effect) due to the pioneer works from 1920 by Thomas Townsend Brown and Paul Alfred Biefeld in their experiments involving capacitors, in which they observed an upward force or thrust acting from the larger electrode toward the small one of the device [1, 2]. In Fig. 1, we schematically show the phenomenon observed for symmetrical and asymmetrical capacitors. In the scheme of this figure, the capacitor devices are constituted by two rounded parallel metallic plates and dielectric material between them. In the symmetrical case, it raises an upward force in the plates and in the asymmetrical capacitors it appears from the small to the large plate, as indicated at the right side of the picture. At the left frame (a), we see an example of symmetrical capacitor and at the right frame (b) the corresponding asymmetrical capacitor in any possible vertical position (up or down) of the electrodes (as seen in the perfil draw). In those cases of asymmetrical capacitors, the anomalous force appears from the large to the small plate, as indicated in the perfil draw. In both cases, the plates are parallel to the ground and when the power source is turned on it is observed the anomalous force on them.

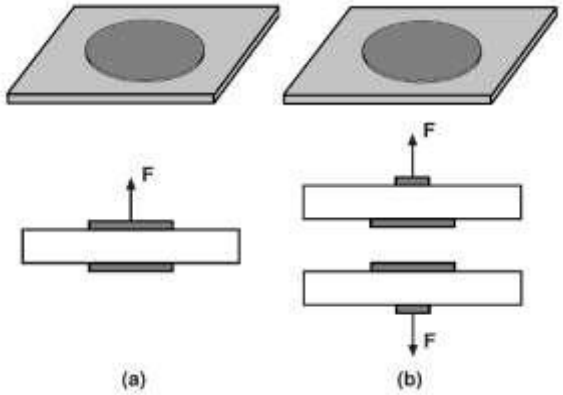

Fig. 1: Scheme of (a) symmetrical and (b) asymmetrical capacitor devices and the anomalous force raised.

The phenomenon was first reported in a patent published in 1928 [1] and it has been intensively studied since then, including other many experimental device configurations, as superconductor apparatus [17], magnetic cores or flying devices [18]. The anomalous forces that appear are very weak, as verified in the works cited above and also in our earlier works [19-21]. The weakness of the anomalous force was observed even in the experiments with very higher voltages up to 100 kV, reported in Ref. [4]. In those experiments, it was observed a reduction of their apparent weight even changing the polarity and, despite of its weak

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magnitude, the observed force consistently appeared and acted on the charged capacitor in a vertical direction when their plates were parallel to the ground. Even so, although a lot of measurements of inertia in capacitors operating in high voltage have supported the existence of their apparent weight reduction [5, 9-11], there has still been a reasonable controversy, mainly due to the weakness of the force generated on the devices. However, the studies have been more and more conclusive in the last years about the existence of the phenomenon due to an increasingly relevant research work by means of a lot of recent publications [7, 12, 13, 22]. Moreover our early works based on huge automatic collected data by using very advanced accelerometers [19-21] also corroborate the existence of Biefeld-Brown effect.

It is also important to mention that similar effects have been reported in literature - although they have features that cannot be directly associated with BB effect - in some alternative experimental devices and experiments, e. g., the detection of anomalous forces in superconducting ceramic disks [23,24], superconducting toroids in rotation [25], thrusts in EM Drives [26, 27] and the early cited superconducting device with different layers [17] that simulates the capacitive effect needed to raise the anomalous forces of BB effect. The importance of verification of BB effect existence is doubtless unquestionable because it will probably provide us with a new valuable resource for technological applications as the propulsion ones. Rather the phenomenon could represent in the future a possible technological way for gravity control or manipulation [28]. The concept of propulsion without propellant has as one version the possibility of manipulating empty space itself (the quantum vacuum) so that one can provide a thrust on space rockets [29]. In Refs. [29, 30], it is analyzed this hypothesis of field propulsion, emphasizing the possibility that interactions between matter and vacuum might be engineered for space applications, so that it would be neither so unfeasible from a fundamental point of view nor unviable from a technical point of view, although it is certainly restricted by strong constraints. Although more and more the phenomenon has been experimentally verified, the theoretical explanation for BB effect remains open and it has been pursued by many researchers. Possible theoretical explanations proposed in the literature for the phenomenon include the Law of Coulomb, electric wind [31, 32], Corona effect [33] or fluctuations of the vacuum [34-37]. However, in the first case, as the internal net resultant force is zero in capacitors, the Law of Coulomb could not theoretically explain the effect. Besides, a possible force between the Earth and the capacitors would not have the right upward direction and its magnitude was also several orders of magnitude higher than that one predicted by the traditional electromagnetic theory. In fact, the weak raised force was dependent on the magnitude of the electrical potential energy stored on the capacitor. In relation to Corona effect or electric wind [39, 40] the analysis is more sophisticated, but despite of their mutual existence one could not explain the magnitude of the anomalous forces as well only with such effects. Experiments in which electric or ionic wind was considered as possible theoretical explanation were realized in Refs. [40]. Moreover, some experiments with capacitors were made with high insulation or in vacuum, as in Honda laboratory [6, 7], not indicating the correct magnitude of the raised forces predicted by such a hypothesis. Rather measurements performed in the vacuum showed that the effect persisted even so [2, 39] and the experiments described in Refs. [4, 6, 7] showed that the insulating materials around the capacitor devices could neither reduce nor eliminate the effect. Beside Law of Coulomb and wind effect, the remaining alternative hypothesis that has been proposed in order to explain BB effect is the zero point vacuum field theory (ZPFT). Beside the works earlier cited, such a hypothesis was successfully considered in Ref. [6], that is, it had relative success in explaining BB effect by means of the interaction between the vacuum fluctuations and the high potential electric field provided by the capacitor. For a capacitor sample of mass 62g reported in Ref. [6], the theory revealed a variation M = 0.31g for DC 18kV, which was close to the experimental value reported in the work, that is, M=(0.29 ± 0.17)g. However, one realizes that the average value of weight loss calculated from ZPFT presented a relatively significant percent error (close to 6.9%), so that there is still margin to a better theoretical explanation of BB effect. Besides, as the error bar was large in that work, experimental measurements must also be improved.

In order to pursue a better theoretical explanation for the phenomenon, we proposed in Refs. [19-21] an empirical formulation that showed to be possible describing with very good accuracy the anomalous effect by the macroscopic manifestation of the microscopic entanglement of all electric dipoles on the dielectric from the same ancient idea used by Clausius and Mossotti in their works [41-43], based on a straightforward relationship between microscopic and macroscopic observables. However, it was still missing a theoretical basis in order to justify such an empirical hypothesis. Based on this motivation, we here investigated BB effect now under two perspectives: in a first one, we investigate the theoretical explanation of the anomaly from a more fundamental point of view. Besides, in a second investigation, in order to reinforce the consistency of the theory, we show that the idea is more profound and general that the proposal one already described only for capacitors. In fact, we implemented a new experimental setting in which by applying strong magnetic fields measurements of forces induced in magnetic cores were performed. In this

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way, one could also verify the idea of relationship between microscopic properties from magnetic dipoles in the devices and their macroscopic effects on the macroscopic observables like the magnetic susceptibility. Thus it was also possible to analyze the Clausius-Mossotti hypothesis also in this new case.

In the following, we present our theoretical model based on an alternative explanation of the phenomenon by considering a more general point of view. Basically, we describe the principle of the alternative scenario based on the manifestation of macroscopic observables by means of microscopic ones. Afterward, we describe the experiments performed with capacitors and magnetic cores and we detail our experimental setups and measurements concerning to weight variations of the devices. We also compared our calculations with the experimental measurements and discuss the accuracy of the theoretical results. Finally, in the last section we present our conclusions and final remarks.

II. THEORETICAL DESCRIPTION

1. Magnetic Dipole Forces and Generalized Quantum Entanglement

Our method of calculation considers, for the microscopic constituents of a physical system, the property of preexisting state of generalized quantum entanglement, so that its existence in extreme conditions would be manifested and its effects could occur and be observed. Rather we assert that the effects can be calculated, in order to predict the values of macroscopic observables associated to the systems. As known from literature [44-48], the quantum entanglement is the consequence of an interaction between two [44-46] or more particles in an arbitrary past time, so that subsequently each particle in the combined state keeps the information from each other, even for large distances, a feature of nonlocal phenomena [47, 48]. The issue concerning to effects of generalized quantum entanglements in systems of huge number of particles is an important point to be analyzed if we desire to understand and even quantify the influence of their effects on our macroscopic world. This point has been avoided in a lot of papers for a long time, as cited in Ref. [49], in which an analysis of quantum entanglement phenomenon is considered in all of its features and consequences. In this reference, Penrose claims that there are two mysteries associated with the entanglement phenomenon: first, the quantum entanglement phenomenon itself; second, it is the issue of the absence of the phenomenon in our daily world. Such an important point in the author's discussion - that issue of the absence of verification of the phenomenon in our real world - means that the physicists always assume that these supposed entanglements with the outside world can be ignored, a vision that seems to rely on the idea that the effects of entanglements will somehow cancel each other so that they do not need to be considered in practice, in any actual situation. However, the author argues that one mystery or puzzle of entanglement consists in its tendency to spread. It would seem that eventually every particle in the universe should become entangled with every other or even they would already be all entangled with each other. This point is reinforced in a recent work [50]. In fact, entanglement is an ubiquitous phenomenon and the huge majority of quantum states are actually entangled, so it becomes very hard to understand why we barely notice its effects in our direct experience of the world. According to the author, it seems that from that point of view in which these supposed entanglements with the outside world could be ignored is based on the idea that the uncountable number of quantum entanglements among lots of particles in the systems seems somehow average out so that it does not need to be considered in practice, in any actual situation. We also agree that such a vision is right in many systems, but it is merely partial and in some cases it hides the general behavior or effects in a system with many bodies. So, we here hypothetically suppose the arbitrary idea that all microscopic constituents of physical systems are quantum entangled, as is the case already reported in literature [50]. The generalized quantum entanglement could be observed as a macroscopic manifestation revealed by means of its possible connection with the gravity [51]. Despite the effects of this property cannot be easily demonstrated or even measured in case of trivial physical systems, we assert that in specific conditions such global effects can be detected. In the case of magnetic cores, it is needed the application of strong magnetic fields in order to realize the presence of the generalized quantum entanglement among the dipoles of the dielectric and the external environment. In the case of capacitors, it is needed the application of high voltage in order to realize the presence and or the effects of the generalized quantum entanglement among the dipoles of the dielectric and the external environment. The conjectures of preexisting quantum entanglement and its influence on the macroscopic observables of the system can be checked in a lot of physical systems, as the system constituted by magnetic dipoles, analyzed in this paper as a possible case of application.

Despite the real complexity of the calculations in systems of many entangled particles, some macroscopic observables can offer a real possibility of successfully calculating their physical values in an easier way, with a relatively good accuracy, as we can see in the formalism that we show from now on.

Let us consider an entangled system for two magnetic dipoles (N=2) of magnetic dipole moments M_1 and M_2 separated by the vector **r**. The magnetic dipole moment M_i at site i is related to the spin σ_i by [52]

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$$M_{ik} = \mu_i g_k \sigma_{ik}, \quad (1)$$

in which k is the index representing the components x, y and z, μ_i is the magnetic moment of the spin i, g_k are the elements of the anisotropic g-factor matrix (with $g_x = g_y = g_\perp \neq g_z$) and σ_{ik} are the classical Ising spins that can take the values ±1. In a first approximated classical calculation in which $gx = gy = 0$ such a system can be described by the hamiltonian showed in Ref. [55]:

$$H = -\sum_{i,j}^{N} J_{ij} \mu_i \sigma_{iz} \mu_j \sigma_{jz}, \quad (2)$$

in which J_{ij} is the operator spin total of the dipole field coupling to the moment of spin i and acting only along the Ising axis. This operator assimilates some numerical factors and falls off as $1/ r^3$. The moments of spin in the hamiltonian are μ_i and μ_j.

Let us assume a negligible magnetic coupling between the two dipoles. Without loss of generality, we also assume that both components of that model have same dipole moment, that is,

$$| \mu_i | = | \mu_j |,$$

but each of them is coupled with a different local external magnetic field aligned in the z (vertical) direction, as similarly shown in EPRB experiment [45, 46]. The dipole moments can be oriented along ($| 0 >$) or against ($| 1 >$) the external fields. In this condition, the following two entangled states for the pair of dipoles can be obtained:

$$|\Psi_2\rangle = \frac{|01\rangle - |10\rangle}{\sqrt{2}} \quad (3)$$

$$|\Psi_3\rangle = \frac{|01\rangle + |10\rangle}{\sqrt{2}}. \quad (4)$$

It means that some change in the local external field (e.g. intensity) applied in a dipole of the pair can change the dipole moment of another one. The total dipolar moment of the system must be conserved accordingly and the dipole moment variation means that a real force can be exchanged between them, but this kind of interaction cannot be taken in place by local forces because we had assumed before a negligible magnetic coupling. The intensity of the nonlocal force exchanged from a dipole to another one is directly proportional to its transition energy E:

$$E = -\vec{\mu} \cdot \vec{B}, \quad (5)$$

in which $\vec{\mu}$ is the magnetic dipole moment and $\vec{B}$ is the local external magnetic field in the site i where the magnetic dipole is localized.

This argument can be generalized accordingly and we can consider a myriad of magnetic dipoles coupled via quantum entanglement between the magnetic core where the strong magnetic field is applied and the environment. The big challenge to use the quantum mechanics framework for a calculation of the nonlocal force intensity is the complexity of the systems composed of a myriad of magnetic dipoles with possible different dipole moments, a considerable magnetic coupling between them and the thermal effects. But everyday more and more academical works [52, 53] have considered studies concerning to quantum entanglement for many bodies or quantum information in macroscopic scale. In particular, there are works [54] consolidating the argument that the quantum entanglement is crucial for explaining a lot of macroscopic properties in high temperatures. Besides, as an additional support to our theory, in Refs. [54, 55] it was reported that in a simulation of 400 magnetic dipoles the entanglement among them could explain deviations from Curie's Law, in a system composed by 10^{20} magnetic dipoles in temperatures close to 0 K. So, the authors explained a macroscopic property of a small bulk, e. g., the behavior of the magnetic susceptibility versus temperature of the bulk for 10^{20} magnetic dipoles in the salt, by means of a simulation with maximum number of 400 spins ($8x10^4$ pair-wise interactions). Above an arbitrary temperature, the result obtained using the quantum hamiltonian is the same one obtained using a classical hamiltonian, so that above this temperature the Law of Curie is valid.

In summary, it is worth to emphasize that all of those articles corroborate the hypothesis of manifestations of quantum entanglement for many particles in the macroscopic level [52-55]. It is also important to stress that such a feature allows us to use the classical formulation in our calculations.

The behavior of the magnetic susceptibility χ_m in low temperatures (near 0 K) cannot be explained if the wide entanglement in spins is not considered accordingly [55]. The magnetic susceptibility curve considering the quantum entanglement contributions follows the Curie law for high temperatures (T > 0 K), hiding the quantum effects.

Nowadays there are some important works [56-62] that show the existence of a macroscopic observable revealing quantum entanglement between individual spins in a solid, a phenomenon called entanglement witness. In Ref. [56], the entanglement witness is shown as being more general (in the sense that it is not only valid for special materials), associating some macroscopic observables such as magnetic susceptibility χ_m with spin entanglement between individual constituents of a solid. It was proposed a macroscopic quantum complementary relation basically between magnetization M, representing local properties, and magnetic susceptibility χ_m, representing nonlocal

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properties. By defining for the system of N spins of an arbitrary spin length s in a lattice the quantities:

$$Q_{nl} = 1 - \frac{kT\bar{\chi}}{Ns} \quad (6)$$

and

$$Q_l = \frac{\langle \vec{M} \rangle^2}{N^2 s^2}, \quad (7)$$

in which $\vec{M}$ is the magnetization vector, k is the Boltzmann constant, T the temperature and the susceptibility $\bar{\chi}$ is defined as $\bar{\chi} \equiv \chi_x + \chi_y + \chi_z$, then it was shown in Ref. [56] that one has:

$$Q_{nl} + Q_l \leq 1. \quad (8)$$

Such quantities have specific meanings, that is, Q_{nl} represents the quantum correlations between the spins in the solid (nonlocal properties) and Q_l represents the local properties of individual spins. The hypothesis of preexisting state of quantum entanglement indicates that there are no isolated systems, thus the magnetic core and the environment around it are both part of the same system where the inequality (8) can be considered accordingly. In other words, if one quantity increases then the corresponding counterpart quantity has to decrease. If Q_l increases and Q_{nl} decreases in the magnetic core, Q_{nl} decreases and Q_l increases in the environment and vice-versa. This is the same framework described before involving a simple system with two entangled magnetic dipoles. If we increase the intensity of a magnetic field (Q_l) applied in one then the nonlocal effects (Q_{nl}) must increase in the other. By nonlocal effects one means nonlocal forces. The conclusion after these arguments is that the calculation of the magnitude of the nonlocal force between a magnetic core and the environment around it can involve the magnetic susceptibility χ_m and magnetization $\vec{M}$ although these macroscopic observables are classical quantities. This chain of thoughts yields a new equation postulated according to the correct dimensional analysis and based on the calculation of the magnetic force of solenoids [63] as follows:

$$F = \frac{0.102}{16\pi^2}\frac{SBI}{\theta}, \quad (9)$$

in which the force F is in units of Kgf, S is the area of circular surface of the cylinder core, B is the magnetic field generated by the electric current flowing in the turns of wire of the solenoid around the cylinder core, I is the electric current flowing in the solenoid and θ is the cylinder core radius.

The calculation of force F via equation (9) is valid for a solenoid with a cylinder ferromagnetic core where the magnetic field lines are parallel to the symmetry axis of the cylinder. It is important to report that the term

$$E_m = SBI \quad (10)$$

in Eq. (9) amounts to the summation of energy eigenvalues of all magnetic dipoles in the core. A numeric term $1 / (16\pi^2)$ of the force equation (9) is adopted to well determine the magnitude of the force and it seems to be related to the constant term used in the Schrödinger equation for the total energy calculation of the multi-particle system.

The equation for the magnetic field magnitude calculation [63] can be represented as follows:

$$B = \frac{\mu_0 \mu_r NI}{L}, \quad (11)$$

in which B is the magnetic field in units of T, L is the solenoid length, N is the number of turns of wire around the cylinder magnetic core, I is the electric current, μ_0 is the vacuum permeability, μ_r is the relative permeability of the solenoid core material and it is directly related to the magnetic susceptibility χ_m via the relation $\mu_r = 1 + \chi_m$.

As we will see in this work, the magnitude of the nonlocal force F calculated regarding the equation (9) is in relatively good quantitative accordance with the experimental results also described in this work where the magnetic interaction between the energized solenoid and the environment around it really became negligible considering the magnetic shield and other procedures adopted accordingly. It seems that the hypothesis of nonlocal interaction explains why the solenoid always loses weight regardless the magnetic field in terms of its upward or downward direction. The symmetry axis of the cylindrical magnetic core of the solenoid always were in the vertical position in our experiments.

When a magnetic field is applied in the magnetic core of a solenoid, an homogeneous magnetic field produces a magnetization in the core and, in this condition, the dipoles exhibit the same excited states with superposition between the states $|0>$ and $|1>$ even reversing the direction of the field from upward to downward and vice-versa. Consequently the states from the external dipoles of the environment follow the same state changes considering the existing mutual entanglement between them. The magnetic dipoles from the magnetic core and the environment suffer a physical (mechanical) displacement according to the magnetic field direction. The result of this nonlocal interaction is a net upward force where the magnetic cylinder core placed on the ground by gravity has an upward displacement from the region with higher density (inside planet) to the lower density of dipoles (atmosphere and outer space). This upward force reduces the weight of the solenoid such as measured in our experiments.

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This effect is almost analogue to the effect that occurs in piezoelectric crystals placed on the ground by gravity, that suffers a shape expansion in the vertical direction and have their center of the mass showing an upward displacement when an electric field in the vertical direction is applied. However, the difference in this latter case is the existence of the local interaction (electric contact force between the crystal and the ground).

2. Electric Dipole Forces and Clausius-Mossotti Formalism

The same hypothesis of nonlocal interaction for magnetic dipoles seems to explain also the reduction of weight measured in experiments involving symmetric capacitors [19, 20] even when the direction of the electric field across a dielectric is reversed by considering their symmetry axis with an upward direction. The electric dipoles exhibit the same excited states with superposition between | 0 > and | 1 > when the strong electric field is applied across a capacitor dielectric. In those experiments, the influence of the electric interactions with the environment around it became negligible by electric shielding implementation and other procedures. For this reason, the possibility of the hypothesis of the nonlocal interaction seems to be very likely. The system of two entangled electric dipoles can be well described by the Hamiltonian showed in Ref. [64]:

$$\hat{H} = \hbar \sum_{i=1}^{N} \omega_i \hat{S}_i^z + \hbar \sum_{i \neq j}^{N} \Omega_{ij} \hat{S}_i^+ \hat{S}_j^-, \quad (12)$$

in which each observable S represents the spin operator of a dipole in the pair and Ω is the electric coupling parameter between them. One can consider that there is a negligible electric coupling (Ω = 0) between the two dipoles. The dipole moments can be oriented either along (| 0 >) or against (| 1 >) the external electrical fields. In this condition, there are two entangled states for the pair of dipoles represented by the same equations (3) and (4) showed before for the entangled magnetic dipoles.

In case of works related to the symmetric [19, 20] and asymmetric capacitors [21], the equations for the force calculation have also applied a classical quantity such as the electric susceptibility χ_e and some analogy with the magnetic susceptibility χ_m can be taken in place accordingly. In other words, the electric susceptibility χ_e can be considered as an entanglement witness [56]. Obviously all of those themes need much more detailed quantitative analysis.

In the 19th century, the relationship between macroscopic observables like electric susceptibility χ_e and individual properties of atomic or molecular electric dipoles such as polarizability α was firstly realized by Mossotti and Clausius for nonpolar materials [65].

The model proposed in this work is based on the theoretical description of a set of electric dipoles, subjected to a high electric potential. By means of the macroscopic observables, we calculate the magnitude of the forces generated in capacitors by employing Clausius-Mossotti equation:

$$\frac{\epsilon_r - 1}{\epsilon_r + 2} = \frac{4\pi N \alpha}{3}, \quad (13)$$

in which *N* is the number of particles per volume, ε_r is the relative permittivity and α is the polarizability of the atom or molecule. Basically, Clausius-Mossotti equation presents at the left side the macroscopic variables and at the right one the microscopic variables. That equation provides the density of dielectric dipoles in a dielectric medium, based on its relative permittivity. The utilization of the equation is worth for solids and for low dielectric constant. So, by supposing the feasibility of the quantum entanglement in the dielectric system in a microscopic scale, it is natural to extend the idea to enclose all the macroscopic scale in a generalized way, by considering Clausius-Mossotti relation applied in the calculation of the electric dipolar force *F* induced by the quantum entanglement. Thus, by applying the idea to generic capacitors we conjecture that such a force can be well described by the empirical relation:

$$F = \frac{0.102}{16.\pi^2} \frac{\epsilon_r - 1}{\epsilon_r + 2} \frac{A_1^2}{A_2} . \epsilon_0 . E^2, \quad (14)$$

in which the force *F* is in units of Kgf, A_2 is the area of the small electrode, A_1 is the area of the large electrode, ε_r is the relative permittivity of the material, ε_0 is the dielectric constant of the vacuum and *E* is the electric field applied on the medium.

The equation for the dipolar force (14) was postulated from its known dependence on the area of the plates, the permittivity and the electric field applied on the capacitor, beside the correct dimensional analysis and the idea of a direct relation between the microscopic and macroscopic quantities. It is an empirical formula that includes the factor of the Clausius-Mossotti relation $\varepsilon_0 (\varepsilon_r - 1) / (\varepsilon_r + 2)$ representing the electric dipoles density in the dielectric such as implemented similarly to equations of dielectrophoresis forces [66]. Another similarity is the implementation of the gradient of the squared electric field but in case of the dipolar force equation, the calculation of this gradient is implemented according to the relation between the areas of the electrodes also explained in Ref. [8]. The numeric term $1 / (16\pi^2)$ of the dipolar force equation is adopted to determine the magnitude of the force

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and it seems to be related to the boundary conditions for the interaction between the inner electric dipoles and the environment. In order to obtain the corresponding empirical formula of the dipolar force for the symmetrical case, it is enough to do $A_1 = A_2 = A$, so that we obtain:

$$F = \frac{0.102}{16.\pi^2}\frac{\epsilon_r - 1}{\epsilon_r + 2}\,\epsilon_0 A E^2, \tag{15}$$

as already described in Refs. [19, 20].
It is important to report that the term

$$E_e = A\frac{\epsilon_r - 1}{\epsilon_r + 2}\epsilon_0 E^2 \tag{16}$$

in Eq. (15) amounts to the summation of energy eigenvalues of all electric dipoles in the dielectrics of the capacitors.
The quantum parameters seem to be embedded in equations (9), (14) and (15) related to the calculation of the magnitude of nonlocal forces between dipoles and environment.
Theoretically, in the case of the capacitors as examples, if internal electric dipoles in the dielectric medium are quantum entangled among them and with the external environment, hence they can induce nonlocal forces that affect their own dynamics when they were subjected to the application of an intense electric field. A lot of different experiments from different laboratories and authors, including our earlier experimental works [19, 20, 21] performed with symmetrical and asymmetrical capacitors indicate strong evidences that such an effect is possible, that is, the devices present anomalous variations of their weights or the existence of anomalous forces raised on them when they are subjected to the regime of high voltage applied.

III. EXPERIMENTAL RESULTS

1. MEASUREMENTS ON CAPACITORS

In order to check our theoretical framework for both magnetic and electric dipoles, we implemented some experimental measurements with two devices: capacitors and magnetic cores. We initially performed the measurement of the maximum weight loss of a symmetrical capacitor sample that we could obtain for our power supply. We consider in our experiment the capacitor sample of two parallel rounded plates characterized in table 1, as earlier described in Refs. [19, 20].
Our experiments were implemented with all needed facilities used in sophisticated laboratories and it was included these precision instruments such as the high resolution accelerometer, the precision digital scale and the high-voltage power supply. It is highly relevant to emphasize that in all of the experimental setups electrostatic and magnetic shielding were implemented accordingly and also other procedures in order to avoid any influence of the known fields. All details of these procedures are explained in our earlier articles and in this work from now on.

Table.1: Features of the first capacitor used in the experiments.

Material Plates	Aluminium
Dielectric	Plastic (Polystyrene)
Capacitance	118.3 pF
Diameter	8 cm
Tickness	1.0 mm
Relativity Permittivity	2.7
Mass	41.154 g

A maximum average weight loss of up to 220 mgf was measured when it was applied a maximum DC voltage of 20 kV. The measurement of the capacitor weight was made by a milligram electronic scale of 300g maximum load that presented very strong fluctuations. Despite the accuracy of the measurements due to the interferences, the results indicated in a consistent way the existence of an upward force on the capacitor when its plates were placed in the horizontal position.
In order to improve the accuracy of the measurements, we adopted in a second stage an experimental methodology already described in Refs. [19-21] in which an advanced accelerometer was used as a weight variation sensor in order to collect a huge quantity of experimental data for the anomalous force. So we obtained a significant improvement in the scheme of measurements because it was possible to obtain automatically hundreds of measurements per second for each value of tension independently of human reading. In the experimental setup implemented for the measurements shown in the scheme drawn in Fig. 2, we slowly varied the tension on our sample symmetrical capacitor and measured the average weight variation of the capacitor in mgf up to the maximum voltage 7 kV.
In the scheme of Fig. 2, we show the experimental setup implemented for the measurements of weight variation of the capacitor devices in our experimental work. All the connections were insulated by layers of polypropylene. The z-axis of the accelerometer sensor was placed in the upward vertical direction and parallel to the symmetry axis of the capacitor. A 12 cm high cylinder of glass supported a plastic tray covered by a shielding aluminum where it was enclosed the accelerometer. The capacitor was connected to the high-voltage power supply and the data were collected initially turning on it with the power supply turned off. After an initial operation time of the accelerometer, the power supply was turned on during a determined operation time interval and the measurements

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of gravity acceleration were done. In the figure, we have the following devices indicated by numbers: 1-Power Supply; 2-Amperemeter; 3-Accelerometer; 4-Glass cylinder; 5-Capacitor; 6-Insulating layers.

A third experiment was different from earlier ones in relation to the geometry of the capacitor. We have also used in our experimental work an asymmetric capacitor device assembled with two parallel rounded electrodes of physical features as described in Table 2.

Table.2: Features of the asymmetric capacitor used in the experiments.

Material Plates	Aluminium
Dielectric	Plastic (Polystyrene)
Capacitance	3.0 pF
Small Electrode Diameter	5.0 cm
Large Electrode Diameter	10.0 cm
Tickness	1.0 mm
Relative Permittivity	2.7
Mass	25.0 g

Independently of possible thermal, electromagnetic, acoustic and seismic interferences one could clearly realize for the asymmetric case the presence of the upward force for 7 kV, by considering the standard deviations determined. The results were conclusive only for that highest voltage applied on the capacitor and are here summarized in the Table 3. The results for the asymmetrical case are also shown in the Table 3, including both changes of plates positioning.

In more details, that table shows measurements of average weight variation (in mgf) of two capacitors, by considering significant time intervals of collected data during the operation of the power supply. The first one corresponds to the symmetrical capacitor, on which is applied 7 kV. In the second one, the asymmetrical case, in which was applied 6 kV in both position cases of the small plate, that is, parallel to the ground and positioned either up or down in the vertical direction, as indicated in Fig. 1. In the first column of Table 3 we indicate the two samples used and the position of the large electrode. The second column indicates the operation time of the power supply; the third one shows the average weight variation measured by the accelerometer; in the 4th column, one reads the correspondent standard deviations calculated and in the last column the corresponding theoretical weight loss variations in mgf.

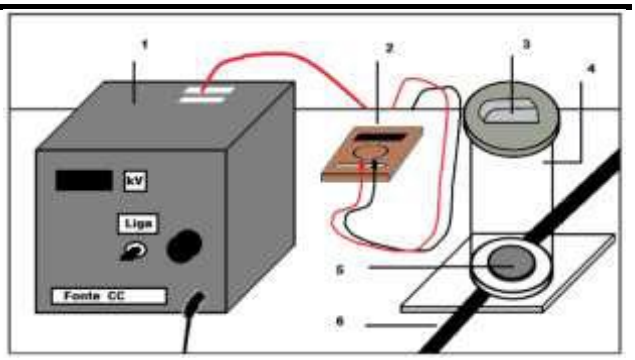

Fig. 2: Scheme of the setup for measurements of weight variation of the capacitors.

For both symmetrical and asymmetrical cases, we implemented the referred experimental procedure of adopting an accelerometer configured to provide high resolution sampling, automatically obtaining 320 samples per second of acceleration measurements for each value of voltage applied on the capacitors.

Table.3: Measurements of average weight variation (in mgf) of the symmetrical and asymmetrical capacitors.

Symmetry	Operation Interval (s)	Weight Variation (mgf)	Error (mgf)	Theoretical Value (mgf)
Symmetrical	31-60	36.8125	4.7	40.38
Symmetrical	35-60	36.7344	3.6	40.38
Symmetrical	40-60	36.7031	2.4	40.38
Asymmetrical (up)	45-55	-251.51	94.3	-185.17
Asymmetrical (up)	50-55	-191.07	28.45	-185.17
Asymmetrical (down)	45-55	247.78	62.42	-185.17
Asymmetrical (down)	50-55	278.83	123.57	-185.17

The high voltage DC was provided by the power supply connected in parallel to the capacitor and the electric current was monitored by an amperemeter serially connected. The z coordinate of the accelerometer sensor was aligned according to the vertical direction and the symmetry axis of the capacitor. The variations of the gravity acceleration were measured by the accelerometer positioned on the capacitors. Such a procedure was also implemented for both positions of the asymmetric case, that is, with the small electrode either in upward or in downward position. The high-voltage power supply was turned on for some seconds after the accelerometer was

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switched on. In the first operation time interval up to 30s, the accelerometer was turned on and remained collecting data while the power supply was switched off; in the second step of the procedure, the power supply was switched on for the maximum voltage applied in each case. The difference of the average values of the measures between two time slots indicated an anomalous upward force in the symmetric capacitor and an anomalous force always pointing in the direction of the small electrode. It was also considered in our analysis the difference in standard deviation between both periods ”on” and ”off” and the increasing in the magnitude of the sign ”on” in comparison with the sign ”off” in terms of their amplitudes indicated a real perturbation caused by the anomalous force. For that high voltage applied, a relative 24 kV/mm of electric field was applied and the breakdown limit of the dielectric (polystyrene) was almost achieved. For other voltage values lower than the maximum reached in the experiment, noises from a lot of sources seemed to compete with the effect in a random way and the results were not conclusive. In fact, for such values, the level of the sign was very small and undistinguishable from the environment perturbations such as acoustic or thermal noises.

It is also relevant to mention that, in the symmetrical case, we could not detect any effect below 3 kV, but an anomalous perturbation was observed for higher voltages from 3 kV, although the competition with interferences during the operation did not allow a positive conclusion on the presence of anomalous forces for all operation time ranges $V < 7$ kV. In the asymmetrical one, we also observed perturbations for $V < 6$ kV, but analyzing the standard deviations the existence of anomalous forces was not conclusive. In summary, for the voltage 7 kV applied on the symmetrical capacitor and 6 kV on the asymmetrical one, we really verify that the anomalous effect existed because the difference between two periods of average measures indicated a consistent upward force even changing the polarity of the capacitor and operation time intervals. By following that procedure, we obtain measurements that are consistent with the weight variation hypothesis for the higher voltage applied. Despite the weakness of the effect, we believe that in hypothesis it could be enhanced if we had used a device with high physical values, as supercapacitance [67] or by techniques of optical control of capacitance through a dielectric constant [68].

We realized in the results shown in the Table 3 that the symmetrical case is more stable, presenting smaller standard deviations. For the asymmetrical case, the variations are higher than in the symmetrical one, but the average value of the weight loss remained in the same order of magnitude. In terms of the relevance of the measurements, in all of the cases, for hundreds of data per second there was the detection of the weight variation and with same order of magnitude for all operation time ranges considered in the experiment, corroborating the existence of the anomalous force.

IV. MEASUREMENTS ON MAGNETIC CORES

Beside our experimental measurements concerning to apparent weight losses in capacitors, we also implemented an experimental scheme in order to measure anomalous forces in magnetic cores. In Table 4, we show the main features and technical information of the devices used in our experimental assembly. The data shown also concerns to the instruments that we have used in the measurements by using the test magnetic coil devices. In order to measure the anomalous force in the solenoid, we have used all the magnetic coils and instruments described in Table 4 according to the electric circuit mounted in Fig. 3 and the schematic diagram of the experimental assembly shown in Fig. 4.

Table.4: Features of the devices used in the experiments with magnetic cores.

Device	Features
Digital Ampere Meter	UNI-T model UT30B; Current Range 200μA ~ 10A; Resolution 100nA (for 200 μA DC current); 3 ½ digits LCD Display
Digital Scale	BEL model S303; Capacity 310g; Readability 0.001g; Linearity ±0.003g; Reproducibility 0.0006g; Power Supply 115/230 VAC ± 15%; LCD display
1st Battery	+3 VDC; Panasonic; CR1620 model; 75mAh
2nd Battery	+6 VDC; Eveready; Super Heavy Duty 1209; 11Ah
Variable Resistor Rheostat	120 Ohm; 10%; 200 W
1st Magnetic Coil	1 cm diameter; 2.7 cm length, 192 loops; Iron Alloy cylinder core
2nd Magnetic Coil	1.6 cm diameter; 5 cm length; 252 loops; Ferrite cylinder core
Neodymium Magnet	1.4 cm diameter, 1.4 cm length; 1.17 Tesla; NdFeB cylinder core

In our experimental measurements, we used a magnetic core containing three different magnets: two magnetic

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coils and one neodymium magnet. The first magnetic coil had dimensions 1 cm diameter, 2.7 cm length and 192 loops around a iron allow cylinder core. The second one had 1.4 cm diameter, 5 cm length, 252 loops and a ferrite cylinder core. The setting was also constituted by a neodymium magnet of 1.4 cm diameter, 1.4 cm length, 1.17 T and a NdFeB cylinder core.

In the experimental set, we used two batteries of 3 DVC and 6 DVC and varied the value of a rheostat of 120 Ohm and 200 W. The measurements of anomalous forces on the magnetic apparatus indicated the existence of a real perturbation on that system. Systematic sequences of measurements by using the a digital scale BEL model S303 with capacity 310 g were implemented by applying a high voltage by means of a power supply of 115/230 VAC ± 15%. The current was controlled by a ampere meter UNI-T model UT30B with current range 200 μA ~ 10 A and resolution 100 nA (for 200 μA DC current). Our measurements do indicate the raising of a anomalous force on the setting, whose results are presented in Table 5.

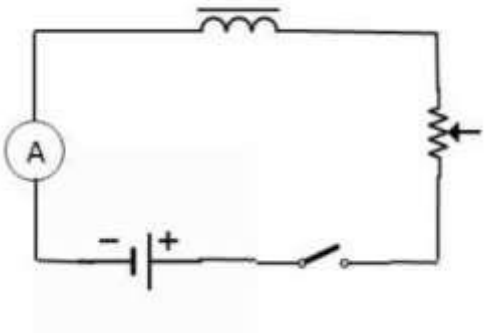

Fig.3: Scheme of the experimental circuit mounted for the measurements of the weight losses (in mgf) of the magnetic core.

We performed some experimental measurements with the objective of verifying the maximum weight loss of the magnetic coil samples. Firstly the magnetic force of the 1st magnetic coil with 1 cm diameter, 2.7 cm length, 192 loops and iron alloy cylinder core in the vertical position was measured with its symmetry axis aligned according to the symmetry axis of the circular stainless steel platform of the electronic scale when a 2.1 A current flow was applied through the coil. The distance between the platform of the digital scale and the cylinder core was 2 cm. The readability of the digital scale was 0.001 g and its capacity was 310 g. Under such conditions, a 2 gf force was measured.

In the measurements involving the magnetic devices, we did not have the value of the magnetic susceptibility of the core, so that we needed to implement an experimental procedure for the determination of the magnetic field. The magnetic field B could be calculated using the known Maxwell's pulling force formula [69]:

$$F = \frac{SB^2}{2\mu_0}, \tag{17}$$

where F is the magnetic force, S is the surface area of the cylinder core, B is the magnetic field and μ_0 is the vacuum permeability. A 1.072 T of magnitude of the magnetic field was calculated and its value is below the saturation range of the iron alloy, that is between 1.6 T and 2.2 T. Some measures were performed and the magnetic interaction between the coil and the platform of the digital scale became negligible for distances higher than 8 cm.

Afterwards the same magnetic coil was positioned on the top of a 31.5 cm high cylinder of cardstock with their symmetry axis aligned mutually in the vertical direction. The cylinder of cardstock was positioned over the center of the circular platform of the digital scale and its length ensured an adequate distance between the platform of the digital scale and the magnetic coil in order to strongly reduce the magnetic interaction. Two wires provided an electric connection of the magnetic coil and two other cylinders of cardstock supported them such as showed in the Fig. 4. A hollow cylinder of thin iron housed the magnetic coil as a magnetic shield in order to reduce 10 times its outer field. The efficiency of this magnetic shield was proved according to the reduction of the magnetic force of a neodymium magnet class N35, 1.4 cm diameter, 1.4 cm length and 1.17 T magnetic field. A foan of plastic was installed below the magnetic coil to reduce any possible effect of the shape magnetic core variation such as a magnetic constriction. The magnetic coil was connected in series with the on/off switch, battery of 6 V, variable resistor rheostat and ampere meter, as showed in the schematic diagram of the Fig. 4. We can see in this figure the setup for measurements of weight losses of the magnetic core (in mgf), composed by the following devices indicated by numbers: 1-Magnetic coil; 2-Foan of plastic; 3-Wire; 4-Hollow cylinder; 5-Cylinder of cardstock; 6-Circular platform; 7-Digital scale; 8-Battery; 9-On/Off switch; 10-Variable resistor rheostat; 11-Digital ampere meter; 12-Cylinder of cardstock.

A 2.1 A electric current magnitude (average) was measured by the ampere meter and controlled by the rheostat when the switch was turned on. In this condition, the weight loss of the setup varied between 15 and 20 mgf including magnetic coil, wires, hollow cylinder, foan of plastic and cylinder cardstock according to the average of maximum values of several measurements performed by the digital scale. The initial weight value of the setup (149.097 gf) was recovered when the switch was turned off again. The direction of the electric current was changed but the weight loss of the setup remained the same. It is also important to note that weight loss value remained the same despite the fact that some devices such as magnetic shield (hollow

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cylinder of thin iron) and foan of plastic were later removed from the setup when new measurements were performed. There were no changes in the weight loss readings even replacing the standard type of wires from cooper to other metallic materials for electric connections of the magnetic coil. In other words, the metallic constriction of the wires regarding the temperature and the electric current flow seemed extremely low in terms of possibility to affect the weight measurements also especially considering the catenary of the suspending wires.

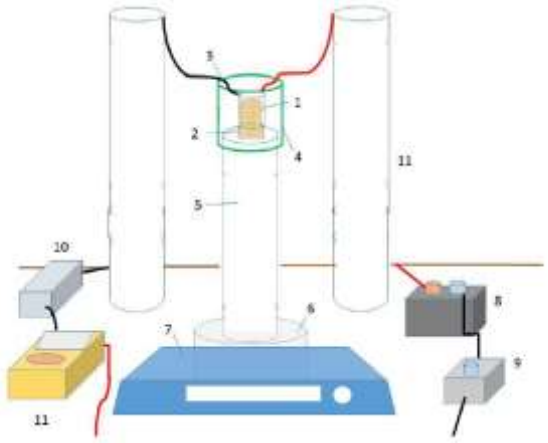

Fig.4: Scheme of the experimental setup for weight losses measurements of magnetic cores.

The experimental features seem to exclude any explanation based on magnetic field interaction between the magnetic coil and the environment (including the digital scale) regarding the weight loss and they reinforce the explanation showed in the theoretical description section related to the nonlocal force.

Considering a 2.1 A electric current and a 1.072 T magnetic field calculated before it is possible to calculate the magnitude of the nonlocal force for the 1st magnetic coil regarding the Eq. (11). The value of the force magnitude obtained is 22.84 mgf. This theoretical value is close to the experimental value of the range between 15 mgf and 20 mgf.

In order to improve our analysis, we performed other experimental measurement using, as showed in table 4, a 2nd magnetic coil with 1.6 cm diameter, 5 cm length, 252 loops and ferrite cylinder core. It was performed the measurements in the same setup mentioned before just replacing the magnetic coil 1 for the magnetic coil 2. The magnitude of the magnetic field of 0.3 T was calculated for an electric current of 1.6 A via a measurement of the magnetic force between the magnetic coil and the platform of the digital scale such as the procedure already mentioned before. This 0.3T magnetic field magnitude value is close to the ferrite magnetic saturation range between 0.2 T and 0.5 T. In other words, the magnetic core was probably saturated or close to this condition.

The average of maximum values of the several measurements of the weight loss of the same setup using the 2nd magnetic coil was the range between 8 and 10 mgf regarding the electric current of 1.6 A and the magnetic field 0.3T. Considering the same parameters, the nonlocal force magnitude calculated via Eq. (11) is 7.79 mgf and this value is really close to the experimental values of the range mentioned before.

Considering the same setup of the magnetic coil 2 except that the battery was replaced to one of 3 V, it was performed new measurements and a weight loss between 1 and 2 milligrams was detected regarding the 0.17 A electric current flowing in the circuit when the on/off switch was turned on accordingly. A 0.828 mgf of theoretical value of the weight loss is also close to the experimental values of the range regarding the 0.3 T magnitude of the magnetic field for a no saturated ferrite magnetic core.

A summary of the experimental results is shown in table 5, in which a comparison between several measurements of the weight loss is shown, considering different magnetic coils and parameters as average electric current and magnetic field magnitude. There is a 3 mg linearity error of the digital scale and therefore the theoretical values are in accordance with the range of measurement values.

The procedures adopted in the experimental setups seem to exclude the outer magnetic interaction and other effects such as magnetic constriction of the core or variation of the shape of the wire conductors regarding the thermal effect of the electric current flow as the cause of the weight loss of the setups.

Table.5: Comparison between several measurements of the weight loss of the magnetic core.

Experimental Setup	Magnetic Field Magnitude (T)	Average Electric Current (A)	Weight Loss Range (mgf)	Theory Forecast (mgf)
Magnetic coil 1 (iron alloy core)	1.072	2.1	15 ~ 20	22.84
Magnetic coil 2 (ferrite core)	0.3 (saturation)	1.6	8~ 10	7.79
Magnetic coil 2 (ferrite core)	0.3	0.17	1 ~ 2	0.828

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The values of the experimental results are close to the theoretical values where a coupling between the magnetic dipoles and the environment via quantum entanglements is taken in consideration.

The authors plan to improve the future experiments and obtain a curve of the weight variation versus the electric current applied in order to better analyze the saturation effect and the standard deviation.

From the exposed results, we conclude that our theoretical proposal is consistent in explaining our experimental results and or the anomalous effects in magnetic and electric devices, based on the macroscopic observables as manifestations of the microscopic generalized quantum entanglement among dipoles and environment.

V. CONCLUSION

In this work, we present our experimental and theoretical investigations concerning to the existence of anomalous forces on symmetrical and asymmetrical capacitors, operating in high voltage, and on magnetic cores operating in high magnetic fields. Our investigation was motivated by a lot of earlier experimental works described in the literature performed by other different authors that confirm the existence of BB effect in the former case. The existence of anomalous forces on magnetic cores was also investigated in our hitherto unpublished experiments. The detected anomalous forces seem to be not explained by electric or magnetic interactions between devices and environment considering the procedures adopted accordingly. Our work claims that despite of such anomalous forces have different sources and seem unrelated they can be explained by the same theoretical framework, that is, basically a momentum variation is exchanged between a myriad of internal dipoles of the devices and other particle groups and particles of outer environment via generalized quantum entanglements. So, the BB effect is one of the anomalous effects that can be explained in this context, that is, by an unique cause that we call generalized quantum entanglements. Some current papers have shown that BB effect remains in the vacuum conditions excluding the ionic wind such as the cause of the effect. In addition, other papers indicate that even experiments related to BB effect measurement with lifters in the air pressure cannot be explained according to the usual electromagnetic theory background.

These facts reinforce our hypothesis related to an nonlocal interaction, considering a preexisting state of generalized quantum entanglement between all particles. Considering some macroscopic observables such as the magnetic and electric susceptibility involving quantum entanglements between magnetic or electric dipoles, we justify how the magnitude of the so called anomalous forces can be calculated via equations using classical quantities. In fact, the theoretical results show that such a concept can explain with good accuracy the majority of the experimental data. We intend in a next step to study the application of the preexisting condition of quantum entanglement to investigate its relation to the gravity and inertia. We also aim to investigate how new materials or other possible configurations with the devices analyzed or new setup possibilities could enhance the interaction so that one can use it in technological applications as electric propulsion. Besides, it would be convenient also to report that we are elaborating other works based on a new experimental setup involving the detection of higher magnitudes of the anomalous forces and the effect of induction of nonlocal forces at distance, having high voltage capacitors as other source devices.

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Investigation of Ageing Parameters on Properties of AL/ALBITE MMCs

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Abstract— *The objective of the work was to investigate effect of an accelerated aging on properties of Al6061/albite metal matrix composites(MMCs) such as age hardening, electric resistivity and micro-structural behavior. The samples were aging at 32, 80, 180, and 320°C for 0.01 to 100 hours. The peak of the hardness and the resistivity values of the MMCs increase with increasing reinforcements and ageing temperatures due to ageing precipitation significantly accelerated because of addition of reinforcement. The nucleation process influences dislocation density and it reduces the activation energy for precipitation hence the faster and higher precipitation was observed in MMCs. Changes in the properties of the composites during aging have been demonstrated on the basis of microstructural alterations during ageing.*

Keywords— Metal Matrix composites, Microstructure, TEM, Heat treatment.

I. INTRODUCTION

Recently the aluminum metal matrix composites (MMCs) got more interest in research due to promising in age hardening considerably higher speed than that of parent material[1]. The hardening of MMCs is due to the enhancement of dislocation density around the ceramic particles. The development of dislocation is due to different in thermal expansion properties between matrix and particles. The addition of higher reinforcements help to the diffusion in solute atoms hence it leads to higher rate precipitation process [2-3]. The quenching / cooling temperature from melting temperature to room temperature plays significant role in formation of nucleation vacancy within the matrix materials. [4-5]. The higher nucleation vacancy promotes the creation of Guinier-Preston (GP) zone such as Al-Mg-Si and Mg-Al alloy.[6]

Transmission electron microscopy (TEM) studies have proved the existence of dislocation due to heterogeneous nucleation which leads to increase the strength of the Al MMCs [7]. Many research work showed that precipitation reaction in some Al MMCs in both theoretical and experimentally and they suggested that only matrix dislocation enhances the precipitation growth [8].

The purpose of the present study was to study the effect of artificial aging on the microstructure, hardness and electrical resistance Al/albite of the MMCs as functions of aging temperature, aging time and reinforcement content. Differential scanning calorimetry (DSC), EDS test, and TEM investigation have been undertaken to observe the effect of reinforcement on the decomposition and precipitation kinetics of the matrix alloy.

II. EXPERIMENTAL STUDIES

In this study Al6061 alloy used for matrix materials (chemical composition given in Table 1) and albite of 30-50 μm particles were used as reinforcement. The albite content varies from 0 to 20% by weight were introduce into the Al molten liquid with appropriate stirring process. The all composition of Al /albite MMCs were fabricated by liquid metallurgical technique. The prepared specimens were subjected to various methods of heat treatment such as solution ageing for 24 hour at 520 °C immediately quenched in to ice cold water, stabling at lab temperature for two days then artificial ageing at different temperature for different duration.

Table 1 Chemical Composition of Al6061

Component	Wt. %
Al	94.8-98.6
Mg	0.8-1.2
Si	0.4-0.8
Cr	0.04-.4
Mn	Max 0.15
Cu	0.15-0.4

The aged and non-aged specimens polished as per standard procedure then they are subjected to optical micro-graphical studies after Keller's reagents. After polishing specimens were subjected to micro hardness with the load of 1N. Care was taken to avoid making an indentation directly on a reinforcing particle which otherwise would cause a great scatter in the hardness value.

The electrical resistivity of metals /MMCs is usually very small (~ μΩ-cm). The electrical properties (resistance) were

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measured for all composite specimens using four probe methods. This method was used in the present work, the current and voltage leads were separated so that the contact resistance is not included in the voltage circuit. In the present work, a constant current from a Keithley 228A voltage / current source, The electrical resistance was calculated using ohm's law and knowing the dimensions of the specimen, the electrical resistivity of the materials was determined.

The differential scanning calorimetry studies conducted between room temperature to 600°C it gives heat flow as a function of temperature for the base alloy and the MMCs was studied. The rate of heating was 10°C / min. and the reference sample was indium. The phase transformations during aging were analyzed by EDS.

III. RESULTS AND DISCUSSION

3.1. Microstructure

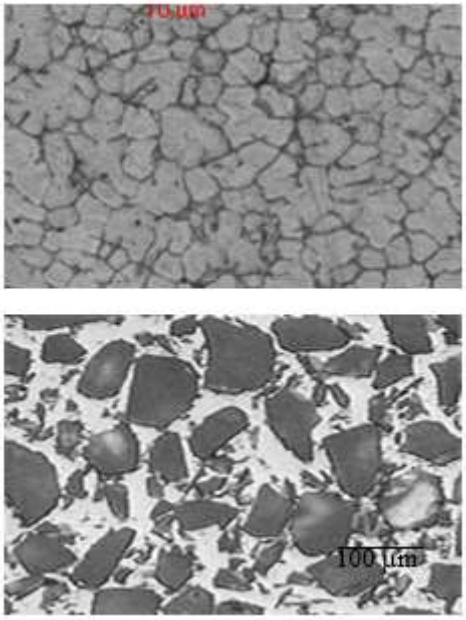

Fig.1: Microstructure of Al and Al/15%albite MMCs

MMCs properties can be determined based on their microstructure as well as distribution of reinforcement. Fig. 1 shows the albite distribution within the Al MMCs. The observation show that the particle uniform distribution and their size vary from 30 to 50 µm. As cast microstructure of MMCs show that the grain size is larger than that of Al/albite MMCs. The nucleation generally starts at colder particle due to temperature gradient between the particles and molten metal. The grain boundaries grow outwards from the reinforcement and caused to solute enrichment. The higher density metal ring is observed between matrix and reinforcement. But there is not gap is seen between them hence the particle is well bonded with matrix alloy.

3.2. Microhardness results

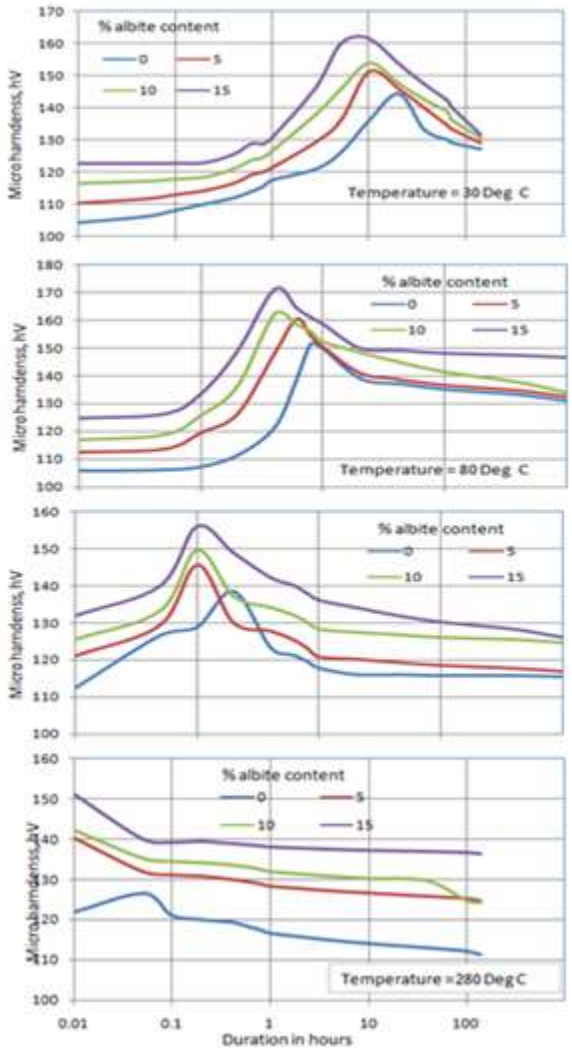

Fig. 2: Vickers microhardness curves of Al alloy and its composites obtained on aging at various temperatures.

The variation of micro-hardness as a function of aging time and aging temperature for the unreinforced as well as albite particulate reinforced Al6061 alloy MMCs is shown in Fig. 2. The plots indicate that in all the cases except at an aging temperature of 320°C, the hardness value initially increases with the increase in aging time. It continuously increased until it reaches the maximum values then it stable and finally decrease marginally with ageing time. The addition of albite has resulted in an increase in the hardness of the MMCs. Increasing hardness of MMCs due to dislocation density and difference in thermal properties of alloy and reinforcement.

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However, there is no significant difference in the hardness values of the composites and the matrix alloy for long aging duration. This dislocation density greatly influence on ageing precipitation during heat treatment. But as the MMCs overage, the dislocation becomes diluted within the matrix alloy hence the slight decrease in hardness during the overage conditions. The MMCs are generally faster reaction in both ageing and over aging hence the peak shift to left side. The maximum hardness peak temperature decreased with increasing albite addition due to faster reactions. In other hand higher aging temperature the aging reaction is faster (more precipitation) hence the shifting of maximum peak towards left in the graph. The peak is not seen at 320 °C ageing temperature for both matrix and reinforcement. This explains the shifting of the hardness peak towards lower aging time as the aging temperature increases. At a higher aging temperature of 320°C, peak is not observed since it must have been already achieved by the time the first observation was recorded.

3.3. Electrical resistivity results

The variation of electrical resistivity with aging time at 32, 80, 180 and 320°C for the Al6061matrix alloy and Al6061/albite particulate reinforced MMCs is shown in Fig. 3. It is observed that at all aging temperatures the overall variation of electrical resistivity with aging time may be categorized into three different stages. The resistivity initially sharply increased, then it maintained constant vales with ageing time and lastly the values sharply decreased with time. There is small difference could be seen in resistivity change between the Al and Al /albite composites. But the resistivity of composites slightly higher than that of the Al alloy. But at centre region of graph for the Al/albite composites are found to be smaller in length compared to matrix materials. In other case the resistivity of Al/albite composites showed drastically decreased at the higher ageing duration.

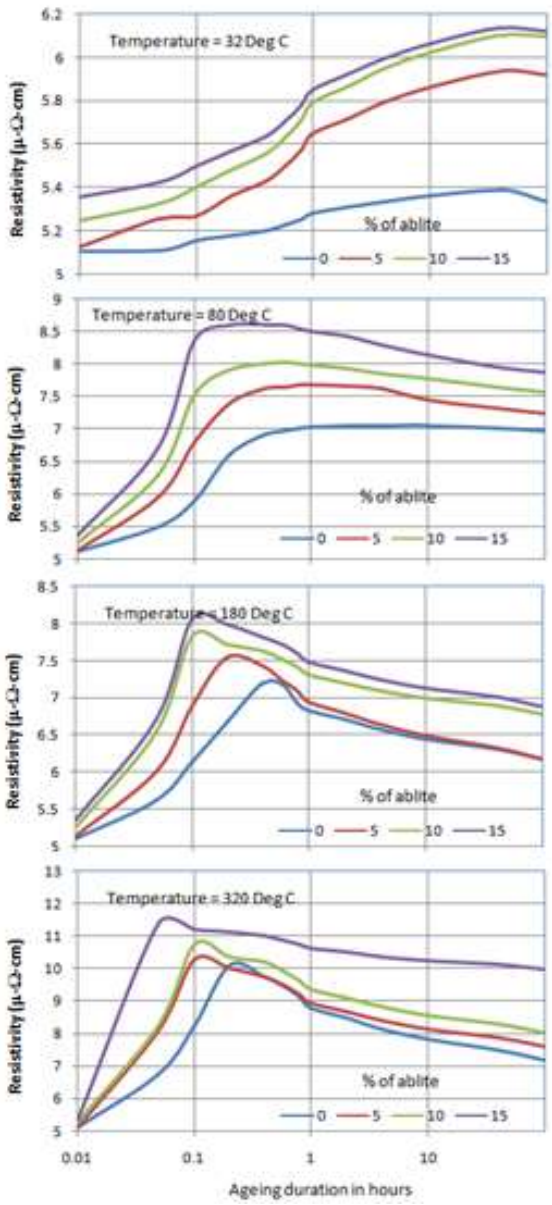

Fig. 3: Electrical resistivity curves of Al alloy and its composites obtained on aging at various temperatures.

3.4. DSC studies

The DSC thermograms of both Al alloy and Al/albite MMCs are plotted in Fig. 4. The all curves show that a unique exothermic peak with respect to their nature of precipitation process during ageing but endothermic peak their dissolution process. The peak precipitation temperature of composites depends upon the percentage of albite content. The temperature decreased with albite content due to accelerate the precipitation kinetics.

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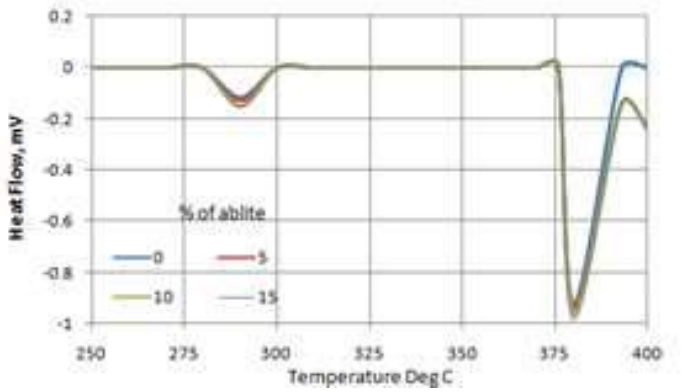

Fig.4: The result of the differential scanning calorimetry for the Al alloy and Al/albite composites

Previous works [9-11] on Al6061 alloys has provided some proof for precipitation concentration obtained by higher temperature as well as quenching rate. The precipitation process starts at 180 °C and their shape generally needle and it is Metaphase [12]. At higher temperature the enhancing the ageing time and clustering process which leads to finer precipitation. The precipitation chemical composition is β-Mg2Si which is main cause for higher hardness. The hardness is mainly depends on the arrangement and size of precipitation. Precipitate β-Mg2Si was small quantity could be seen in the Al/albite composites but evenly distribution could be seen in the aged matrix alloy.

IV. CONCLUSION

1. On quenching Al6061 alloys into cold water at 0°C after heat treatment, both precipitation and cellular reaction has been found to occur.
2. The hardness of both Al alloy and its composites sharply increased at beginning and reaches maximum peak then they decrease due to their dislocation density.
3. The similar trend was observed for electrical resistivity for both matrix alloy and composites but the property depends on phase transformation factors.
4. The maximum temperature decreased with addition of reinforcement due to reinforce particles acts as a nucleation sites.
5. In summary, the annealing temperature at 523 °C for 24h followed by aging at 180°C are recommended for Al/albite composites on the based on their temperature.

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Performance Analysis of Absorption Refrigeration Cycles

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Abstract— *The thermodynamic analysis of a vapor absorption refrigeration system employing ammonia as the refrigerant are presented. The thermodynamic analysis of these three combination of the absorption pairs namely NH_3/H_2O, $NH_3/LiNO_3$, $NH_3/NaSCN$ are performed. The best alternative to the ammonia water absorption pair are proposed as ammonia lithium nitrate and ammonia- sodium thiocyanate. It is very much important to select a prominent working substance and their properties have great effect on the system performance. Detailed thermodynamic properties of these fluids are expressed in polynomial equations. Energy and entropy balance equations are applied to analyse each of the process to estimate the individual heat transfer and entropy generation rates for all the systems. Among these three pairs NH3/ NaSCN yields the highest coefficient of performance. Cooling/Heating of the generator/absorber results in significant entropy generation in all the systems. The solution heat exchanger significantly improves the performance of the cycle and yields in the better cooling output.*

Keywords— absorption, refrigerant, evaporator, vaporizes, high temperature.

I. INTRODUCTION

In recent years, growing energy needs, cooling load demand in industrial, commercial, domestic sectors, scarcity of fossil fuels, rise in fuel price and faulty power supply have made people contemplate greater use of renewable energy sources. Apart from this, use of refrigerants with high global warming potential, CO_2 emissions from the combustion of fossil fuels in the power generation lead to effects detrimental to the environment. In such cases, alternative sustainable technologies are desirable to attain a holistic environmental safety.

Absorption refrigeration systems are environment friendly as they use low grade nts, industrial plants and automobile emissions, and the low global warming potential. Although huge efforts have been spared over several past decades in this field, COP of the sorption refrigeration system is still quite low compared to vapor compression refrigeration systems; thus there is an urgent need for further improvements in material, component and overall system design to make these systems a viable alternative to vapor compression systems.

Absorption refrigeration system uses various refrigerant-absorbent combinations known as the solution pairs, it is important to select the appropriate working substance the properties of which have a great effect on the performance of the cycles. The absorbent acts as a secondary fluid to absorb the primary fluid which is the refrigerant in its vapor phase. The most widely used working fluid pairs in absorption refrigeration system have been ammonia-water and water-lithium bromide solutions.

Table.1: Working pairs for refrigeration applications

Liquid-gas (Absorption/ Chemical reaction)	**Solid-gas (Absorption/ Chemical reaction)**	**Adsorption**
$CH_3NH_2/H_2O/LiBr$	$H_2O/LiCl$	$C_2H_5OH/PX21$
$CH_3NH_2/LiSCN$	H_2O/NaI	$C_3H_8/PX21$
$CH_3OH/LiBr$	H_2O/K_2CO_3	$CH_3NH_2/PX21$
$CH_3OH/LiBr/ H_2O$	H_2O/Na_2S	$NH_3/PX21$
H_2O/ H_2SO_4	$H_2O/MgCl_2$	$SO_2/PX21$
$H_2O/LiBr$	$H_2O/CaCl_2$	H_2O/Silica gel
$H_2O/NaOH$	$H_2O/CaSO_4$	$C_2H_5OH/TA90$
NH_3/H_2O	H_2O/LiB	$CH_3NH_2/TA90$

Assumptions used in the simulation

1. Simulations and analyses are performed under steady conditions.
2. Conditions of the refrigerant (ammonia) at the exits of the condenser and the evaporator are saturated.
3. The solution is at equilibrium conditions at the exits of the absorber and the generator and at the corresponding device temperatures
4. Pressure losses due to friction in the heat exchangers and the connecting piping are negligible.
5. Heat exchanges between the systems and the surroundings, other than that prescribed by heat transfer at the generator, evaporator, condenser and absorber, are assumed negligible.

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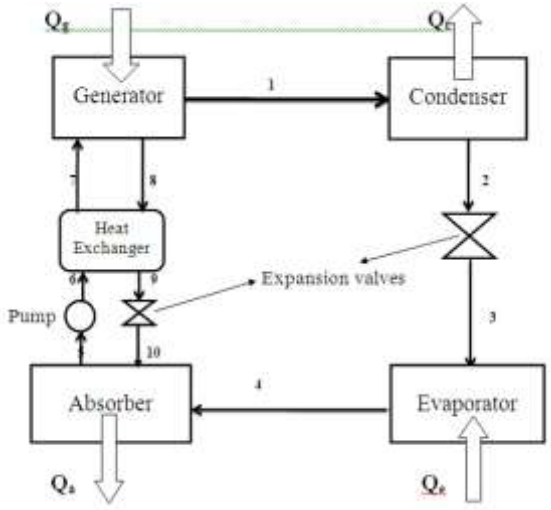
6. Simulations and analyses are carried out for a constant refrigeration capacity in all the systems.
7. The reference environment state for the system is the average temperature of the heat rejection media and 100 K Pa.
8. Salt properties such as density and specific heat are constant.

II. WORKING PRINCIPLE

The essential components of the vapor absorption system are an evaporator, an absorber, a generator, a condenser, a expansion valve, a pump, a solution heat exchanger. The compressor in the vapor compression system is replaced with an absorber, generator, pump, solution heat exchanger. Heat flows in the system at generator and it is directly added from the heat source like fuel burner, steam and work input takes place at pump for increasing the pressure and temperature what exactly compressor does in the vapor compression system. Heat rejection takes place at the absorber. The solution commonly used is aqua- ammonia.

Figure 1 shows the layout of the single effect absorption refrigeration system. The single effect cycle works between the two pressure levels, where higher pressure is at generator and condenser and the lower pressure is at absorber and evaporator. In this cycle the refrigerant used is the ammonia. High pressure liquid refrigerant 2 from the condenser passes into the evaporator 4 through an expansion value 3 that reduces the pressure of the refrigerant to the low pressure in the evaporator. The liquid refrigerant vaporizes in the evaporator by absorbing latent heat from the material being cooled and the resulting low pressure vapor 4 passes to the absorber, where it is absorbed by the strong solution 8 coming from the generator through an expansion value 10 and forms the weak solution 5. The weak solution exists in the absorber and its pressure is raised to the generator pressure by means of the pump 6 and this solution is pre heated by the solution heat exchanger 7 using the heat released by the strong solution 8 from the generator. The solution heat exchanger increases the cycle efficiency by avoiding the need to add that heat in the generator. In the generator a high temperature heat source is required to generate refrigerant vapor 1 from the weak solution. This refrigerant vapor 1 flows through the circuit and first becomes a liquid in the condenser and rejects heat to the cooling medium and the cycle repeats. The definition by ASHRAE to the weak/strong solution is that the ability of the solution to absorb the refrigerant vapor is weak/strong. If this cycle works on the ammonia water absorption pair then this had a added advantage of using the rectifier and analyzer to remove water vapor from the refrigerant mixture leaving the generator before reaching the condenser.



FIRST LAW OF THERMODYNAMICS

For the generator mass and energy balance is given

$m_7 = m_1 + m_8$ (total mass balance) …..1

$m_7 X_7 = m_1 + m_8 X_8$ (NH3 balance) ….2

$Q_g = m_1 h_1 + m_8 h_8 - m_7 h_7$

The flow rates of the strong and weak solutions are determined from the equations (1) and (12)

$$m_8 = \frac{1 - X_7}{X_7 - X_8} m_1$$

$$m_7 = \frac{1 - X_8}{X_7 - X_8} m_1 \quad \text{……..(3)}$$

The circulation ratio of the system is derived from the equation (3) as

$$f = \frac{m_7}{m_1}$$

The energy balance for the solution heat exchanger is as follows

$T_9 = E_{ex} T_6 + (1 - E_{ex}) T_8$

$$h_7 = h_6 + \frac{m_8}{m_6}(h_8 - h_9)$$

The increase in energy by using pumping is

$h_6 = h_5 + (P_6 - P_5) v_6$

$W_{me} = (P_6 - P_5) v_6$

The energy balance for the absorber is given by

$Q_a = m_4 h_4 + m_{10} h_{10} - m_5 h_5$

The energy balance for the condenser is given by

$Q_c = m_1 (h_1 - h_2)$

The energy balance for the evaporator is given by

$Q_e = m_1 (h_4 - h_3)$

The first law of thermodynamics for the basic cycle is given by

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$$Q_g + Q_a + Q_c + Q_e = 0$$

The ideal COP is given by

$$COP_{ideal} = \frac{(T_g - T_a)T_c}{T_g(T_a - T_c)}$$

III. RESULTS AND DISCUSSION

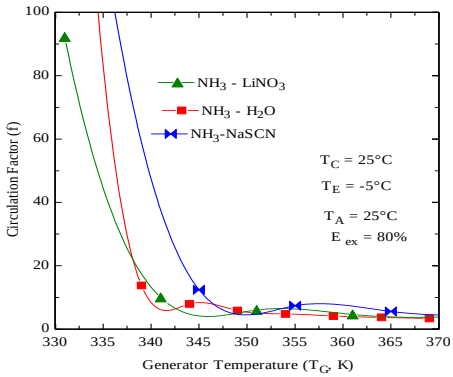

Fig. 2: Effect of COP on generator temperature

With the increase in the generator temperature the COP values also increases. By these comparision NH_3/NaSCN has the best performance where the generature is at its temperature in higher limit. The $NH_3/LiNO_3$ gives the best performance at its lower generator temperature that is by using the solar energy etc. NH_3/H_2O has the lowest performance.

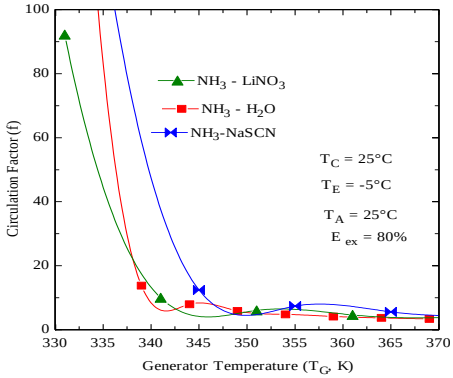

Fig. 3: Effect of circulation ratio with generator temperature

Comparison of the circulation factor values with the generator temperatures. The circulation ratio for the NH_3/NaSCN cycle is higher than that of the other two cycles. This is that either the solution pump needs to run faster or a bigger pump is required. If the generator temperature reaches its low temperature limit then circulation factor increases tremendously, but it is highly impossible to operate a cycle at low temperature.

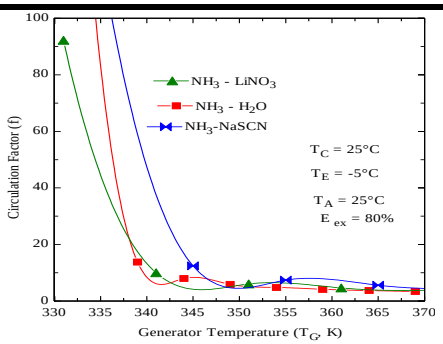

Fig. 4: Effect of COP on evaporator temperature

Comparison of the circulation factor values with the generator temperatures. The circulation ratio for the NH_3/NaSCN cycle is higher than that of the other two cycles. This is that either the solution pump needs to run faster or a bigger pump is required. If the generator temperature reaches its low temperature limit then circulation factor increases tremondeously, but it is highly impossible to operate a cycle at low temperature.

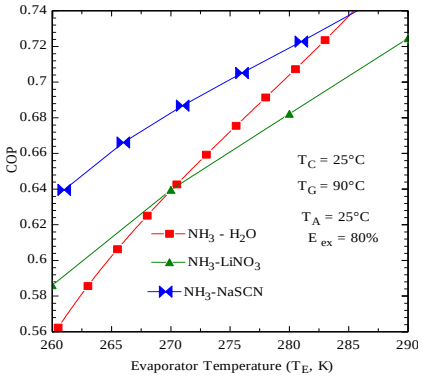

Fig . 5: Effect of circulation factor with Evaporator temperature

Comparision of the COP values with the evaporator temperature for the three absorption pairs. With the increase in the evaporator values the COP values also increases. But for the evaporator temperature lower than zero temperature range for the refrigeration the NH_3/NaSCN gives the better performance and the ammonia/water cycle has lower COP values. However for the high evaporator temperatures the performance of the ammonia/water pairs gives better than $NH_3/LiNO_3$.

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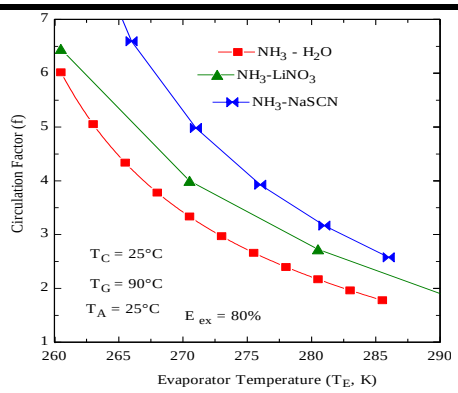

Fig. 6: Effect of COP on condenser temperature

The comparison of the circulation factor with evaporator temperature over the three absorption pairs. But the circulation factor for the NH_3/NaSCN cycle has best performance and is higher than the other two cycles.

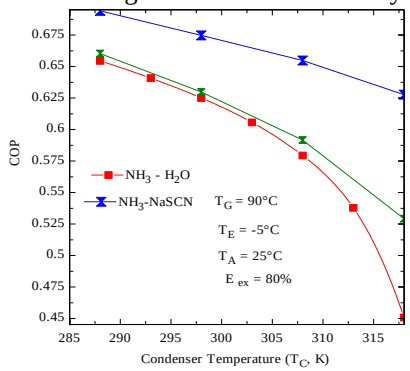

Fig. 7: Effect of circulation factor with condenser temperature

Comparison of the COP values with the change in the condenser values for all the three absorption pairs. By the increasing in the condenser temperature results in the decrease in the COP values. For the lower condenser temperature the absorption pair NH_3/NaSCN pair has better performance and for higher condenser temperatures the absorption pair $NH_3/LiNO_3$ has the better performance.

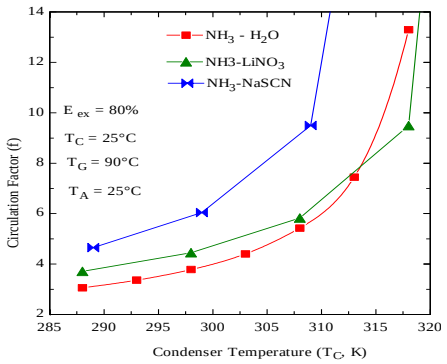

Fig. 8: Effect of COP with Absorber temperature

Comparison of the circulation factor with the condenser temperature for all the three absorption pairs. By the increase in the condenser temperature the circulation factor values also increases. And among all these the absorption pair ammonia/sodium thiocyanate has the better performance.

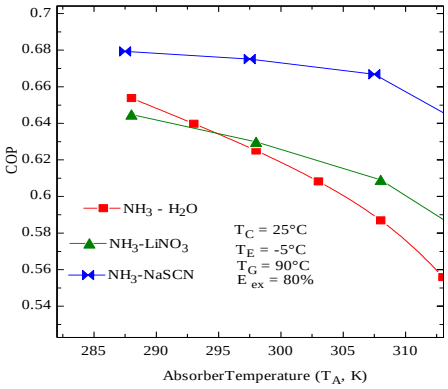

Fig. 9 : Effect of circulation factor with Absorber Temperature

Comparison of the effect of COP values with the absorber temperature for all the three absorption pairs. The effect of the absorber temperature is as similar to the condenser temperature values. As our assumptions both the condenser and the absorber should be at the same level. As on the absorber temperature increases there is a decrease in the COP values.

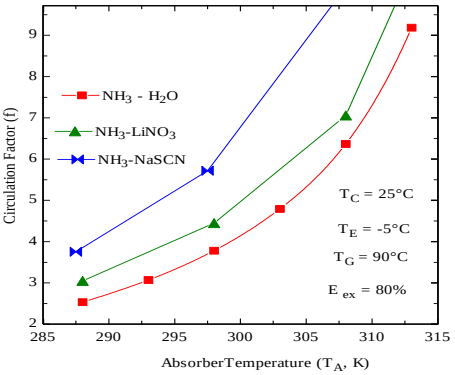

Fig. 10: Effect of external entropy with Generator temperature

Comparison of the circulation factor with the increase in the absorber temperature for all the three absorption pairs. The effect of the absorber temperature is as similar to the condenser temperature as they are working at the same temperature levels. As on the absorber temperature increases there is a increase in the circulation factor. Among these three absorption pairs the NH_3/NaSCN has the higher value than the remaining two absorption pairs, next to that $NH_3/LiNO_3$.

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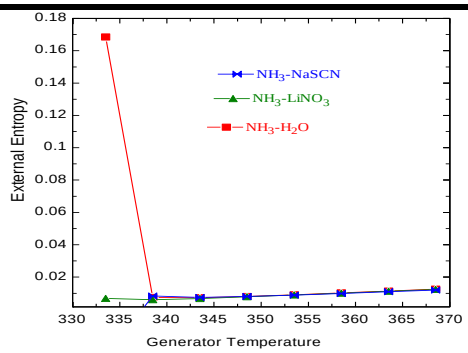

Fig. 11: Effect of Internal Entropy with Generator temperature

Comparison of the effect of the external entropy with the generator temperature for all the three absorption pairs. By the increase in the generator temperature the external entropy slightly increases for the two cases that is ammonia/sodium- thiocyanate and ammonia/lithium nitrate. For the absorption pair ammonia/water first at the initial condition it increases tremendously and then falls suddenly to a lower value and slightly increases. This external entropy is due to the heat transfer between the heat source and the generator

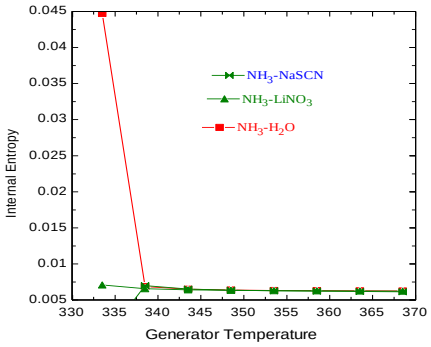

Fig .12: Effect of Total Entropy with Generator Temperature

For the absorption pair ammonia/water first at the initial condition it increases tremendously and then falls suddenly to a lower value and slightly increases. By the increase in the generator temperature the internal entropy slightly increases for the two cases that is ammonia/NaSCN and ammonia/lithium nitrate.

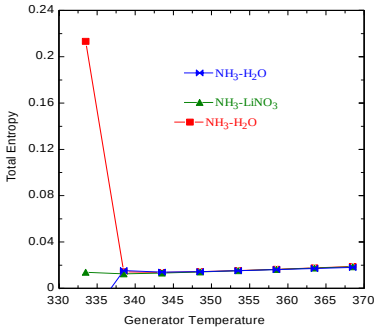

Fig .12: Effect of Total Entropy with Generator Temperature

Comparison of the effect of the total entropy with the generator temperature for all the three absorption pairs.For the absorption pair ammonia/water first at the initial condition it increases tremendously and then falls suddenly to a lower value and slightly increases. By the increase in the generator temperature the total entropy slightly increases for the two cases that is ammonia/ NaSCN and ammonia/lithium nitrate. Here total entropy is by the sum of internal and external entropy.

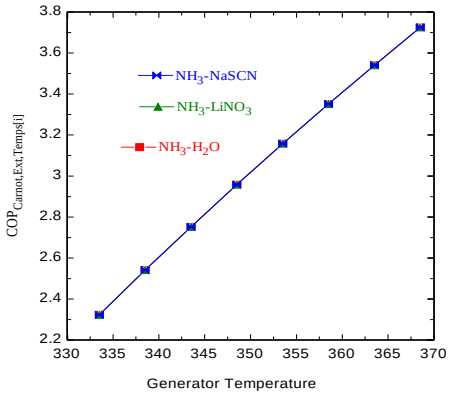

Fig.13 : Effect of carnot COP with Generator Temperature

Comparison of the Carnot COP to the generator temperature is given for the three absorption pairs. As the generator temperature increases the Carnot COP also increases similarly for all the three. Here Carnot COP is considered as the base line COP and compared with them.

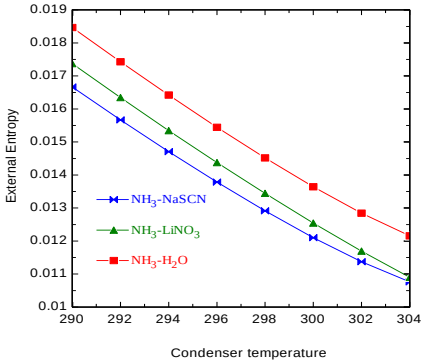

Fig .14: Effect of External Entropy with condenser temperature

Comparison of the effect of external entropy with the condenser temperature for all the three pairs that are used for the absorption. Here as the condenser temperature increases the external entropy decreases for all the three pairs. Among them the absorption pair ammonia/water has the highest entropy generation, next to that ammonia/$LiNO_3$ has the highest external entropy. The lowest entropy generation is for the ammonia/NaSCN absorption pair.

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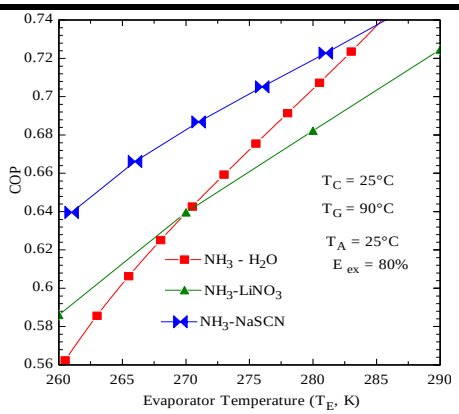

Fig . 15: Effect of Internal entropy with condenser temperature

Comparison of the effect of internal entropy with the condenser temperature for all the three pairs that are used for the absorption. Here as the condenser temperature increases the internal entropy also increases for all the three pairs. Among them the absorption pair ammonia/water has the highest internal entropy generated, and next to that ammonia/$LiNO_3$ has the highest internal entropy. The lowest internal entropy generation is for the ammonia/NaSCN absorption pair.

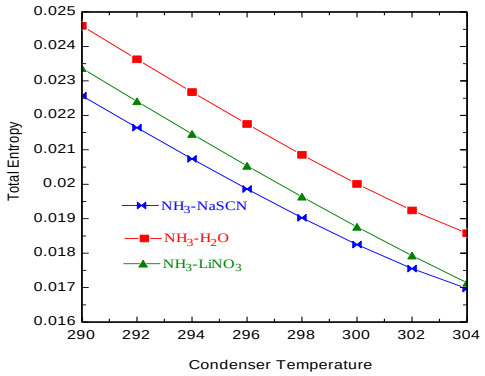

Fig. 16 : Effect of total entropy with Condenser temperature

Comparison of the effect of external entropy with the condenser temperature for all the three pairs that are used for the absorption. Here as the condenser temperature increases the total entropy decreases for all the three pairs. Among them the absorption pair ammonia/H_2O has the highest total entropy generated and next to that ammonia/$LiNO_3$ has the highest total entropy. The lowest total entropy generation is for the ammonia/NaSCN absorption pair. Total entropy is obtained from the both internal and external entropy.

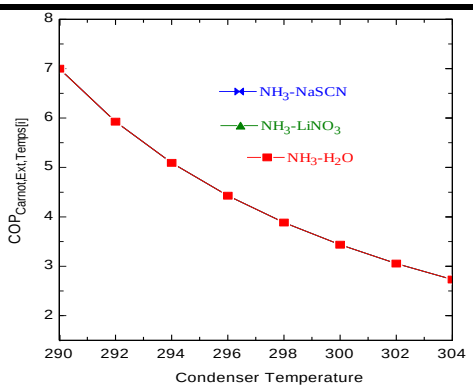

Fig.17: Effect of Carnot COP with Condenser temperature

Comparison of the Carnot COP to the condenser temperature is given for all the three absorption pairs. As the condenser temperature increases the Carnot COP decreases similarly for all the three absorption pairs. Here Carnot COP is considered as the base line COP and compared with these three absorption pairs and the COP that is obtained from the first and second laws is compared.

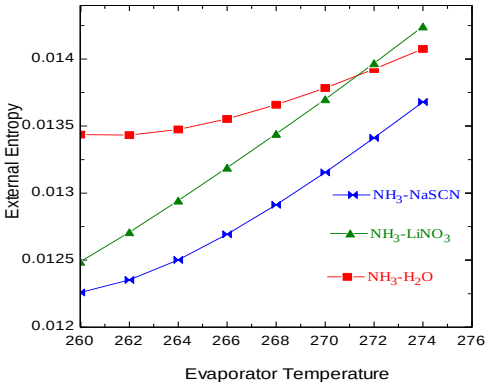

Fig.18: Effect of the External entropy with evaporator temperature

The effect of the external entropy with the evaporator temperature for all the three absorption pairs are compared. As the evaporator temperature increases the external entropy also increases. Among all these absorption pairs NH_3/H_2O has the highest entropy but as the evaporator temperature is increasing there is a sudden increase in the ammonia/$LiNO_3$ at the end and increases than NH_3/H_2O pair. The lowest entropy is for the ammonia/NaSCN pair.

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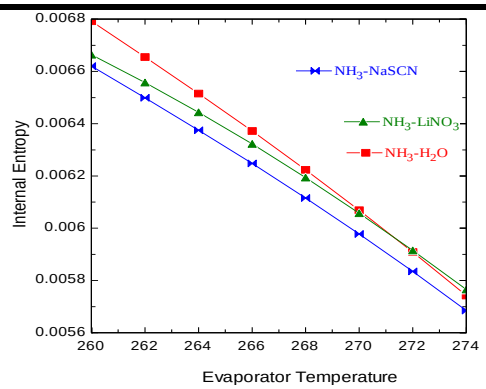

Fig.19: Effect of internal Entropy with evaporator Temperature

As the evaporator temperature increases the internal entropy also decreases. Among all these absorption pairs NH_3/H_2O has the highest entropy but as the evaporator temperature is increasing there is a sudden increase in the ammonia/$LiNO_3$ at the end and increases than NH_3/H_2Opair.

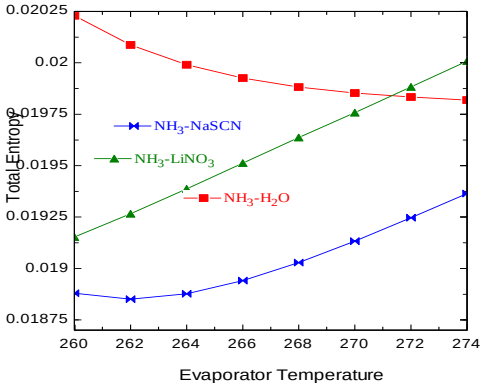

Fig. 20: Effect of the Total Entropy with Evaporator Temperature

The total entropy for the ammonia/water first increases and then decreases slightly. For the ammonia/lithium nitrate it increases and has the highest value as on the evaporator temperature increases. As usual the entropy is lowest for ammonia/sodium thiocyanate absorption pair.

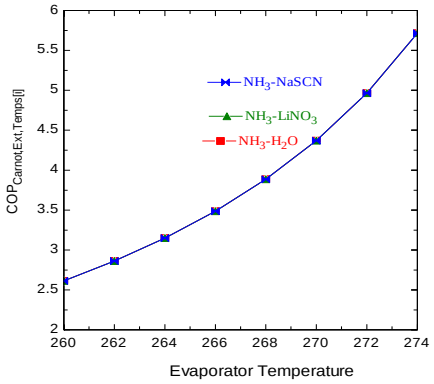

Fig. 21: Effect of the Carnot COP with the Evaporator Temperature

Comparison of the Carnot COP to the evaporator temperature is given for the three absorption pairs. As the evaporator temperature increases the Carnot COP also increases dramatically for all the absorption pairs. Here Carnot COP is considered as the base line COP and compared with the first and second law COP.

IV. CONCLUSIONS

1. Results for all the three combinations of the absorption pairs such as ammonia/water, ammonia/lithium nitrate and ammonia/sodium thiocyanate are compared.
2. The ammonia-water absorption pair is mainly used for the refrigeration temperatures below 0^0c.
3. The thermodynamic properties of these absorption pairs are expressed in polynomial equations.
4. The performances against various generator, absorber, condenser and evaporator are compared for all the three absorption pairs.
5. The result shows that the ammonia/NaSCN and ammonia/$LiNO_3$ gives the better performance than the ammonia/H_2O pair.
6. The absorption pairs have the better performance not only because of the higher COP but also because of the no requirement of analyzers and rectifiers.
7. Ammonia/NaSCN cycle cannot operate at the evaporator temperature below -10^0c for the possibility of crystallization.
8. But generally speaking ammonia/ sodium thiocyanate and ammonia/ lithium-nitrate have similar performance but operate at higher and lower temperature limits.
9. The first law and second law analysis are carried out and the COP's are compared.
10. Energy and entropy balance equations are applied to analyze each of the process to estimate the individual heat transfer and entropy generation rates for all the systems.
11. The entropy generated is higher for the ammonia/water pair and least for the ammonia/sodium thiocyanate pair.

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Review Papers Related to k-cordial of Research Labeling of Graphs

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Review of a Research Paper entitled, "*A*-cordial Graphs".
Concise Summary:
Author: Mark Hovey.
Published in: Discrete Mathematics, Vol. 93 (1991), 183-194.

This paper contains the results on *k*-cordial labeling. The author proved that trees are *3*, *4* and *5* cordial. Further the author conjecture that all trees are *k*-cordial for all *k*. The author provides a partial classification for cycles and complete graphs to become *k*-cordial. He also proved that for even *k* and $k > 4$, most graphs are not *k*-cordial.

Evaluation of Paper:

1. Positive Aspects:
(i) The language used in the paper is easily comprehensible.
(ii) The concept of *A*-cordial labeling is introduced and further categorization of it is done as *k*-cordial, *e*- cordial, *n*-cordial and *2*-cordial.
(iii) The author has extensively worked on *k*-cordial labeling.

2. Negative Aspects:
(i) The paper is indistinctly written.
(ii) Each and every case of the theorem clarified with examples.

3. Discrepancy:
Deviation in the proof of the result Cycles are *k*-cordial for all odd *k*. (for $n < k$)

Further Comment:

In this paper the author has predicted that for *k* even and $k > 4$, most graphs are not *k*-cordial. But in the course of the paper he has not been able to prove it correctly.

Review of a Research Paper entitled, "On *k*-cordiality of Cycles, Crowns and Wheels"
Concise Summary:
Author: Tao Ruihua.
Published in: Systems Science and Mathematical Sciences, Vol 11, No 3 (1998), 227-229.
In this paper the author proved the conjuncture "Cycles are *k*-cordial for all even *k*" made by M. Hovey. The author also proved the *k*-cordiality of crown and given a general statement for *k*-cordiality of Wheels under certain Conditions

Evaluation of Paper:
1. Positive Aspects:
(i) The language used in the paper is easy to understand.
(ii) Examples are cited for each result to make it understandable.
2. Negative Aspects:
(i) The pattern in the proof of the result Crowns are *k*-cordial is not written in general form.
(ii) More examples should be given.
(iii) The proof the statement wheel *Wn* is *k*-cordial is not given.

3. Discrepancy:
The Proof of the Theorem Crowns are *k*-cordial is not at all clear.

Review of a Research Paper entitled, "On cordial *k*-Labeling"

Concise Summary:
Author: Maged Z. Youssef.
Published in: Australian Journal of Combinatorics, Vol 43 (2009), 31-37.
This paper includes some necessary conditions for a graph to be *k*-cordial for certain values of *k*. The author also gives some new families of *4*-cordial graphs.

Evaluation of Paper:
1. Positive Aspects:
(i) The language used in the paper is easy to understand.
(ii) The paper is mathematically sound.
(iii) He has given relation between *k*-cordial labeling and other labeling.

2. Negative Aspects:
(i) The pattern is not given in the proof in all theorems.

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(ii) Not a single general result is given to justify the title of the paper.

Further Comment:

The necessary condition for *k*-cordial labeling is given without proof for certain values of *k*.

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Classification of Human Skin Diseases using Data Mining

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Abstract— *Many Information can be extracted from the data that are hidden in images. The extraction process can be done using data mining techniques. In this paper, the researcher will use a system based on the decision tree for mining and processing image data. This system will be used for classification of human skin diseases. The researcher will try to use the decision tree and digital image processing principals to detect skin diseases using some features found in a digital image for a skin. The major steps involved in the system are: pre-processing, features extraction and decision tree classifier. This system enhances the classification process to be more accurate. The physicians can make use of this accurate decision tree classification phase for classifying the skin images. The system is designed and implemented on MATLAB and is tested with the images of various databases.*

Keywords—Expert system, Data Mining, Image Processing, Skin Diseases, Decision Tree.

I. INTRODUCTION

Knowledge Discovery and Data Mining are rapidly evolving areas of research that are at the intersection of several disciplines, including statistics, databases, AI, visualization, and high-performance and parallel computing. People in business, science, medicine, academia, and government collect such data sets, and several commercial packages now offer general purpose Knowledge Discovery and Data Mining tools. An important Knowledge Discovery and Data Mining goal is to "turn data into knowledge." For example, knowledge acquired through such methods on a medical database could be published in a medical journal. Knowledge acquired from analyzing a financial or marketing database could revise business practice and influence a management school's curriculum [1]. Valuable information can be hidden in images, however, few researches discuss data mining on them[2]. Further development of a computer-assisted diagnosis is associated with the use of new intelligent capabilities such as data mining, which allow discovering the relevant knowledge for image analysis and diagnosis from the database of image descriptions. The application of data mining will help to get some additional knowledge about specific features of different classes and the way in which they are expressed in the image. The decision tree method has been used to classify the medical images for diagnosis An additional advantage of data mining application for the decision of medical or other tasks is on the long-run the opportunity for creation of fully automatic image-diagnosis systems that could be very important and useful in the case of lack of knowledge for decision-making . Classification is one of the most common applications for data mining[3]. Classification is an important form of knowledge extraction, and can help make key decision[4]. It corresponds to a task that occurs frequently in everyday life. For example, a hospital may want to classify medical patients into those who are at high, medium or low risk of acquiring a certain illness, an opinion polling company may wish to classify people interviewed into those who are likely to vote for each of a number of political parties or are undecided, or we may wish to classify a student project as distinction, merit, pass or fail. Decision Tree have been a powerful and attractive tool in the field of classification, mainly because they produce easily interpretable and organized results. In general computationally efficient and capable of dealing with noisy data[4]. Image mining is more than just an expansion of data mining to image domain. It is an interdisciplinary challenge that draws upon proficiency in computer vision, digital image processing, image extraction, data mining, machine learning, databases, and artificial intelligence[5].

II. BACKGROUND

One of the problems that arises in any collection of data is the classification. The classification is important in many fields. One of these fields is image classification (medical image classification). The classification process depends on the principal of data mining, especially image mining, and can be done using one technique in data mining that is called decision tree. The decision tree will be used to classify medical skin diseases images. This classification can done using a system consists of the following phases on images: pre-processing, features extraction and decision tree classifier. This system is very important and useful for physicians to detect skin diseases

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of the human and so to determine the suitable medicine for that disease.

In this paper, the researcher will propose a system to detect and recognize skin diseases in human. The system will distinguish between normal skin and infected skin. The distinction is based on using data mining techniques, specifically the decision tree, and image processing to extract the important features used in classification process. This system can be used by physicians to make the recognition process for skin diseases more accurate depending on a database of skin images.

III. RELATED WORKS

At the existing conditions of computerized skin diagnosis systems, there are some workarounds. Access closed which are still under and research developments. And it is determined some restrictions and barriers in those and therefore this solution tries to overcome the problems that exist together with different take.

a) An automated system for recognizing disease conditions of human skin

In this model, the condition of the skin disease is identified by evaluating skin disease images by using grey normalized symmetrical simultaneous occurrence stencils (GLCM) method. The proposed system is used in an efficient and economical for the automatic recognition of skin diseases. This system is useful for the skin to reduce the error with medical diagnosis. Another is the first test for patients in rural areas, where the good doctors are missing. The system works with relational databases to the storage of implying the need for textual skin images. This system can also work for same type of images directly over feature vectors [6].

b) Image-based diagnosis method

This system mainly focuses on diagnosing diseases of skin that are occurred by viruses and bacteria. This system used image of the diverse area and those images are taken and then machine learning techniques and image processing applied to train the computer to diagnose the skin disease. This is an optional diagnosis method for these skin diseases and it is safe and no risks, side effects or inconveniences from the patient perspective. It also gives advantageous to doctors because it is fast and can be implemented in various ways (mobile phones, computers and digital cameras). And also it can be safely used by non-Specialized medical personnel. First, the patients were clinically analyzed by a professional (dermatologist/medical doctor), then laboratory tests were conducted to foresee and confirm the skin disorder. The doctor then apprehended some images from the patients whose results showed that they had a viral or bacterial infection [7].

c) Expert System for Diagnosis of Skin Diseases

This system is developed for diagnosing skin diseases which allow user to identify diseases of the human skin to provide advises or medical treatments in a very short time period. The system uses technologies such as image processing and data mining for the diagnosis of the disease of the skin. The image of skin disease is taken and it must be subjected to various processing for noise eliminating and enhancement of image. This image is immediately segmentation of images using threshold values. Finally data mining techniques are used to identify the skin disease and to suggest medical treatments or advice for users[8].

d) The Development of Online Children Skin Diseases Diagnosis System

A system enables the user recognize skin diseases confronted of children through the Internet and make user for advice or Treatments in the shortest period of time. The is based on law and the ahead was used a sequence heuristics engine for development From the system. With this system, to assist and allows the user to Recognition of Pediatric. Dermatology through the Internet and offer helpful Proposal the user[9] .

IV. ARCHITECTURE OF THE PROPOSED SOLUTION

An Expert System for the diagnosis of skin disease. In our situation we need resolved teams of the pattern first step in styles having a system to retrieve all the images to a particular level as styles is much more obvious to use no noisy and unwanted data then we extract specific features like the colors characteristics can be used to create a model classification the area. With this system model at last classification a predictable disease of the a new image from the skin disease. Building on once more on such diseases prophesied system would ask a user constitute and is based on the system and the answer is decides to the type of disease is the case with used again in the data mining technique. Eventually refers or a medical the tips that are based on the expected to as a result of a skin disease therapy system.

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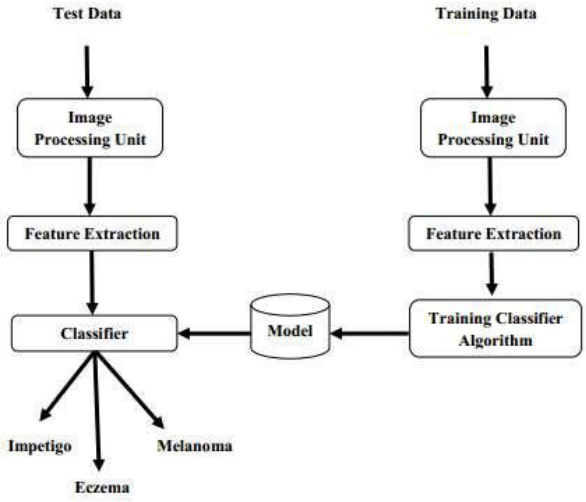

Fig. 1: Architecture of the System

This paper there is plenty of searching in an image data preparing and mining of find out what are most effective method of more accurately using the techniques and getting the best solutions for skin diseases to identify and diagnose. Search consists of three portions .

1. Processed image, and dividing and an advantage essence.
2. Model of classification and attribution skin disease.
3. The medical treatment or advice suggestions.

V. THE EXPERT SYSTEM

A. IMAGE PROCESSING

The image processing is the main part in the design process at an expert system. In the beginning needed to define the affected the area of skin disease that part of The image processing of this process must be It has been implemented. Imaging provide techniques and processes in creating images of human body or samples for clinical purposes medical science or for knowledge discovery. Digital image processing involves the screening of a region for processing and saving this region to a location (possibly a file) for processing [10]. Image process of adjusting digital image so that the result are more suitable for display or further image analysis for example can remove noise sharpen or brighten of digital images, making easier to identify key feature[11]. The detection of skin disorders and their evaluation is divided into some basic steps[12]. The image processing and image filtering techniques. The mathematical concepts of convolution and the kernel matrix are used to apply filters to signals, to perform functions such as extracting edges and reducing unwanted noise the Sobel operator and Gaussian smoothing filter are implemented in MATLAB to achieve the functions previously mentioned, and are evaluated on test images. The effects of adding Gaussian and 'salt and pepper' noise before filtering are then presented as an approximation to signals that occur in real applications. Pre-processing images before applying other filters is shown to produce improved results when extracting edges from images with noise[13]. Gaussian filtering g is used to blur images and remove noise and detail. In one dimension, the Gaussian function is:

$$G(x) = \frac{1}{\sqrt{2\pi\sigma^2}} e^{\frac{x^2}{2\sigma^2}} \quad (1)$$

Using algorithms in the image cutting to the Background Removal from the image process. We separate the area from the disease. A will then be done with retail the image of the picture. Is feature extraction out of and then send the extracted features to the unit data for diagnosis the extraction shows Figure 2 Image processing.

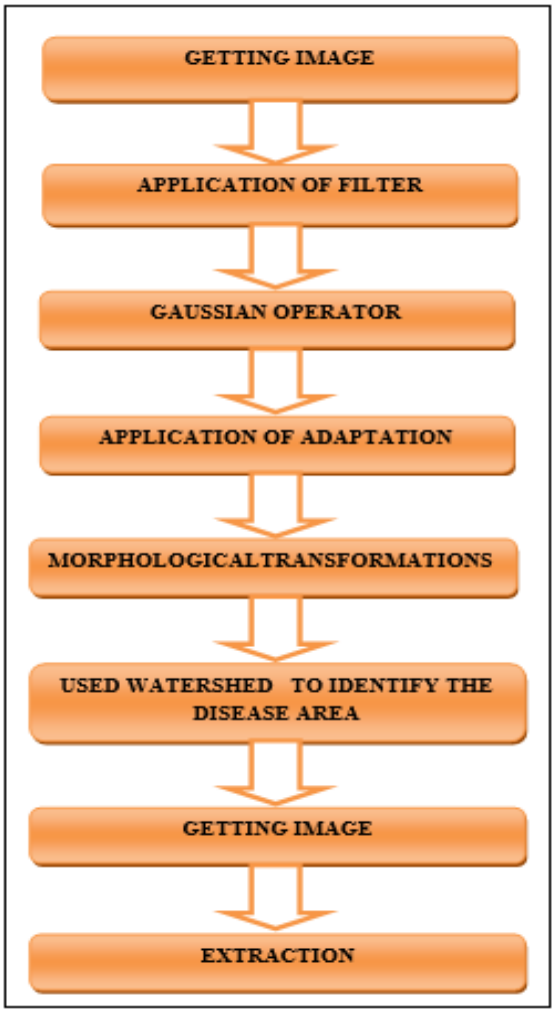

Fig. 2: Image processing

B. DATA MINING

Data mining is the extraction of hidden predictive information and unknown data, patterns, relationships and knowledge by exploring the large data sets which are difficult to find and detect with traditional statistical methods. Data mining it is powerful technology which

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will discover most important information from the data warehouse of the organizations. It is a very crucial step that collectively examine large amount of routinely data[14]. Data mining is the process of extracting meaningful information from large database. In Medical field the problem may arise in the era data mining has vital role to predict and diagnosis the disease in early stage with the use of machine learning tool[15]. Data Mining and KDD Process Furthermore before conducting a review and analysis work, we first have to understand what data mining is as the main area of the study declared that data mining came into existence in the middle of 1990ʺs and appeared as a powerful tool that is suitable for fetching previously unknown at tern and useful information from huge dataset. Various studies highlighted that data mining techniques help the data holder to analyze and discover unsuspected relationships among their data which in turn helpful for decisions making stated that a data mining is a technique that deals with the extraction of hidden predictive information from a large database. It uses sophisticated algorithms for the process of sorting through large amounts of data sets and picking out relevant information. Data mining the Analysis step of the Knowledge Discovery in Databases process, or KDD a relatively young and interdisciplinary field of computer science, is the process of extracting Patterns from large data sets by combining methods from statistics and artificial intelligence with database management coined that the term Knowledge Discovery in Databases, or KDD for short, refers to the broad process of finding knowledge in data, and emphasizes the "high-level" application of particular data mining methods. It is of interest to researchers in machine learning, pattern recognition, databases, statistics, artificial intelligence, knowledge acquisition for expert systems and data visualization. Furthermore researcher had presented an outline of the steps of the KDD is the last stage as shown in Figure 3[16].

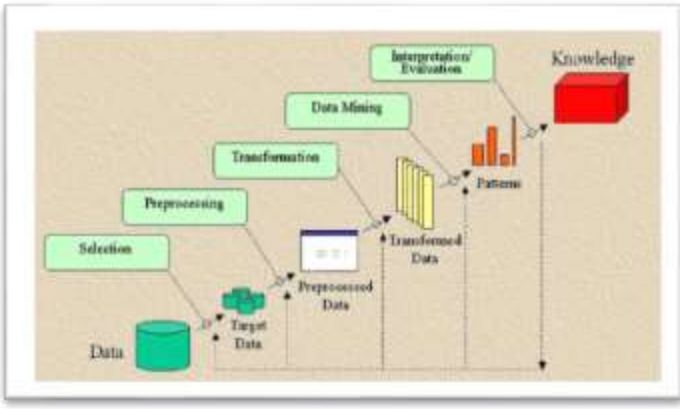

Fig. 3: Stages of Knowledge Discovery Process (KDD)

Data mining algorithms are needed in almost every step in KDD process ranging from domain understanding to knowledge evaluation. It is necessary to identify and evaluate the most common data mining algorithms implemented in modern .Determining performance of data mining solutions require much time and effort. Data mining algorithms may give in better results for one type of problems while others may be suitable for different ones. The need is for algorithms with very high accuracy as medical diagnosis is considered as a significant yet obscure task that needs to be carried out precisely and efficiently[17]. The descriptive data extraction model is to find patterns in the data and identifies the correlation between traits actress in the data. In contrast, the intended to mining predictive input model largely to predict future results.

C. DECISION TREE

Decision tree produces recognition or regression products through a tree construction. It splits a dataset into smaller subsets while at the same time connected decision tree is incrementally developed. The final result is a decision tree with decision nodes and leaf nodes[18]. Decision tree is a predictive data mining techniques often used in clinical medicine to easily visualize, and understand resistant to noise in data. And is applicable in both regression and association data mining tasks[19]. Tree induction decision trees are used to predict and/or classify tree are two phases, the training and implementation. During the training phase, the data set is partitioned iteratively[20]. In this, the target concept is represented in the form a tree, where the tree is built by using the principle of recursive partitioning. In this, attributes are selected as a partitioning attribute or as a node based on the information gain criteria and then the process continues repeatedly for every child node until all attributes are considered and a decision tree is constructed. Some pruning techniques may further be considered so that the size of the tree is reduced and the overfitting is thereby avoided[21]. Be used to create a model for predicting rating assessing skin disease expert system predicted the results is a major task in the system c expert suggests classification algorithms to predict skin disease**.**

VI. CONCLUSION

The main of this paper is to focus is the use of a proposed program and using image processing can predict and resolve enormous applications. The discovery of knowledge from large amounts of data considering both the result of which is obtained by way of images and the way the questionnaire addressed. That means, we will have a system made up with many of the questions prepared by the system from the user. And the system to

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get help answer that was given to the above questions for the skin disease diagnosis. In this system administrator can manage information from a skin disease, symptoms, medical treatment and suggestions and prepared a statement to display the description of the skin disease.

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A Review on use of Mistake Proof (Poka Yoke) Locating Fixture on Ultra SD Cartridge Assembly Line

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Abstract— *Manufacturing defects are the major concern of all manufacturing industries. These defects occur due to poor material quality or lack of skilled labour. This paper focuses upon one such operation that was dependent on the skills of the operator which was deskilled by one of the successful devices in lean production which is used to eliminate waste caused by errors i.e 'mistake-proofing' or 'Poka-yoke'. The use of Poka Yoke in the Ultra SD Cartridge assembly operation eliminated the requirement of skilled operator. This was effectively done by introducing a new locating fixture on the assembly line.*

Keywords— Poka Yoke , Deskilling of operations, locating fixture.

I. INTRODUCTION

A "manufacturing defect" is a problem that becomes part of the product when it is made. The two most common causes of manufacturing defects are poor-quality materials and carelessness in putting the product together, or shoddy workmanship. A manufacturing defect is one that could be made less dangerous, or gotten rid of altogether, if the product were made with better-quality materials or was made by a more careful and experienced worker. The manufacturing industries are constantly shifting to new areas in order to obtain cost effective and economic resources. The Experienced workers may not be available at these places and therefore it is very important for any manufacturing industry to reduce its dependence on the skilled labour. This dependence on the skilled labour was very high in lock manufacturing industry and to reduce this dependence a Lean manufacturing tool (Poka Yoke) was used.

In any industry, to reduce the dependence on skilled labour, it is very essential to identify the key areas where the skilled employee plays a key role. After the identification of these defect causing area , the process should be altered in such a way that the work done by the skilled operator is replaced by some sort of machine or device which is an essential part of the process itself and can be moved wherever required. In this paper we have discussed about a Defect that could have occurred on the Ultra SD Cartridge Assembly Line after its shifting to the new factory location due to lack of Skilled labour.

II. THE PIN FILLING PROCESS OF ULTRA SD CARTRIDGE ASSEMBLY

The Ultra SD Cartridge is a Level 2 security Product, which is commonly used in safe deposit locks. The Ultra Sd Cartridge was made by assembling 4 products

1. Ultra SD Cylinder + Housing subassembly
2. (Note: Ultra SD Cylinder + housing is written as CH for convenience)
3. 2. The operating pin
4. 3. The driver pin
5. 4. The Spring

The ultra SD cylinder + housing are prepared in three stages. The CH consists of three rows of drilled holes and at each stage a specific row is pin filled according to the provided combination of pin.

It is very important to select the row at each stage, because a minute mistake in this could lead to malfunctioning of the entire lock.

The process of Ultra SD Cartridge Assembly is explained below.

The Pin filling process

1. The operator picks up an Ultra SD Cylinder + Housing from the tray
2. The operator inspects the lock manually and aligns the lock CH with respect to the drilled holes
3. The operator puts the lock CH on the the fixture with the row to be filled on the topmost surface
4. The operator fills 4 operating pins from the pin tray within the CH by observing the combinations on the HMI Screen
5. The operator fills 4 driving pin pins from the pin tray within the CH

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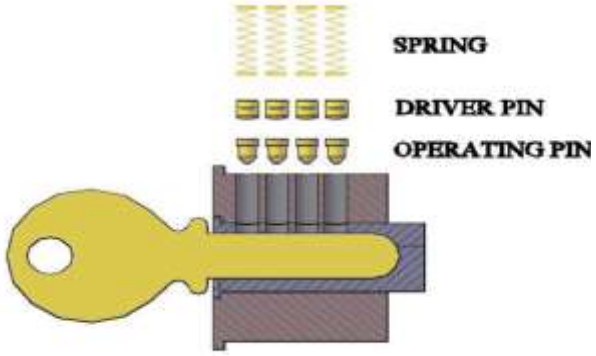

Fig.2.1: Assembled Ultra Sd Cartridge

III. THE PROBLEM

The above highlighted operation is the step where the skills of the operator were required.

The Ultra SD Cylinder + Housing Subassembly had a reference hole on the collar .which was observable from in the front view.

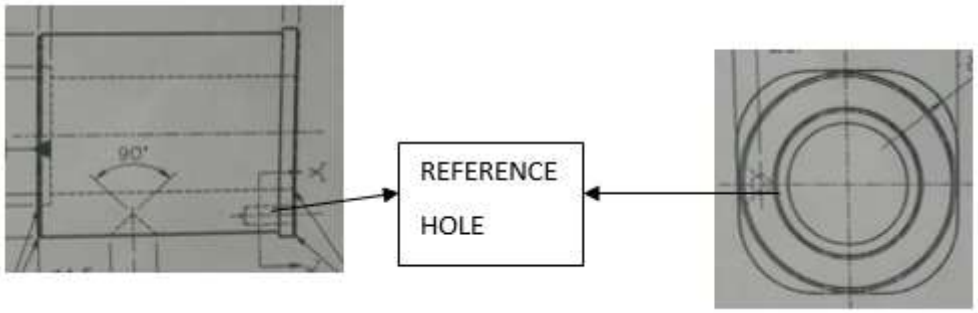

Fig.3.1: Front View of CH

This reference hole had a specific position for each row when it was on the topmost surface .The row which was on the topmost surface was pin filled by the operator.

Therefore to get the desired row on the top most surface it was very essential to locate the position of this reference hole. This was the area where the skilled operation was required .Depending upon the problem various all the devices were observed and the following solution was implemented.

Functions of a Fixture:

1. To increase the production.
2. To assure the high accuracy of the parts.
3. To provide for interchangeability.
4. To enables heavy and complex shaped parts to be machined by holding rigidly to a machine.
5. To control quality control expenses.
6. Less skilled labour.
7. Saving labour.
8. There use partially automates the machine tool.
9. Improve the safety at work, thereby lowering the rate of accidents

Function of a Locator:

1. To Locate the Part
2. To support the Part
3. To hold the part

The problem was then eliminated by combining the functions of a fixture and locator. A new mistake proof solution was obtained using the poka Yoke method.

IV. POKE YOKE

Poka-yoke is a Japanese term that means "fail-safing" or "mistake-proofing". A poka-yoke is any mechanism in a lean manufacturing process that helps an equipment operator avoid (yokeru) mistakes (poka). Its purpose is to eliminate product defects by preventing, correcting, or drawing attention to human errors as they occur. The concept was formalised, and the term adopted, by Shigeo Shingo as part of the Toyota Production System. It was originally described as baka-yoke, but as this means "fool-proofing" (or "idiotproofing") the name was changed to the milder poka-yoke. Shigeo Shingo recognized three types of poka-yoke for detecting and preventing errors in a mass production system. The contact method identifies product defects by testing the product's shape, size, color, or other physical attributes. The fixed-value (or constant number) method alerts the operator if a certain number of movements are not made. The motionstep (or sequence) method determines whether the prescribed steps of the process have been followed. Either the operator is alerted when a mistake is about to be made, or the poka-yoke device actually prevents the mistake from being made. In Shingo's lexicon, the former implementation would be called a warning poka-yoke,

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while the latter would be referred to as a control poka-yoke. Shingo argued that errors are inevitable in any manufacturing process, but that if appropriate poka-yokes are implemented, then mistakes can be caught quickly and prevented from resulting in defects. By eliminating defects at the source, the cost of mistakes within a company is reduced.

When & Where Poka Yoke is used.

Poka-yoke can be used wherever something can go wrong or an error can be made. It is a technique, a tool that can be applied to any type of process be it in manufacturing or the service industry. Errors are of many types;

1 Processing error: Process operation missed or not performed per the standard operating procedure.

2 Setup error: Using the wrong tooling or setting machine adjustments incorrectly.

3 Missing part: Not all parts included in the assembly, welding, or other processes.

4 Improper part/item: Wrong part used in the process.

5 Operations error: Carrying out an operation incorrectly; having the incorrect version of the specification.

6 Measurement error: Errors in machine adjustment, test measurement or dimensions of a part coming in from a supplier.

How to use it?

Step by step process in applying poka-yoke:

- Identify the operation or process - based on a pareto.
- Analyze the 5-whys and understand the ways a process can fail.
- Decide the right poka-yoke approach, such as using a shut out type (preventing an error being made), or an attention type (highlighting that an error has been made) poka-yoke take a more comprehensive approach instead of merely thinking of Poka-yokes as limit switches, or automatic shutoffs a poka-yoke can be electrical, mechanical, procedural, visual, human or any other form that prevents incorrect execution of a process step
- Determine whether a contact - use of shape, size or other physical attributes for detection, constant number – error triggered if a certain number of actions are not made sequence method - use of a checklist to ensure completing all process steps is appropriate
- Trial the method and see if it works
- Train the operator, review performance and measure success.

V. APPLICATION OF POKA YOKE

The area where the defect could occur, if skilled operator is not used was anticipated and induction of a new fixture along with the a locator was chosen as a feasible solution. The fixture that was used earlier was only meant to hold the CH in position while the pin filling operation was being performed. It was important to locate the CH on the fixture itself so ,that it could be an integral part of the process .

Fig.5.1: The Old Fixture

The new fixture was made up of mild steel and it consisted of an additional backplate that could locate the CH .The backplate consisted of one cylindrical projection that used to locate the reference hole and a rectangular projection that used to locate the cam slot which was present on the CH .The backplate also consisted a guideway that facilitated the proper placement of CH on the Fixture.

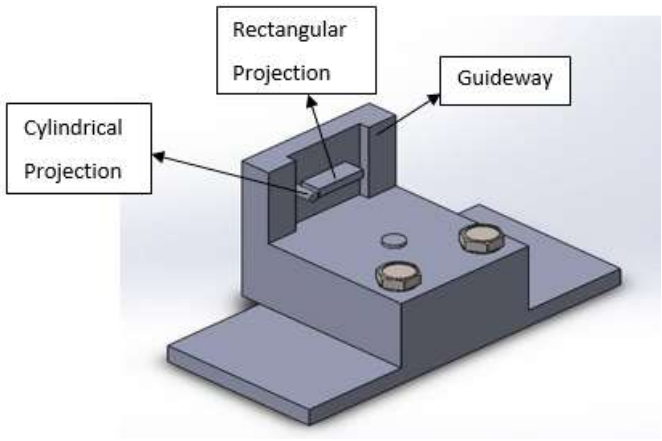

Fig.5.2: The New Fixture

The back plate was made as per the dimension of CH with a tolerance of 0.02mm.The proper placement of the cylinder on the new fixture assured the row to be pin filled to come on the top surface, if a random row was selected then the CH would be placed properly on the fixture.

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Fig. 5.3: Properly Placed CH

Fig.5.4: Improperly Placed

The properly placed CH did not have a Gap between the collar of CH and the backplate, while the one which was not placed properly had a gap.

VI. CONCLUSION

The introduction of the new fixture on assembly line completely eliminated the possibility of the operator pin filling a wrong row. The guide ways on the new fixture facilitated a firm placement on it .The CH did not distort from its position during the pin filling operation.

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Design Patterns for Effective Technology Enabled Learning

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Abstract— *As always seen from past times, the most effective way of learning is via observing, imitating and participation. But with advent of technology in our daily lives, the use of information and communication technologies (ICT) in learning is quite essential. The use of technology has brought about radical changes in the field of distance education. Also for successful progress of any interactive learning environment, the role of an efficient Design is very crucial. In this paper we firstly discuss the role of an effective design pattern, secondly the need of Technology Enabled Learning (TEL) and finally elaborate on the various design patterns that can be applied in the field of TEL.*

Keywords— Student-Centric Learning, Interactive Lecture model, Design Pattern, ICT, TEL, Student Blog, Peer, Taxonomy.

I. INTRODUCTION

The term Technology-enhanced learning (TEL) is used to describe the application of information and communication technologies to teaching and learning [1]. The design methodology for TEL is a big challenge as it needs to cater to a range of issues from understanding basic requirements of learning theory to designing software solutions for effective TEL tools. Also in today's world due to rapid technological advancements, instructors or teachers face huge difficulties in designing and using new learning tools. Generally, the kind of help which is provided is either in the form of pedagogical theories or in the form of informal descriptions of someone else's practice. The pedagogical theories are usually too general and methodical to be useful and the descriptions are often too ad hoc or context precise to be easily applicable more broadly. Hence the teachers face a daunting task of finding out what is relevant and what is not and build the course material in a cumulative manner. Design Patterns comes to aid this task and make the entire teaching-learning process effective [2].

II. DESIGN PATTERNS

2.1 Introduction

Christopher Alexander says, "*Each pattern describes a problem which occurs over and over again in our environment, and then describes the core of the solution to that problem, in such a way that you can use this solution a million times over, without ever doing it the same way twice*" (Alexander et al, 1977, p.x). In *The Timeless Way of Building* Alexander [3] elaborates:

Each pattern is a three-part rule, which expresses a relation between a certain context, a problem, and a solution.

As an element in the world, each pattern is a relationship between a certain context, a certain system of forces which occurs repeatedly in that context, and a certain spatial configuration which allows these forces to resolve themselves.

As an element of language, a pattern is an instruction, which shows how this spatial configuration can be used, over and over again, to resolve the given system of forces, wherever the context makes it relevant.

The pattern is, in short, at the same time a thing which happens in the world, and the rule which tells us how to create that thing, and when we must create it. It is both a process and a thing; both a description of a thing which is alive, and a description of the process which will generate that thing (Alexander, 1979, p 247).

Design Patterns provide the educators practical and usable ideas with customizable solutions that they can apply to their teaching process. The patterns are open for modifications, revisions and are extensible to make them more relevant to their subject area.

2.2 Pedagogical Design Patterns

Pedagogical design patterns relate the concept of design patterns to educational design [4]. Pedagogical patterns try to gather skilled knowledge of the practice of teaching and learning. To capture the real meaning of the subject in a compact form that can be easily taught to those who need the knowledge is the main goal of these patterns. Presenting this information in a logical and available form can mean the variation between every new instructor needing to relearn what is identified by senior faculty and easy transference of knowledge of teaching within the community.

2.3 Need for Design Patterns in Technology-Enabled Learning

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Design Patterns present to us a design experience in form of design problem and design solution [5]. The patterns-based approach offers a way of capturing design experience that:

- Combines identifiable problems with tested solutions
- Identifies to design problems at any scale level (micro, meso, macro, etc), and connects design solutions across scale levels
- Can be supported with research-based evidence
- Gives guidance but can be extended with creativity
- Has wide application but is customisable to meet specific needs

Design approaches in technology-enabled learning have a distinct unifying constraint: the learner. Every design pattern developed aims to make the learner achieve an insight into a particular subject and each design approach supports this underlying philosophy. Design Pattern tools have the potential to be used by researchers for performing intricate TEL-related tasks. They can also be designed and used as a practical tool; for example, directly resolving TEL design issues with regard to technological development and tool deployment. Essentially, once patterns are available, anyone involved in the TEL development process can take them, in any variety of combinations, and use them to (collaboratively) design their own tools. Additionally, each pattern can be evaluated and modified to take into account the context of use [4].

III. STUDENT-CENTRIC LEARNING DESIGN PATTERN

The concept of student–centred learning has been credited as early as 1905 to Hayward and in 1956 to Dewey's work (O'Sullivan 2003). Carl Rogers, the father of client–centred counseling, is associated with expanding this approach into a general theory of education (Burnard 1999; Rogoff 1999) [6].

In Student-Centric learning, the knowledge about a particular topic is constructed by student groups and the teacher just facilitates the whole process [2],[3]. The focus here is on what the student has achieved rather than what has the teacher taught. It addresses the need for active and deep understanding of the student instead of his passive learning. Brandes and Ginnis (1986) in their book for use in second level education (post–primary), entitled 'A Guide to Student–Centred Learning', have presented the main principles of student–centred learning as:

- The learner has complete responsibility for her/his learning
- Involvement and participation are a must for learning
- The relationship between learners is more equivalent, encouraging growth, development
- The teacher becomes a facilitator and resource person
- The learner experiences convergence in his education (affective and cognitive domains flow together)

3.1 Technology enhanced student-centric learning

Student-centred learning environments have been regarded as an alternative to externally-directed instruction. While, at face value, the potential of student-centred learning environments is compelling, the ground problems associated with implementing them are daunting. Recent advancements in computer and related technologies, however, have facilitated the management of e-resources, making student-centred options both possible and feasible. Technology-enhanced learning environments "promote engagement through student-centred [learning] activities" (Hannafin, 1992, p. 51). Computer-enhanced, student-centred learning environments organize interrelated learning ideas into meaningful contexts, often in the form of a problem to be solved or an orienting goal, that functionally bind their features and activities. They promote interactive, flattering activities that facilitate individuals to address unique learning interests and needs, study different levels of complexity, and deepen their subject knowledge. They establish conditions that enrich thinking, understanding and learning, and use technology to enable flexible methods through which the processes can be supported [7]. As seen technology-enabled student-centric learning has many benefits, in this paper we have discussed two design patterns for the same: Interactive Lecture Mode and Student Blog.

3.2 Design Pattern: Interactive Lecture Mode

Traditionally schools, universities and adult education providers have implemented a "lecture-based" teaching model. This approach to learning was developed during the industrial age, some centuries ago. The concept is for students to sit passively in rows of chairs or tables all in front of the presenter, who usually resides at a lectern. A lecture is a "one-to-many" form of communication, involving little or no audience participation. By nature, it is authoritarian, For an information dump a lecture works fine. Unfortunately, for any type of profound learning to take place more interactive teaching methods must be

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utilized. Modern brain science suggests that human beings are not wired to learn passively.

Sonja Kabicher & Renate Motschnig-Pitrik suggested this efficient design pattern named Interactive Lecture Mode [8]. This pattern proposes that knowledge about a particular subject can be offered to students via interactive learning instead of traditional classroom teaching. The students can form group and submit project proposals related to the subject. They have to explain the motivation and intent behind the proposal and submit the goals of the project. The project can then be peer-reviewed by other student groups and the final evaluation would be carried out by the teacher. This pattern helped the students grasp the subject knowledge more efficaciously [5]. This pattern supports instructors who aspire to teach their students in a learner-centred way and to support deep and meaningful learning. The pattern helps to design and implement an interactive mode of lecture in academic courses by including (1) an electronic diary (or e-portfolio) service, (2) interactive spaces for team projects, and (3) personal as well as interpersonal reflection.

The goals and the purpose of the interactive lecture mode might be highlighted, namely:

- the support of students, with space for deepening core lecture topics and their own interests in the subject
- collection of their own experiences in self-initiated and guided processes
- reflection on subject-specific and personal learning
- enhancement of social interaction
- support of their own research if desired
- reduction of pressure that may arise from focused learning for the final exam by guiding students through several learning activities that lead to a particular level of achieving the course's learning outcomes

3.2 Design Pattern: Student Blog

Micheal Derntl proposed this competent design pattern wherein student can create his own blog to share his queries, insights, etc. regarding a particular topic [9]. A blog can be considered as a personal journal where the student can give his own opinions, comments regarding a particular task assigned, the knowledge they gained from that task, the reason if they were unable to perform a particular task, future amendments to the task, so on and so forth. The blogs can be then published on a shared blogging portal wherein other students and the teacher can access and share their views. Such kind of blogs can make the overall learning experience to be fun and engaging [10].

Some of the benefits of using blogs are as follows:

- The blogs offer rich sources of insight into student learning processes. Students can share in detail on how they tried to solve the given assignments, describing the problems they encountered, explaining and sometimes 'showing off' the solutions they came up with.
- The students can use all sorts of fancy technology gadgets available in the technology market, e.g. widgets that enable embedding to-do lists, friend lists, personal information, and web bookmarks, into their blog page.

IV. RELATED TAXONOMIES FOR TECHNOLOGY ENABLED LEARNING

Several taxonomies of technologies for learning have been proposed (Bruce &Levin 1997; Jonassen, 2000; Chickering & Ehrmann, 1996; Conole et al., 2004). For example, we can think of tools and systems for reading, thinking, communicating, and acting in the world:

- Technologies as media for accessing and studying learning material: Software systems like Learning Management Systems (e.g. Blackboard, Moodle) or Learning Objects Repositories (e.g. MERLOT) are being widely used for the dissemination/ acquisition of educational material in various formats.
- Technologies as media for learning through inquiry: One example is the WISE learning environment, which has been developed in Berkeley, where learners examine real world case studies and analyse current scientific controversies (http:// wise.berkeley.edu/). STOCHASMOS is a web-based learning environment developed at the University of Cyprus, which allows learners to investigate, organise and interpret complex and diverse scientific data and phenomena (http://www.stochasmos.org). Of course, simulation environments like STELLA, Stagecast Creator, Cabri, have been effectively used in learning environments.
- Technologies as media for learning through communication and collaboration: Many computer-supported collaborative learning (CSCL) systems, such as CENTRA, DimDim, Synergeia, CoolModes, have been developed to facilitate synchronous and asynchronous collaborative learning tasks. Nowadays, wikis, blogs as well as 3D shared worlds like Secondlife, ActiveWorlds are being extensively used in learning scenarios for various courses (Alexander, 2006).
- Technologies as media for learning through construction: Various software tools have been developed for enabling learning by doing. Typical

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examples are lego-like logo robots (Turner, 2006). Learners build robots out of LEGO pieces, using not only the traditional LEGO building bricks but pieces like gears, motors, and sensors. They also build complex computer programs by "snapping together" Logo commands thus adding behaviour to the LEGO.

- Technologies for learners' assessment: Several freeware and commercial self-assessment tools (e.g. HotPotatos, Question Mark Perception) have been designed for assessing learners' knowledge. Nowadays, there is a tendency to build tools that allow new methods of evaluations such as Electronic Portfolios which offer capabilities for storing, displaying and reviewing/grading learners' work in a variety of formats (Meyer & Latham, 2008).
- Technologies for digital and multimedia literacy: Various tools have been designed for supporting learning through expression using multimedia such as tools for video editing and annotating, image processing, web comics creation, and so on (Goodman, 2003; Gutierres Martin, 2003).

The role of technology is to direct, foster thinking and facilitate the acquisition of higher order skills. The challenge is to creatively use technologies by focusing upon their affordances. In a well designed technology-enhanced learning environment learners will engage in the process of manipulating information and critical thinking as well as expressing and sharing their knowledge to peer-learners.

V. CONCLUSION

In this paper we observed that technology plays a major role in engaging the learner in the whole learning process. Technology helps to bind the three internal processes of learning-observation, imitation and participation. With the use of Technology Enhanced Learning (TEL) methodologies, new opportunities for gaining knowledge can be sought [8].

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Keyword Specific Cloud Computing

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Abstract— *It is now a known fact that Internet of things (Iot) and Cloud computing will be the way ahead. Store and transmit of massive amounts of data is on the cards in the coming years which will profoundly affect other areas of everyday life in the next generation. Cloud and Iot are merged together is seen as an enabler of a large number of application scenarios. As an example at the start of 2016 automakers are building a driverless taxi service. Keeping this in mind a novel idea of keyword based Cloud Computing is brought about in this paper which gives out entire data to the user if the user types the keyword of the required entity.*

Keywords— Cloud, Cloud Computing, Cloud Architecture, Cloud Services, Computer Network.

I. INTRODUCTION

It has proved beyond imagination that our body resembles entire cloud of nervous system and if this system gives out a signal (keyword) to walk, the body starts walking. The eye is seen as cloud of scenarios and if any name (keyword) is brought to its notice, an entire object is placed as a virtual image in front of it. This keyword based facility is available in smart phones and GSM phones wherein a key is attached to a specific Stored (cloud) messages. It is possible to build a similar type of system by using Internet of things (IoT) and Cloud Computing which is the idea of this paper but, before that it is must to detail the concepts of cloud computing.

II. REVIEW OF CLOUD COMPUTING

The other name of cloud computing is Internet computing, using which users can access shared resources and common infrastructure, offering services on demand over the network to perform operations. Cloud is very dynamic, scalable and independent platform in terms of computing. Cloud has centralized server administration system which administers the system, balances client supply, adjusts demands, monitors traffic and avoids congestion. This server follows middleware protocols which controls the communication between cloud networks. High scalability, Agility, High availability, Multi sharing, Pay per use services and all service oriented support are some of the characteristics of the cloud.

A) ARCHITECTURE

Architecturally Cloud computing system consists of Front end and Back end in which front end comprises of end users whereas back end comprises of servers. Architecturally cloud models are commonly divided into *Software as a Service* (SaaS), *Platform as a Service (*PaaS), and *Infrastructure as a Service (*IaaS). It's helpful to add more structure to the service model stacks: Fig. 1 shows cloud reference architecture.

Fig.1: Cloud Architecture

Software as a Service (SaaS)

SaaS only hosts completed cloud applications .Cloud consumers release their applications in a hosting environment, which can be accessed through networks from various by application users. Cloud consumers do not have control over the cloud infrastructure that often employs multi-tenancy system architecture.

Platform as a Service (PaaS)

PaaS is a development platform which supports software life cycles. PaaS, must have supporting application hosting environment, development infrastructure, programming environment, tools, configuration management, etc.

Infrastructure as a Service (IaaS)

Cloud consumers directly use IT infrastructures provided in the IaaS cloud. IaaS cloud uses virtualization in order to integrate and decompose physical resources Virtualization sets up independent virtual machines (VM) that are isolated from both the underlying hardware and other VMs.

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B) CLOUD PLATFORMS

Following are some of the cloud platforms which are in existence.

AbiCloud

Abicloud used to build, integrate and manage public as well as private cloud in the homogeneous environments platform. This is much helpful for the transformation of the working environment and will make the cloud deployment process much easier and flexible.

Eucalyptus

Eucalyptus (Elastic Utility Computing Architecture for Linking Your Programs to Useful Systems) uses to build open-source private cloud platform. It is an open-source infrastructure using clusters or workstations. Eucalyptus is compatible with EC2 from Amazon, and may support more other kinds of clients with minimum modification and extension.

Nimbus

Nimbus is an open tool set and it permits users lease remote resources and build the required computing environment through the deployment of virtual machines.

OpenNebula

OpenNebula is also an open source cloud service framework. It allows user deploy and manage virtual machines on physical resources and it can set user's data centers or clusters to flexible virtual infrastructure that can automatically adapt to the change of the service load. Through the interior interfaces and OpenNebula data center environment, users can easily deploy any types of clouds.

C) CLOUD DEPLOYMENT MODELS

There are four types of cloud computing deployment models

Private cloud: The cloud is managed by an organization and serves it solely; it can exist inside or outside the organization's perimeter

Community cloud: The cloud is managed by several organizations and supports a specific community that has the same interest.

Public cloud: The cloud infrastructure is owned and managed by a large Cloud Service Provider

Hybrid cloud: The cloud infrastructure is composed of two or more of the above models (e.g. Private and public, private and community)

These were the few technological advances that led to the emergence of Cloud Computing and enabled a lot of service providers to provide the customers a hassle free world of virtualization fulfilling all their demands. The prominent ones are: Amazon-EC2 (Elastic Compute Cloud), S3 (Simple Storage Service), SQS (Simple Queue Service), CF (Cloud Front), Simple DB, Google, Microsoft Windows-Azure, Proof Point, Right Scale, Salesforce.com, Workday, Sun Microsystems etc. and each of them are categorized either as one of the three main classifications based on the cloud structure they provide: private, public and hybrid cloud. Each of the above mentioned cloud structure has its own limitations and benefits.

D) ISSUES

More and more information on individuals and companies is placed in the cloud because of which following cloud issues emerged.

Privacy: Cloud computing utilizes the virtual computing technology, users' personal data may be scattered in various virtual data centers rather than stay in the same physical location, users may leak hidden information when they are accessed cloud computing services. Attackers can analyze the critical task depend on the computing task submitted by the users.

Reliability: The cloud servers also experience downtimes and slowdowns.

Legal Issues: Worries crop up with safety measures and confidentiality of individual all the way through. Legislative levels.

Compliance*:* Numerous regulations pertain to the storage and use of data requires regular reporting and audit trails. Data centers maintained by cloud providers subjected to compliance requirements.

Freedom: Cloud computing does not allow users to physically possess the storage of the data, leaving the data storage and control in the hands of cloud providers.

Long- Term Viability*:* one should be sure that the data one puts in to the cloud will never become invalid even your cloud computing provider go broke or get acquired by a larger company.

Intermediary Layer: A number of recent works address the interoperability issue by providing an intermediary layer between the cloud consumers and the cloud-specific resources.

Open Standard*:* Standardization appears to be a good solution to address the interoperability issues.

Open API*:* it is an open cloud platform which defines a set of clear and easy-to-understand Web services interfaces, through which cloud consumers are able to create and manage cloud resources, including compute, storage, and networking components in a unified way.

Apart from this Cloud Security Alliance (CSA) listed Data breaches, Compromised credentials and broken authentication, Hacked interfaces and APIs, Exploited system vulnerabilities, Account hijacking, Malicious insiders, The APT parasite, Permanent data loss, Inadequate diligence, Cloud service abuses, DoS attacks, Shared

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technology, shared dangers as 12 emerging treats and its solutions the world may face in the coming years.

III. PROPOSED IDEA

In recent years cloud has evolved in two broad perspectives – to rent the infrastructure in cloud, or to rent any specific service in the cloud. Where the former one deals with the hardware and software usage on the cloud, the later one is confined only with the 'soft' products or services from the cloud service and infrastructure providers. With this perspective an idea has been brought forward in this paper wherein keyword based cloud service has been proposed as an future scope of work The question is how to get data pertaining to a keyword. The idea proposed is Internet of things, Virtualization, Web Services, and Very Small Aperture Terminal (VSAT) systems can be integrated to get a total build up of an entity like Dams, Malls, and Bridges etc. so that other organizations can emulate them and thereby can save themselves from time complexity, man power complexity, investment complexity, area complexity and so on. The implementation of this idea is in process and can be a point of research to others in the years to come.

IV. CONCLUSION

Cloud computing is seen as a trend in the present day scenario with almost all the organizations trying to make an entry into it. It is a way of delivering IT- enabled services in the form of software, infrastructure and more. Cloud Computing is the implementation of engineering principals to obtain high quality applications through Internet. Main goal of the cloud computing is to provide scalable and inexpensive on-demand computing infrastructures with good quality of service levels. The advantage of cloud computing are the reduction of IT costs and increased flexibility, scalability and the possibility to pay only for the used resources. The users range from individual to large government or commercial organizations, and each one has their own concerns and benefit. The paper presents the basic projected idea wherein cloud supposed to give out details about an entity if that particular entity's related keyword is given to the system.

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Study and Importance of Fencing Guardrail for High Ways

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Abstract— *Guardrail, fixed to lessen the sternness of run-off-road clash, is the most frequent traffic security system found on California State Highways. Guardrail may forward a sinful vehicle and disperse force from the collision in some, but not for all cases depending on the series of events throughout the conflict. Even though guardrail is itself a permanent object, it may lessen conflict sternness in situations where it is firm that remarkable the guardrail is less severe than striking fixed objects or slopes behind the guardrail. The road traffic safety (RTS) management system is focal point on serious injury and death due to road mishap and always tries to reduce. Many methodology and technology is developing to reduce accidental effect on human body as well as vehicle. The aim of paper is to study the importance and functions of the Guardrail.*

Keywords—Fencing guardrail, highway, accident, safety, collisions.

I. INTRODUCTION

In traffic engineering, highway guardrail may avoid a delinquent vehicle from impacting roadside obstacles which may be either man-made (sign structures, culvert inlets, utility poles) or natural (trees, rock croppings), running off the road and going behind a steep embankment, or veering off the roadway into approaching traffic. Roadside obstacles are usually referred to as predetermined objects. A secondary objective is keeping the vehicle upright while deflected along the guardrail. The most regular type of guardrail in use today is the Blocked-Out W-beam (Strong Post). Strong-post W-beam guardrail consists of wood posts and wood blockouts or steel posts with wood or plastic blockouts or composite material posts. The wood or plastic blockouts lessen or decrease a vehicle snagging on the posts upon collision. In addition, a blockout may be used to enhance the offset of guardrail with an obstacle such as a curb. The posts' main function is to uphold the height of the guardrail during the initial stages of post deflection.

II. IMPORTANCE OF GUARDRAIL

Transportation engineers limit the quantity of guardrail placed as much as feasible, as guardrails should only be positioned when the roadside conditions create a greater threat than the guardrail itself. In addition to new investigate into end treatments, public awareness among both drivers and engineers has been gradually reducing injuries and fatalities due to guardrails.

Maintaining guardrail height also reduces the potential for a vehicle to vault over the guardrail upon initial impact. The posts also play a role in the amount of conflict and deflection a guardrail may incident during collision. Confrontation in a strong post system results from a combination of tensile and flexural stiffness of the rail and the bending and shearing resistance of the posts. One of the most important concerns with strong-post W-beam guardrail has been the capability of the system to control and redirect modern vehicles that have a higher center of gravity along with the increased weight of those vehicles.

FUNCTIONS AND ADVANTAGES OF GUARDRAIL

In most cases guardrail would not be able to withstand the shock of a vehicle just by the force of the individual posts in the area hit by the vehicle. Guardrail functions as a system with the guardrail, posts, link of rail to the posts and to each other, and the end anchors (or terminals) all playing an integral role in how the guardrail will purpose upon impact. Soil conditions, height of rail, existence of curb or dike, heaviness of impacting vehicle, space from back of post to hinge point and depth of post within soil can all determine how well the system will function upon impact. Guardrail is efficiently one strong band that transfers the energy of the vehicle to the rail elements, posts, and end terminals or anchors A run of guardrail must be anchored at each terminating end either by transitioning the rail into a fixed anchor such as a bridge rail or with an end terminal or end anchor placed in the ground or within an embankment. Newer concrete barriers, while usually tough enough to withstand direct hits by cars, still work on a similar standard in deflecting heavier vehicles such as trucks.

Guardrail is projected to deflect. The quantity of deflection is dependent on a number of factors some of which consist of type and weight of impacting vehicle, height the guardrail is placed, type of soil the posts may be embedded within, length of embedment of the posts, and distance of the hinge point to the face of guardrail are just a few. A guardrail that deflects considerably can causes pocketing

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which has the potential to snag a vehicle which may cause it to flip or roll, or cause the rail to fail allowing a vehicle to go through the guardrail.

Absorption is when the energy of impact is directly transferred between the vehicle and guardrail, which may cause the end to puncture the vehicle. This is most common where a "whale tail" or blunt end treatment exists. To mitigate this a number of guiderail end treatments exist such as "Extruder end treatments", "eccentric loaders" and "Driveway wrap treatments" which result in blunt ends rarely being left exposed in modern installations.

COMPOSITE MATERIAL

The composite material prepared from composed of at least two or more than two element. Which mixed together to create new material have unusual property approach through element improving the composite material property. Most composites mingle of fiber reinforcement material with matrix material add to increase the strength as well as stiffness. The reinforcement is basically fiber and matrix is liquid. Combine together made solid structure

TYPES OF GUARDRAILS

The approved types of guardrail are metal beam, concrete and cable.

Metal Beam Guardrail is typical for embankment and fixed object shielding. It is made up of "W" shaped metal beam rail elements mounted on wood or plastic blocks fastened to a wood or galvanized steel posts.

All metal/composite material wood posts and blocks for guardrail are force treated to resist decay. Line posts shall not be installed in structural pavements that would restrict movement of the posts during impact. Only one type of post, either wood or steel, should be used in a run of guardrail. Vegetation control should be considered for use around guardrail. Details for vegetation control beneath guardrail are in the Standard Plans.

Concrete Barrier is generally harm resistant and can be used in place of metal beam guardrail to decrease maintenance worker exposure..

GUARDRAIL INSTALLATION CRITERIA

When making an allowance for setting up of guardrail at an embankment or a fixed object the following criteria, although not an all inclusive list, may be used as a guide:

1. *Collision History*: Based upon the run-off-road collision record, statistical experience or analysis can be used to forecast if guardrail is a potential solution to reducing the sternness of a impact at a particular roadway segment.
2. *Roadway Alignment*: Remote curves on relatively straight roadway alignment may enlarge the risk of running off road. Also, on roads with curving alignment, curves that are Sharper than expected may increase the probability for run-off-road collisions.
3. Operating Conditions: The location's traffic characteristics can also affect the potential for a vehicle to depart the traveled way:
   a. Volume: The higher the volume of traffic, the better the potential for run-off-road collisions.
   b. Speed of Traffic: Higher operating speed can amplify the potential for run-off-road impact, and will influence the distance that a vehicle will cross before the driver can regain control or bring the vehicle to a stop.
   c. Merge and Weave Areas: The potential for run-off-road or lane departure collisions may increase in the locality of ramp merge and diverge areas, especially those without auxiliary lanes where stopped or slowing traffic can cause abrupt lane changing and collision avoidance maneuvers.
4. Climate Conditions: Frequent dense fog, rain, or snow and ice conditions increase the risk of run-off-road collisions.
5. *Roadside* Recovery Area: The risk of a run- off-road vehicle colliding with an embankment or a fixed object is greater as the recovery area decreases.

The highway facility type, whether a freeway, expressway, or a conventional highway, has an impact on the analysis for installing guardrail due to the differing characteristics of these facilities.

GUARDRAIL AT EMBANKMENT SLOPES

Installing guardrail to shield embankment slopes is largely a result of analyzing the above criteria on a case by case basis and determining whether a vehicle hitting guardrail is more severe than going over an embankment slope. The line in Figure 7-1 represents collisions at combinations of embankment height and slope that resulted in severities generally equal to the severity of an average guardrail collision to install or not to install guardrail and the type of end treatment at an embankment slope, and the consent must be documented in the project files.

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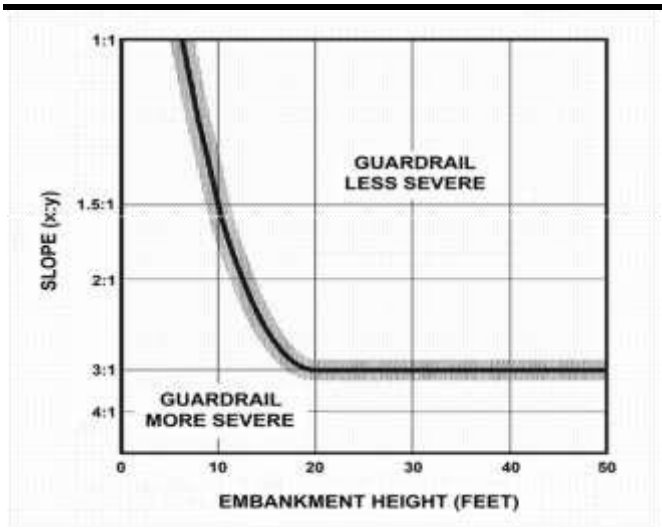

Fig.1: Equal Severity Curve

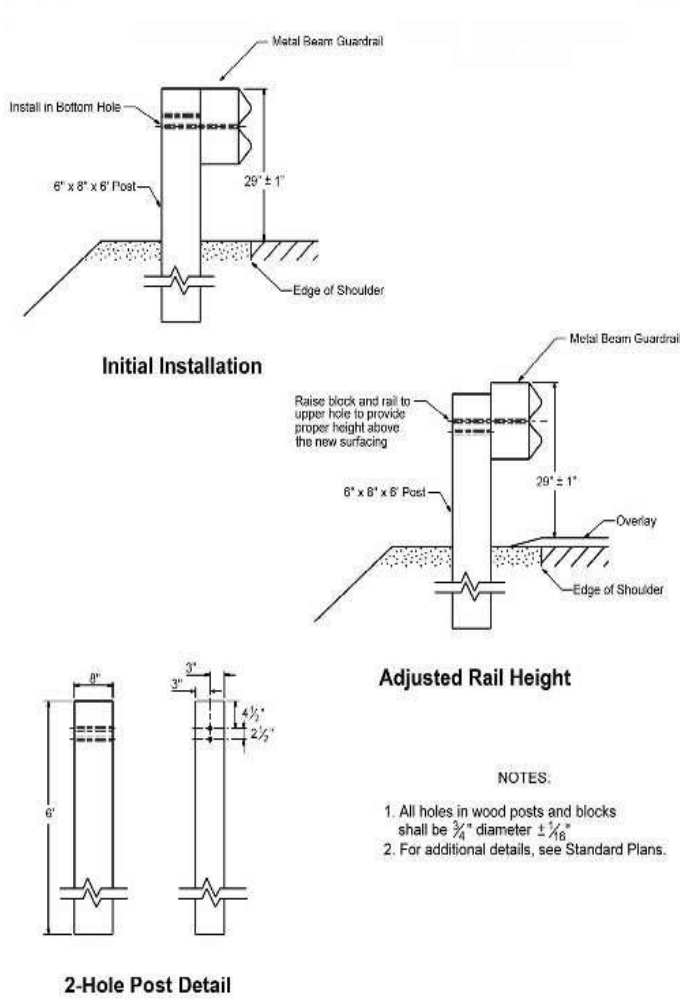

Fig.2: W-Beam Semi-Rigid Barriers

Fig.3: Flexible cable barriers

III. CONCLUSIONS

Every day several human are death or injuries in road accident cases. Most of the accident, vehicle are hit the road divider and damage the vehicle as well as itself. When the human is fall on road divider possible maximum injuries, in this condition it is provided the composite guard rail it's have good inflexibility and stiffness properties. The composite road guardrail is absorbing the shock and slowly relies; this is the attractive properties to selection for road divider. The composite road divider is design three types with rubber pad, without rubber pad, with composite guardrail. This composite guardrail is compare with concrete guard rail and found that the composite guard rail reduces maximum impact force. In that cases if we use the composite guardrail the injuries chances will be reduce.

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Prediction of the production of oil palms (*Elaeis guineensis* Jacq.) by inflorescences and bunches counting method in the Dabou region (Côte d'Ivoire)

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Abstract— *Knowledge of the expected production for the next six months allows the managers of agro-industrial plantations of oil palms to better organize their technical and financial management. However, the estimation methods must be easy to apply, yet sufficiently accurate. This study was initiated in order to contribute to the development of a model for the estimation of oil palm production on the one hand and to evaluate the sensitivity of the method face the data necessary for this forecast. These data are of two types: the actual production data and the inflorescence and bunch count data. The experiment was carried out on the experimental station Robert-Michaux of the CNRA of Dabou, located in the South-East of the Côte d'Ivoire. The proposed methodology is based on the duration of plan formation and maturation. It takes 5.5 to 6 months between the exit of the female inflorescence and the harvest of the corresponding ripe bunch. Counting of bunches and female inflorescences in the crown provides information on the number of rips bunches to be harvested in the next six months. The evolution of the average weight of bunches harvested previously makes it possible to predict the average weight of bunches that will be harvested during the same period. The model makes it possible to estimate the tonnage of production for the next six months provided that, for a plantation unit, it can be applied to representative samples of the whole. The yield is translated into production at different scales taking into account planting density. The estimated production variations and those of the previous production make it possible to estimate production in the months to come. The results are very satisfactory, with error accuracy of 9 %. They demonstrate the economic and technical interest of such a method in the case of production sites with little information on the conditions of oil palm cultivation.*

Keywords— Production forecast, yield, inflorescences, bunches, oil palm, Dabou.

I. INTRODUCTION

Today, estimated at 831 million, the African population is expected to reach 3.8 billion by the year 2100. These demographic changes overwhelm deep environmental changes, due to climate change, which in the region where extensive agriculture is dominant; will negatively impact agricultural production (Wheeler and von Braun, 2013; Challinor *et al*., 2014; Leroux, 2015). In this context of risks of food insecurity, it is essential to improve the means of monitoring agricultural production to face the challenges of development and reduce the vulnerability of the populations. The forecasting of crop productivity is thus a strategic challenge for the developing countries both in terms of food security (autonomy) but also economic (mastery, control and optimization of the volumes produced). It is therefore increasingly important in developing countries and, as in developed countries, to forecast agricultural yields accurately and punctually at regional and even national levels (Meyer-Roux, 1990). Forecasting crop yields is an exercise to prepare and disseminate quantitative or qualitative information about the expected yield of a crop before harvest. Production forecasts are of particular importance in food security estate (FAO and AFRISTAT, 2000) in developing countries where climate disasters sometimes occur. Its importance lies in its role as an early warning system to monitor the situation of food supply by evaluating production that may be available.

As in the case of developing countries, the Ivorian economy relies mainly on agriculture, particularly the exploitation of industrial crops (cocoa, oil palm, coffee, rubber, etc.). Since

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2007, palm oil, with an annual production of about 400,000 tons, has been the second largest export product after cocoa (1,300,000 tons) (Anonyme, 2012). Palm oil is the most consumed vegetable oil in the world (Koné, 2012) with 42 million tons in 2011, or 25 % of all edible oils.

However, there is often an approximate management of the agricultural operators of the production of oil palm, leading to a mismatch between the volume of production and the means mobilized. This leads to production losses during peaks, resulting from poor synchronization of equipment, seasonal personnel and rolling materials. Knowledge of future yields is of prime importance for the management of an oil palm plantation: preparation of a forecast budget, mobilization of the means of production, appreciation of the quantities of oil produced and establishment of the marketing calendar. However, the estimation method must be easy to apply with sufficient precision.

The proposed method is based on the duration of training and bunch ripping. It takes 5.5 to 6 months between the exit of the female inflorescence and the harvest of the corresponding ripe bunch. Counting of inflorescences and bunches can therefore provide information on the number of ripe bunches that will be harvested in the next 6 months. The study of the evolution of the average weight of bunches previously harvested makes it possible to predict the weight of bunches that will be harvested during the same period. This means that the tonnage of production over the next 6 months can be assessed, provided that the planting unit can be representative of the whole.

The general objective of this study is to partially overcome the uncertainties of supply and demand, and to better control stocks through better mastery of the future production of oil palm. With a view to improving the mastery of oil palm production, the specific objectives of this study are (1) to provide a reliable method for forecasting production in one of the main areas of oil palm production of Côte d'Ivoire and (2) to evaluate the sensitivity of the method to the data required for this forecast.

II. MATERIAL AND METHODS

Study site

Observations were made at the Robert-Michaux experimental station in Dabou, located in South-Eastern of Côte d'Ivoire. Its geographical coordinates are 05°18' north latitude and 04°28' west longitude. It is a research station of the CNRA, with what it implies as rigor in the collection of the data. The soils are desaturated ferralitic tertiary sands. The total area of this station is 4115 ha, presenting a series of 5 harvesting systems (CM: chisel-machete, SS: small sickle, MS: medium sickle, TS: tall sickle and STS: super tall sickle). The trial was randomly implanted on 5 % of the plots of each harvesting system of the station.

Vegetal material

The vegetal material is composed of oil palm hybrids obtained by crossing between *Dura* (female parent) and *Pisifera* (male parent). The *Dura* type is characterized by fruit having a thin pulp and a thick shell. The *Pisifera* type is characterized by a high abortion rate of the fruit and by a shell very thin or squarely absent. The *Tenera* hybrid, called C1001F, from the "La Mé x Deli" crop was used. This vegetal material, characterized by high yield and resistance to *Fusariosis*, comes from the second cycle of recurrent reciprocal selection. This new plant material is currently popularized in all Ivorian oil palm growing areas.

The oil palm is a monoecious and strictly allogamic plant (Cochard *et al.*, 2001). The same individual bears both males inflorescences and female inflorescences. They are born in the axils of the leaves. The two inflorescences, described by Böni *et al.* (1994), are carried on sturdy, erect and compressed peduncle.

The male inflorescence (Figure 1) is formed of an ovoid mass, bearing free flowering spikes, erect, imbricate one above the other. These ears bear the male flowers. In the counting process, male inflorescences were not counted.

The female inflorescence, when young, is enclosed in a spate, recalling the shape of the male spadice, but its peduncle is shorter. On the axis of the inflorescence are inserted female ears whose insertions are made in a spiral. These sessile, linear and ascending ears bear the female flowers (Figure 2). They were used to count inflorescences monthly.

After the natural opening of the spate of the female inflorescence, occur the flowers which will be fertilized, not more than three days later, by the pollen grains of the neighboring trees. The female inflorescence then turns into a bunch (Figure 3), which will reach the stage of maturity 5.5 to 6 months after setting.

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Fig.1: Male inflorescence not taken into account in the counting process

Fig.2: Female inflorescence taken into account in the counting process

Fig.3: Oil palm bunch taken into account during the counting process

Sample choice

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In planting, a sample of the order of 5 % of the trees is generally considered sufficient. But to take account of the edaphic variations encountered on a growing unit, this sample must be distributed over the whole extent of the plot. It was therefore systematically chosen one tree out of 20 (for small areas per harvesting system) or one line out of 20 of which all trees were observed (for large areas). In total, these trees or lines were chosen, and distributed over the entire test plot. The same trees or lines were always kept in order to be able to adjust the results obtained after several series of counts compared to the actual results obtained. The lines were marked with an identical mark on the whole station, by metal labels bearing the numbers of the line and the tree. This practice makes it possible to better organize the work of counting, weighing regimes and carrying out systematic control.

Methods

Observation by counting of inflorescences and bunches

An observer fit with a form visits the selected lines of observation and notes for each tree, the number of female inflorescences and bunches present in the crown. He must therefore make the complete turn of the tree to count all bunches and inflorescences open and viable. The observer alternately travels from South to North and from North to South on successively chosen lines. It indicates on the form the number of female inflorescences and bunches observed in the crown of the identified tree. The process ends with the marking of the last male or female inflorescence in anthesis to the painting. These observations were made monthly.

When the trees are aged (from 8 to 10 years), they will have to climb on the foliar peduncle up to the base of the crown to see the young bunches and the female inflorescences. Beyond 12 years, he uses a ladder that he must move to observe the crown on the two opposite sides.

When a tree has neither bunch nor inflorescence, it should be noted 0. However, when a tree is absent, the symbol M (missing) is adopted, not to be confused with a non-producing tree.

Determination of bunches yield

The yield components were determined from individual crops. For this operation carried out every fortnight, a team comprising a harvester, a weigher and a writer clerk visits each identified tree of the plot to collect the production data, according to each harvesting system. The number of bunches per tree (NB/tree) and the weight of bunches per tree (WB/tree), from which the bunch average weight per tree (BAW/tree) and the tonnage of bunches or yield (TB/ha/year). The number of bunches per tree is determined by counting all bunches harvested on each useful tree. The weight of bunches is determined by weighing, using a scale (balance with support) of all bunches harvested by tree. The data collected is used to calculate yield per harvest system (Table 1) from which the yields per unit area are deducted.

Thus, the estimated monthly production is obtained according to the following formula:

TB (tons)/harvesting system = Average value counts * Total trees * BAW.

As for the bunch average weight (BAW), it is obtained from the following formula:

BAW (kg) = total weight of bunches per tree / number of bunches per tree

The annual inventory of the plantation is necessary for the control of the trees actually in production; which will enable the results to be compared with the expected total figures by harvesting system and age groups.

Table.1: Summary of bunch and inflorescence count data

Harvest systems		**Inflorescences**		**Bunches**				**Inflorescences**		**Bunches**				
		1 year	**2 year**	**3 year**	**4 year**	**5 year**	**6 year**	**1 year**	**2 year**	**3 year**	**4 year**	**5 year**	**6 year**	
a	a10	a11	a12	a13	a14	a15	a16	1a= a11/a10	2a= a12/a10	3a =a13/a10	4a =a14/ a10	5a =a15/ a10	6a =a16/ a10	s(1..6)_ a
b	b10	b11	b12	b13	b14	b15	b16	1b =b11/b10	2b =b12/ b10	3b =b13/b10	4b =b14/ b10	5b =b15/ b10	6b =b16/ b10	s(1..6)_ b
c	c10	c11	c12	c13	c14	c15	c16	1c =c11/c10	2c =c12/c10	3c =c13/c10	4c =c14/ c10	5c =c15/ c10	6c =c16/ c10	s(1..6)_ c

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d	d10	d11	d12	d13	d14	d15	d16	1d =d11/d 10	2d =d12/ d10	3d =d13/d1 0	4d =d14/ d10	5d =d15/ d10	6d =d16/ d10	s(1..6)_ d
e	e10	e11	e12	e13	e14	e15	e16	1e =e11/e 10	2e =e12/e 10	3e =e13/e10	4e =e14/ e10	5e =e15/ e10	6e =e16/ e10	s(1..6)_ e
Tot aux	s(co l)	s(col m1)	s(col m2)	s(col m3)	s(col m4)	s(col m5)	s(col m6)	s(col m11)	s(col m22)	s(col m33)	s(col m44)	s(col m55)	s(col m66)	stotale_ (a...e)

S(col): column sum; S(col mi): sum column month i; S (col mii): sum column i of month i; Stotal (a..e): sum of lines a to e

III. RESULTS

For this study, the estimated production was compared with that actually obtained by the producers for the same period. In order to evaluate the reliability of the forecast model, the correlation coefficient and the mean deviation were calculated.

Figure 4 shows the relationship between the estimated yield and the average yield of the Dabou area over the period 1998 - 2008. The Dabou-scale performance estimation model for this study period provides a highly significant relationship with the observed average yields (R^2 = 0.955***). The prediction error is also very low (less than 5 %). The prediction model found explains for more than 95 %, the average yield of Dabou at this period.

Figure 5 shows the evolution of the monthly production observed and the monthly production estimated from the linear equation. It appears that the two curves (prediction and realization) generally have the same pace. However, there is a strong overestimation of production in the months of July and November. On the other hand, during the months of March to May, there is a very strong underestimation of the monthly production in this study area.

The model generally follows the walk of the monthly production curve observed in the Dabou area. Differences between observed production in this region and estimated production range from -25.7 % (in November) to 25.3 % (in February) as shown in Figure 6. For this study area, the predicted production allows a good estimate. Overall, the differences remain relatively low over the period considered.

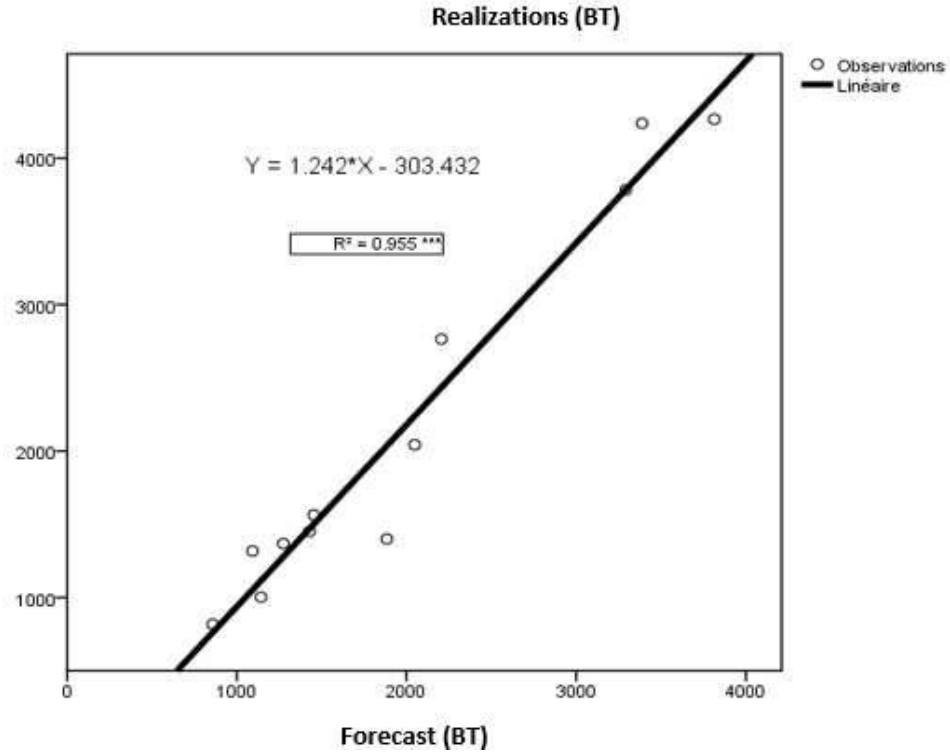

Fig.4: Relationship between the average yield achieved and the estimated yield of inflorescences and bunches counting in the Dabou area

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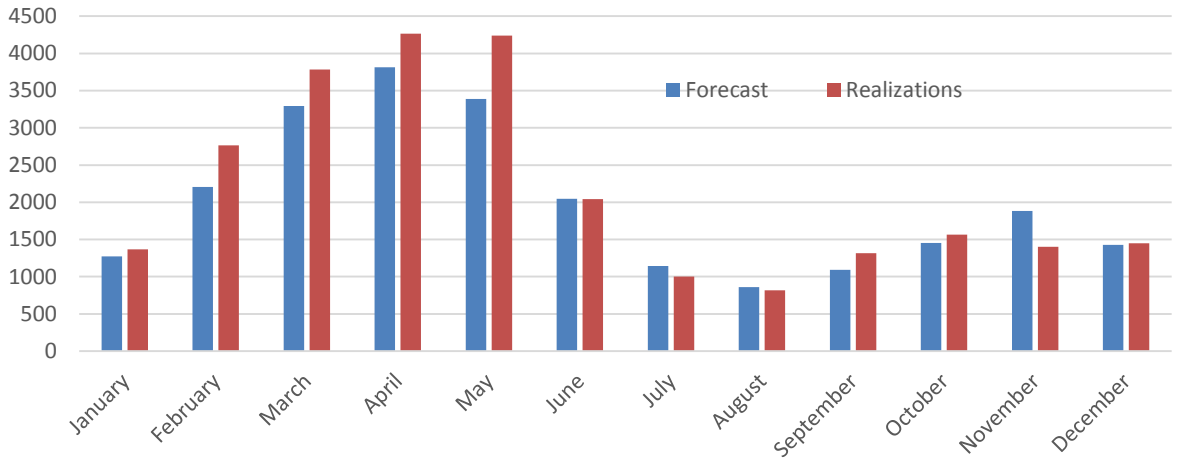

Fig.5: Comparaison between the estimated monthly production and the observed production in the Dabou area for the period 1996 - 2008

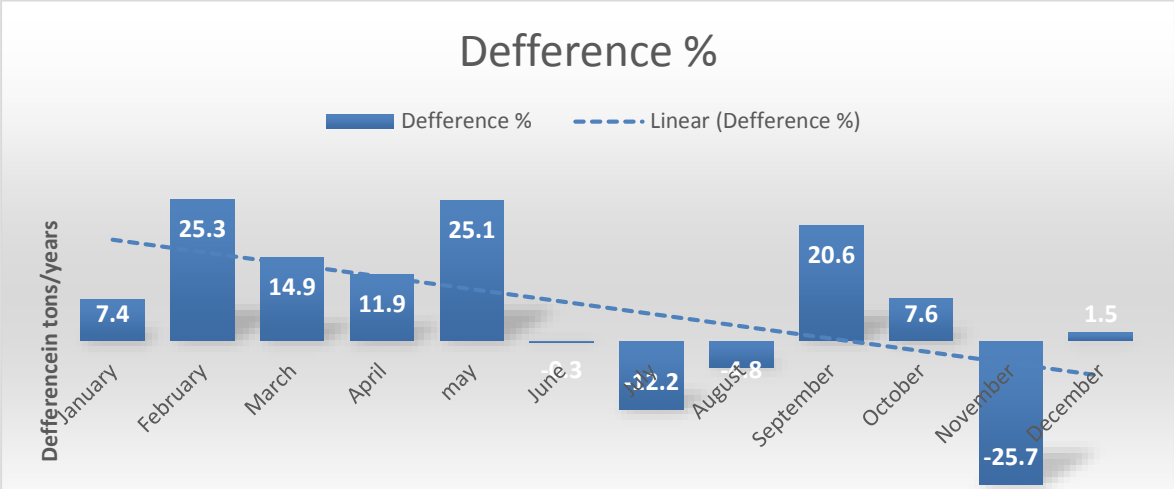

Fig.6: Monthly changes in the variance between forecast and realization (%)

Table 2 shows the productions observed monthly in the Dabou area during the best four years (1998, 1999, 2004 and 2008). In the first half of the year, representing 2/3 of the average annual production, the peak was reached with the month of April (4266 tons of bunches). However, the total average production of the second half (from July to December) represents 1/3 of the annual total. The peak production (1564 tons of bunches) of this semester was recorded during the month of October. Production over the four years ranged from 19.9 (1998) to 28.1 tons/ha/year (1999). The most productive year was 1999.

The precision obtained from the estimated production and the production observed in the study area is presented in Table 3. During this study period, annual production was 23,883 and 26,014 tons of bunches, respectively, for estimated production and observed production. The difference observed between the average observed and estimated production shows that for a site such as that of Dabou, it is rather low (9 %) over the 12 months of the year. For this site, the production forecast model makes it possible to obtain a good estimate of the realizations.

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Table.2: Presentation of the monthly and semi-annual production observed over the best four years

Month	1998	1999	2004	2008	Average	Peak
January	1399,25	623,9	1453,06	1994,84	1368	
February	3722,35	2307,08	2486,4	2541,38	2764	
March	4470,96	4120,58	4273,18	2269,02	3783	
April	4445,93	4847,64	4198,33	3572,24	4266	1
May	4274,87	4892,2	3968,46	3817,5	4238	
June	1846,04	2450,59	1570,32	2302,48	2042	
Total Half-year 1	**15 884**	**19 242**	**17 950**	**16 497**		
July	438,3	1029,85	950,4	1594,82	1003	
August	182,58	692,92	1121,6	1271,3	817	
September	776,46	1610,98	1283,58	1598,74	1317	
October	872,23	1778,94	1566,98	2036,36	1564	2
November	857,8	1689,7	1680,26	1370,7	1400	
December	909,52	2138,56	1858,86	895,34	1451	
Total Half- year 2	**4 037**	**8 941**	**8 462**	**8 767**		

Table.3: Presentation of the accuracy between the estimated production and the production observed in the Dabou area during the four years

	x	y		((y-x)/x)*100
Months	**Forecast**	**Realization**	**y/x**	**Defference %**
January	1274	1368	1,07	7,4
February	2206	2764	1,25	25,3
March	3292	3783	1,15	14,9
April	3814	4266	1,12	11,9
May	3388	4238	1,25	25,1
June	2049	2042	1,00	-0,3
July	1143	1003	0,88	-12,2
August	858	817	0,95	-4,8
September	1093	1317	1,21	20,6
October	1453	1564	1,08	7,6
November	1884	1400	0,74	-25,7
December	1429	1451	1,01	1,5
Total/year	23 883	26 014		9
Area (ha)	2200			
BT/ha	11	12		

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IV. DISCUSSION

The results outlined above highlight the importance of the method of forecasting production by counting bunches and inflorescences. The reliable estimate of bunches production therefore uses counting of inflorescences and bunches because, the mean deviations are below 10 %. Forecasting also makes it possible to establish forecast operating accounts, make production forecasts and meet anticipated sales commitments, thus creating a climate of confidence between producers and trading partners. Production forecasts thus contribute to the regulation of the market for agricultural products. Harvest forecasts should be widely disseminated to the relevant national decision-makers and to the cooperating organizations, which are the main applicants. Indeed, according to the FAO (1991), in some countries, the political decision-maker tries to censor the publication of the results of the forecasts, if not to modify them.

This technique, which, despite its supposed subjectivity, makes it possible to obtain reliable forecasts in industrial plantations, remains virtually irrelevant in its application in village plantations.

The production forecast, according to Whisley *et al.* (1986), is part of a series of statistical activities that take place in the following order: crop condition assessment, crop forecasting, crop estimate and final estimate. They are easy to implement with conventional statistical data and with good precision provided they are used in their estate of definition. For Horie *et al*. (1992), the data obtained allow to derive yield forecasts using regression models, empirical rules or informal models based on sectoral experience. This is an effective and reliable method. The precision of forecast depends on the number of fields studied and the parameters measured and the reliability of the regression models for different places and varieties grown.

"Precision" means the difference between the yield forecasts and the production data obtained. Such discrepancies have multiple origins: sampling errors, unexpected harvest damage and specification errors. The definition of precision is retrospective in the sense that it requires a posteriori verification. Other measures of "precision" should then be used, such as the correlation coefficient (r) and the mean deviations (%) between forecast and realization.

The mean deviation makes it easy to assess the degree of similarity between realization and forecast, and also allows measuring the relative error committed on the estimate. A low mean deviation means that the error is small, so the results obtained are reliable (Vossen, 1993). In our study, the 9 % difference was observed between forecast and realization. This value is less than 10 %, below which the estimate is very credible. This highlights the reliability of the forecasting method. As for the correlation coefficient, it allows to describe the percentage of variation of the real yields explained by the forecasts. It makes it possible to explain variations in yield. In other words, the higher the value of r (value tends to 1) the more the predictive model presents the same variations as the real values. The coefficient of variation of 0.955 obtained, explains the smallest variation in yield between the estimate and the realization. The value of any output forecast depends on its accuracy and the speed with which it is available. Routine procedures for rapid processing of data collected during field surveys are therefore particularly important. This approach is of great benefit because the international community is interested in developing an operational model for early crop assessments of main crops (King and Meyer-Roux, 1990).

Since the bunch takes about six months to mature, the production corresponding to this period is visible on the trees. Counting bunches on 5 % of oil palms (one tree in 20 or one lines out of 20) and the average weight of bunches provide an excellent basis for forecasting yields over the next six months. Short-term oil and palm seed contracts can be based on this reliable information provided by the forecast model.

However, yield variability is explained by the fact that crop varieties have some potential for yield. Experimental fields benefiting from optimal conditions make it possible to obtain an approximation of this potential. In reality, yield will be conditioned by relatively stable parameters, such as soil and climate. Crop practices will also condition performance and depend on the skill and skills of farmers. The use of fertilizers and protection against diseases are linked to these skills, but also to economic conditions. Climate change, cropping techniques and land improvement or degradation may well be the main factors influencing yield. These various elements are not independent of one another; some agricultural practices attenuate or, on the contrary, increase variability due to weather conditions (Li, 1990; Liu and Zheng 1990; Benedetti and Rossini 1993; Groten 1993; Maselli *et al.*, 1993).

Table 3, showing monthly production, shows that the first half-year represents 2/3 of the annual average production and the second half-year (from July to December) represents 1/3 of the annual total. The best production of oil palm is characterized by years and months of high productivity. The best seasons of production are at the beginning of the rainy season. The rainy season is still in the first half-year in this region of Dabou. This explains the uneven distribution of oil palm production during the year.

Agricultural yields, particularly, of oil palm, are all affected by a number of factors. Performance prediction systems

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simulate physiological processes or provide statistical links between yield and one or more of the factors listed below. It should be noted, however, that all these factors cannot easily be integrated into the yield forecasting systems. Harvest forecasts, both yield forecasts and production forecasts, have become an essential component of food security surveillance and alert systems. Other models, based on the analysis of the relationships between yields and agrometeorological data, should be combined to better adapt to longer areas and longer periods, thus improving the results obtained.

V. CONCLUSION

The method described is a simple means of assessing the output of the semester, but it should be considered as an indicative indicator of management. Indeed, despite relatively high production, they may be slightly overestimated or underestimated, due to seasonal variation, length of maturation and the difficulty of adopting a fully reliable average weight of bunches. It has, however, the merit of easy employment and giving sufficient information. This method of forecasting production by counting inflorescences and bunches appears to be standardized.

However, it is obviously necessary to improve this model of production forecasting. Improving the predictability of oil palm yields depends on a better ability to model the interactions between yields and the variables affecting these yields; such variables affect areas as varied as the climate or the economy. It is only by integrating all the factors involved in this model that forecast errors can be reduced. This condition of integration of number of variables is essential to the development of this technique on a large scale. This model of forecasting will require an extension and a redeployment of the means used with a transfer of the skills acquired since the implementation of these different programs. Additional studies are also essential to obtain the most reliable forecast possible.

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Forensic Technique for Detection of Image Forgery

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Abstract— *Todays digital image plays an important role in all areas such as baking, communication, business etc. Due to the availability of manipulation software it is very easy to manipulate the original image. The contents in an original image can be copy-paste to hide some information or to create tampering. The new area introduces to detect the forgery is an image forensic. In this paper proposes the new image forensic technique to detect the presence of forgery in the compressed images and in other format images. The proposed method is based on the no subsampled contoured transform (NSCT). The proposed method is made up of three parts as preprocessing, nsct transform and forgery detection. The proposed forensic method is flexible, multiscale, multidirectional, and image decomposition is shift invariant that can be efficiently implemented via the à trous algorithm. The proposed a design framework based on the mapping approach. This method allows for a fast implementation based on a lifting or ladder structure. The proposed method ensures that the frame elements are regular, symmetric, and the frame is close to a tight one. The NSCT compares with and dct method in this paper.*

Keywords— Digital Image forensics, multidimensional filter banks, no subsampled countourlet transform, image forgery, filter bank.

I. INTRODUCTION

Digital images are widely used communication medium and play very important role in today's technical world. Images acts as photographic evidence. Due to the speedy advancement in image editing software's make extremely simple to alter the content of digital images. Authenticating a given digital image content has become more difficult because of the possible diverse origins and the alterations that could have been operated on images. When the digital content of an images is used to support legal evidences its important details could be maliciously hidden or erased or duplicated or tampered from the recorded scene, and the true original source can be concealed. A common, easy manipulation is to remove objects from an image or simply remove undesired event from an image. When done carefully, such a digital tampering is difficult to detect. The image forensic is a new research area developed assessing the credibility of an images using different forensic techniques. There are many forensic techniques are available for revealing the presence of forgeries in digital images through geometrical and statistical features ,jpeg quantization artifacts and camera based artifacts. Basically two types of image forgery detection techniques- one is active and other is passive. The two main active techniques are Digital Watermarking and Signature. In case of Watermarking technique it inserting of digital watermark at the source image and then verifying at the receiver end. In case of Digital signature is encoded at the sender side and decoded at receiver end to ensure its integrity. Both the active techniques are intrusive in nature and reduce the quality of image. Passive techniques verify authenticity of images without using pre extracted information. Passive techniques are defined as passive techniques because it does not need any prior information about the image .These passive methods are also called blind methods. So these passive techniques use to perform the image forgery detection task. Various artifacts are introduced by different blind methods that are categorized as Noise Inconsistency, blur, Sharpening, lightening, projective geometry and JPEG compression properties. These artifacts are used to detect whether images are forged or not. In this paper propose forensic technique which is used to detect image forgery. This proposed method divided into three parts:

1. Image preprocessing
2. NSCT transform
3. Forgery detection

The proposed method is compare with an existing Discrete cosine transformation (DCT). DCT used in jpeg as jpeg is a lossy compression image format. Most of the image forensic techniques which are based on the jpeg compression uses DCT [4] transformation which is very poor in accuracy and correction of a result.

The outline of article contains introduction regarding forensic, brief information about previous work in the area

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of forgery detection in section II .Detail about methodology of used for practical forgery detection in section III, experimental results and observations under section IV, while section V gives conclusions for this concept.

II. RELATED WORK

Arthur L. da Cunha, Jianping Zhou and Minh N. Do proposed the nonsubsampled countourlet transformation theory and design, application. The NSCT used in image denoising, enhancement application. NSCT compare with the countourlet transformation and shows that NSCT is multidirectional, multiresolutional and shift invariant as CT and other existing methods are not like that. But NSCT is not used in image forgey detection field [1].

Jianping Zhou, Arthur L. Cunha, and Minh N. Do proposed the non subsampled countourlet transform in the image enhancement. In this paper it gives the short details of an NSCT. It gives algorithm for an image enhancement based on NSCT transform [2].

Hany Farid gives a survey on image forensic techniques. These techniques are pixel based techniques, format based techniques, camera based techniques, physically based techniques, geometric based techniques. Pixel based techniques are cloning ,splicing, resampling, statistical are explain in short. Format based techniques jpeg quantization, double jpeg, jpeg blocking are give in short details. Camera based techniques are color filter array, chromatic aberration, camera response are in short details. Physically based techniques are light direction 2D, light direction 3D, light environment are explain. Geometric based techniques are principal pont, metric measurement are explain in short. [3]

Shi-Lin Wang, Alan Wee-Chung Liew, Sheng-Hong Li, Yu-Jin Zhang and Jian-Hua Li proposed the phenomenon of shifted double jpeg compression effect. When the tampered region is small the SDJPEG detection methods do not provide satisfactory results. In this paper propose a new SDJPEG detection method based on an adaptive discrete cosine transform (DCT) coefficient model. In this proposes the DCT coefficient distributions for SDJPEG and non-SDJPEG patches analysis. An adaptive DCT model for an SDJPEG is compare with another existing methods which give better result for a small size forged object.[4]

Z. Lin, J. He, X. Tang, and C.-K. Tang proposed image tampering detection based on DCT coefficient analyasis. This paper examines the double quantization effect which is hidden in DCT transform. But this proposed method works only on jpeg images not on other images. [5]

Y.-L. Chen and C.-T. Hsu proposed the technique for detection of tampering in a recompressed jpeg images. It requires all the source data in jpeg format.

It works on the mathematical and theoretical formulation of periodicity of compression artifacts. It Only detects the aligned and misaligned recompression images. [6]

Kurakula Sravya, Dr. P. Govardhan, Naresh Goud M praposed Image Fusion on multifocused images based on Non-Subsampled Contourlet Transform. In this paper the NSCT is compare with an wavelet and curvelet transform for an multifocused images. [7]

Yahui Liu, Yao Zhao, Rongrong Ni proposes forensics of Image blurring and sharpening history based on NSCT domain. This article gives a detection algorithm which detect only manipulated image of blur and sharpen operations. [8]

Mandeep kaur, Jyoti and Prakriti proposes the image tamper detection based on JPEG artifacts. The paper presents various artifacts that are introduced during the cut and paste operation when multiple JPEG compression is performed within a specified region of a digital image. This gives short survey on the jpeg artifacts. [9]

T. Bianchi, A. Piva proposed the analysis, detection and localization of an tamperd images but works on only those images which is having nonaligned double jpeg compression. [10][11]

III. METHODOLOGY

They are various image authentication technique to detect the image forgery. These techniques are shown in Fig 1. The proposed method work under the category passive technique. The proposed work divided into three parts as shown in Fig 2.

1. Preprocessing

This preprocessing converts the image into gray scale format. Grayscale image in which the value of each pixel is a single sample, that is, it carries only intensity information. Images of this sort, also known as black-and-white, are composed exclusively of shades of gray, varying from black at the weakest intensity to white at the strongest.

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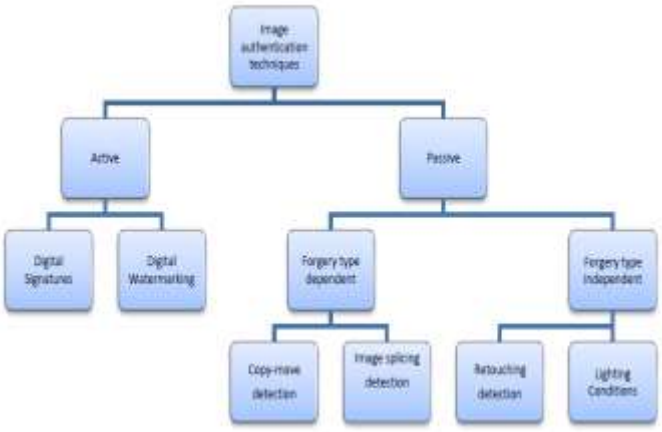

Fig 1: Image Authentication Technique

2. NSCT transform

Nsct is divided into two parts as nonsubsampled pyramid and nonsubsampled Directional Filter Bank (DFB).

2.1. Nonsubsampled Pyramids

The nonsubsampled pyramid is completely different but its evolved from the contourlet transform, the Laplacian pyramid. The nonsubsampled pyramid is a two-channel nonsubsampled filter bank as shown in Fig. 2(a). A nonsubsampled filter bank has no downsampling or upsampling, and hence it is shift-invariant. The perfect reconstruction condition is given as

$H0(z)G0(z) + H1(z)G1(z) = 1.$

This condition is much easier and allows better filters to be designed and also satisfy than the perfect reconstruction condition for critically sampled filter banks. The frequency response is shown in following fig 2.

2.2 Nonsubsampled DFB

The shift-invariant version of the contourlet transform is nonsubsampled DFB. The DFB is also a two-channel nonsubsampled filter bank The ideal Frequency response for a nonsubsampled DFB is different, as shown in Fig. 2(b).

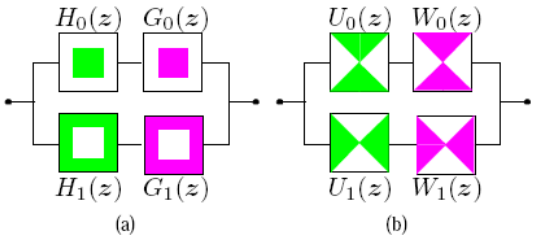

Fig.2: *Ideal frequency response of the building block of:(a) nonsubsampled pyramid; (b) nonsubsampled* DFB [3]

The nonsubsampled contourlet transform combines nonsubsampled pyramids and nonsubsampled DFB's as shown in Fig.3. The multiscale decomposition is provided by Nonsubsampled pyramids and directional decomposition provided by nonsubsampled DFB's. As shown in Fig 3 (a) nonsubsampled pyramid split the input into a lowpass subband and a highpass subband. Then a nonsubsampled DFB decomposes the highpass subband into several directional subbands. The scheme is iterated repeatedly on the lowpass subband. The resulting frequency division is shown in Fig 3(b), the number of directions is increased with frequency.

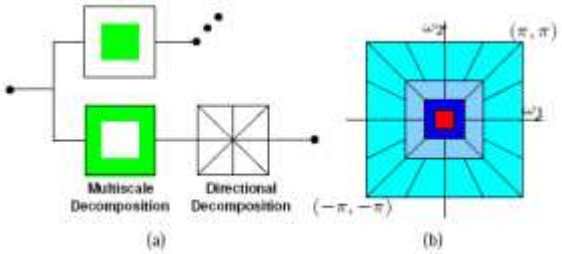

Fig. 3: The nonsubsampled contourlet transform [3]

3. Forgery detection

In forgery detection step it detects the forged object. Consider that one objet is copied and paste into the original image.In this that paste object is an forged object. In proposed method it calculates the absolute subband difference between low frequency components and high frequency components. Based on that difference it detect the forged object easily. Morphological technique makes the bounding box to the forged object.The final output is obtain in this step as shown in Fig 4

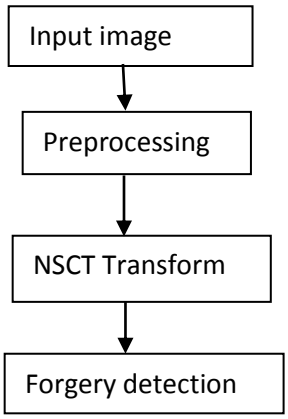

Fig 4: Proposed method

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IV. EXPERIMENTAL RESULTS

The implementation has been tested on MATLAB-R2013a with system having Intel Core i3 4005U CPU Processor 1.70GHz, 4GB DDR3 RAM, Windows 7.

Fig 5: (a) Original image (b) manipulated image (c) low frequency component (d)high frequency component (e)detected forged object with nsct. (f) detected forged object with dct.

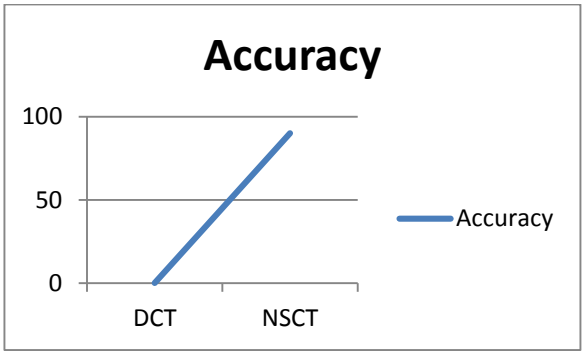

Fig.6: Accuracy graph of NSCT and DCT

The proposed method gives the correct forgery detection of an object compare with DCT. The existing dct method gives red dot forgery detection without accuracy. The low frequency and high frequency image is shown in Fig 5 it is computed using NSCT transform.

V. CONCLUSION

In this paper the new forensic technique is proposed. This forensic technique is used in the detection of image forgery. This technique is based on the Non subsampled countourlet transformation. This proposed method gives maximum accuracy than the previous existing method. Proposed method is multidirectional, shift invariant, multiresolution. This paper gives comparison of NSCT with DCT.NSCT gives better accuracy than the DCT.

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Impact of Climate Change on the Production of Wheat and Rice in India

Assaad Ghazouani, Hedia Teraoui

Abstract— *India is a world agricultural power, the share of agriculture in GDP is 17.8%, agricultural employment represents 54.87% of total employment and the country is considered the second largest producer wheat and rice. But this advantage is facing several obstacles because India is likely to be severely affected by climate change. India is one of the country's most vulnerable to disasters around the world and many of its 1.2 billion people live in areas vulnerable to hazards such as floods, cyclones and droughts.*

In this work, we propose a model that highlights the impacts of climate changes (changes in temperatures and precipitations) on the production of wheat and rice. The results confirm the hypothesis according which the impact of climate changes in India are Important.

Keywords—Climate Change, Precipitation, Temperature, Impact, Wheat, Rice, India

JEL: Q15, Q54

I. INTRODUCTION

In developing countries, agriculture provides employment to 60% of their population and represents approximately 30% of their gross domestic product (GDP), it is a central part of the livelihood of 40% of the world population and occupies 40% of total land (90% of farms in the world have a size of less than 2 hectares). In many countries, economic health is closely linked to wealth or poverty of the farming communities. But the current vulnerability to climate change and extreme events is a major threat to agricultural systems.

By 2100, in South Asia, the decline in wheat and rice yields is important for a temperature increase of 2.5°C. The net cereal production in South Asian countries should drop within 4 to 10% by the end of this century. Changes in cereal production potential indicate an increasing strain in many developing Asian countries.

India is a world agricultural power, the share of agriculture in GDP is 17.8%, agricultural employment represents 54.87% of total employment and the country is considered the second largest producer wheat and rice. But this advantage is facing several obstacles because India is likely to be severely affected by climate change. India is one of the countries most vulnerable to disasters around the world and many of its 1.2 billion people live in areas vulnerable to hazards such as floods, cyclones and droughts.

All aspects of food security are potentially affected by climate change, including access to food, land use, and price stability. The increase in temperature between 1°C to 4°C result in a reduction of 5 to 30% of cereal production.

In our study, we tried analyzing the impacts of climate variability (temperature and precipitation) on the yield of wheat and rice in India and how will evolve their production? At the first section, we will pass the main studies related to this subject, the second section will be devoted to the empirical estimation and finally the main results are past in the third section.

II. EMPIRICAL LITERATURE REVIEW

In the agricultural sector, Guiteras (2009) evaluated the medium term (2010 to 2039) that climate change will reduce crop in India between 4.5 and 9%, depending on the degree of warming. Agriculture accounts for 17.8% of GDP in India, the only impact on this sector would decrease GDP by 1 to 1.8%. This could significantly slow the pace of poverty reduction in India; recent estimates show than an agricultural GDP point in less decreases the consumption of the poorest of 4 to 6%.

The frequency and intensity of droughts inter and intra-seasonal and floods can have a significant impact on agricultural production and therefore food security. A strong linear decrease in the yield of wheat was noted when the temperature increase in January. For each degree increase in the average temperature, the grain yield decreased to 428 kg/ha.

Malli et al (2006) reported than an increase of 2°C in average air temperature could decrease rice yield of about 0.75 t / ha in high-yield areas and about 0,06 t/ha in coastal areas with low yields. In addition, a temperature increase of 0.5°C winter may reduce the duration of the wheat harvest seven days and reduce the yield of 0.45 t/ha.

An increase in winter temperature of 0.5°C will result in a 10% reduction in wheat production in areas with high yield of Punjab, Haryana and Uttar Pradesh. The reduction will be smaller in eastern India compared to all other regions.

Kaur Hundal and (2002b) studied the impact of climate changes on the productivity of wheat, rice and maize in Punjab. If all other climate variables remain constant, the increase in temperature of 1.2 to 3 reduced wheat grain

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yield by 8.1 to 25.7%, the rice from 5.4 to 25.1%, the maize from 10.4 to 21.4%.

Chatterjeea observed that the increase in temperature reduced the yield of maize and sorghum from current conditions. The temperature increase of 1°C to 2°C decreased potential yields of sorghum 7 to 12%, on average. Sahoo (1999) made of maize simulation studies on climate change in irrigated and rainfed conditions. The increase in temperature decreases the yield under both conditions.

According Saseendran et al (1999), the experiments of temperature sensitivity, showed that for positive change in temperature to 5°C, there is a continuous decline in performance. For each increase of one degree, the efficiency drop is about 6%.

III. Methodology and Data

2.1. Model specification

The model is based on an approach in terms of production function. Production of wheat (*wheat*) and rice (*Rice*) depend of on five factors of production: arable land (*Arable*), the irrigated area (*Irrig*), temperature (*Temp*), precipitation (*Prec*) and employment agricultural (*Empl*).

$$Wheat = f(Arable, Irrig, Temp, Prec, Empl) \quad (1)$$

$$Rice = f(Arable, Irrig, Temp, Prec, Empl) \quad (2)$$

According to the functions (1) and (2) our model is written:

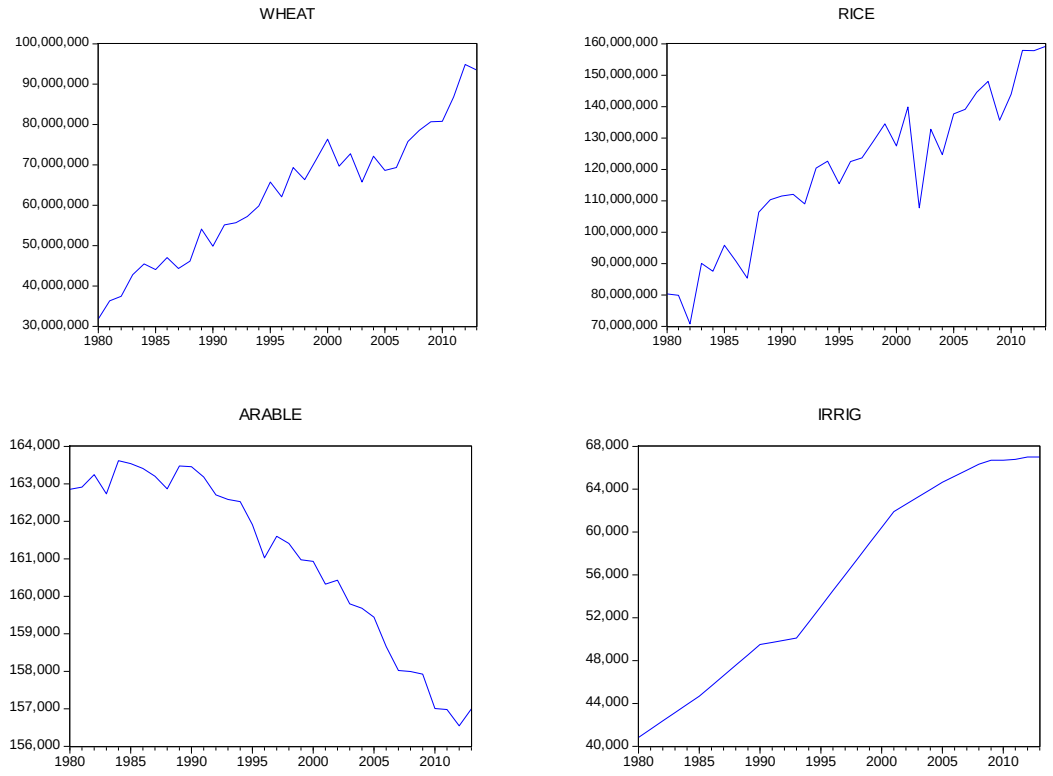
$$Wheat = \alpha + \beta Arable + \gamma Irrig + \delta Temp + \varphi Prec + \theta Empl \quad (3)$$

$$Rice = \alpha + \beta Arable + \gamma Irrig + \delta Temp + \varphi Prec + \theta Empl \quad (4)$$

To study the impact of climate change on wheat and rice, we use equations (3) and (4) equations that describe the relationship between the production of wheat and rice and arable land, irrigated area, temperature, rainfall and agricultural employment.

The evaluation of the effect of climate impact on the dynamics of long and short term will be done with an ECM (error correction model) or VAR (Vector Autoregressive). For each crop, the goal is to know its impulse response function following a climate shock. The data to use in the empirical analysis are from the World Bank database, the Indian government and the NOAA, these data are annual and cover the period which runs from 1980 to 2013.

Table.1: Variables of model



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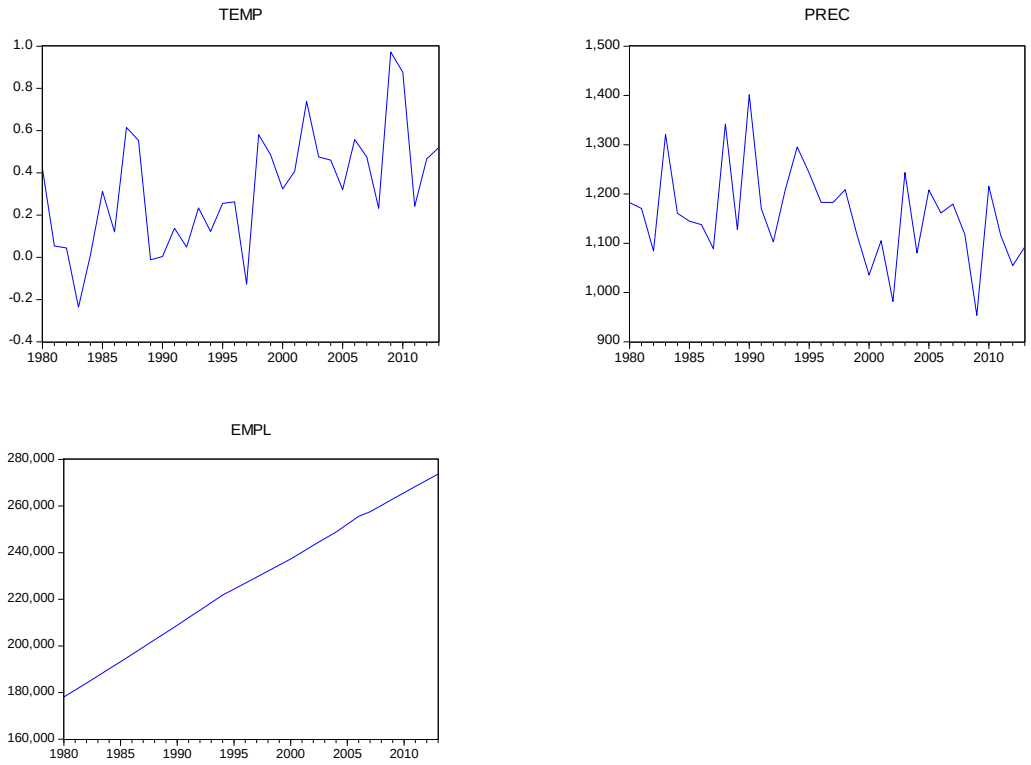

IV. ESTIMATE

4.1. Impulse response function

The ECM methodology provides the ability to analyze the short-term dynamic relationships between variables in the model through the study of the dynamic response following a unitary shock suffered by the series.

In general, the analysis of a shock is a measure the impact of the variation of a share (innovation, shock pulse) on variables. For example from the model of wheat estimated for India:

$$Wheat = \beta Arable_{t-n} + \gamma Irrig_{t-n} + \delta Temp_{t-n} + \varphi Prec_{t-n} + \theta Empl_{t-n} + \epsilon_{1t}$$
$$Arable = \beta Arable_{t-n} + \gamma Irrig_{t-n} + \delta Temp_{t-n} + \varphi Prec_{t-n} + \theta Empl_{t-n} + \epsilon_{1t}$$
$$Irrig = \beta Arable_{t-n} + \gamma Irrig_{t-n} + \delta Temp_{t-n} + \varphi Prec_{t-n} + \theta Empl_{t-n} + \epsilon_{1t}$$
$$Temp = \beta Arable_{t-n} + \gamma Irrig_{t-n} + \delta Temp_{t-n} + \varphi Prec_{t-n} + \theta Empl_{t-n} + \epsilon_{1t}$$
$$Prec = \beta Arable_{t-n} + \gamma Irrig_{t-n} + \delta Temp_{t-n} + \varphi Prec_{t-n} + \theta Empl_{t-n} + \epsilon_{1t}$$
$$Empl = \beta Arable_{t-n} + \gamma Irrig_{t-n} + \delta Temp_{t-n} + \varphi Prec_{t-n} + \theta Empl_{t-n} + \epsilon_{1t}$$

A change at a given time of ϵ_{1t} has an immediate impact on $wheat_t$ then $Arable_{t+1}$, $Irrig_{t+1}$, $Temp_{t+1}$, $Prec_{t+1}$ and $Empl_{t+1}$ for example if there is a shock in t ϵ_{1t} at 1, we have the following impact:

At time t:

$$\begin{bmatrix} \Delta Wheat_t \\ \Delta Arable_t \\ \Delta Irrig_t \\ \Delta Temp_t \\ \Delta Prec_t \\ \Delta Empl_t \end{bmatrix} = \begin{bmatrix} 1 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \end{bmatrix}$$

At time t+1:

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$$\begin{bmatrix} \Delta Wheat_{t+1} \\ \Delta Arable_{t+1} \\ \Delta Irrig_{t+1} \\ \Delta Temp_{t+1} \\ \Delta \Pr ec_{t+1} \\ \Delta Empl_{t+1} \end{bmatrix} = \begin{bmatrix} \beta & \gamma & \delta & \varphi & \theta \\ \beta & \gamma & \delta & \varphi & \theta \\ \beta & \gamma & \delta & \varphi & \theta \\ \beta & \gamma & \delta & \varphi & \theta \\ \beta & \gamma & \delta & \varphi & \theta \\ \beta & \gamma & \delta & \varphi & \theta \end{bmatrix} \begin{bmatrix} 1 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \end{bmatrix} = \begin{bmatrix} \beta \\ \beta \\ \beta \\ \beta \\ \beta \\ \beta \end{bmatrix}$$

At time t+2 :

$$\begin{bmatrix} \Delta Wheat_{t+2} \\ \Delta Arable_{t+2} \\ \Delta Irrig_{t+2} \\ \Delta Temp_{t+2} \\ \Delta \Pr ec_{t+2} \\ \Delta Empl_{t+2} \end{bmatrix} = \begin{bmatrix} \beta & \gamma & \delta & \varphi & \theta \\ \beta & \gamma & \delta & \varphi & \theta \\ \beta & \gamma & \delta & \varphi & \theta \\ \beta & \gamma & \delta & \varphi & \theta \\ \beta & \gamma & \delta & \varphi & \theta \\ \beta & \gamma & \delta & \varphi & \theta \end{bmatrix} \begin{bmatrix} \beta \\ \beta \\ \beta \\ \beta \\ \beta \\ \beta \end{bmatrix} = \begin{bmatrix} \beta^2 + \gamma\beta + \delta\beta + \varphi\beta + \theta\beta \\ \beta^2 + \gamma\beta + \delta\beta + \varphi\beta + \theta\beta \\ \beta^2 + \gamma\beta + \delta\beta + \varphi\beta + \theta\beta \\ \beta^2 + \gamma\beta + \delta\beta + \varphi\beta + \theta\beta \\ \beta^2 + \gamma\beta + \delta\beta + \varphi\beta + \theta\beta \\ \beta^2 + \gamma\beta + \delta\beta + \varphi\beta + \theta\beta \end{bmatrix}$$

Etc.…

The various values thus calculated are the impulse response function.

The analysis of impulse response functions in the following figures reveal than the variation in rainfall positively affect wheat production while the temperature variation is negative and that this effect is prolonged in time. Both effects cannot be neutralized.

Recent increases in climate variability may affect yield in India causing great variability in wheat and rice yields. Even cultures middle latitudes might suffer at very high temperatures in the absence of adaptation.

The extremes temperatures changes in short-term can be critical, especially if they coincide with development milestones. Only a few days of extreme temperatures (over 32 ° C) at the flowering stage of many crops can significantly reduce performance. (Wheeler et al. 2000).

Temperatures have a strong influence on the growth and yield of rice. The air temperature is a major factor in areas where, because of the latitude or altitude, or both, nighttime temperatures may fall below acceptable limits. Low temperatures, eg from 14 to 18 ° C during floral initiation, meiosis and pollen development have negative effects on culture.

Crop response to changes in growth conditions may be non-linear and subject to combinations of stressors that affect their growth, their development and potential output. In the short term high temperatures can affect the enzymatic reactions and gene expression. In the longer term, they will impact on carbon assimilation and therefore the growth rate and the potential return. The impact of high temperatures on the final yield may depend on the stage of crop development.

The impact of changes in rainfall on the production of rice is positive and also extends in time, while the temperature has a negative impact. Beyond the seventh period these two effects have even a small positive impact on rice production.

Changes in rainfall in India are partly due to the expected weakening of the dynamics of the monsoon circulation (decrease Indian monsoon precipitation) compared to the increase in atmospheric moisture content associated with warming (increase Indian monsoon precipitation (Meehl et al 2006).

However, changes in seasonal rainfall may be more relevant to agriculture than the average annual variations. In India, climate models generally predict a decline in dry-season of rainfall and an increase during the remainder of the year, the monsoon season, but still with a big gap between the models (Christensen et al 2004).

The rainfall is not the only influence on water availability. The increasing demand for evaporation because of higher temperatures and longer growing seasons could increase the need for irrigation of crops worldwide between 5 and 20% or more, for 2070 and 2080, but with large regional variations irrigation needs in Southeast Asia that could increase by 15% (Döll. P 2002).

In recent years we observed heavy rainfall and shorter monsoons in semi-arid regions. In 2009 parts of Maharashtra, Karnataka and Andhra Pradesh received heavy rainfall between September and October, thus causing flooding and major crop losses.

The rain does not allow groundwater to recharge enough because they need moderate rainfall. Rising temperatures increase the water needs of crops and dry soils. The

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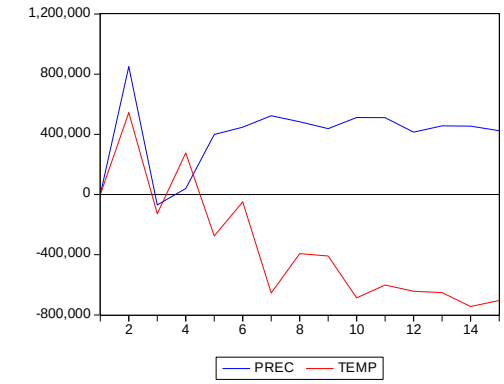
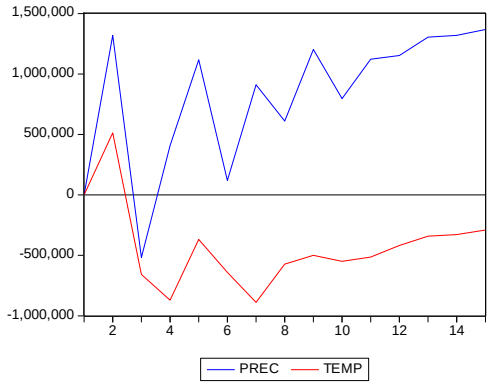
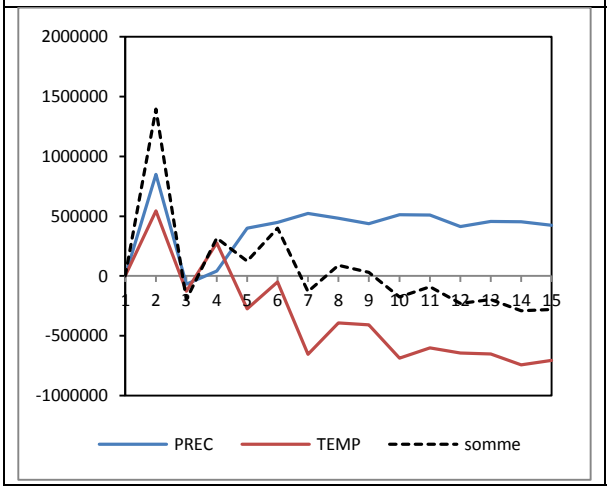
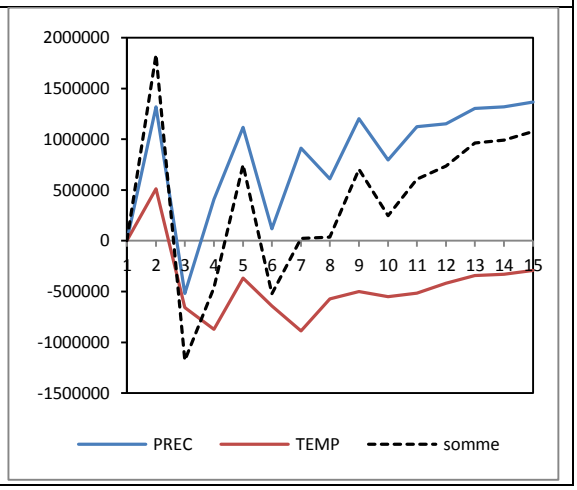
climate change projections indicate that even if farmers come adapt them cultural in arid zone, stress and the growing demand for the resulting water would decrease agricultural productivity and seriously endanger their livelihoods.

Table.2: Response of wheat and rice has a shock (precipitation and temperatures)

Wheat	Rice
	

Source : A. Ghazouani, et al

Table.3: Response of wheat and rice has a shock (rainfall + temperatures)

Wheat	Rice
	

Source : A. Ghazouani, et al

4.2. variance decomposition

The objective of the variance decomposition of the forecast error is calculated for each of the innovations contributing to the variance of the error. By a mathematical technique, we can write the variance of the forecast error at horizon h depending on the variance of the error assigned to each variable, and just bring each of these variances to the total variance for its relative weight in percentage.

if we take our model estimate for India, we interest for example at the two variables $wheat_{1t}$ and $temp_{2t}$, the variance of the forecast error for $wheat_{1t+h}$ can be written:

$$\sigma^2_{Wheat1}(h) = \sigma^2_{\varepsilon 1}\left[m^2_{11}(0) + m^2_{11}(1) + \ldots + m^2_{11}(h-1)\right] + \sigma^2_{\varepsilon 2}\left[m^2_{22}(0) + m^2_{22}(1) + \ldots + m^2_{22}(h-1)\right]$$

m_{ii} are the terms of the matrix M.

On the horizon h, the decomposition in percentage of the variance of innovations $wheat_{1t}$ on $wheat_{1t}$, is given by:

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$$\frac{\sigma_{\varepsilon 1}^2\left[m_{11}^2(0)+m_{11}^2(1)+\ldots+m_{11}^2(h-1)\right]}{\sigma_{Wheat1}^2(h)}$$

And the decomposition in percentage of the variance of $wheat_{1t}$ innovations on $Temp_{2t}$ is given by:

$$\frac{\sigma_{\varepsilon 2}^2\left[m_{22}^2(0)+m_{22}^2(1)+\ldots+m_{22}^2(h-1)\right]}{\sigma_{Wheat1}^2(h)}$$

Interpretation of the results is important:

If a shock on ε_{1t} does not affect the variance of the $temp_{2t}$ error whatever the forecasting horizon, then $Temp_{2t}$ can be considered as exogenous because $Temp_{2t}$ evolves independently ε_{1t}.

- If a shock on ε_{1t} strongly affects (see totally) the variance of the $temp_{2t}$ error, $Temp_{2t}$ can be considered endogenous.

In practice, the results are not as marked but show the contribution of each variable in the variance of the error.

The variance decomposition of the forecast error, allow evaluate for a several time horizons, the relative importance of different shocks on the fluctuations of the dependent variables of the model. In our case, we use this decomposition to measure the relative magnitude of impact of changes in precipitation and temperature on the fluctuation in the production of wheat and rice. The variance decomposition of the forecast error allows determine which way and in which direction the impact of a shock has more importance.

Table.4: Variance decomposition of wheat

Period	WHEAT	ARABLE	EMPL	IRRIG	PREC	TEMP
1	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	88.85405	0.905167	0.576558	4.078792	3.959658	1.625773
3	81.82434	1.646682	4.525393	8.126985	2.710677	1.165920
4	82.52718	2.268504	4.335284	7.252169	2.357592	1.259269
5	71.15187	2.189242	9.165400	14.23808	2.136685	1.118724
6	63.85082	3.213237	9.071292	21.11194	1.925816	0.826900
7	59.09907	2.810198	10.33362	24.44280	2.000323	1.313991
8	55.10106	2.733481	10.84962	28.14551	1.912726	1.257601
9	50.32072	3.425101	12.21826	31.06147	1.770272	1.204178
10	46.82947	3.407491	12.99142	33.66386	1.704657	1.403104
11	44.52337	3.514225	13.54647	35.26784	1.668790	1.479301
12	41.94629	3.735877	14.39414	36.81714	1.559957	1.546596
13	39.99340	3.984294	14.87834	38.05367	1.490958	1.599333
14	38.30170	4.106055	15.44182	39.01509	1.433464	1.701876
15	36.89287	4.276616	15.86217	39.84281	1.371451	1.754091

Source : A. Ghazouani, and al

Table.5: Variance decomposition of Rice

Period	RICE	ARABLE	EMPL	IRRIG	PREC	TEMP
1	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	84.86334	7.640466	1.998442	3.779426	1.492785	0.225536
3	81.75912	6.705364	5.290681	4.421835	1.353808	0.469190
4	76.59566	10.03468	5.348529	5.978026	1.224735	0.818367
5	73.91863	9.945693	6.092966	7.698230	1.601061	0.743426
6	71.28126	11.29017	6.094942	9.161585	1.373253	0.798793

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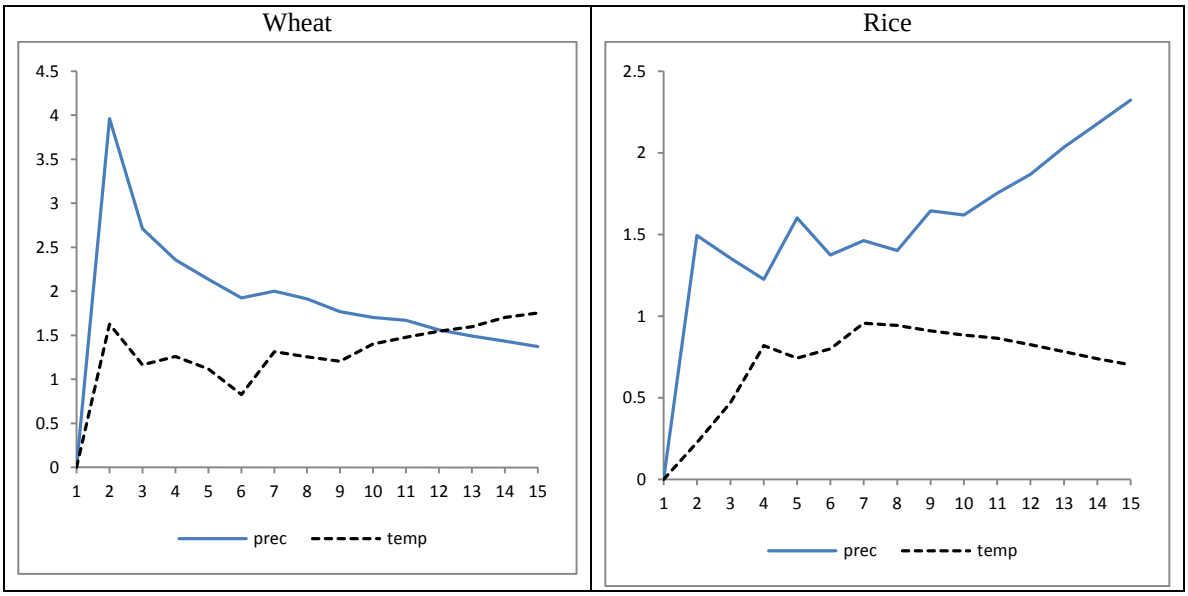
7	69.30065	11.52490	6.239556	10.51826	1.461320	0.955321
8	68.13045	12.04743	6.234020	11.24428	1.401879	0.941939
9	66.46767	12.48004	6.695692	11.80341	1.643780	0.909406
10	66.07303	12.44789	6.769702	12.20617	1.619360	0.883858
11	65.07207	12.71728	6.853968	12.74133	1.752018	0.863325
12	64.68753	12.57137	7.142455	12.90591	1.868481	0.824263
13	64.05070	12.69860	7.331352	13.10331	2.035313	0.780724
14	63.77337	12.53246	7.517197	13.26073	2.176810	0.739433
15	63.41238	12.48989	7.678230	13.39415	2.323592	0.701751

Source : A. Ghazouani, and al

Table.6: Evolution of the share of rainfall and temperature variation in wheat and rice



Source : A. Ghazouani, and al

Tables 4 and 5 shows that wheat production is influenced by temperature variation: the impact on temperatures contributes at 1.62% in explaining the variance of wheat production to a horizon of 2 year and 1.75% in 15 years, the influence of this shock becomes important as we move away from the moment of its occurrence.

The result confirms the negative impact of rising temperatures on wheat production. It should be stressed that the relative share of shock fluctuations in rice production gradually increases over time from 0.22% to 0.95% and then decreased to 0.70%. The temperature will have little impact on rice production as opposed to the production of wheat (Wheat poor resistance to water stress).

The relative share of the variation in rainfall fluctuations in the production of wheat fell by 3.95% to 1.37% after 15 years and its share in the production of rice increases from 1.49% to 2.32% in 15 years. This result confirms the importance of precipitation in rice production in India. The variability of rainfall during the growing period is extremely important.

4.3. Discussion

Climate changes have a negative overall impact on Indian agriculture. The two main crops (wheat and rice) will see their yields decline in the first half of the XXI century. Rising temperatures would affect grain quality and shorten the duration of crop growth. But agriculture will be affected primarily by higher droughts and water shortages.

Increasing droughts and climate variability would increase the likelihood of crop failures and the problems of desertification could be severe due to the more random nature of rainfall and rising temperatures due to climate change, which would also lead to an increase the use of fertilizers and pesticides, which has serious consequences on the quality of water and soil.

Farmers are exposed to significant economic and social risks posed by the evolution of the agricultural potential of the India. Increasing in the likelihood of reduced their crop yields will be a constraint to improving their living standards. Crop losses and increased drought resulting could harm farmers´ capacity to adapt to these impacts and lead to rural exodus to other more favorable agricultural areas to urban centers or in full growth.

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The issue of food security and the potential impact of the entry of the India on the market of international agricultural products is an important issue, because of the loss of arable land, rising water shortages and rising extreme weather events. India will see its capacity to produce cereals decrease, which will lead the country to the import huge quantities of cereals.

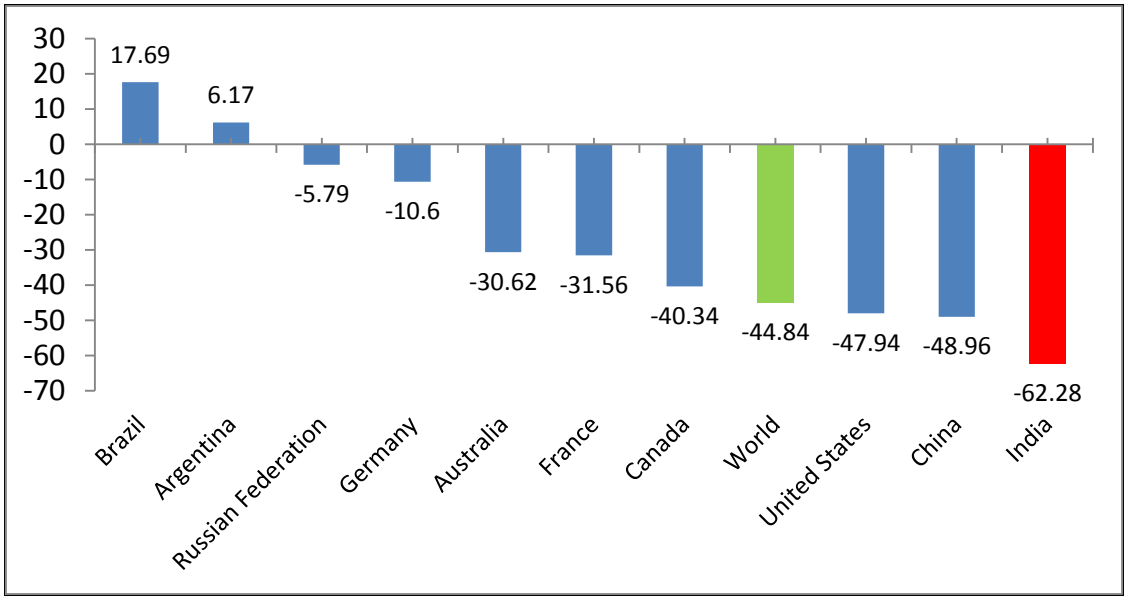

Fig.1: Evolution of arable land between 1962 and 2012 (in %)

Source : A. Ghazouani, et al

To feed its population with 17.83% of the 7.3 billion people on the planet (WDI 2016) and in strong growth, India must focus either on a import agricultural model or to increase production by adapting to climatic hazards. In 2006, adverse weather conditions (drought and increased temperatures) have affected most of the countries. India under the effect of rising temperatures has seen its wheat production reduced, what pushed the country to import 6079555 tons of wheat (a record) either 1,291,789,000 US dollars (wheat stocks fell 1.138 million tons) (FAO).

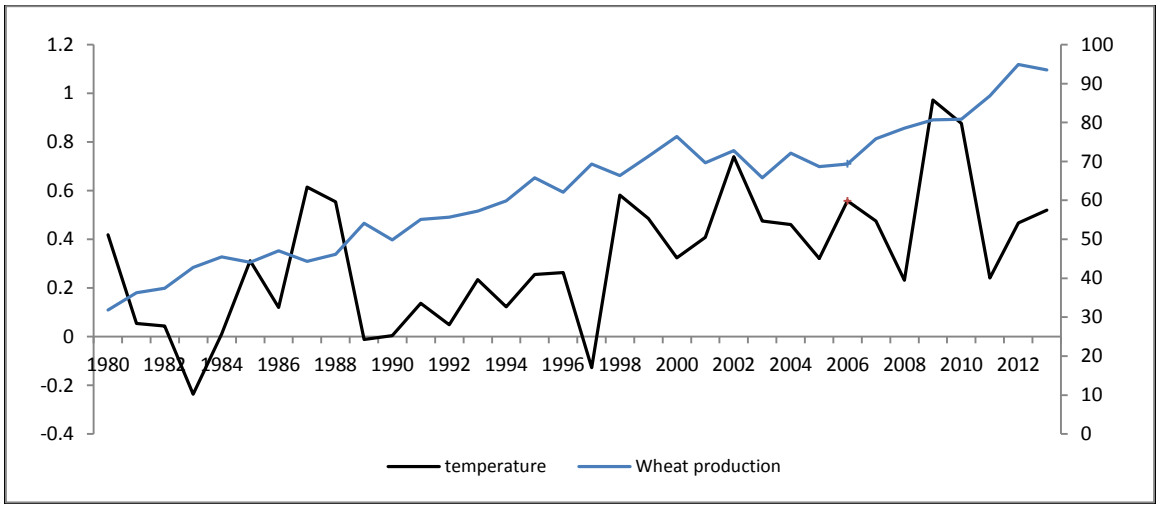

Fig.2: Change in temperature (° C) and wheat production (in millions)

Source : A. Ghazouani, and al

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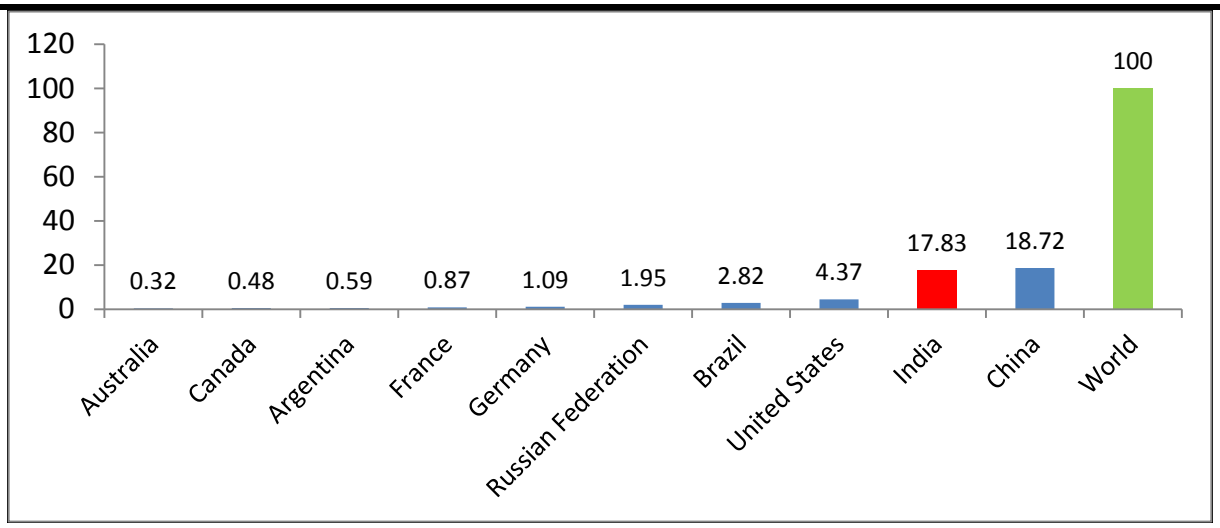

Fig.3: Part of the Indian population in the world population in 2015 (in %)

Source : A. Ghazouani, and al

The dependence of India for some agricultural products has a negative impact on world agriculture, especially in South America and Africa, and represents a great danger to food security due to the instability of commodity prices.

The consequences would be a significant increase in prices on international markets and a growing threat to political stability and food security in the world. Climate changes will accentuate these trends by increasing soil loss by amplifying the desertification, drought or flooding and increasing water deficits.

Disruptions in global agricultural products markets could essentially come coping strategies than will take India to respond to the food crisis. The ability to produce grains needed to feed more than one billion people remain adequate, but push the use of land and water resources to their maximum would not be rational.

V. CONCLUSION

The rate of climatic changes involves changes in the yield of agricultural crops in each region. Now it seems as wheat and rice produced in India have joined this disturbing list of crop punished by global warming, there is a link between the increase in average temperatures in India and lower production of wheat and rice.

The high temperatures recorded in recent years in the main belt of wheat and rice in India have a negative effect on the performance of these cultures and these temperatures are expected to increase in the coming decades because of climate changes.

Farmers should start thinking seriously about change the varieties of wheat and rice cultivated to more heat tolerant varieties, to avoid production losses caused by temperature.

Currently in India, 213 million people suffer from food insecurity and over 100 million expense of the national food aid which uses large quantities of wheat and rice. This highlights that the wheat varieties will grow in the coming decades to ensure production.

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Annex

1. ADF test of Dickey-Fuller

variables	Test for unit root in level	Test for unit root in 1st difference
Wheat	-0.018	**-9.283**
Rice	-0.726	**-10.524**
Arable	0.654	**-6.482**
Irrig	-1.510	**-5.330**
Temp	**-3.683**	-
Prec	**-5.855**	-
Empl	-2.898	**-3.704**

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2. Numbre of lags

Wheat		Rice	
Lag	AIC	Lag	AIC
0	101.1483	0	102.2997
1	88.40714	1	89.98189
2	87.95041*	2	89.82065*

3. Cointégration test of Johansen

$$Wheat = \beta Arable_{t-n} + \gamma Irrig_{t-n} + \delta Temp_{t-n} + \varphi Prec_{t-n} + \theta Empl_{t-n} + \epsilon_{1t}$$

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.849957	145.6383	95.75366	0.0000
At most 1 *	0.637427	86.83650	69.81889	0.0012
At most 2 *	0.551496	55.38609	47.85613	0.0084
At most 3 *	0.440507	30.52910	29.79707	0.0411
At most 4	0.271343	12.52662	15.49471	0.1334
At most 5	0.083811	2.713502	3.841466	0.0995

$$Rice = \beta Arable_{t-n} + \gamma Irrig_{t-n} + \delta Temp_{t-n} + \varphi Prec_{t-n} + \theta Empl_{t-n} + \epsilon_{1t}$$

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.851267	155.1993	95.75366	0.0000
At most 1 *	0.704021	96.12561	69.81889	0.0001
At most 2 *	0.533233	58.38409	47.85613	0.0038
At most 3 *	0.442986	34.76438	29.79707	0.0123
At most 4 *	0.314649	16.62429	15.49471	0.0337
At most 5 *	0.146529	4.911757	3.841466	0.0267

4. Error Correction Model Estimation

$$Wheat = \beta Arable_{t-n} + \gamma Irrig_{t-n} + \delta Temp_{t-n} + \varphi Prec_{t-n} + \theta Empl_{t-n} + \epsilon_{1t}$$

Error Correction:	D(WHEAT)	D(ARABLE)	D(IRRIG)	D(TEMP)	D(PREC)	D(EMPL)
CointEq1	0.417648	0.000112	-8.32E-06	-3.71E-09	-2.76E-05	4.43E-05
D(WHEAT(-1))	-0.841967	-4.74E-05	2.56E-05	7.15E-09	1.60E-05	-4.41E-05
D(WHEAT (-2))	-0.224920	-4.33E-05	1.07E-05	-3.50E-09	7.18E-06	-2.08E-05
D(ARABLE(-1))	-2749.290	-0.366259	0.121740	0.000122	0.125416	0.273462
D(ARABLE(-2))	-334.7578	-0.540905	-0.203833	-4.58E-05	0.053560	-0.134382
D(EMPL(-1))	-2015.450	0.203169	0.136744	0.000225	0.010976	0.188704
D(EMPL(-2))	-2605.469	-0.550247	0.184378	-0.000290	0.186865	0.080325
D(IRRIG(-1))	1196.130	-0.203838	0.962256	0.000250	0.031202	-0.374203
D(IRRIG(-2))	-8335.462	-0.770053	-0.038211	-0.000151	0.196494	-0.098131
D(PREC(-1))	-14548.77	-4.988456	0.830398	-8.34E-05	0.735279	-2.566790
D(PREC(-2))	2093.555	-2.930282	0.314172	-0.000478	0.203133	-1.767130
D(TEMP(-1))	-1040993.	-305.3002	347.5503	-0.357706	97.75004	-324.4331
D(TEMP(-2))	695066.7	-323.6313	420.0647	-0.358488	55.19606	-170.2822
C	22575204	1588.719	-975.3327	0.140040	-770.7516	2637.829

$$Rice = \beta Arable_{t-n} + \gamma Irrig_{t-n} + \delta Temp_{t-n} + \varphi Prec_{t-n} + \theta Empl_{t-n} + \epsilon_{1t}$$

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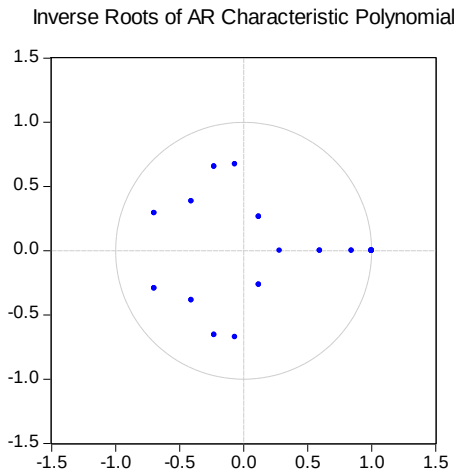
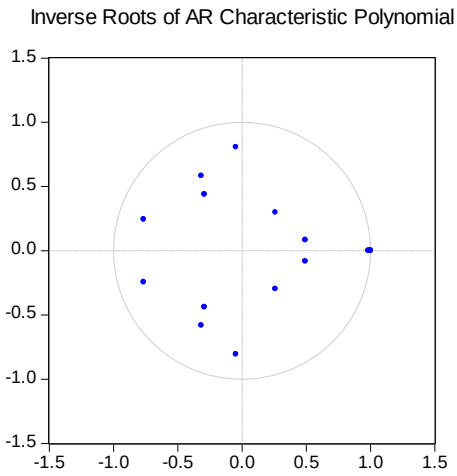
Error Correction:	D(RICE)	D(ARABLE)	D(IRRIG)	D(TEMP)	D(PREC)	D(EMPL)
CointEq1	-0.163131	-2.81E-05	-1.42E-05	-2.69E-10	6.24E-08	-1.47E-05
D(RICE (-1))	-0.500531	5.24E-05	1.98E-05	7.68E-10	-5.20E-06	1.40E-05
D(RICE (-2))	-0.038986	4.42E-05	6.35E-06	3.62E-11	-4.41E-06	7.58E-06
D(ARABLE(-1))	2466.303	-0.681494	-0.080097	0.000125	0.073053	0.048397
D(ARABLE(-2))	-5826.234	-0.169265	-0.332440	-8.14E-05	-0.077365	0.005810
D(EMPL(-1))	-7885.488	-0.644570	-0.271776	0.000203	0.059304	-0.085945
D(EMPL(-2))	5852.881	-0.622615	-0.023772	-0.000272	0.095653	-0.105798
D(IRRIG(-1))	-9392.390	-0.546688	0.831769	0.000223	0.023559	-0.430383
D(IRRIG(-2))	3549.326	0.325066	-0.150354	-0.000164	-0.051757	0.232884
D(PREC(-1))	33319.68	2.451201	0.809987	-0.000322	-0.635834	0.950228
D(PREC(-2))	5940.840	-0.217706	0.449852	-0.000478	-0.253436	-0.254478
D(TEMP(-1))	6175657.	326.1507	521.3690	-0.364060	35.93394	-19.17139
D(TEMP(-2))	127092.6	65.70183	313.3612	-0.343541	-22.46302	-64.46394
C	14240647	3249.630	951.0643	0.182850	-405.5759	3565.152

5. Dynamic stability of model

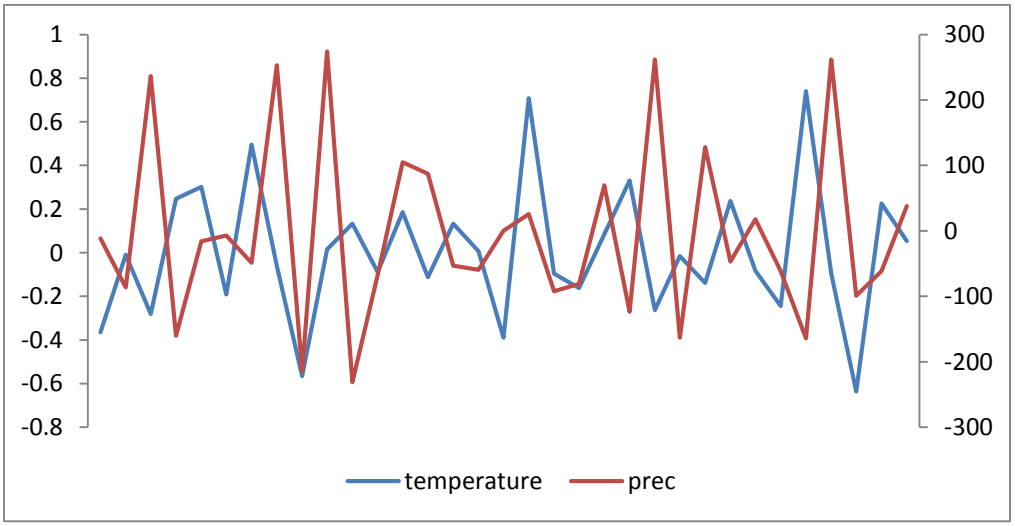
Wheat



Rice



Changes in temperatures and precipitation in India between 1980 and 2013



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Information and Communication Technologies (ICT) way to enhance standard of Primary Education

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***Abstract*—** *Technology and ICT have been drivers that have re-engineered our society and commerce in recent years. The creative use of Information and Communications Technology (ICT) in primary education has the capacity to increase the quality of stakeholder's lives by enhancing teaching and learning. This needs a shift within the delivery and pedagogy employed in the present primary education system. The aim of this paper is to put forth benefits of Information and Communication technologies (ICT) in standards of primary education.. In this context, individual teachers have exploited the potential of ICT to complement their own pedagogical practices, and to extend their children's learning.*

The Primary School Curriculum promotes the use of ICT to enhance teaching and learning across the curriculum. The curriculum integrates ICT into the teaching and learning process and provides children with opportunities to use modern technology to enhance their lives

Keywords*—Curriculum, Information and Communication Technologies [ICT], pedagogy Learning, pedagogical practices, stakeholders.*

I. INTRODUCTION

ICT has the potential to "bridge the knowledge gap" in terms of improving quality of education in India. Technology and ICT have been drivers that have re-engineered our society and commerce in recent years. The creative use of Information and Communications Technology (ICT) in primary education has the capacity to increase the quality of society lives by enhancing teaching and learning. In recent years, several studies and reports have highlighted the opportunities and the potential benefits of information and communication technologies (ICT) for improving the quality of primary education. ICT is viewed as a "major tool for building knowledge societies" (UNESCO 2003, 1) and, particularly, as a mechanism at the primary school education level that could provide a way to rethink and redesign the educational systems and processes, thus leading to quality education for all .

ICT enabled primary education can ultimately cause the group action education, particularly in developing countries like India, effective use of ICT for the purpose of primary education has the potential to bridge the digital divide. Primary education drives the aggressiveness and building a powerful new generation in Republic of India. Primary School Education System in India is the future of our country. There are various schools in India and many new one are also coming up. Different types of schools like residential schools, boarding schools, government schools, day schools, primary schools and secondary schools operate in the country. Most of the schools these days have world class facilities including the best teachers to provide quality education to children. Most of the primary schools are now ready to accept ICT for enhance the quality of primary education. But facing some barriers while implementing it.

II. LITERATURE REVIEW

Albert Sangràa* and Mercedes González-Sanmamedb in his research paper "The role of information and communication technologies in improving teaching and learning processes in primary and secondary schools"concluded that, The integration of ICT is as a resource and a strategic element for the innovation and the improvement of teaching and learning processes. Or to change the teaching models, the teacher's role, issues regarding classroom organization, the teaching and learning processes. The teaching staff has a fundamental role in determining what to teach and how to teach it (and what the students are going to learn) using ICT.

Peter Ruddin his paper "School Improvement through ICT: Limitations and Possibilities" mentioned that As increasing amounts of money are spent on ICT and new learning infrastructures in primary schools, it is important that these two areas of educational research and practice should be brought closer together. So that it will be more beneficial to schools, teachers, students and parents.

Bottino (2003) and Sharma (2003) mention that the use of ICT will improve performance, teaching, administration, and develop relevant skills within the deprived communities. It conjointly improves the quality of education by facilitating learning by doing, real time spoken communication, delayed time spoken communication, directed instruction, self-learning, drawback finding, data seeking and analysis, and

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emending thinking, similarly because the ability to speak, collaborate and learn (Yuen et al, 2003).

Casals(2007)mentioned that ICTs conjointly offer a platform for sharing data and information. ICT will play a valuable role to monitor and log the progress of the students across time, place and varied activities. Mooij (2007) states that differentiated

ICT-based education will be expected to offer bigger responsibility, validity potency of knowledge assortment and bigger easy analysis, evaluation, and interpretation at any instruction level. In absence of ICT, most of the responsibility of teaching and learning lies on the academics. However, with the facilitate of ICT one will transfer the responsibilities to the scholars therefore that they will self manage. Mooij additionally puts forth the read that ICT-based registration, evaluation, Associate in nursing administration helps to link totally different levels of info and facilitate an overall read of new whole instructional setup. It facilitates the analysis and examination of the training method and results by the scholars and also the folks in an exceedingly versatile and convenient approach.

Innovative use of Information and Communication Technology can potentially solve this problem. Education is the driving force of economic and social development in any country. Considering this, it is necessary to find ways to make education of good quality, accessible and affordable to all, using the latest technology available. The last two decades have witnessed a revolution caused by the rapid development of Information and Communication Technology (ICT). ICT has the potential to remove the barriers that are causing the problems of low rate of education in our country. It can be used as a tool to overcome the issues of cost, less number of teachers, and poor quality of education as well as to overcome time and distance barriers (McGorry, 2002)..

III. RATIONALES FOR INTRODUCING ICT IN PRIMARY EDUCATION

Individuals have to access information via ICT to keep space with the latest. In such a state of affairs, education, that continually plays an essential role in any economic and social growth of a rustic, becomes even a lot of necessary. Primary Education not solely will increase the productive skills of the individual however conjointly his earning power. It offers him a sense of well-being as well as capability to absorb new concepts, will increase his social interaction offers access to improved health and provides many a lot of intangible advantages .The varied types of CT product out there and having conation to Primary education, such as teleconference, audio, TV lessons, radio broadcasts, audiocassettes and CD ROMs etc have been used in education for totally different functions.

Table.1: Rationales for introducing ICT in Primary education

Rationale	***Basis***
Sharing	*Playing through various sharing tools (Tablets, Videogames)*
Development	*counseling child to be a good human being from childhood.*
Catalytic	*Utility of technology to improve performance and effectiveness in teaching, management and many other social activities.*
Pedagogical	*To utilize technology in enhancing learning, flexibility and efficiency in curriculum delivery*

Today ICTs—including laptops wirelessly connected to the web, personal digital assistants, low value video cameras, and cell phones have become reasonable, accessible and integrated in massive sections of the society throughout the world. It will reconstitute organizations, promote collaboration, increase democratic participation of voters, improve the transparency and responsiveness of governmental agencies, build education and health care additional wide accessible, foster cultural creativeness, and enhance the development in social integration. It is solely through education and the integration of ICT in education that one will teach students to be participants within the growth method during this era of speedy amendment.

Use of ICT in primary education develops various skills like co-operating with each other, sharing and adjust with real world issues. It improves the perception and understanding the situation.

ICT can be used as a tool in the process of Primary education in the following ways:

1) **Informative tool**: It provides informative data in various formats such as audio, video multimedia.
2) **Situating tool**: It creates situations, which the student experiences in real life. Thus, simulation and virtual reality is possible.
3) **Constructive tool**: To draw various pictures/images & coloring.
4) **Communicative tool**: It can help to enhance communication skill from childhood

The following mediums are used for the delivery and for conducting the education process:

1) **Voice** – Instructional audio tools that include interactive technologies as well as the passive ones.

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2) **Video** - Instructional video tools that include still images, prerecorded moving images, and real-time moving images combined with audio conferencing.

Advantages of ICT in primary Education:

1) Eliminating time barriers in education for learners as well as teachers
2) Enhanced group collaboration made possible via ICT within children.
3) New educational approaches can be used.
4) It improves the national dimension of primary educational services
5) It allows for just in time and fundamental education to child
6) It can also be used for non-formal education like health campaigns and literacy campaigns .

By studying the secondary data sources in detail the following main benefits of using ICT in primary education for various stakeholders is summarized

Table.2: Benefits of ICT in primary education to the main stakeholders.

Stakeholder	Benefits
Student	➢ enhance communication skill, ➢ Increase sharing attitude, ➢ Learner-centered approach, ➢ Improves quality of primary education and new ways of interaction.
Teachers	➢ High quality, cost effective professional development in the workplace, ➢ Upgrading of teaching skills, increased productivity, ➢ Increasing awareness of innovative Teaching methodology.
Non-Teaching Staff	➢ Searching and updating is flexible ➢ Development of a new working culture ➢ Increase efficiency and minimize the workload
Governments	➢ Increase the capacity and cost effectiveness of primary education and training systems, ➢ To support and enhance the quality and relevance of existing Primary educational structures, ➢ To ensure the connection of primary school and curricula to the emerging networks and information resources,

IV. BARRIERS OF USING ICT IN PRIMARY EDUCATION

In Indian school education system ICT have a great role to enhance the quality of primary education. But, there are some barriers to make the school education completely ICT based. They are as follows-

1. Lack of teacher's competency to handle ICT equipment's, is one of the biggest barrier in Indian school education system for making it ICT based.
2. Lack of infrastructures and equipments are another problems for back warding primary school education than other country,
3. Lack of interest in teachers and learners keep ICT in the school education
4. Lack of investigation for fruitful schemes of ICT.

V. CONCLUSION AND SUGGESTIONS

Quality in primary education through ICT and its awareness among stakeholders will have positive impact on the society. ICT can be helpful in quality and standards of education by implementing it in primary phases of education. ICT can be employed in formal and Non-formal types of primary education and would eventually make the learners employable and socially useful part of the upcoming generation. By employing ICT in teacher training can save a lot of money of the Government.

By employing ICT in administration can help in solving the problem of Absenteeism of students and teachers. Good quality content is one of the major issues and directly affects the standards of education and quality. By overcoming the certain challenges involved in the process of primary education can help a lot in this side. Conclusively a lot of quality improvement is going on after careful and planned implementation of ICT in school education by various stakeholders.

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A Competent Approach for Type of Phishing Attack Detection Using Multi-Layer Neural Network

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Abstract— *With the enlargement of contemporary technologies and the large-scale global computer networks web-attacks are escalating because of emergent curiosity of people and lawful institutions towards internet. Phishing is one of web-attack carried out by attacker using both social and technical engineering. Generally on web more attacks are launched every month with seek of crafting web addict to consider that they are contacting with a legalized entity for the intention of embezzle identity information, logon records and account details. The phishing attack detection and classification methods are utilized for the prevention and in-depth analysis of the attacks. In this paper, the proposed model has been designed with the multi-directional feature analysis along with the Back-Propagation Probabilistic neural network (BP-PNN) classification. The proposed model has performed better in the terms of the accuracy in all of the domains based upon the attack detection and classification.*

Keywords—Phishing detection, Neural Network, Probabilistic Classification, Phishing Attack Classification.

I. INTRODUCTION

Phishing is fraudulent process carried out by phisher to cheat people by creating spurious websites that have same manifestation to valid one to mislead individual's personal information [2]. Primarily focus of phisher is to amass monetary information, economic fatalities, identity hiding, loss in ecommerce and e-banking. Presently, Researchers have studied that phishing attacks have broadened beyond emails & append instant messaging, social networking sites, multiplayer games etc. Mostly used phishing attack is spear phishing in which attacker sends fake emails to specific target people rather than sending mass emails without knowing who the victim will be. For that reason, now Anti-phishing is multifaceted, rigid and critical disaster in recent humanity. Due to increasing online business it's very important to grasp this problem.

A. Types of Phishing Attacks

- Spear phishing - In this type of phishing [5] attacker have definite target of individuals and companies from whom he/she possibly will collect delicate information. It is most successful on web having 91% of phishing attacks.
- Whaling - Has tricky messages intended to look similar as received from actual business organization. Here phisher creates authoritatively looking FBI written order and ensures executive at upper level will click link and launch unusual programming.
- Clone phishing - In this beneficiary addresses are taken and used to make a practically indistinguishable or we can say duplicate (clone) email.
- Link manipulation - Traps used in this type of phishing is wrong spelling of URL and also sub-domains are utilized.
- Website forgery - Once a sufferer visits the phishing website the trickery isn't over. Scams use JavaScript commands so as to change the address bar. This is done by putting an image of a legitimate universal resource locator over the address bar.
- Phone phishing – Clients get fake [8] messages and phisher guaranteed that these are from bank advising to dial a telephone no. in regards to issues with their accounts.

B. Anti-Phishing Solutions

- Email Signed Digitally
- Online Brand Checking
- Web Browser Extensions
- Browsers Alert To unreliable Websites
- Identify Valid Websites

Also apart from these solutions there are more techniques and approaches proposed by researcher and anti-phishing [6] working groups (APWG) that are set up in various countries which detect and classify these phishing attacks.

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II. RELATED WORK

Authors proposed an efficient approach for phishing detection using single-layer neural network. In this new phishing websites can be detected & the weights of the heuristic are derived dispassionately [1]. In this paper new neuro-fuzzy model is proposed to detect phishing sites without by means of rule sets. Membership function has been used to calculate the value of heuristics efficiently [2]. Classification of large volume deception sites is very pricey both economically and computationally. To reduce problems like financial and computation that can be solved by distributed cloud environment [3]. Intelligent model for detection of fraud emails and websites by extracting features of emails & url by using preprocessing phase. New premeditated model results of accuracy 98.87% by using random forest algorithm (RFA) having standard dataset [4].Dudhe [5] presented that phishing is attack on web which make use of technical & social engineering to formulate phony websites and messages to fool users on internet to have their personal information. Various approaches have been applied to detect forged websites such as blacklist, whitelist, heuristic-based, machine learning approach. Presently increasing problems for internet users due to attacks on internet by falsified websites and emails which to attain sensitive information [6]. In this neural networks are used to predict the phishy websites [7]. This paper has multilayer neural network minimize error and make higher the performance. Discovered diverse features concerning the attacks of phishing, problems caused by them and projected the problem statement to seek out the supreme result for the dilemma [8]. Google Page Rank based approach was proposed for detection of phishing website. The proposed techniques have four phases. Further the features for phishing sites were selected. To get results classification process is carried out for testing and accuracy [9].In this paper authors used 2889 phishing and legitimate emails for revise, to test and train the classifiers 43 additional features have been used [10]. HTML is broadly use for webpages formation in computer network of Internet and Intranet [11]. Source code of HTML and JavaScript is obtained while webpages load in browser. In this they had presented different algorithms for encryption and decryption of html & JavaScript. Thabtah et al. [12] has predicted the websites phishing detection using neural network trained with back-propagation. It shows high reception ability for fault tolerance, noisy data and other parameters. In this paper approach to classify vehicles based on probabilistic neural network and features are extracted with feature extractor [13].The intellectual Phishing Website Detection System using Fuzzy method for E-Banking that have advantage to facilitate dispensation of hazily distinct variables and their relationship between them [14].Phishing is web attack done by attacker while online transaction or social media to grasp personal details of victim [15]. In this detail information is provided regarding anti-phishing techniques along with their advantage and disadvantages. Sung et al. [16] had projected that how to detect phishing URLs using different approaches designed by organizations. Here comparison is done with previous machine learning approaches with newly proposed real-time application.

III. PROPOSED WORK

Phishing [1] is untruthful process carried out by phisher using both social and technical engineering to swindle people by crafting spurious websites that have same manifestation to legal one to mislead individual's delicate information. From most current statistics phishing is escalating felony on web that includes major loss of capital and perceptive information communal on web. The proposed model has been analyzed under the variety of the experiments and has been specifically designed for the detection and classification of phishing attacks. Some of phishing attacks included in proposed work are Clone phishing, Link manipulation, Phone phishing, Spear phishing, Website Forgery and Whaling method. Here artificial neural network is used as classifier for classification and detection [12] of phishing attacks. Due to non-linear nature of neural networks, they consists large number of processing elements called neurons. To bare the patterns in data neural networks have complex connection between inputs and outputs. The most interesting feature of neural network is the possibility of learning. Also fuzzy rules have been estimated here to remove crispy values.

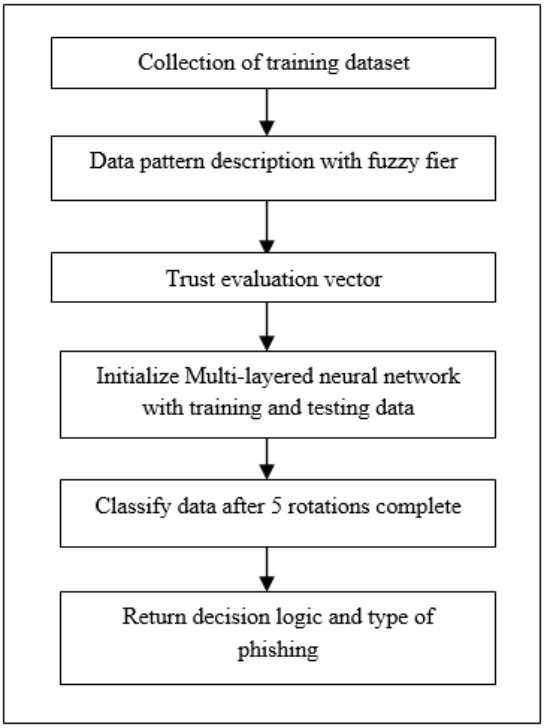

Fig.1: Flowchart of Methodology

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In this paper, a competent approach for detecting type of phishing attack based on multi-layer neural network is proposed having output on the basis of similarity.

A. Artificial Neural Networks

An Artificial neural network (ANN) repeatedly now called "neural network" (NN) is a statistical model based on genetic neural networks [17] that look a lot like the brain. Due to non-linear nature of neural networks, they consists large number of processing elements called neurons. To uncover the patterns in data neural networks have complex connection between inputs and outputs. Neural network as classifier works in similar way humans' processes information. The interneuron association strength called synaptic weights mount up knowledge that the neural networks require from a learning process. Neural network have large amount of nerve cells which are extremely simple that work similar and have the ability to learn. These artificial neural networks (ANN) fluctuate from each other with one or two layers of single route logic, to complicated multi-input with many directional feedback loops and inputs.

From above observation we can say that phishing is classification problem that can be solved by different classifiers [10] in data mining that are Support Vector Machine (SVM), K-Nearest Neighbor (KNN), Neural Networks (NN).In this paper to propose our model Neural Networks (NN) are used because it has quite a lot of advantages like high precision, noise lenience, relieve of maintenance, independence from earlier assumptions. Neural networks are worn to predict type of phishing attack with the help of its learning and generalization aspects.

B. System Model Design

In previous work the model was designed [1] in which single-layer neural network was intended with 11,660 training dataset including phishy & legal sites and 2 testing dataset having 5000 phishing sites or 5000 legitimate sites over which testing is done. In our proposed model we had used multi-layer neural network with 32000*2 phishy dataset and there are 12 samples as testing dataset. Here fuzzy [14] fier is also used for reducing data or we can say feature reduction is done. We have all phishy patterns because main objective is to detect and classify type of phishing attack.

1. Phase I - In this 20 main features are extracted some of them are Trust factor, No. of nodes, each node priority, each node trust factor, ranking, patterns etc.
2. Phase II - Then trust evaluation vector calculates the trust value on the basis of prominent pattern selection.
3. Phase III - Here in this phase Multi-layered neural network is trained with training data to calculate value of output node.
4. Phase IV – Classify phishy data after 5 rotations compute.
5. Phase V – At last decision logic is generated after neural network computes 30 times and type of phishing attack will be result.

C. Classification using Back Propagation Probabilistic Neural Network (BP-PNN)

A Probabilistic neural network (PNN) [13] is neural network which is plagiaristic of Bayesian network and kernel fisher discriminant analysis. It is feed forward neural networks, which has layered structure. In this layered formation one or more processing elements are present at each layer. No additional extensive training is required while training samples are added or removed.

Here due to layers each processing aspect gets input from previous layer or also can get from outside world. A PNN is an accomplishment of numerical algorithm called kernel discriminant analysis where operations are keen on multilayered feed forward neural network with four layers named as:

- Input layer
- Hidden layer
- Summation layer/Pattern layer
- Output layer

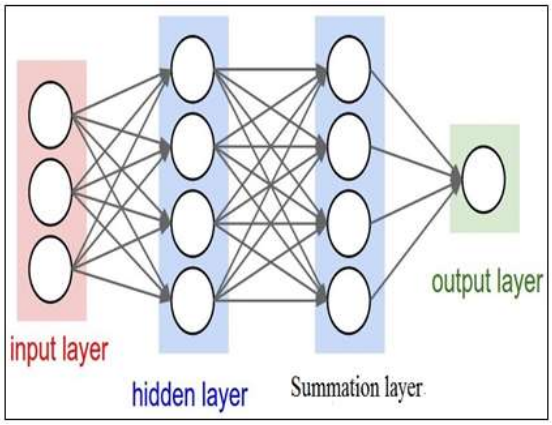

Fig.2: Architecture of probabilistic neural network

In the implementation of phishing pattern discovery algorithm (PPDA) using the multiple input layers initialized with the variety of the features extracted. The phishing pattern discovery module adds the robustness to the proposed classification model to process input data according to the target data. Testing of the input web patterns and their recognization as the phishing patterns is done by using different functions like performance, error evaluation and feature extraction modules [6].

D. Proposed System

For the purpose type of phishing attack classification, proposed system has datasets i.e. training dataset consists type of phishing attacks spear phishing (s) ,whaling (z) ,clone phishing (c) ,phone phishing (p) , website forgery (w) ,link manipulation (l) and testing dataset consist samples

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(n=12).Also database is created which have multiple data i.e. 32000*2 phishy data .Then additional neural network is initialized for processing which evaluates 5 rotations on each of attack i.e. NN will compute 30 times. From here we can examine that NN [7] will evaluate result after computing whole sample. The end result will be having parameter i.e. similarity (maximum similar results).Moreover graphs are also generates in pyramid and triangular shape by neural network meanwhile it is trained.. We compute NN 5 times so that it can converge and accuracy can be obtained.

Steps of Training Algorithm [1] [2] :-

1. Firstly weights of heuristics are initialized and collect training dataset.
2. Then neural network structured access these weights as input and in forward direction these are transmitted to whole network until it appears at output layer. Afterward equation is used to calculate input for output layer:

$$O_I = \sum_{i=1}^{n} W_i \times I_i \quad \ldots\ldots\ldots\ldots\ldots (1)$$

Here in this equation O_I is input value for output layer, W_i are the weights initialized for ith input node and I_i is the input value of the ith node. Now here output value of output node is calculated by equation below:

$$O_o = \frac{1}{1+ e^{-o_I}} \quad \ldots\ldots\ldots (2)$$

3. To calculate the error we deduct output value of output node from real output value.

$$err = T - O_o \quad \ldots\ldots\ldots\ldots\ldots\ldots (3)$$

where T is real output.

4. To train neural network supervised learning is employed, in this back-propagation probabilistic neural network algorithm is used. In this below equation is used to adjust weights:

$$W_i = W_i \times R \times err \times O \quad \ldots\ldots\ldots (4)$$

Where W_i is weight of input it node and R is learning rate here.

5. When neural network stops then forward procedure begins again until the error is minimized between valid output and predicted output.

IV. RESULTS AND DISCUSSION

In this network, there is ten input layer with seventy four neurons, ten hidden layers and an output layer having one neuron. Features which have been previously extracted are saved in dataset. There are 20 numbers of features that are extracted. These features are supplied to input layer of Feed Forward NN (FFNN). Data will be processed for classification in hidden layers. Output layer will provide the result phishing sample and identify it according to the target value. Test the performance of overall system on the basis of accuracy, precision, recall and elapsed time.

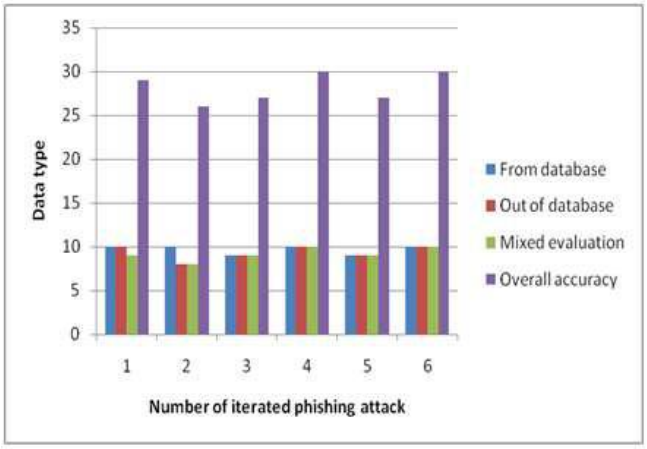

Fig.3: Accuracy analysis of iterated phishing attack

Figure.3 portrays accuracy analysis of iterated phishing attack recognition system that is detected in proposed model. Here in column graph number of phishing attack is on x-axis and data type is on y-axis. Classification method can be used to classify dataset into one of seeded set of classes or groups. Training dataset consist of types of phishing attacks i.e. on x-axis: spear phishing (s) ,whaling (z) ,clone phishing (c) ,phone phishing (p) , website forgery (w) ,link manipulation (l). Sequence followed to detect accuracy of phishing attack is clpswz.

Elapsed Time: is defined as measurement of time completing an activity, job or task. In other words, it is defined as difference between finishing time and starting time of the neural network.

Elapsed Time =Finishing Time –Starting Time.

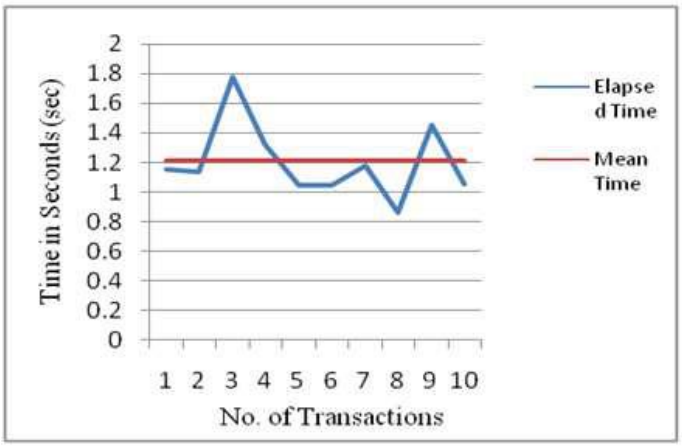

Fig.4: Elapsed time graph of neural network

Figure 4 shows elapsed time graph of neural network. X-axes represent no of transactions and y-axes represent time in seconds. Some point of elapsed time is greater than average time of neural network and some point of elapsed

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time is below the average time of neural network. This graph shows two lines blue and red. Blue line represent elapsed time of neural network .Red line represents mean time (average time) of elapsed time of the neural network.

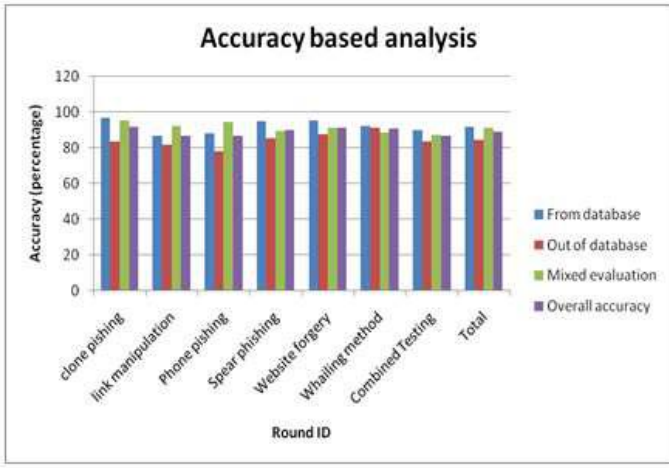

Fig.5: Accuracy analysis of system in percentage

Figure.5 above illustrates accuracy analysis of system in percentage. Column graph demonstrates two axis where x-axis correspond to different type of phishing attack, combinational testing, total of them and y-axis correspond to accuracy in (percentage) among various data type i.e. From database, Out of database, Mixed evaluation, Overall accuracy.

Also in figure.5 same sequence is followed that is clpswz i.e. shown above and the proposed model is sculpt for classification of phishy data and then detect which type of phishing attack is it.

V. CONCLUSION AND FUTURE WORK

This research work proposed an innovative technique to detect and classify type of phishing attack. In this new proposed technique, the system sculpt is built to detect phishing attack using multi-layer neural network. In consequence, the boosted model formation is necessitating for steady revolutionize and buffet these changes in websites. As discussed above phishing is fraud carried out by invader on web is swindling to divulge individual's credentials like account details, user name, passwords etc. It's critical impasse to be foretell to defeat identity stealing and economic losses which are its commencement. The multi-layer neural network Back-propagation probabilistic neural network (BP-PNN) is experimented with large database i.e. 32000*2 phishy data. Neural network is trained with 6 types of phishing attacks and 12 testing samples for classification of phishy data. So from this we believe that as compared to existing system tools the proposed system has better performance and less error rates.

In future the projected multi-layer neural network will be enlarged to improve the detection ratio. Also more classifiers like SVM, KNN, DT, NB etc. can be used for classification and further comparison can be done to get best results among them. Additional features can be used to detect newly created phishing attacks by invader on web.

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Vibrational Analysis in Condition Monitoring and faults Diagnosis of Rotating Shaft - Over View

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Abstract— *Rotating shaft is a vital element in power stations like Gas power stations, steam power station and Tidal power stations. These shaft failure or break down lead to the consequences, ranges from annoyance to the financial disaster or human damage. Hence predictive maintenance which includes early detection, identification and correction of machinery problems is paramount to anyone involved in the maintenance of industrial machinery to insure continued, safe and productive operation. Condition monitoring of machines is become necessary to run the machines efficiently. Vibrations are caused due to unbalance in the rotating components, dry friction between the two mating surfaces, misalignments, imperfect of coupling or bearings, and cracks in the shafts or blades. In predictive maintenance, vibration monitoring and analysis is essential. Health of any rotating shaft can be identified by its signature includes number of peaks. The peaks in the spectrum or signature give the information regarding the type of fault. In this paper gives a overview on vibrations analysis and faults diagnosis in various rotating machine parts and also this paper attempts to epitomize the recent research and developments in rotating element vibration analysis techniques.*

Keyworks— Vibrations Analysis, Condition monitoring, Fault Diagnosis.

I. INTRODUCTION

Every machine consists of rotating parts like bearings, Gears and rotating shafts etc., Failure of these components may lead to cost of unplanned down time, loss of life or machinery. This can be minimized by identification of the failure before it occurrence which is called predictive maintenance. Condition monitoring is one of best technique among various predictive maintenance techniques. Condition monitoring is the process of continuously monitoring the working health of machinery.

1.1 Condition Monitoring Techniques

The following are the major seven techniques of condition monitoring and are commonly used.

They are:

1. Visual monitoring
2. Contaminant or debris monitoring
3. Performance and behavior monitoring
4. Temperature monitoring or IR Thermography
5. Sound monitoring.
6. Shock pulse monitoring.
7. Vibration monitoring using spectrum analyzer. [1]

1.2 Detection of cracks in rotor shaft

High vibration amplitude in rotor system may due to fault in any one of the part of rotating machine or crack in the rotating shaft. Operating rotating machinery with a cracked rotor is very dangerous because the rotor crack grows with time and rotor may fail due to fatigue, causing a catastrophic accident. It is mandatory to check the occurrence of a rotor crack in time to time inspections during general maintenance of the system using the ultrasonic testing method or the dye testing method. However, these methods have own disadvantages such as more cost and difficulty in early detection method. Vibration diagnosis of a rotor crack by paying attention to the changes of vibration characteristics has been investigated [2, 3]. On his survey Gasch [4] reported the dynamic behavior of the de Laval rotor with a transverse crack. Grabowski [5] investigated a theoretical model of the crack mechanism and performed numerical simulation. Dimarogonas [6] used the de Laval rotor and compared with experiments. Inagaki [7], Mayes [8], and Nelson [9]

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investigated a general rotor system with a transverse crack using methods such as the transfer matrix method, and finite element method. Some of them [7, 10] performed experiments using a test rotor and compared with theoretical results. The propeller-bearing-shaft system has been holistically modeled using FE procedure with the actual in-situ profiles for the propeller, bearings, supports and torque loading aluminum arm. Also vibration analysis for experimental results has been successfully correlated with the finite element results. These results show that it is possible to detect the crack presence beyond the crack depth ratio of 20% [11]. A harmonic excitation force is applied to the cracked rotor and its excitation frequency is swept, and the nonlinear resonances due to crack are investigated. The occurrence of various types of nonlinear resonances due to crack are clarified, and types of these resonances, their resonance points, and dominant frequency component of these resonances are clarified numerically and experimentally [12].

1.3 Detection of rotor shat unbalance

Another important reason for high vibration is due to unbalance of masses, an unbalanced rotor always produces high vibrations and generates excessive force on the bearing area and reduces the life of the rotating machine. The vibration Produced due to unbalance may damage critical parts of the machine, such as bearings, seals, gears and couplings etc. In actual practice, rotors can never be perfectly balanced because of manufacturing errors like non-uniform density of material, tolerances in manufacturing, loss of material during operation, porous casting[13]. Mechanical malfunctions such as, rotor unbalance and shaft misalignment are the most common causes of vibration in rotating machineries. Excessive unbalance can lead to fatigue of machine components and can cause wear in bearings or internal rubs that can damage seals and degrade machine performance. The unbalance part of the rotor rotates at the same speed as the rotor and therefore the force caused by the unbalance is synchronous [14].

1.4 Detection of bearing defects

Rotating shaft system may be shutdown due to defects in the bearings. Vibration based condition monitoring is the process, which monitors the engine parameters periodically in order to ensure safety of the machine and hence predicts the faults in the system before occurrence of a catastrophic failure [15]. Vibration Monitoring is carried out with the help of accelerometers, which senses the vibration in the bearing and provides the required data for analysis. This can be carried out by three methods, namely, Time domain analysis, Frequency domain analysis, and Time frequency analysis. All the three techniques have been described in detail [16]. Vibration signals collected from bearings reviles much information about machine health conditions. Therefore, the vibration-based methods have received greater intensive study during the past decades. We can obtain vital characteristic information from the vibration signals through the use of signal processing techniques [17]. Bearing may fail by either of the following reasons - bearing subjected to normal loading will fail due to material fatigue such as pitting, spalling or after a certain running time. Fatigue damage begins with the formation of minute cracks below the bearing surface [18, 19]. As loading continues, the cracks progress to the surface where they cause material to break. The surface damage severely disturbs the motion of the rolling elements which leads to the generation of short time impacts repeated at rolling element defect frequency [20, 21, 22]. Wear is common cause of bearing failure, caused mainly by dirt & foreign particles entering the bearing through inadequate lubrication. Severe wear changes the raceway profile & alters the rolling element profile, increasing the bearing clearance. Increase in rolling friction leads to high levels of slip & skidding, results in complete breakdown [18]. Corrosion damage occurs when water, acids or other contaminants in the oil enter the bearing arrangement. This can be caused by damaged seals, acidic lubricants or con-densation. As the rust particles interfere with the lubrication rust on the running surfaces produces uneven & noisy operation. Incorrect design can involve poor choice of bearing type or size for the required operation. Incorrect bearing selection can result in low load carrying capability the end result will be reduced fatigue life. [23].

II. VIBRATION ANALYSIS TECHNIQUES

There is several vibration analysis techniques used to analyze the rotor shaft system vibration. In this paper the vibration analysis technique categorized the following way: Time domain, Frequency domain, Time Frequency Analysis, Cepstrum Analysis

2.1 Time domain analysis

Time domain analysis is the process in which statistical features are computed from the vibration data. By comparing the statistical features, particular faults can be identified. The statistical features that are used for time domain analysis in this paper are mean (M), variance (σV),

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Root Mean Square (RMS), Kurtosis (K), Skewness (S). These statistical features are described in this section.

Mean (M)

Mean is the average of the total number of samples in the vibration signal x (n) as:

$$\mathrm{M} = \frac{1}{N}\sum_{n=0}^{N-1} x(n)$$

Where, N is the length of the vibration signal and
X (n) is the raw vibration signal.

Variance (σV)

Variance is the square of standard deviation. Hence, it is also useful in differentiating between the normal and faulty rotating elements. It is represented as:

$$\sigma_{\mathrm{V}} = \frac{1}{N}\sum_{n=0}^{N-1} (x(n)-\mu)^2$$

Root Mean Square (RMS)

The Root Mean Square (RMS) value indicates the power content in the vibration signal. RMS is the effective value of the vibration signal. It can also be defined as the standard deviation of the signal. It is a feature, suited for steady state signals. As the rotor shaft elements life approaches the end RMS level increases considerably [24]. It provides excellent results in following the noise level throughout the signal and is the normalized second statistical moment of the signal [25]. It is represented as:

$$RMS = \sqrt{\frac{1}{N}\sum_{n=0}^{N-1} \left(x(n)-\mu\right)^2}$$

Skewness (S)

Skewness is the normalized third statistical moment of the signal. It indicates the relative energy over and under the mean level [26]. It is represented as:

$$S = \frac{\frac{1}{N}\sum_{n=0}^{N-1} \left(x(n)-\mu\right)^3}{RMS^3}$$

Kurtosis (K)

Kurtosis is the normalized fourth statistical moment of the signal. It indicates the impulsive nature of the signal. Since the signal is raised to the fourth power, it effectively amplifies the isolated peaks in the signal [27]. Kurtosis value is a negotiation between the tactless lower moments and extra-sensitive higher moments [26]. Kurtosis increases rapidly at the initial stage of a fault itself which is very helpful in finding the faults [24]. For continuous time signals, kurtosis is defined as

$$K = \frac{\frac{1}{N}\sum_{n=0}^{N-1} \left(x(n)-\mu\right)^4}{RMS^4}$$

2.2 Frequency Domain Techniques

Frequency domain, or spectral analysis, is the most popular technique for the diagnosis of faults of various rotating members. Frequency-domain techniques converts' time-domain vibration signals into discrete frequency components using a fast Fourier transform (FFT). Simply stated, FFT mathematically converts time-domain vibration signals trace into a series of discrete frequency components. The Fast Fourier Transform (FFT) is an algorithm for calculation of the Desecrate Fourier Transform first published in 1965 by J.W.Cooley and J.W.Tuckey [28].In a frequency spectrum plot, the X-axis is frequency and the Y-axis is the amplitude of displacement, velocity, or acceleration. The main advantage of frequency-domain analysis over time-domain analysis is that it has ability to easily detect the certain frequency components of interest. James Taylor [29] well explained the sequence of appearing and disappearing of peaks in the spectrum. The detailed knowledge of bearing characteristics frequencies (see section-III) required to indentify the location of defect in rolling element bearing. Power spectrum is used to identify the location of rolling element defects by relating the characteristic defect frequencies to the major frequency components which can be found in the spectrum. Power cepstrum is important bearing fault detection technique and it is defined as the inverse Fourier transform of the logarithmic power spectrum. A modified cepstrum analysis was proposed by Merwe and Hoffman [30].

2.3 Time -Frequency Domain Techniques

Time-frequency domain techniques have capability to handle both, stationary and non- stationary vibration signals. This is the main advantage over frequency domain techniques. Time–frequency analysis can show the signal frequency components, reveals their time variant features. A number of time-frequency analysis methods, such as the Short-Time Fourier Transform (STFT), Wigner-Ville Distribution (WVD), and Wavelet Transform (WT), have been introduced. STFT method is used to diagnosis of rolling element bearing faults [31]. The basic idea of the

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STFT is to divide the initial signal into segments with short-time window and then apply the Fourier transform to each time segment to ascertain the frequencies that existed in that segment. The advantage of wavelet transform (WT) over the STFT is that it can achieve high frequency resolutions with sharper time resolutions. An enhanced Kurtogram method used to diagnosis of rolling element bearing faults by Wang et al. [32].

III. CONCLUSION

In this paper an attempt made to epitomize the recent development in condition monitoring using vibration analysis techniques for diagnosis defect in rotary shaft. This study reveals that the time domain techniques and frequency domain techniques can indicate the faults in the rotor, but time domain technique can't identify the location. Frequency domain techniques have ability to identify the location of fault(s) in rotor.

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Determination of the Organoleptic Quality of Hard Dough Biscuits during the Shelf Life by Chemical Analysis

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Abstract*—The variations of moisture, pH, free fatty acids (FFA), peroxide value (PV), total carbonyl content (TCC) and organoleptic properties of hard dough biscuits packed with double laminated wrapper, were studied for 56 days of storage under accelerated shelf life conditions at 40^0C and 90% relative humidity. Variations of FFA, PV and TCC were statistically analyzed using V-masks with time-weighted CUSUM control charts. Sensory test results revealed that the biscuits began to deviate from the organoleptic freshness from 22^{nd}day. Moisture content and FFA gradually increased and pH value slightly declined. The PV and TCC were remarkably elevated during the study. Only the variation of PV was statistically significant on 22^{nd} day which was compatible with the sensorily decay of freshness in biscuits from the 22^{nd}day onwards. However, PV declined after 42^{nd}day onwards while showing a compatible increment in TCC. Either PV ≥1.07meq/kg or TCC ≥0.25ppm were identified as the indicators of deviation from organoleptic freshness. Thus, the typical hard dough biscuits were considered to be organoleptically fresh when both PV and TCC remained <1.07meq/kg and<0.25ppm respectively. Accordingly, a color scale was developed to efficiently measure the TCC in typical hard dough biscuits.*

Keywords*— *Free fatty acids, Hard dough biscuits, Organoleptic properties, Peroxide value, Total carbonyl content.

I. INTRODUCTION

Biscuits are cereal based food products that are baked to a moisture content of less than 5%. The cereal component is variously enriched with two major ingredients, fat and sugar [1]. Hard dough biscuits have relatively high amounts of water and low amounts of fatand sugar by dough composition. Generally these biscuits areproduced through laminating, dusting, sheeting, and cutting processes.

Typical hard dough biscuits, which are unsweetened, fermented, aerated, thin, and crisp to eat, are highly susceptible for the changes in physical, chemical and organoleptic properties during the accelerated storage life due to their open-flaky texture [1]. In food technological aspects, freshness and organoleptic quality is measured with sensory evaluation by sensory panel which is practically time consuming, subjective, labor intensive and even difficult to perform routinely. At the time of this study, none of alternative or reliable chemical method was identified and practiced in industry to determine the sensible freshness of hard dough biscuits except labor-intensive sensory evaluation methods. Therefore, the study was focused to determine a quantitative chemical measure which would reliably represent the deviation of freshness in terms of organoleptic quality of typical hard dough biscuits. Another intention of this study was to modify the selected appropriate chemical measure as to perform quickly, saving the experimental time under the industrial processing conditions.

Biscuit deterioration is usually associated with different phenomena, where three incidents are predominant; loss of crispiness, fat bloom, and rancidity [2]. The latter is the most effective in generating off-flavors that would thereby most adversely contribute to the organoleptic quality of the hard dough biscuits leading to consumers'

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rejection. In dry bakery products like biscuits, the deterioration during storage is mainly caused by lipid oxidation and resultant rancidity [3]. Rancidity in fat is twofold, hydrolytic and oxidative rancidity, of which mechanisms are largely hypothesized, researched and documented in literature.

According to Dobarganes and Velasco (2002), the available physical and chemical methods to monitor lipid oxidation in foods can be classified into five groups based on what they measure, such as (i) absorption of oxygen, (ii) loss of initial substrates, (iii) formation of free radicals, (iv) formation of primary oxidation products, and (v) formation of secondary oxidation products [4]. Depending on the availability of resources, peroxide value (PV) test and total carbonyl content (TCC) tests were selected as indicators of primary and secondary oxidation respectively.

The carbonyl compounds are suggested to be the major contributors to off-flavors associated withthe rancidity of many food products [5]. TCC is measured by a colorimetric spectrophotometric procedure [6,7] developed by American Society for Testing and Materials (ASTM) for determination of trace quantities of carbonyl compounds with 2,4-dinitrophenylhydrazine (2,4-DNPH) based upon the work of Lappin & Clark (1951) [8]. With the special emphasis on this test method during this study, a color scale was developed for the quicker determination of TCC. This study contributed to identify the most correlated chemical test parameter(s) with organoleptic quality of hard dough biscuits, and to determine their critical level(s) which would distinguish the point of occurrence of sensory unacceptability.

II. MATERIALS AND METHODS

2.1 Samples

A typical variety of hard dough biscuits; namely plain crackers, freshly produced in commercial scale (containing 13.40% w/w% total fat (7.37% unsaturated fat) and 0.56% w/w% sugars as per the nutritional information claimed by the manufacturer) were taken and wrapped in double laminated and metalized (BOPP+MCPP) wrapper with 4 biscuits per each packet. These packets were stored at 40 ± 1^0C temperature and 90% relative humidity (RH) for 8 weeks (56 days) and samples were drawn weekly in order to analyze changes in freshness and sensory quality, moisture content, pH, FFA, PV and TCC. All quantitative outcomes of chemical analysis in the study were mean values of triplicates.

2.2 Triangular Sensory Test

Three biscuits were individually packed in flexible wrappers with two of which were identical and one was odd, and then coded in 3-digit random numbers. Trained panelists were supposed to identify odd biscuit through the forced-choice method. (Half of sensory panel were given with 1 fresh biscuit as odd sample and 2 old biscuits as identical samples, rest of panel was given with 1 old biscuit as odd sample and 2 fresh biscuits as identical samples). The number of correct replies per week was assessed as per the ISO 4120:1983 to determine whether there was a significant difference between the fresh and old biscuits at 0.01 significance level.

2.3 Determination of Moisture Content

Moisture content of finely ground biscuits were weekly determined with triplicates according to the AOAC method (1990).

2.4 Determination of pH value

The pH values in 10% (w/w) aqueous solution were weekly determined with triplicates, using a pH meter (HANNA instruments, USA).

2.5 Extraction of Fat for FFA

With a slight modification to the method carried out by Calligaris *et.al.* (2008), finely ground biscuit sample of 10g was extracted under room temperature, to obtain the fat, using solid-liquid direct extraction in two steps of 1 hour per each (first step with 1:3 (w/v) solid : liquid ratio and second step with 1:2.5 (w/v) solid : liquid ratio) with diethyl ether AR - petroleum ether AR mixture (1:1, v./v) [3]. Two fat-solvent fractions were pooled and filtered through a filter paper (Whatman, Qualitative), then evaporated at 45^0C$\pm5^0$C to separate fat(Gemmy, Taiwan).

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2.6 Determination of FFA

Three extracted fat portions from three samples per week were analyzed for titrimetric FFA level in 1.0 gram of sample with a slight modification to the AOCS method Ca 5a-40.

2.7 Extraction of Fat for PV

As per the method described by Mildner-Szkudlarz*et.al.*(2009), fat in 10g of finely ground sample was extracted twice by direct solid-liquid extraction with 30ml and 25ml of chloroform (Assay 99.2%) separately in two intervals of 30 minutes. Two fat-solvent fractions obtained in each interval were pooled and filtered through a filter paper (Whatman, Qualitative) [9]. The extraction was weekly carried out with triplications.

For PV, according to Patrignani*et.al.*(2015), direct solvent extraction was faster, simpler, and most suitable for low lipid biscuits extraction [10]. Thus, the directly extracted fat with chloroform was analyzed for PV.

2.8 Determination of PV

Three extracted fat-chloroform fractions were analyzed for iodometric PV in meq/kg of biscuits pooling with relevant proportionate volume of glacial acetic acid based on AOCS standard test method of Cd 8-53 and were averaged with respect to storage days. No evaporation of chloroform was followed in order to make the testing faster, which was one of the objectives of this study.

2.9 Standardization f TCC

The standard curve for total carbonyl compounds was spectrophotometrically determined with triplicates as per the test method described by the Lappin and Clark (1951) [8], referred by the standard test method; ASTM E411-05, using acetone (HPLC Grade, Assay 99.8%, 58.08 $gmol^{-1}$, Density 791 kgm^{-3}) as the reference carbonyl compound, through a carbonyl concentration series from 0.00 ppm (blank) to 0.60 ppm (with an error of 0.05 ppm).

As per the Beer's Law, a linear model was derived to depict the linear relationship between the two variables; TCC concentration and absorbance.

2.10 Development of a Color Scale for TCC Test

The standardized series of wine-red colored alkaline 2,4-DNPH solution filled into cuvettes (380-780nm; Vis, Nephstar) was captured with a digital camera (focal length 3.5mm, ISO 350) against the concentration of carbonyls (in ppm). The color series was used to develop a color scale with which the quantification of TCC would become quick and simple.

The corresponding colors captured against the concentration were electronically extracted for their RBG values for further validation.

2.11 Determination of Sample Extraction Method for TCC Test

The optimum solvent; either ethanol (Assay 99.99% v/v) or methanol (HPLC Grade, Assay 99.8%), optimum extraction time; either 10 minutes or 20 minutes, and optimum volume of aliquot from carbonyl extract from hard dough biscuit; either 3 ml or 5 ml were determined using 3-factor: 2-level factorial design. The results were statistically analyzed to identify the treatment combination which gave the maximum difference in spectrophotometric absorption between fresh biscuit and deteriorated (expired) biscuit. The chosen treatment combination was used for forth TCC test.

2.12 Determination of Carbonyls

Finely ground 15.0g sample was extracted by solid-liquid (3:5 w/v) direct extraction with 25ml of methanol (Assay 99.8%) for 10 minutes. The liquid layer was filtered out through a filter paper and 3ml aliquot of extract was reacted with reagents as per the ASTM E411-05 to determine the spectrophotometric absorption, and then concentration of carbonyls was quantified using the standard curve. TCC was weekly done with triplicates.

2.13 Statistical Analysis

All the data were statistically analyzed through MINITAB® Release 14.1 statistical software. The V-mask by time-weighted CUSUM control chart was used to determine where the each parameter had been significantly shifted by half of standard deviations.

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III. RESULTS & DISCUSSION

3.1 Organoleptic Freshness by Triangular Sensory Test

According to the Table 1, which represented the outcome of the sensory triangle test for overall acceptability, the test samples were significantly deviated from fresh samples **from 22nd day of storage onwards** with concern on the odor, taste and texture.

Table.1*: Triangular test results to determine freshness in hard dough biscuits in terms of organoleptic quality (overall acceptability)*

Age of biscuit (Storage in Days)	Total responses	No. of correct answers	Required No. of correct answers to be significant*	Decision on difference between fresh & old biscuits
1	10	4	8	Not significant
7	10	7	8	Not significant
14	10	7	8	Not significant
22	10	10	8	Significant
29	15	13	10	Significant
35	15	12	10	Significant
42	12	11	9	Significant
49	16	15	11	Significant
56	12	11	9	Significant

*Minimum number of correct replies to establish a difference at α=0.01 significant level for triangular test, at ISO 4120:1983 (Trained sensory panel)

3.2 Variations of Moisture Content

According to Fig.1, the moisture content of biscuits was gradually increased with time. Moisture is a critical quality parameter in biscuits as higher moisture contributes to the loss of crispiness and potentially causes for hydrolytic rancidity that probably leading to a lesser sensory quality. Since, biscuits are highly hygroscopic, they tend to absorb water vapor from the micro-environment (inside the pack), thereby developing a partial pressure gradient from macro-environment (outside the pack) to micro-environment through wrapper.

As a result of that, water vapor permeability occurs through the wrapper. Thus, a steady increase of moisture content in biscuits was observed throughout the storage.

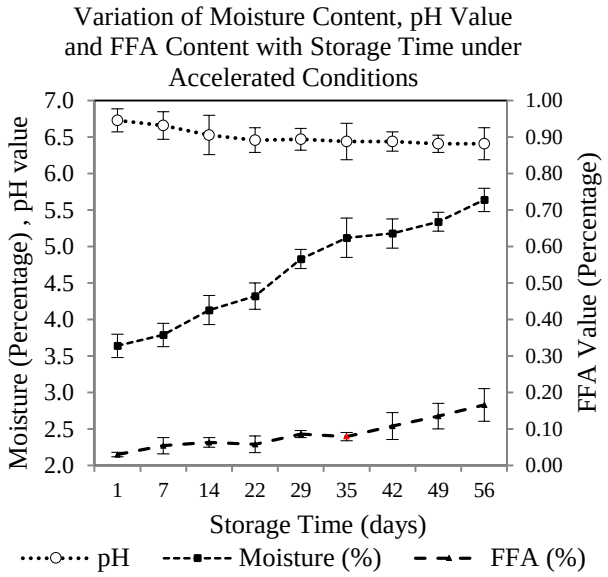

Fig. 1: Variation of moisture (wet basis), pH (in 10% aqueous solution) and FFA (in terms of oleic acid) during storage

3.3 Variations of pH Value

The pH value of the biscuits was gradually declined as illustrated in Fig.1, and this decline could be due to the increase of free fatty acids in the extracted fat from biscuits.

3.4 Variations of FFA

In this study, the fat extraction method was designed to avoid the extreme temperatures which the fat was exposed to; therefore, the observed increase of FFA was predominantly identified as the increase of hydrolytic rancidity of fat since the fat was continuously in contact with increasing moisture content within the biscuit matrix. Fatty acids were released to the biscuit matrix from the fat-hydrolyzation reaction.

As graphically presented in Fig.1, FFA value had a strong positive correlationship with moisture content (r=0.965; p=0.000), and a moderate negative relationship with pH (r=-0.764; p=0.017) at 0.05 significant level. More the moisture content, more hydrolyzation of fat and more free fatty acids, thereby lesser the pH value.

Fig.2 illustrates the V-mask by time-weighted CUSUM control chart for variations in FFA, which was used to

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monitor behavioral pattern of FFA during 56 days of shelf life. According to Fig. 2**,** for the first time, FFA value was significantly shifted on the 49th day under the accelerated storage conditions, when the biscuits had yielded only a mean FFA of 0.135% as demarcated in red color in Fig.1. Therefore, FFA was not an adequate measure to represent the freshness of biscuits as there was no significant deviation of FFA value occurred on 22nd day, at which the sensory panel was proficient to identify the turning point of deviation of freshness of biscuits.

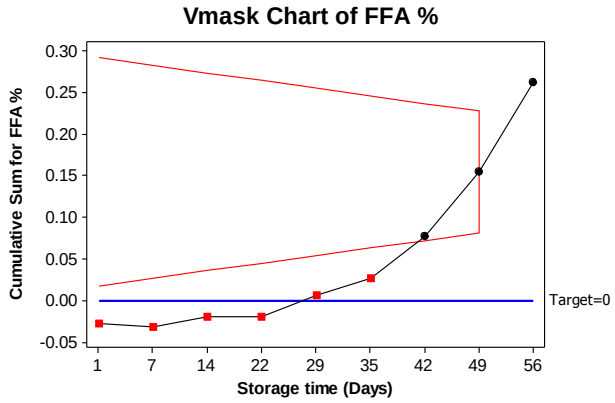

Fig.2: V-mask (on 49th Day) on CUSUM chart for variation of FFA% against storage (CUSUM plan with h=4.0 and k=0.5)

3.5 Variations of PV and TCC with Storage

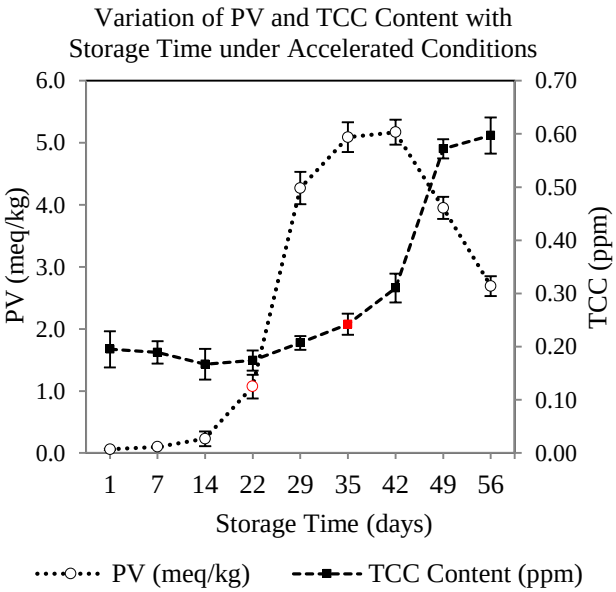

Fig.3: Variation of PV (meq/kg) and TCC (ppm) during storage

Variations of PV and TCC in hard dough biscuits during 56 days of storage are tabulated in Table 2 and further, graphically illustrated in Fig.3. The PV gradually increased up to a peak, followed by a gradual drop. TCC level started with a non-zero value, and then slightly declined, followed by a slight increase along with the acceleration of PV, finally drastically increased with the decline of PV.

3.5.1 Variation of PV

In this study, hydroperoxides in biscuits were quantified with PV, which is considered as an indicating test of the initial stages of oxidative change. The fat extraction method was designed to avoid the extreme temperatures to avoid acceleration of oxidation process at elevated temperatures, which is called as thermal oxidation [11].

Auto-oxidative increase in PV represents the continuation of spontaneous free radical mediated reactions which result in hydroperoxides, utilizing available triplet oxygen in the microenvironment inside the packaging [12].

However, these hydroperoxides are very unstable and susceptible to decomposition through secondary oxidation reactions. Therefore, a net decline of PV after 42nd day of storage in Fig.3 was observed as a result of a greater decomposition rate of hydroperoxides than the generation of them.

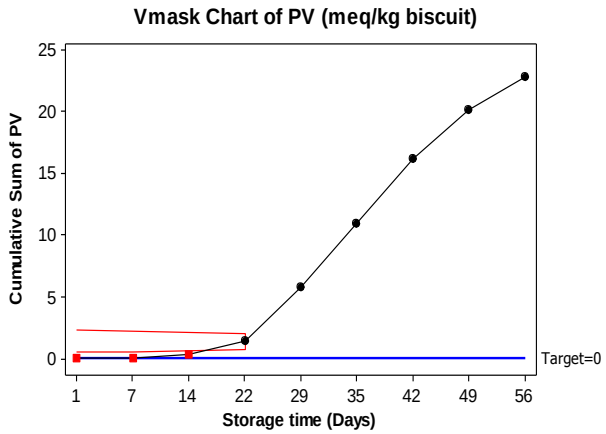

Fig.4: V-mask (on 22ndDay) on CUSUM chart for variation of PV against storage (CUSUM plan with h=4.0 and k=0.5)

Fig.4 shows the CUSUM control chart along with the V-mask for the development of PV during 56 days of storage of biscuits. According to the chart**,** the first time

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the PV significantly shifted was the 22nd day under the accelerated storage conditions. It had yielded a mean PV of 1.07meq/kg (on 22nd day) as illustrated in Fig.3. Therefore, PV was compatible with sensory test results.

Saxby (2012), O'Brien (2009) and Talbot (2011) have described that the peroxides (measured by the PV test), themselves, are generally tasteless and it is only when they are broken down further into aldehydes, ketones, etc., those impart off-flavors to the product [12, 13, 14]. Conversely, results of this study show that the PV can indicate the onset of organoleptic quality deviation or deterioration of hard dough biscuits. Similar results have also been reported by Calligaris *et. al.*(2008and 2007a) concluding and validating PV as a representative index for the quality of depletion of bakery products [3, 15].

However, the nature of PV observed was similar to that of being described in literature as a bell-shaped curve [16]. In observations, it initially moved up and thereafter moved down at 42nd day onwards. As widely described in literature, peroxides are unstable and further degrade into non-peroxide materials such as carbonyl compounds. Therefore, high PVs (>1.07meq/kg biscuits) sounds poor sensory quality, but a low PV (<1.07meq/kg biscuits) is not always an indication of good sensory quality.

3.5.2 Variations of TCC

3.5.2.1 Factorial Design for Sample Extraction Determinants for TCC

Carbonyl extraction method with alcoholic solvent which could obtain a maximum absorption difference in fresh and old biscuits, was investigated under three factor - two

Table.3:Analysis of 3-factor 2-level Factorial Design of 8 treatments for biscuit extraction determinants in TCC test (under 0.05 level of significance)

Treatment	Factor (X)			TCC of old biscuit Mean ± SD	TCC of new biscuit Mean ± SD	Absorbance Difference Mean ± SD
	Solvent	Volume of aliquot	Extraction Time			
1	Et	3	10	0.419 ± 0.081	0.351 ± 0.048	0.068 ± 0.033
2	Et	3	20	0.569 ± 0.096	0.414 ± 0.095	0.156 ± 0.054
3	Et	5	20	0.390 ± 0.068	0.303 ± 0.073	0.087 ± 0.010
4	Et	5	10	0.376 ± 0.112	0.500 ± 0.011	-0.124 ± 0.117
5	Me	3	10	1.404 ± 0.086	0.977 ± 0.052	0.427 ± 0.043
6	Me	3	20	1.247 ± 0.152	0.979 ± 0.134	0.269 ± 0.021
7	Me	5	10	1.339 ± 0.157	1.153 ± 0.152	0.186 ± 0.008
8	Me	5	20	1.346 ± 0.055	1.158 ± 0.049	0.188 ± 0.007
Main Effect[A]		P = 0.000	Solvent		P = 0.000	Me > Et
			Volume		P = 0.000	3 > 5
			Extraction Time		P = 0.101	-
Two-way interactions[B]		P = 0.000	Solvent * Volume		P = 0.475	-
			Solvent * Extraction Time		P = 0.000	Me: 10 > 20, Et:20> 10
			Volume * Extraction Time		P = 0.003	3:10>20, 5:20>10
Three-way interactions[B]		P = 0.661	Solvent * Volume * Extraction Time		P = 0.661	-

Me – Methanol, Et – Ethanol, 5 – Aliquot of 5 ml, 3 – Aliquot of 3 ml, 20 – 20 minutes, 10 – 10 minutes

All values are means of 3 determinations ± standard deviation (SD).

alternative Hypothesis on testing at 0.05 level of significance;

A - H_1: At least one pair of the different levels of X factor is significantly different with the absorbance difference.

B - H_1: At least one pair of the interactions of different levels of two or three factors is significantly different with the absorbance difference.

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level factorial design with 8 (as 2^3) treatments as indicated in the Table 3. The main effects of solvent (p=0.000) and aliquot volume (p=0.000), interaction effects between solvent and extraction time (p=0.000) and between volume and extraction time (p=0.003) were only statistically significant on the difference of absorbance (between fresh and old biscuit extracts) under 0.05 level of significance.

Main effects were identified to have a higher absorption difference between fresh and old hard dough biscuits for methanol solvent, and for 3 ml aliquot volume. In the "interaction effects plot" between solvent and extraction time, methanol solvent with 10 minutes extraction yielded the greatest absorbance difference. In the interaction effects plot between aliquot volume and extraction time, volume of 3 ml for 10 minutes extraction imparted the highest absorbance difference. Since there was no significant effect of extraction time as per the main effect analysis (p=0.101) according to the Table 3, 10 minutes of extraction time was more preferred than 20 minutes, as to save time.

According to the outcome, the treatment combination of **"extraction time of 10 minutes, with methanol solvent, by 3 ml aliquot"** was selected to extract carbonyls from hard dough biscuits prior to the TCC tests.

3.5.2.2 TCC Variation in Samples

Under the TCC test, the presence of carbonyl compounds such as aldehydes and ketones in biscuit matrix were quantified with 2,4-DNPH, which is recognized as a conventional method for measuring carbonyls, being most reliable and widely used too [17]. Extreme temperatures were avoided in fat extraction process to avoid thermal oxidation. The reagent; 2,4-DNPH, with a carbonyl compound, generates hydrozone compound, and then converts into a resonating quinoidal complex which is wine-red in color in the presence of excess alkali [8, 11].

The carbonyl compounds are incorporated into the biscuit matrix through several methods. Different volatile and non-volatile carbonyls are produced during the fermented hard dough biscuit manufacturing process**,** both at (i) fermentation by baker's yeast (*Saccharomyces cerevisiae)* and at (ii) sugar degradation while baking. The latter is two folds; as (ii.a) the caramelization of sugars and (ii.b) the series of Maillard browning reactions of sugars in combination with amino acids (specifically at the steps of Strecker reactions)while baking [1, 18].

According to Rothe and Thomas (1959), most of fermentation carbonyl products are volatilized during the latter stages of fermentation and baking [19]. Rooney *et.al.*(1967) has concluded that the Maillard-type browning is the major source of carbonyl compounds and brown color in starch paste model systems like breads [20]. Accordingly, the compounds with carbonyl groups are responsible for the yellow-brownish hue [1] on the biscuit and cracker-like aroma [21], which are prominently occurred during the production process of biscuits, especially at baking. Hence, the biscuit samples just after production had a non-zero TCC level; an initial TCC of 0.195 ppm, as indicated in Table 2 and Fig. 2.

Fig. 2 illustrates a lesser TCC of biscuits recorded in $7^{th}$and 14^{th}days of storage than the initial TCC level. This slight decline may be due to the loss of volatile carbonyls by volatilization from biscuit matrix when they are stored under accelerated conditions (at 40 ± 1^0C temperature).

With the acceleration phase of primary oxidation from 22^{nd} day to 42^{nd} day, a steady but slight increase in TCC level was observed. Within this phase, the formation rate of unstable hydroperoxides dominated over their degradation rate. Thus a little of carbonyls (secondary oxidation products) was being produced from degradation of hydro peroxides, which was represented with this slight increase in TCC level from 22^{nd} day to 42^{nd} day.

The TCC level was recorded to drastically increase on 49^{th} day onwards, while PV continued to drop severely. This drop of PV represented a lesser generation--rate with greater degradation rate of hydro peroxides, which lead to a net loss of hydro peroxides, and thereby, an escalation of the generation rate of carbonyls, as demonstrated in

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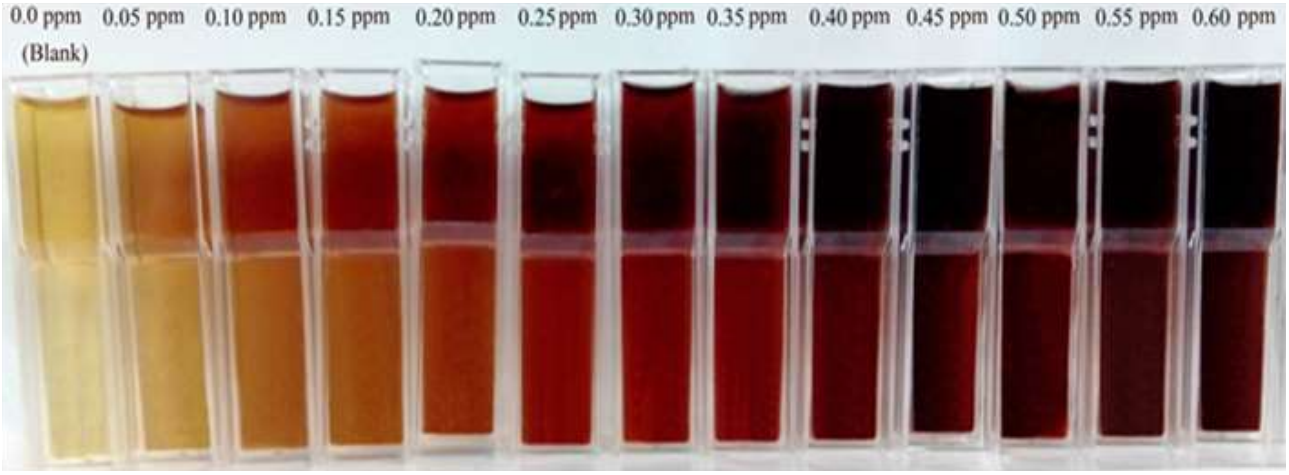

Fig. 6 :Series of known concentrations of carbonyl compounds (resulting alkaline 2,4-DNPH solutions are filled into cuvettes (380-780nm; Vis, Nephstar) and corresponding concentrations are noted above the cuvette)

Table.4: Development of color scale to measure TCC in hard dough biscuits

Concentration of carbonyls (ppm)	0.00	0.05	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60
R	242	241	237	232	216	203	185	190	164	166	124	118	100
G	199	180	139	119	096	096	071	058	052	025	037	035	051
B	092	052	000	034	024	021	000	052	058	046	041	047	053
Color													

Fig. 2. Antolovich*et.al.* (2002), Saxby (2012) and Belitz (2009) have identified those carbonyl compounds as the contributors to off- flavors associated with the rancidity of many of food products [5, 12, 18].

Fig. 5 indicates the CUSUM control chart along with the V-mask for the development of TCC during 56 days of storage of hard dough biscuits. It indicates that TCC was significantly being shifted from the 35thday, where the carbonyls had been observed with a mean TCC value of 0.242 ppm as demarcated in red color in Fig. 3. Therefore, TCC was also not an adequate **single** measure to justify the sensory test results as there was no significant deviation occurring on TCC value on 22nd day.

Under this synopsis, when PV decreased, TCC increased as illustrated in Fig. 3. Therefore, a **combination of TCC**

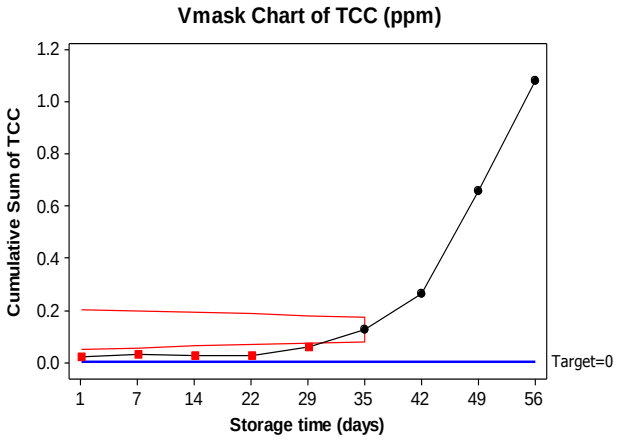

Fig. 5: V-mask (on 35thDay) on CUSUM chart for variation of TCC against storage (CUSUM plan with h=4.0 and k=0.5)

-and PV tests becomes a good measure of the decay of organoleptic freshness in hard dough biscuits.

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3.5.2.3 Color Scale as a Routine Measure for TCC Test

The wine-red color series illustrated in Fig. 6was the basis to develop the color scale for quantification of TCC. The corresponding colors captured against the concentration are also recorded in Table 4, with their RBG values. With the use of this color scale, the level of TCC in the extracted solution of hard dough biscuit sample would be easily quantified with an error of 0.05ppm. The concept requires performing both of "blank determination [Blank]" and "sample determination [Sample]" at a time to obtain the subtracted value [Sample - Blank] as the level of TCC in sample.

3.1 Chemical Analysis as a Measure for Organoleptic Quality in Quality Assurance

During this study, neither FFA nor TCC, but the PV was only compatible with sensory test results which could identify the onset of the deviation of organoleptic freshness in hard dough biscuits stored under accelerated conditions.

This result is compatible with the outcome of Calligaris *et. al.* (2007a) with evidence that the PV is well correlated to the organoleptic quality of bakery goods [15], and further this outcome has been validated by Calligaris *et. al.* (2008) for bread sticks [3]. However the bell-shaped behavior of PV was not been considered by Calligaris *et. al.* (2007a and 2008) since this decline was to be observed much later than the onset of organoleptic quality deterioration [15, 3].

With the quality assurance perspective throughout the shelf life in food industry, the declining nature of PV was also considered in this study. In case, PV requires verification from a second supportive measure, for which the TCC is proposed during this study. When PV is obtained lesser than the minimally acceptable point with <1.07 meq/kg of biscuits, the biscuits may either be too early to deteriorate, or else, too late from deterioration. This controversy can be solved by using TCC as a verification test.

In order to rapid up the entire testing time, TCC can be performed using the developed color scale within few minutes as the first test, and then PV as the verification test.

IV. CONCLUSION

Hard dough biscuits; the plain crackers stored for 56 days under accelerated storage conditions, were significantly deviated from freshness in sensory aspects, from 22ndday of storage onwards. Throughout the storage, moisture content and FFA were gradually increasing while pH value was slightly decreasing. PVrepresented a bell-shaped curve with the peak level on 42nd day. Rise of TCCwas remarkable from the 42nd day onwards, showing a negative correlationship with PV thereafter.

First significant shifts in CUSUM charts were observed on 49thday for FFA (mean 0.135%),on 22nd day for PV(mean 1.07meq/kg), and on 35th day for TCC (mean 0.242 ppm). Therefore, only the PV was compatible with the sensory test results. Since PV has a bell-shaped behavior through storage with a latter decreasing phase, it was recommended to be used**in combination** with TCC test**,**for determination of the organoleptic quality of hard dough biscuits.

For TCC test, 3ml aliquot from methanol extract from 10 minutes direct extraction of finely powdered hard dough biscuits was optimum, with which had resulted the highest color variance between fresh and deteriorated biscuits.

Hard dough biscuits are unacceptable organoleptically either if TCC [Sample - Blank] is 0.25ppm or more(with color scale) ***or*** if the PV is 1.07 meq/kg or more. Further, the organoleptic freshness of hard dough biscuits can be chemically identified if TCC [Sample - Blank] is less than 0.25 ppm (with color scale) ***and*** the PV is less than 1.07 meq/kg simultaneously.

As an extension, this study can be further validated to develop colorimetric testing equipment which can be used to determine the TCC in hard dough biscuits in a lesser experimental time.

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Regional Flood Frequency Analysis Using Computer Simulations

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Abstract— *Different probability distribution methods were employed to determine the flood frequency analysis using computer simulations. Many probability distributions including Gumbel, lognormal, log-Pearson type iii, General Extreme value have been tried to fit the data. The length of record for most of the stations is over 10 years (chosen from 1956 0nwards). The data was procured from J.R.M.Hosking for various project sites. The common time period of 1956 onwards has been chosen only to avoid the effect of interception of basin due to construction of storage reservoir and was also subject of flood data. The best fitting distribution works out to be General Extreme Value Distribution. Gumbel's distribution ranks poorly among different probability distributions. A trial version of probability software is used to evaluate the best fit distribution and parameters of distribution.*

Keywords— Gumbel distribution, General Extreme value, Log normal, Log Pearson distribution.

I. INTRODUCTION

Natural disaster like Flood is one of the most serious problems that are affecting countries worldwide. Many natural and Un-natural factors affects the flood, monitoring the factors responsible for flood is very important to minimize the impact and damage. Flood real time monitoring system and flood forecasting model is difficult to develop, due to a large amountof data required are difficult to obtain. In the present study, length of record for most of the stations is over 10 years (chosen from 1956 0nwards) and the data was procured from J.R.M Hosking for various project sites.

Many papers discuss the estimation of flood frequency using different distribution techniques.[3] used different methods were employed in applying probability distribution in hydrology.[4] develops flood Model to analyze the maximum water level and drainage density using Gumbel distribution. [5] analyzed the frequency ofNyanyadzi River floods using the Gumbel distribution.

Latest CWC guidelines, spelled out in the manual on estimation of design flood and USGS guidelines are used for analysis.In the present study many distribution techniques such as Gumbel distribution, Gumbel extreme value distribution, Log normal and Log Pearson distribution techniques were adopted to find the frequency of flood occurrence and best method is identified.

II. METHODOLOGY

The data has been checked for randomness and corrected for high and low outlier. Missing data is generated by correlation of flood peaks. Correction for trend has not been exercised because of absence of long term data for most of the stations. Each catchment is assumed to generate its own peak flood without intervention.

Gumbel Extreme value probability distribution by variates was adopted for frequency analysis at the initial stage assuming that most of the stations follow this type of distribution which eventually has proved otherwise. Excel spreadsheet simulation models and probability modeling tools are used for the analysis of the probability statistics.

Many probability distributions including Gumbel, lognormal, log-pearson type iii, General Extreme value have been tried to fit the data. The best fitting distribution works out to be General Extreme Value Distribution. Gumbels's distribution ranks poorly among different probability distributions. A trial version of probability software is used to evaluate the best fit distribution and parameters of distribution. The methods of moments and maximum likelihood are used for evaluation. The parameters obtained from easy fit for distributions like Gumbels (largest EV), lognormal(2p), General extreme value has been considered in working out the flood quintiles for various return periods like 2,2.33,10,25,50,100,200 and 500 years. The different distributions give closer value at small values of return periods and vary considerably at large return periods.

The station-wise, distribution-wise graphs depict the variations. Further, distribution- wise graphs for various

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stations also indicates the flood values at different return periods.

A) GUMBEL DISTRIBUTION

The annual flood peak of a catchment area forms the annual series. The data is arranged in the decreasing order of the magnitude and the probability peak periods of flood being equal or exceeding is estimated by the following equation.

P=m/N+1, where,

P=probability of exceedance,

m= order number.

N=total no of events.

The recurrence interval T also called return periods of frequency is calculated as,

$$T=1/P$$

Chow has shown that most frequency distributions applicable to hydrologic study can be expressed by the following general equation of hydrologic frequency analysis.

$$Xt= x^- +K\,\boldsymbol{\sigma} \quad \text{where,}$$

Xt = value of the variate of a random hydrologic series in the return period T.

x^- = the mean of the variate

$\boldsymbol{\sigma}$ = standard deviation of the variate

K = frequency factor which depend upon the return period.

B) LOG NORMAL DISTRIBUTION

Log trans series data to be used.

Z=norm lnV(F,0,1)

F=1-(1/T)

$X(f)=e^{(\log \text{mean} + \log \text{stdev}*Z)}$

C) LOG PEARSON DISTRIBUTION

F=1-(1/T)

Z=Norminv (F,0,1)

K=log skew/6

$Kt=Z+ (Z^2-1)*K+ (Z^3-6K)*K^2/3-(Z^2-1)*K^3+Z*K^4+K^5/3$

$X(f)=e^{(\log \text{mean} +\log \text{stdev}(Kt))}$

D) GENERALIZED EXTREME –VALUE DISTRIBUTION:

Parameters (3); ξ (location), α (scale),k (shape)

Range of x: $-\infty < x \le \xi +\alpha/k$ if k>0; $-\infty < x < \infty$ if k=0; $\xi +\alpha / k \le x < \infty$ if k<0

$f(x) =\alpha^{-1}*e^{-(1-k)y-e-y}$ $y=\{-k^{-1}*\log \{1-k(x- \xi)/\alpha\}$,k≠0

$y= \{(x- \xi) /\alpha.$ k=0

$F(x) =e^{-e-y}$

$x (F)=\{ \xi +\alpha\{1-(- \log F)^k\}/ k$ k≠0

$x (F)=\{ \xi -\alpha*\log(- \log F)\}$ k=0

Special cases k=0 is the gumbel distribution, k=1 is a reverse exponential distribution on the interval $\xi \le x \le \xi +\alpha$.

The three parameters is given by,

$k= 7.8590c + 2.9554\ c^2$

where, c= (2+ (3+t3))-(log 2 / log 3)

$\alpha= L2*k / \{(1-2^{-k})\ \beta\ (1+k)\}$

$\xi = L1 – \alpha\ \{1- \beta\ (1+k)\} / k$

III. RESULT AND DISCUSSION

Table.1: OUTLIER KnVALUES

Sample Size	Kn value
10	2.036
15	2.247
20	2.385
25	2.486
30	2.563
35	2.628
40	2.682
45	2.727
50	2.768
55	2.804
60	2.837
65	2.866
70	2.893

Kn =0.408 ln (n) + 1.158 (for 10 to 100)

Kn =0.352 ln (n) + 1.394 (for 60 to 100)

Kn =0.443 ln (n) + 1.040 (for 10 to 50)

Kn =0.364 ln (n) + 1.342 (for 50 to 100)

Rule a) High outlier must be greater than the maximum value.

b) Low outlier must be lesser than the minimum value.

Since it is difficult to show all the 44 stations, hence flood value for different return periods is shown only for four stations. We can also compare the flood values for different distributions.

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Table.2: FLOOD VALUE BY GUMBEL

T \ STATIONS	1	2	3	4
2	1537	1321	1431	1350
2.33	1570	1380	1552	1409
5	1712	1640	2076	1668
10	1827	1851	2503	1879
25	1973	2118	3043	2146
50	2081	2316	3443	2343
100	2189	2512	3840	2540
200	2296	2708	4236	2735
500	2437	2966	4758	2993

Table.3: FLOOD VALUE BY LOGNORMAL

T \ STATIONS	1	2	3	4
2	1558	1337	1425	1366
2.33	1594	1399	1535	1428
5	1733	1655	2027	1684
10	1832	1850	2438	1879
25	1944	2084	2967	2111
50	2020	2251	3369	2276
100	2090	2412	3777	2435
200	2157	2569	4193	2591
500	2189	2645	4339	2666

Table.4: FLOOD VALUE BY LOG PEARSON

T \ STATIONS	1	2	3	4
2	1560	1324	1322	1299
2.33	1596	1385	1427	1359
5	1734	1651	1982	1658
10	1831	1863	2574	1954
25	1939	2128	3554	2412
50	2012	2324	4496	2827
100	2079	2520	5665	3320
200	2142	2717	7121	3910
500	2221	2982	9623	4882

Table.5: FLOOD VALUE BY GUMBEL(EXTREME VALUE) DISTRIBUTION

T \ STATIONS	1	2	3	4
2	1563	1314	1299	1350
2.33	1601	1377	1394	1410
5	1746	1651	1894	1659
10	1842	1876	2427	1850
25	1943	2165	3315	2076
50	2005	2383	4174	2233
100	2056	2600	5245	2381
200	2100	2820	6582	2521
500	2148	3113	8878	2694

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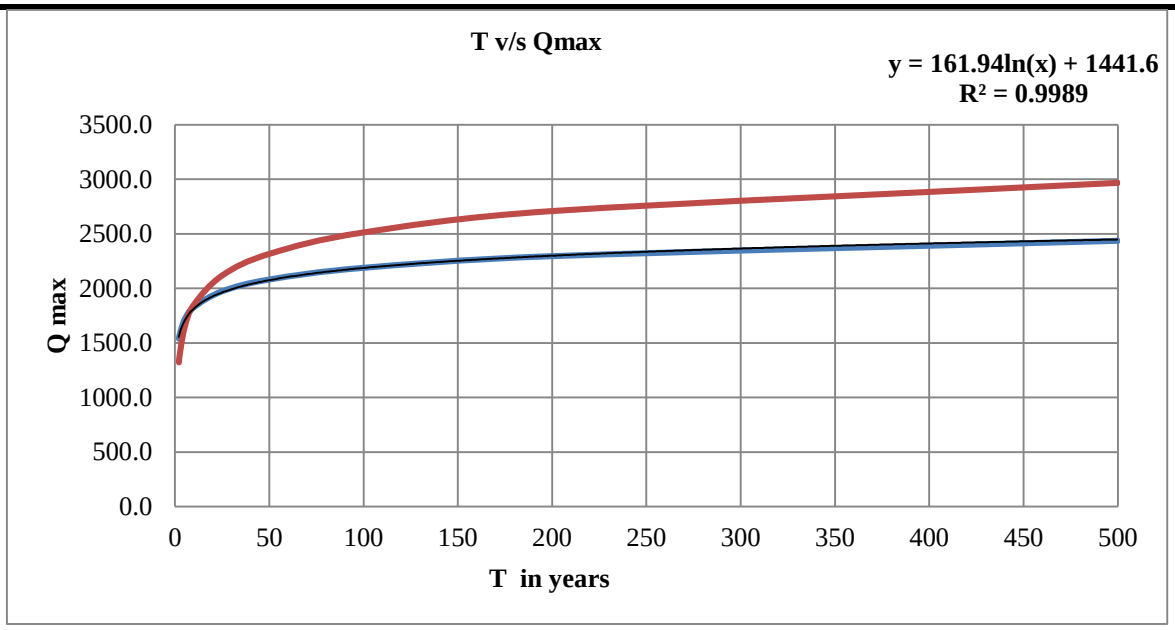

Fig.1: COMPARISON OF T v/s Qmax FOR GUMBEL AND LOGNORMAL DISTRIBUTION

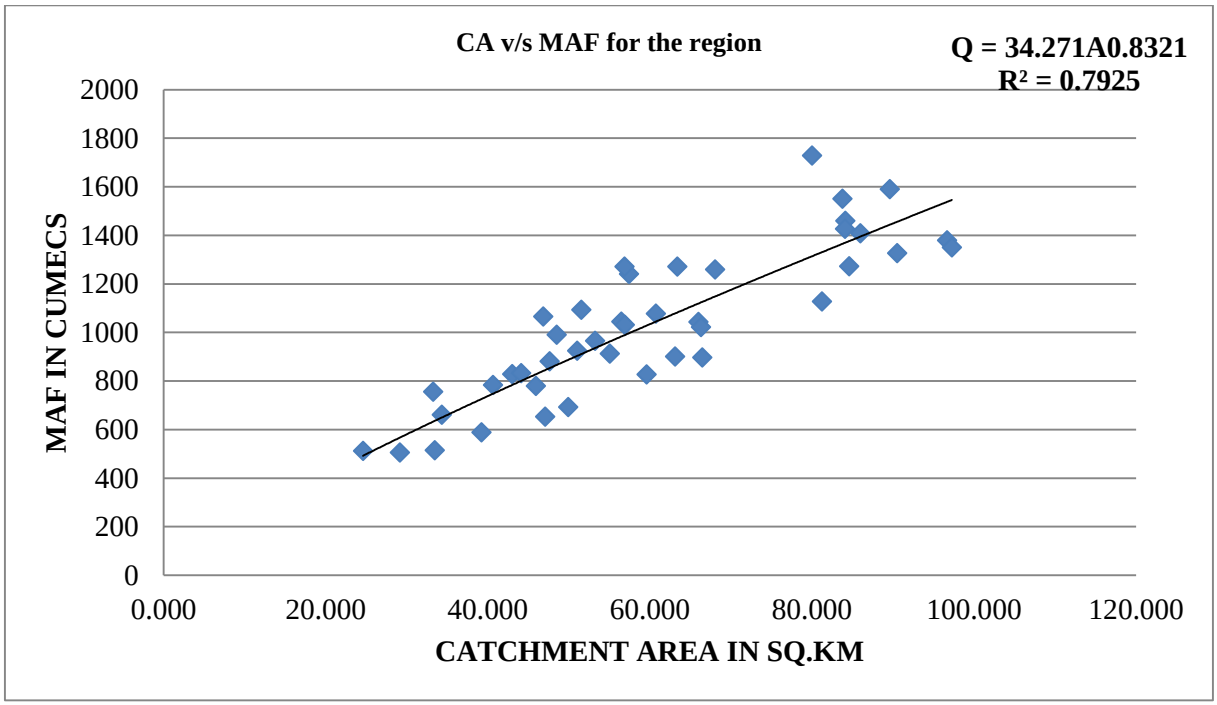

Fig.2: Regional Flood Equation arrived for the region

IV. CONCLUSIONS

a) Gumbel distribution does not too close as compare to lognormal and log Pearson distributions. Only GEV and LN3 distributions fit well for most of the sites.
b) Gumbel distribution used for modeling gives different magnitudes of flood quantiles at high return periods.
c) The regional flood equation arrived at for region is $Q=34.271A^{0.8321}$ with $R^2=0.7925$
d) Accuracy of the predicted flood values depends primarily on the accuracy of the data. This study being based on annual maximum stream flow data available in Hosking book.
e) This flood values obtained will be different for different methods. It is based upon the terrain, land

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cover and land use pattern. With the available data these methods will follow their own pattern to determine the flood value.

f) Discordancy test is conducted for all the stations, all stations are having the value less than three except one station which is having a value more than three, which will be discorded.

ACKNOWLEDGEMENT

Authors are grateful to Sri C.S.NAGENDRA Research officer and Sri. K.R.SATHYANARAYANA Assistant research officer, K.E.R.S, Krishnaraja Sagara, Government of Karnataka, for their valuable guidance encouragement and co-operation in all stages of work.

ABBREVIATIONS

CA: Catchment area, GEV: Generalized extreme value, m:order number, ξ:Location parameter,N:Number of observation, P or F:Probability of exceedance, PDF:Probability Density Function,2P:Two parameters,Q:Flood peak,R:Regression coefficient, σ: Standard deviation, T: Return period, USGS: United State Geological Survey, k: Shape parameters.

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Study on Behaviour of Concrete Blocks with EPS and Partial Replacement of Fly ash and Quarry Dust

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Abstract— *We are developed a new structural concrete member by completely replacing coarse aggregate, fine aggregate. A study of concrete made with expanded polystyrene (EPS) beads as aggregate was carried out. Here, Fly ash partially replaced by cement was found the compressive and tensile strength of EPS concrete and then compared to conventional concrete M20.Old construction technique is being more costly due to loading, so light weight concrete is used. This paper reports the results of an experimental investigation into the engineering properties EPS concrete.*

Keywords— Expanded polystyrene, Fly ash, Quarry dust, M20 conventional concrete, Compressive strength, Tensile strength.

I. INTRODUCTION

Expanded polystyrene (EPS) is a rigid cellular plastic invented in Germany 1950. EPS beads are often used as the basis of packaging material. Currently millions of tons of waste polystyrene are produced in the world. It was produced harmful effect in ecosystem. This is leads to large amount of waste material which is not biodegradable. The polystyrene beads can be easily merged into mortar or concrete to produce light weight concrete. Light weight concrete can be used in various constructions such as carrying walls of low thermal conduction, bridge decks etc.

Fly ash is a pozzolanics material when mixed with lime (calcium hydroxide), pozzolanics combine to form cementicious compounds. Concrete containing fly ash becomes stronger, more durable, and more resistant to chemical attack. Pulverized fuel ash commonly known as fly ash, is comprised of the non-combustible mineral portion of coal. When coal is consumed in a power plant, it is first ground to the fineness of powder. It's having molten particles of silica, alumina and calcium. These particles solidify as microscopic, glassy spheres that are collected from the power plants exhaust before they can fly away.

Quarry dusts are also known as rock powders, rock flour. It consists of finely crushed rock processed by natural or mechanical means. The aim of this report is to achieve a mix design for light weight EPS concrete with enough high compressive strength so that it can be used in construction purposes.

II. MATERIALS

This experimentation were locally available by product materials are used. Its include cement (fly ash) as a binding agent, quarry dust as fine aggregates, EPS beads (Expanded polystyrene) as a coarse aggregates. Normal water was used for mixing and curing of entire work.

2.1 Cement

The Ordinary Portland Cement (OPC) cement was used.

2.2 Fly ash

Fly ash are also known pulverized fuel ash, is one of the coal combustion product.

Table.1: Properties of Fly ash

Sr. No.	Physical Property	Results
1.	Color	Whitish grey
2.	Bulk density	0.994(g/cm^3)
3.	Specific Gravity	2.29
4.	Moisture	3.14
5.	Particle size	6.92µm

2.3 Quarry dust

Quarry dusts are also known as rock powders, rock flour. It consists of finely crushed rock processed by natural or mechanical means.

2.4 Expanded polystyrene (EPS)

EPS balls as an aggregate instead of crushed stones used for regular concrete. Such as increase sound and thermal insulation of conventional concrete.

Table.2: Properties of EPS

Sr. No.	*Physical Property*	*Result*
1.	*Shape*	***Spherical***
2.	*Size*	***1.18-2.36(mm)***
3.	***Specific Gravity***	***0.011***

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Table.5: Mix proportion

TYPE II				
Water content (w/c)	Cement (kg)	Fly ash (kg)	Quarry dust (kg)	**EPS beads (kg)**
0.50	**0.7**	**0.3**	**1.5**	**3**

III. PROCEDURE

3.1 Batching and Mixing

Volume batching was done as per mix proportion.

IV. MIX PROPORTION

The substantial properties of ingredients are determined. The mix proportion for conventional M20 grade concrete is deriving as per IS: 10262-1982.

Assumed w/c ratio = 0.50,

Table.3: Mix proportion

Water content	**Cement**	**Fine aggregate**	**Coarse aggregate**
191.6	383 (kg)	546 (kg)	1187 (kg)
0.50	1	1.42	3.09

This mix proportion of conventional concrete is taken as the reference to the EPS beads concrete. The mix proportion of EPS beads concrete taken by replacing coarse aggregates.

Two mix proportions are formed and tests are taken on to EPS beads concrete mix proportion. The mix proportions for EPS beads concrete are.

Table.4: Mix proportion

TYPE I				
Water content (w/c)	Cement (kg)	Fly ash (kg)	Quarry dust (kg)	**EPS beads (kg)**
0.50	**0.5**	**0.5**	**1.5**	**3**

The mix was prepared manually. First all the dry ingredients are mixed thoroughly such as cement, fly ash, quarry dust, and EPS beads mixed by adding water after it makes uniform mixture.

Fig.1: Mixing of EPS concrete.

4.2 Placing and Compacting

Moulds are properly cleaned and oiled. The fresh concrete filled into the moulds in three layers each layers are damped at 25 blows. The entrapped air in concrete is removed by using vibrator. After the compaction, the excess mortar was removed from the mould with the help of trowel and the surface was leveled.

Fig.2: placing and finishing.

4.3 Remolding and Curing

After placing it was allowed to set for 24 hours. Samples were remolded and it was marked. Concrete samples now kept in curative tank for required time of 7days, 14 days and 28 days, after that time, concrete samples were removed from curative tank.

4.4 Testing

After testing the specimen was checked for cracks, EPS beads distribution. The results of compressive strength test were given in chart 1.It was observed that, the compressive strength of all the concrete mixes increases with increase in age of concrete. It is seen that the larger the amount of EPS beads lesser the compressive strength. The conventional concrete has more compressive strength at all the ages compared to EPS beads concrete.

After curing concrete sample were taken to remove the excessive water content for the sample. Then samples are tested on Universal testing machine (UTM), available in college.

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V. TESTS ON CONCRETE

FRESH CONCRETE TEST

5.1 Workability Test (Slump Cone Test)

The slump test is used to measure the workability of fresh concrete. More specifically, it measures the consistency of the concrete.

Type	Conventional	Type I	Type II
Slump (mm)	21	26	24

HARDENED CONCRETE TEST

5.2 Compressive Strength Test

Compressive strength test of the cube was carried out on Universal Testing Machine (UTM). The load applied on specimen uniformly, without any shocks up to the specimen fails.

Fig.3: Testing on UTM.

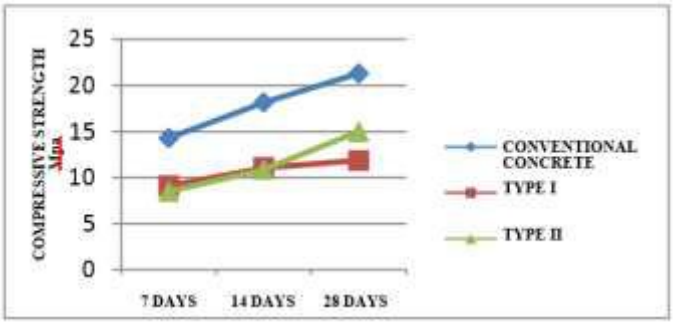

Chart.1: Compressive Strength Test Results for Specimens

5.3 Split Tensile Strength Test

Split Tensile strength test of the cylinder was carried out on Universal Testing Machine (UTM). The load applied on specimen uniformly, without any shocks up to the specimen fails. The specimen placed like the center of specimen and center of moving plates are same. A set of three cylinders are tested for each concrete mix for 7days, 14 days and 28 days of curing. The maximum load taken by specimen was noted for each specimen. Average strength was calculated for every set of specimens. After testing the specimen was checked for cracks, EPS beads distribution. The results of Split Tensile strength test were given in chart 2.

It was observed that the split tensile strength of all concrete mixes increases with increase in ages. It was seen that the larger the amount of EPS beads lesser the split tensile strength. The concrete mix proportion for TYPE B gives more split tensile strength than conventional concrete.

The specimen placed like the center of specimen and center of moving plates are same. A set of three concrete cubes are tested for 7days, 14 days and 28 days of curing. The maximum load taken by specimen was noted for each specimen. Average strength was calculated for every set of specimens.

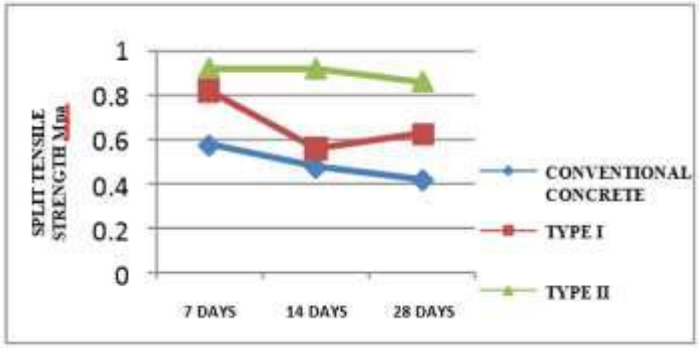

Chart.2: Split Tensile Strength Test Results for Specimens

VI. CONCLUSIONS

The following conclusions are drawn from the study.

1. Workability increase with increase EPS content and reduce the fly ash content.
2. Here, we are observed the cost of EPS concrete is lower than compared to conventional concrete.
3. Type 2 concrete sample is having high compressive strength than compared to Type 1concrete sample.
4. Fly ash added to the mixes based on 30%replacement rate on cement is reduced.
5. The concrete useful for non structural applications like pre cast concrete members, partition walls, wall panels etc.
6. EPS concrete having more workability, light weight and low thermal conductivity.

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Model of LPG Refrigerator: A Literature Review

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Abstract— *This work investigates the result of an experimental study carried out to determine the Coefficient of performance of domestic refrigerator when a propane-butane mixture is liquefied petroleum gas (LPG) which is available and comprises 56.4% butane, 24.4%propane, and 17.2% isobutene. This paper also presented an experimental investigation of COP by the effect of changing capillary tube length, capillary tube inner diameter and capillary coil diameter on the mass flow rate of refrigerant in an adiabatic helical capillary tube. Large amount of electricity supply is not available easily in large part of underdevelopment country like India. It will also prove to be an effective for remote area such as research sites, mines, & deserts where electricity is generally not available. The LPG is cheaper and possesses an environmental free in nature with no ozone depletion potential (ODP). Also LPG is available as a side product in local refineries. The results of the present work indicate the successful use of this propane-butane mixture as an alternative refrigerant to CFCs and HFCs in domestic refrigerator. It would include Experimental setup of working model and detailed observation of the LPG refrigerator and represents its application in refinery, hotel, chemical industries where requirement of LPG is more. Keywords: LPG refrigerator, domestic refrigerator, eco friendly refrigerants, Mixed Refrigerant.*

Keywords— LPG refrigerator, evaporator, zero cost refrigerators, electricity free refrigerator.

I. INTRODUCTION

The energy crisis persists all across the globe. We think of recovering the energy which is already spent but not being utilized further, to overcome this crisis with no huge investment. The climatic change and global warming demand accessible and affordable cooling systems in the form of refrigerators and air conditioners. Annually billions of dollars are spent in serving this purpose. Henceforth, we suggest NO COST Cooling Systems Petroleum gas is stored in liquefied state before its utilization as fuel. The energy spent for pressurizing and liquefying is not recovered afterwards. If it is expanded in an evaporator, it will get vaporized and absorb heat to produce cooling. This property has been used for refrigeration and air conditioning. So that the liquefied form of LPG can be used for cooling and the expanded gas (LPG) can be further used for combustion as a fuel. The ozone depletion potentials (ODPs) of HFC-134a relative to CFC-11are very low (<5 · 10_4), the global warming potentials (GWPs) are extremely high (GWP¼1300) For this reason, the production and use of HFC-134a will be terminated in the near future. The applications of new refrigerant mixtures to replace conventional refrigerants in domestic refrigerators have been studied by a number of researchers. Jung and Radermacher [3] performed a computer Simulations of single evaporate or domestic refrigerators charged with many pure and mixed refrigerants. The study attempted to find the best potential replacement for CFC- 12. James and Missenden [2] studied the use of propane in domestic refrigerators. Energy consumption, compressor lubrication, costs, availability, environmental factory and safety were the criteria for investigation. The results revealed that propane showed as an attractive alternative to CFC-12. Richardson and Butterworth [2] determined the performance of a vapor compression refrigeration system working with propane and a mixture of propane and isobutane. The obtained performance was higher than that obtained from CFC-12under the similar experimental conditions. Alsaad and Hammad [10] investigated experimentally the refrigeration capacity, compressor power and coefficient of performance (COP) to determine the performance of a medium size CFC- 12domestic refrigerator working with a propane/butane mixture. The results indicated the successful application of the mixture of propane and butane for their placement of CFC-12 in domestic refrigerators. Jung et al. [6] examined the performance of a mixture of propane and isobutane used in refrigerators. A thermodynamic analysis showed that the coefficient of performance of the system was increased up to 2.3% as compared toCFC-12 when the test was run at a mass fraction of propane ranging between 0.2and 0.6. Tashtoush et al. [4] presented an experimental study on the performance of domestic vapor compression refrigerators

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with new hydrocarbon/hydrofluorocarbon mixtures as refrigerants for the replacement of CFC-12. The results revealed that a mixture of butane, propane and HFC-134a gave excellent performance. Lee and Su [15] conducted an experimental study on the use of isobutane in a domestic refrigerator.

The results showed that the coefficient of performance was comparable with those obtained when CFC-12 and HCFC-22were used as refrigerants.LPG consists mainly of propane(R-290) and butane (R-600), and LPG is available as a side product in local refineries. In Cuba for already several decades LPG is used as a drop-in refrigerant. LPG mixtures have composition of a commercial LPG mixture suitable as „drop-in" replacement for R-12was calculated crudely as 64% propane and 36% butane by mass. Liquefied petroleum gas (LPG) of 60% propane and40% commercial butane has been tested as a drop-in suitable for R 134a in a single evaporator domestic refrigerator with a total volume of 10 ft3.In march 1989, the Institute of Hygiene in Dortmund Germany needed anew cold storage room. The young idealistic director, Dr Harry Rosin, could not consider using a CFC refrigerant and so tried propane and isobutane. Greenpeace Australia imported a For on refrigerator in February 1993 and in December 1993 Email Ltd, Australia "slargest appliance manufacturer, displayed prototype LPG refrigerators. In 1994, German manufacturer announced one by one their intention of switch to LPG refrigerants. The US EPA may not approve this either but OZ"s petition (OZ 1994) is convincing, comprehensive and technically sound especially on safety. Calor released Care 30 in June 1994. Care 30 is a high purity mixture of R-290 and R-600a and is a drop- in replacement for R-12 and R134a. it has been very successful in vehicle refrigeration and air-conditioning.

II. CONSTRUCTION

The LPG refrigerator shown in figure. We have made the one box of the Plywood. The plywood sheet size is 12mm for used the LPG refrigerator. The size of the refrigerator is 255*200*115 mm3.The evaporator is fitted in the box inside. Inside the refrigerator, we also put the Thermo-coal sheet. Because of the cold air cannot the transfer from inside to outside Of refrigerator. The schematically diagram of the LPG refrigeration system is shown in next page. The gas tank is connected by pipes to the Capillary tube. The capillary tube is fitted with evaporator. The evaporator coiled end is connected to the stove by another gas Circulation pipe. When two pressure gauges is put between capillary tube and gas tank, and another is put the end of the Evaporator

III. WORKING OF LPG REFRIGERATOR

The basic idea behind LPG refrigeration is to use the evaporation of a LPG to absorb heat. The simple mechanism of the LPG refrigeration working is shown in figure.LPG is stored under high pressure in LPG cylinder. When the regulator of gas cylinder is opened then high pressure LPG passes in gas pipe. This LPG is going by high pressure gas pipe in capillary tube .High pressure LPG is converted in low pressure at capillary tube with enthalpy remains constant. After capillary tube, low pressure LPG is passed through evaporator.LPG is converted into low pressure and temperature vapour form and passing through the evaporator which absorbed heat from the chamber. Thus the chamber becomes cooled down. Thus we can achieve cooling effect in refrigerator. After passing through evaporator low pressure LPG is passed through pipe by burner and we can use low pressure of LPG is burning process.

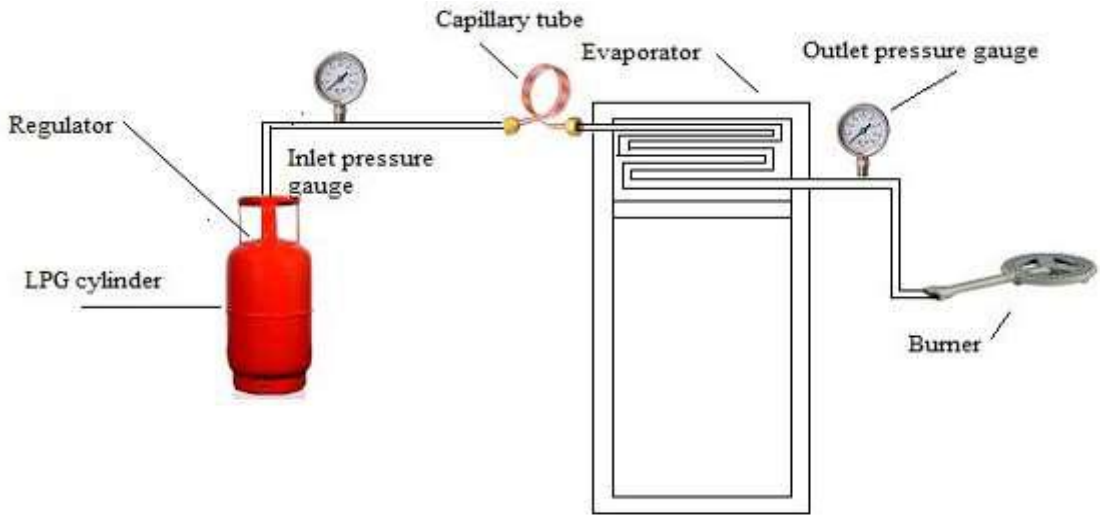

Fig.1: Working of LPG Refrigerator

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IV. LITERATURE REVIEW

ALTERNATIVE REFRIGERANTS TO R134A SYSTEM

[1].A.Baskaran&P.Koshy Mathews

A Performance Comparison of Vapour Compression Refrigeration System Using Eco Friendly. Refrigerants of Low Global Warming Potential VCR system with the new R290/R600a refrigerant mixture as a substitute refrigerant forCFC12 and HFC 134a. The refrigerantR290/R600a had a refrigerating capacity28.6% to 87.2% higher than that ofR134a.

[2].A.Baskaran&P.Koshy Mathews

A Performance Comparison of Vapour Compression Refrigeration System Using Eco Friendly Refrigerants of Low Global Warming Potential.R600a have a slightly higher performance coefficient(COP) thanR134a for the condensation temperature of 50 C^0 and evaporating temperatures ranging between -30 C^0 and10^{0}C.Hence,The coefficient performance (COP) of this mixture was up to 5.7% higher.

[3].M.Mohanrajet. al.

Have studied experimentally the drop in substitute forR134a with the environment friendly, energy efficient hydrocarbon (HC) mixture which consists of 45% HC290and 55% R600a at various mass charges of 50g, 70g and 90g in domestic refrigerator. The experiments were carried out in 165 liters domestic refrigerator using R134a with POE oil as lubricant. The power consumption of HC mixture at 50g and 70g are lower by 10.2% and 5.1% respectively and90g shows higher power consumption by 1.01%. The percentage reduction in pull down time is 18.36%, 21.76% and28.57% for 50, 70 and 90g mass2870charges respectively when compared toR134a. The HC mixture because of its high energy efficiency will also reduce the indirect global warming. In conclusion HC mixture of 70g is found to be an effective alternative to R134a in 165 liters domestic refrigerator.

[4]. B.O.Bolaji

Have Experimental study of R152a/R32 to replace R134a in a domestic refrigerator and find out that COP obtained by R152a is 4.7%higher than that of R134a. COP of R32is 8.5% lower than that of R134a and propane is an attractive and environmentally friendly alternative to CFCs used currently

[5]. R.W.James&J.F.Missenden

Have use of propane in domestic refrigerators and conclude that the implications of using propane in domestic refrigerators are examined in relation to energy consumption, compressor lubrication, costs, availability, environmental factors and safety propane is an attractive and environmentally friendly alternative to cfcs used currently.

[6]. Bilal A. Akashet. al.

Has conducted performance tests on the performance of liquefied petroleum gas (LPG) as a possible substitute for R12in domestic refrigerators. The refrigerator which is initially design to work with R12 is used to conduct the experiment for LPG (30% propane, 55%N-butane and 15% isobutane). Various mass charges of 50, 80 and 100g of LPG were used during theexperimentation.LPG compares very well to R12. The COP was higher for all mass charges at evaporator temperatures lower than −15˚C. Overall, it was found that at 80g charge, LPG had the best results when used in this refrigerator. The condenser was kept at a constant temperature of 47˚C.Cooling capacities were obtained and they were in the order of about three to fourfold higher for LPG than those forR12.

[7].M. Fatouhet. al.

Investigated substitute for R134a in a single evaporator domestic refrigerator with a total volume of 0.283 m3 with Liquefied petroleum gas (LPG) of 60% propane and 40% commercial butane. The performance of the refrigerator, tests were conducted with different capillary lengths and different charges of R134aand LPG. Experimental results of the refrigerator using LPG of 60g and capillary tube length of 5 m were compared with those using R134a of100g and capillary tube length of 4 m. Pull-down time, pressure ratio and power Consumption of LPG refrigerator were lower than those of R134a by about7.6%, 5.5% and 4.3%, respectively. COP of LPG refrigerator was 7.6% higher than that of R134a. Lower on-time ratio and energy consumption of LPG refrigerator was lower than 14.3% and 10.8%, respectively, compared to R134a. In conclusion, the proposed LPG is dropping in replacement for R134a, to have the better performance, optimization of capillary length and refrigerant charge was needed.

[8]. M.A.Hammadet.al.

Has experimentally investigated the performance parameters of a domestic refrigerator with four proportions ofR290, R600 and R600a are used as possible alternative replacements to theR12.An unmodified R12 domestic refrigerator was charged and tested with each of the four hydrocarbon mixtures that consist of 100% R290,75%R290/19.1%R600/5.9%R600a,50%R290/38.3% R600/11.7%R600a and25%R290/ 57.5%R600/17.5% R600a. The results show that the hydrocarbon mixture with

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50%R290/ 38.3%R600/11.7%R600a is the most suitable alternative refrigerant which has COP which is 2.7% higher than the R12.

[9]. Somchai Wongwiseset. al.
Has conducted to substitute R134a in a domestic refrigerator with hydrocarbon Mixtures of R290,R600 and R600a. A239 liter capacity refrigerator initially designed to work with R134a was chosen in the experiment. The experiments are conducted with the refrigerants under the same no load condition at a surrounding temperature of 25˚C. The results show that 60%R290/40%R600 is the most suitable alternative refrigerant to R134a.

[10]. Sanjeevsinghpunia&Jagdev Singh
Have Experimental investigation on the performance of coiled adiabatic capillary tube with lpg as refrigerant and conclude that There was an increase in mass flow rate by 106%, When the capillary inner diameter was increased from 1.12mm to 1.52mm.When the coil diameter of capillary tube was decreased from 190mm to 70mm, the mass flow rate was decreased by13%, 7% and 9% for 1.12mm, 1.4mmand 1.52mm inner diameter of capillary Tube respectively. 1.40 mm diameter capillary affected the system more as compared to 1.12 mm diameter capillary tube. Mass flow rate increases with increase in capillary inner diameter and coil diameter where as mass flow rate decreases with increase in length. It was observed that the COP of system increases with similar change in geometry of capillary tube.

V. CONCLUSION

Finding from literature we conclude that:

- Propane is an attractive and environmentally friendly alternative to CFCs used currently.
- Mass flow rate increases with increase in capillary inner diameter rand coil diameter where as mass flow rate decreases with increase in length. It was observed that the COP of system increases with similar change in geometry of capillary tube.
- The coefficient of performance of refrigeration appliances improves in case of retrofitting the capillary tube.
- Cooling capacities were obtained order of about three- to four fold higher for LPG than those for R-12.
- COP of LPG refrigerator was higher than that of R134a by about7.6%. LPG seems to be an appropriate long-term candidate toreplaceR134a in the existing refrigerator,
- High COP values were obtained No operation problems have been encountered compressor. The use of LPG as a replacement refrigerant can contribute to the solution of (ODP) problem and global warming potential.
- It seems that propane/butane60%/40% is the most appropriate alternative refrigerant to HFC-134a.

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The Study of Shared Space in Inner Building of Low Income Flats

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Abstract— *As a capital of East Jave Province, Surabaya has an important role for region development .Surabaya is promising for all the job seekers especially from low-income rural and Surabaya suburb. They are coming to Surabaya looking for a decent living. However, Surabaya has not enough land to receive the migrant from that low economic class. As a result, it formed slums and unhealthy areas in Surabaya.*

The rejuvenation of the city was the right step increasing a city to make it clean and in orderly. Then Surabaya city can be vehicle for tourism and education.. Furthermore the inhabitants moving down to the flats of low income people and to hope the occupants can be develop by themselves. The occupants' behavior (eg. simple, natural, and solid) also carry on lives of complex flats. Togetherness of the occupants was applied to the shared spaces in flats that already exist or made by inhabitants in the buildings. The situation in residential neighborhood, which is the only unplanned shared spaces, are formed by the occupants, and often used for variety activities to meet all their need.. It is shown that they required shared spaces inside that low income flats unit. But their presence nearby residential units of citizens, as a part of the placement, and did not interfere with the privacy of the families.

The objective of the research is to investigate how the placement of shared spaces can be appropriate in flats for the occupants, and support's their life as well. The location of shared spaces must be adjusted to their wishes and interests of all the users. Otherwise the share spaces cannot be used optimally nor switching. If the shared spaces are not appropriate with citizens there cannot be maximal used or switching functions and the occupants are looking for in other places to live.

The research method that issued in the research are descriptive, qualitative, and explorative methods, which need theoretical studies and field observation to will support to each other.

The common spaces for religious and formal activities can be used toward the existing design. The shared spaces which is served as a support facilities, (e.g. shower/ WC, washing facilities, laundry, and kitchen) are placed in each occupancy unit, so they still can have privacy.

Keywords— The behavior occupants, Inner shared space, Low income flat .

I. INTRODUCTION

Procurement realization of housing for the lower classes and small employees who do not have homes in the city, was organized by constructing cheap houses and low income flats. The government's options have to meet the needs of decent housing as well organize the visible urban slums due to urbanization the lower classes of the village and suburbs. According with Menpera regulation, No.08 / Permen / M / 2007; said that "the low-income communities can be categorized politically and economically. Which meant the politically if they do not have access to the decision-making process concerning the quality of life, while the economy if the quality of human resources (including health, education and skills) is still low considered as not impact on income levels have ". The urban renewal is one way in creating the city that are clean, healthy, orderly and organized. With eviction in slums area in the city, and put the occupants into the low income flats alternatively that in flats complex. There are many objects that can be used together with inhabitants where are there inside and outside the residential blocks. The existence of a common room (eg. shared spaces) there was already planned in the low income flats complex design, but apart from it, moreover there is no appropriate with mean of the occupants culture in there.

Planned of shared spaces have some vary functions, some spaces are used entirely by residents on a regular basis, but the other one is useless. Even if when a space that is already planned in design can be switch its functions.

According to Silas (1990), states that "the behavior and culture of low-income people will be brought on lives of the lower classes flats in the city". Furthermore Poerwanto (1997), states that "settlement is a place for human living that have to be prepared properly, and to be a clear goal point, so the future is expected to provide the citizens of the occupants a better welfare". The flats complex built in a neighborhood in the city, both horizontally and vertically structured that can be owned and used together and separately, should be also be equipped with adequate facilities and infrastructure

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adjusted occupant behavior. Leisure inhabit if the applications of behavior are going well in environment, that the culture of residents should be considered since the planning of flats to begin by the government.

Rapoport (2005), stated that "the culture is actually an abstract concept, and have a characteristic that making it difficult to connect between these concepts with an environment directly, because the two between are not in a level. The culture is wider than the environment ". Both observations are conducted to find out how the mechanism of the relationship occurred, so that the desired known occupants suitability. Furthermore, the facility could be designed right for the citizens, in order to be used fully and no switching function. A cultural change has occured as a result of city penetration, is not same between one group and another,since it depends on the situation. Behavior, as a cultural expression of lower classes cannot be deprived from its roots. The togetherness as a color of life needs appropriate spaces availability.

According to Silas (1990), stated that "the low-income level is difficult to adapt in a flats building is not correct, which within one year inhabit only, the residents of Dupak flats in Surabaya they can adapt well." This is to prove that even in a short time, low class residents can adjust to an environment, including in flats complex. With this adjustment, the residents hope to improve welfare of the family as well as economic developing in flats. Although flats are not an option to stay lke a home, but its presence can give the best option of worthy dwelling in cities inhabited that affordable for the lower classes. The existence of a container as a physical occupancy of environment, with various elements inside can completely synergize and form a solid occupancy. To see how these circles settled in urban cities and adapted, because cultural expression that is applied in occupants'behaviour can continuously taken by new settlements such as flats complex (researcher observation, 2016). According to Poerwanto (1997), stated that "regarding the togetherness behavior of rural communities, that shape and quality of theirflat housesare not different from the conditions of abandoned houses in villages. There are country home with irregulargrowing settlement patterns that were not in order arrangement and atmosphere impression"

The existence of a common room in flats building approached dwelling units, in which the distance to achieve from dwelling unit residents are not far away. So some of the functions can be carried out at the same time, such as socializing within residents, small businesses, and family control. Taking care of small children by the parent also can be safely provided while reciting some fairy tales there. The shared space in flats building have been planned according to the design of government, their use by the occupants and there are quite varied (often, less, or not used).

While the unplanned of shared space existence that formed by the occupants, it is utilized fulfilled. This condition is thought to cause the onset of an undisciplined atmosphere inner building (researcher observation, 2016). The disorderly situation associated with lack of a tolerance feeling as a function of user control to environment within the dwelling exist. According to Lang (1987), stated that "the disorderly situation can affect a person's behavior negatively, because excessive of social burden".

Lack of the situation in residential neighborhood of flats, which is the only the unplanned shared spaces formed by the occupants, often used by people for activities variety to meet all the needs. Disorder atmosphere in a residential location is complained by the resident of adjacent units, because for people who experience internal problems can get devastated impact. The law of low income flats in Indonesia (1985), stated that "the facilities provided in neighborhood of flats, covering the room with shared spaces for residents, where they do socialization, children's playground, as well as the daily needs can be met according to prevailing standards. There as small business activities, worship, non-formal education, sport and so on".

The location of shared spaces must be adjusted to wishes and interests all of users, because if the shared spaces are not appropriate with citizens that cannot be maximal.

The objective of the research is to study how the right placement of the shared space inner building, so that all the occupants can be lived in each comfort unit flat and develop their life. The conducted research is to devote the common room whose presence in the building, either it is just planned or already made by the occupants.

II. INDENTATIONS AND EQUATIONS

This study requires a thorough research which applies to descriptive, qualitative, and explorative methods (Moleong, 2010). Data information about the placement of shared space, inner flats building collected must be observed in the field. This study must be accomplished by interviewing the persons who live in such flats occupants, flats society leaders, and associated bureaucrat who know the details of the objects.

Some of the facilities can be shared outside and inside of dwelling units of the building, but it is not used by the occupants. Answering the question "why they existing of shared space is not be used by the residents", this is caused by there is no certain standard for convenience factor of low-income occupants since they try to adapt for the existing.

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The planning of low-income flats complex with all the amenities must be adapted to the behavior of the occupants. The entire facilities are designed in a building that used by the citizens occupants. By exploiting the whole shared space in occupants 'togetherness, so the residents can be stay adaptively.

Material Discussion

The benchmarks of adaptive room with occupants'behavior as a cultural expression of users (Lang, 1987), then was also applied by the lower classes also are :

a. Human Behavior and Culture :
   Existing space utilization by routine user, does not migrate or switch its functions.
b. Needs :
   Used spaces to meet various needs of togetherness between residents and occupants of low-income residents of the flats complex
c. Environment:
   Joint directions between human interrelation with residents and environment in order to get benefit from sustainable grow.
d. Aestetics:
   The lower classes concern with the existence of shared space to meet various needs, with simple standard, in open space, thus all the occupants can live adaptively.
e. Safety:
   The existence of a common room where the occupants can be controlled to each other so that the property of citizens can be secured by collective security.

If five benchmarks that mentioned above can be met, then it is possible for the occupants to maximize use of all common rooms."The Maximum" is a condition of the highest and most (Indonesian large Dictionary / KBBI); means the spaces formed that exist and can be used entirely as a function, it's also can be created the condition orderly within the flats complex. "The Orderly" is "a condition where there is in order, follow the rules and take responsibility to do something" (Indonesian Large Dictionary / KBBI).

The building of low-income flats complex with high density offered city land saving. To keep the land productive is the aims and hopes of the occupants while maintaining the balance of the environment. So that the existence of some shared spaces in residential flats are appropriate for citizens' behavior. In other hand, the inhabitants can use the facility flats complex that meet all various needs of community.

According with Poerwanto (1997), stated that :

1. Conduct of Low-Income Communities :

Settlements as the venue for the inhabitant's life, that is necessary to enter the several of all characters into the residential planning (participatory approach); so the occupants of low-income flats complex can adaptively live there for long term. There are including:

- Togetherness color of the community that are communal, simple character, and natural like situation.
- Community pattern form is opened as an interconnection within occupants directly, without limitation of time and space.
- All the things unlike formal condition.

Embodiment of community's neighborhood concept, which can take relationship between each member of communities easily, smoothly and quickly. According to character grassroots, there are some characters based on some conditions that allow them causing feel free selecting and determining the appropriate utilized facilities. It is necessary to find a new balance between individual with collective community as a character of low income.

2. Various Activities in Building Flats :

Field observations in some low-income flats, with respondent and community leaders interviews can be described various activities that are took place within the shared space inner flats buildings complex. They are :

- Reguler social gathering whose members the housewives and teenagers, that held once in a month (eg. social gathering to inform the government's program, economic enterprise, credit items and so on).
- Recitals, by housewives, teenagers, adolescent and the fathers collectively or separately; held one time each week (eg. such as understanding Al-Quran intensively, repeated recitation, routine chanting). While the children, is done once in a week (such as to learn Al-Quran with interpretation). For large scale the religious activities are in Mosque flats complex.
- Small businesses of the occupants, (such as convection / tailor / barber shop, saloon / small shop / money credit; there are settled activities); selling snacks and ice / vegetable / household equipment / meatballs / salad / pulp / toys, etc.(there are settled around the flats complex).
- Citizens formal meeting which covers all occupants in the flats complex, such as reception, illuminated to the residents by the flat authorities, festivity, circumcision, etc. (incidental).
- Conducted by the government or hometown management procurement has been urgent to be done (when launching of government programs, or particular disease outbreak in).

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- Youth activities in some flats (implementing environmental hygiene, non-structural repair buildings, e.g. facilities or infrastructure); but today has been reduced significantly, because regeneration is not going well in flats complex.
- Safety flats activity, there conducted by involving citizens in rotation regularly.
- The parking area used for all the motorcars, wagons, pedicabs, children's indoor playground, and so on (on ground floor and corridor in each floor flat building).

3. Utilized Inner Flats Shared Spaces

Field observations and interviews with community leaders in several flats (the inhabitants of the lower classes); described somekind of utilized spaces in building flats. They are :

- Corridor in each floor flats is used for some togetherness activities.
- Corridor in ground floor on each flat available for parking area.
- Musholla in each floor of flat is built for religious activities on small scale.
- Mosque flat in the complex area is used for religious activities on large scale.
- Multipurpose room complex, for variety of formal activities.
- Toilet share on each floor flats building (in old flats mostly), to support hygienic and health for the citizens in each flats complex.
- Washing share area on each floor flats building (in old flats mostly), to support them.
- Kitchen share in unit area on each floor of the flats building (in old flats mostly), to Support citizens daily activities.

4. Determination of Space and Place in complex

Field observations and interviews with community leaders in several flats (the inhabitantsof the lower classes complex); can be described "some of the placement of shared spaces in flats that become a favorite space". They are :

- Corridor in typical floor on each flat.
- Corridorin the ground floor of flats building.
- Mosque of flats complex.
- Multipurpose building of flats complex.
- Some spaces near the stairs in each floor of flats building.
- Market building, with a strategic setting location in flats complex.
- Supporting rooms (eg. The Toilet, Kitchen, Washing room, and Small storage) inside are needed for each unit of the occupants.

III. FIGURES AND TABLES

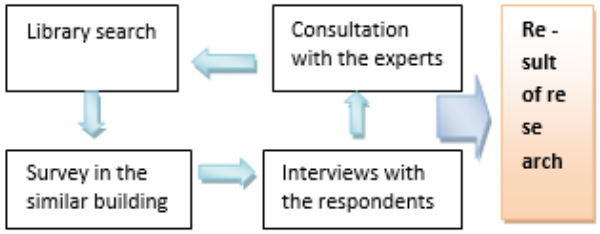

Fig. 1: Research Method

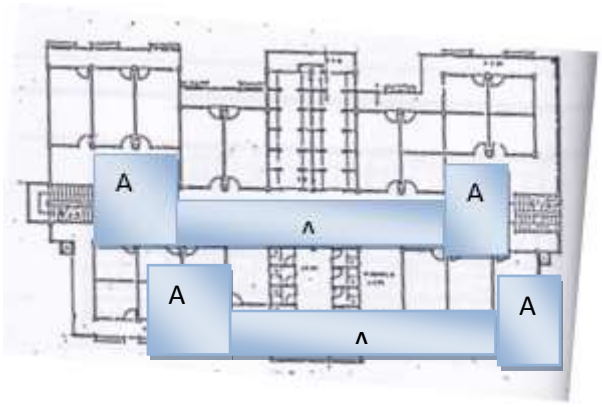

Fig. 2: Blueprint of Flat Building

A B C

Fig. 3. Picture of Shared Spaces

A : Parking area of motorcycle
B : Multipurpose room
C : Indoor playing area

A B C

Fig. 4. Picture of Shared Spaces

A : Market building area
B : Kitchen area
C : Multipurpose building

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IV. CONCLUSION

Pre-requirement of existing shared spaces in building flats, stated that :

- *Easy achievement (for access) :*
  The existence of a common room in the flats, mostly can be easily reached. Especially for routine activities to support life, which can be done by taking care of their family especially their kids (eg. selling snacks, socialization, etc). While the activities are formally done (not to do in everyday), that can be taken in different floors but in the same flat building (eg. economic enterprise, credit items, etc).
- *Open Views :*
  The shared spaces are used by the occupants and its must be needed by them, so the mutual relations between the occupants will not be restricted, and the color of togetherness can be applied more in the existing spaces.
- *Free air circulation (air circulation in room) :*
  Shared spaces used by the occupants, always need free air circulation. For the important things the residents can share in shared spaces that location nearby to achieve dwelling units.
- *Natural condition and open situation :*
  Format of existing shared spaces are made in natural shades and open situation. Religious activities in inner flats building the residents agree with fixed specified space existence are planned by the government.

Following are the results of the research, that already conducted :

- The shared spaces, is still needed in flats of low income occupants to accommodate a variety of togetherness activities.
- The existing shared spaces which is not located interfere with the privacy of the family relatives. To noisy atmosphere become disorder the corridor situation. The shared space, which is adjacent to the stairs should be accommodate all routine activities. The corridor should preserve only for formal activities in small scopes (such as learning, religious teaching, social gathering).
- The existing shared spaces, for "the occupants are praying",is acceptable for the existing planning below (which is already in accordance with the religious requirements).
- The existing shared spaces support the lives of citizens (such as: toilet share of the occupants, washing share area of the occupants, kitchen share of the occupants; they are available in old flats complex). They want all of them entry the dwelling units of citizens to support the privacy condition.
- The kitchens share that presence in each floor of flats, are still needed especially by the occupants, only to receive meals or cakes to be served at special event. Thus, togetherness of citizens can take place in a block of flat constantly.

ACKNOWLEDGEMENTS

The research findings : *"When the placement of shared-spaces among low-income occupants can be fulfilled, it can support inhabitants' life".*

Recommendation

Further research is recommended to review conduct assessments against the existing Shared-Spaces outside the Flats Building Complex, in The Context of Behavior as Cultural Expressions for Low-Income Occupants.

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The Effects of Recycled Aggregates on Compressive Strength of Concrete

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Abstract— *Demolished concrete can be used as recycled concrete aggregate (RCA) for construction purposes. In the research, the compressive strength of concrete made from 100% recycled coarse aggregates and 100% natural coarse aggregates was compared. The values of compressive strength of the natural aggregates concrete (NAC) served as a control. 24 concrete cubes (150 x 150 x 150mm) each for the NAC and RCA were casted making a total of 48 concrete cubes. Three cubes for each category was cured for 3 days, 7 days, 21 days and 28 days respectively. Concrete mix ratios of 1:2:4 and 1:1.5:3 were used in both cases. The results show clearly shown that the compressive strength of RAC was higher than those of NAC at the early ages before day 12. It can be deduced from the graph that the compressive strength of RAC was higher than that of NAC at early ages while the compressive strength of NAC was higher than that of RAC at later ages. This means that RAC will have better usage in quick set concrete where early strength is desired.*

Keywords— Strength of Concrete, RCA, NAC, C &DW.

I. INTRODUCTION

Concrete is a mixture of binder materials usually cement, aggregates and water. Aggregate is commonly considered inert filler as they do not get involved in any serious chemical reaction in the process, which accounts for 60 to 80 percent of the volume and 70 to 85 percent of the weight of concrete. Although, aggregate is considered inert fillers, it is a necessary component that defines the concretes thermal and elastic properties and dimensional stability. Aggregate is classified as two different types, coarse and fine aggregate.

Concrete, one of the dominant construction materials due to its availability, relatively lower cost and the possibility to be cast into desired shapes, has contributed strongly internationally in terms of infrastructure development. The successes are however accompanied by large volumes of construction and demolition waste (C &DW). Recycling of concrete by crushing C &DW and using it as aggregate in structural concrete, has become possible in several countries, where national standards provide for appropriate use of recycled concrete aggregate(RCA).

The use of RCA in construction work started after the Second World War, when many structures were demolished by bombing. During rebuilding, the demolished concrete was used as aggregate in construction. Today, RCA is used successfully in many countries, in many fields such as road construction, protection against erosion, parking areas as well as structural concrete. A number of structures in Germany, Norway, United Kingdom, Finland and Netherlands have been built with RCA as partial or full replacement of natural aggregate.

Coarse aggregate is usually greater than 4.75mm (retained on no. 4 sieve), while fine aggregate is less than 4.75mm (passing the no.4 sieve). The compressive strength is an important factor in the selection of aggregate.

Other physical and mineralogical properties of aggregate must be known before mixing concrete to obtain a desirable mixture. These properties include shape, texture, size gradation, moisture content, specific gravity, reactivity, soundness and bulk unit weight. These properties along with the water/cement ratio determine the strength, workability and durability of concrete.

The shape and texture of aggregate affect the properties of fresh concrete more than hardened concrete. Concrete is more workable when smooth and rounded aggregate is used instead of rough angular or elongated aggregate. Most natural sands and gravel from riverbeds or seashores are smooth and rounded and are excellent aggregate. Crushed stone produces much more angular and elongated aggregates, which have a higher surface-to-volume ratio, better bond characteristics but requires more cement paste to produce a workable mixture. A smooth surface can improve workability, yet a rougher surface generates a stronger bond between the paste and the aggregate creating a higher strength.

The advantages of using recycled concrete product as road base aggregates includes:

- Recycled concrete is non-expansive and will not grow or expand with moisture.
- Recycled concrete has optimum moisture of approximately 13 percent about twice that of natural road base, due to its particles size

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distribution, it may absorb twice the water before becoming saturated.

- Recycled concrete is 10-15 percent lighter in weight, resulting in reduced transportation cost.
- Recycled concrete compact faster-up to two to three times as fast as non-stabilized natural road base.

II. LITERATURE REVIEW

The particle shape analysis of recycled aggregate indicates similar particle shape of natural aggregate obtained from crushed rock.

The recycled aggregates which originated from a low strength concrete had less adhered mortar and the high strength concrete had more adhered mortar, when the crushed concrete was grinded with the same type of the machine and the same energy applied.Prasad et al. (2007) noted that the specific gravity of demolished concrete aggregates is lower than that of natural aggregate. The average specific gravity of aggregate usually varies from 2.6 to 2.8.Bairagi et al. (1993) concluded that very rapid rates of absorption are observed for recycle aggregate. Nearly 75% of the 24hour absorption capacity was attained in the first 30 minutes of the soaking period. In accordance with Hansen et al. (1983), recycled aggregate concrete made with recycled coarse aggregates and natural sand needs 5% more water than conventional concrete in order to obtain the same workability. If the sand was also recycled, 15% more amount of water was necessary to obtain the same workability.Tavakoli et al. (1996) demonstrated that concrete made with 100% recycled aggregate with lower W/C ratio than the conventional concrete can have a larger compressive strength. When the W/C ratio is the same, the compressive strength of concrete made with 100% recycled aggregate was lower.

Though researchers have reported a reduction in strength in recycled aggregate, it should be noted that the extent of reduction is related to the parameters such as the type of concrete used for making the recycle aggregate (high, medium or low strength), replacement ratio, water/cement ratio and the moisture condition of the recycled aggregate (Crentsil et al., 2001). At a high w/c ratio (between 0.6 and 0.75*)*, the strength of recycled aggregate is comparable to that of reference concrete even at a replacement level of 75%(Katz, 2003*)*. Hansen et al. (1983) concluded that, not only the w/c ratio influences the compressive strength of concrete made with 100% of recycled aggregate, but the compressive strength of the recycled aggregate concrete also depends on the strength of the original concrete. The compressive strength of recycled aggregate concrete is strongly controlled by the combination of w/c ratio of the original concrete, when other factors are essentially equal. Therefore, dependence exists with respect to the old w/c ratio. Bairagi et al. (1993) concluded that the average relative compressive strength varies from 98 to 94% when the replacement ratio is varied from 0.25 to 0.50. For the replacement ratio 1.0 the average relative compressive strength was 86%.

Salem et al. (1998) concluded that the compressive strength of concrete made with 100% of recycled aggregate increases by 2% from 7 to 28 days with respect to the 16% increase by conventional concrete. This could be due to either the absorption capacity of the recycled aggregate or the bad adherence of the aggregate with the Cementpaste. In particular, the strength of the concrete with HPC recycled aggregates reached the level of the concrete prepared with the crushed natural granite aggregates after 90 days of curing. The difference in the strength development between the concretes with high-performance concrete and normal-strength concrete recycled aggregates was due to the differences in both the strength of the coarse aggregates and the microstructural properties of the interfacial transition zones.

III. MATERIALS AND METHOD

Laboratory tests was carried out to obtain the relevant data and information needed to aid this project such as sieve analysis determination, specific gravity determination, bulk density determination and compressive strength test.

3.1 Sourcing of Aggregate

The recycled aggregate for this project was sourced from demolished culverts concrete and crushed concrete cubes from CRUTECH laboratory in Calabar. The recycled aggregate was afterwards manually crushed in the laboratory, filtered and graded in accordance with British Standards (812, 1974, 1990).

The natural coarse aggregate and fine aggregates was sourced from heaps of commercial supply of crushed quarried natural aggregates within Calabar.

3.2 Experimental Work

The experimental works were directed towards achieving the aim of this research. Comparison of two grades of concrete using basic properties of recycled aggregate and natural aggregate was made. The compressive strength was the main criteria used in the comparison. Two concrete types were tested within the research project. Mix proportions of the concrete types were tested in accordance with the following conditions:

- Same cement content
- Same workability
- Same maximum grain size (25mm)
- Same grain size distribution of aggregate mixture
- Same type and quantity of fine aggregate.

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The type and quantity of coarse aggregate varied in the following ways:

- The first concrete mix had 100% natural coarse aggregate (NCA).
- The second concrete mix had 100% recycled coarse aggregate.

3.3Casting Of Concrete Samples

Casting was done for concrete cubes to test for the compressive strength. The mould used for the research work was a steel mould of size 150x150x150mm, it was oiled to avoid friction during moulding and de-moulding of concrete cubes. Mix ratios of 1:2:4 and 1:1.5:3 were used.

Table.3.1: Schedule of Samples Per mix Ratio

		3 Days	**7 Days**	**14 Days**	**21 Days**	**28 Days**
Number of cubes (150x150x150mm)	RAC	3	3	3	3	
	NAC	3	3	3	3	

IV. RESULTS AND ANALYSIS

The data used for this project were results obtained from laboratory test conducted on Natural Aggregate Concrete (NAC) and Recycled Aggregate Concrete (RAC) specimens at the Material Testing Laboratory, Cross River University of Technology, CRUTECH, Calabar.

Table.4.1: Compressive Strength Test Result on Natural Aggregate Concrete NAC, Mix Ratio 1:2:4

Age of Cubes (Days)	Compressive strength in N/mm^2
3	11.5
7	14.0
14	17.6
21	19.7
28	21.1

Figure 4.1 below shows the average compressive strength of natural aggregate concrete (NAC) versus age. As the age increases, the compressive strength also increased.

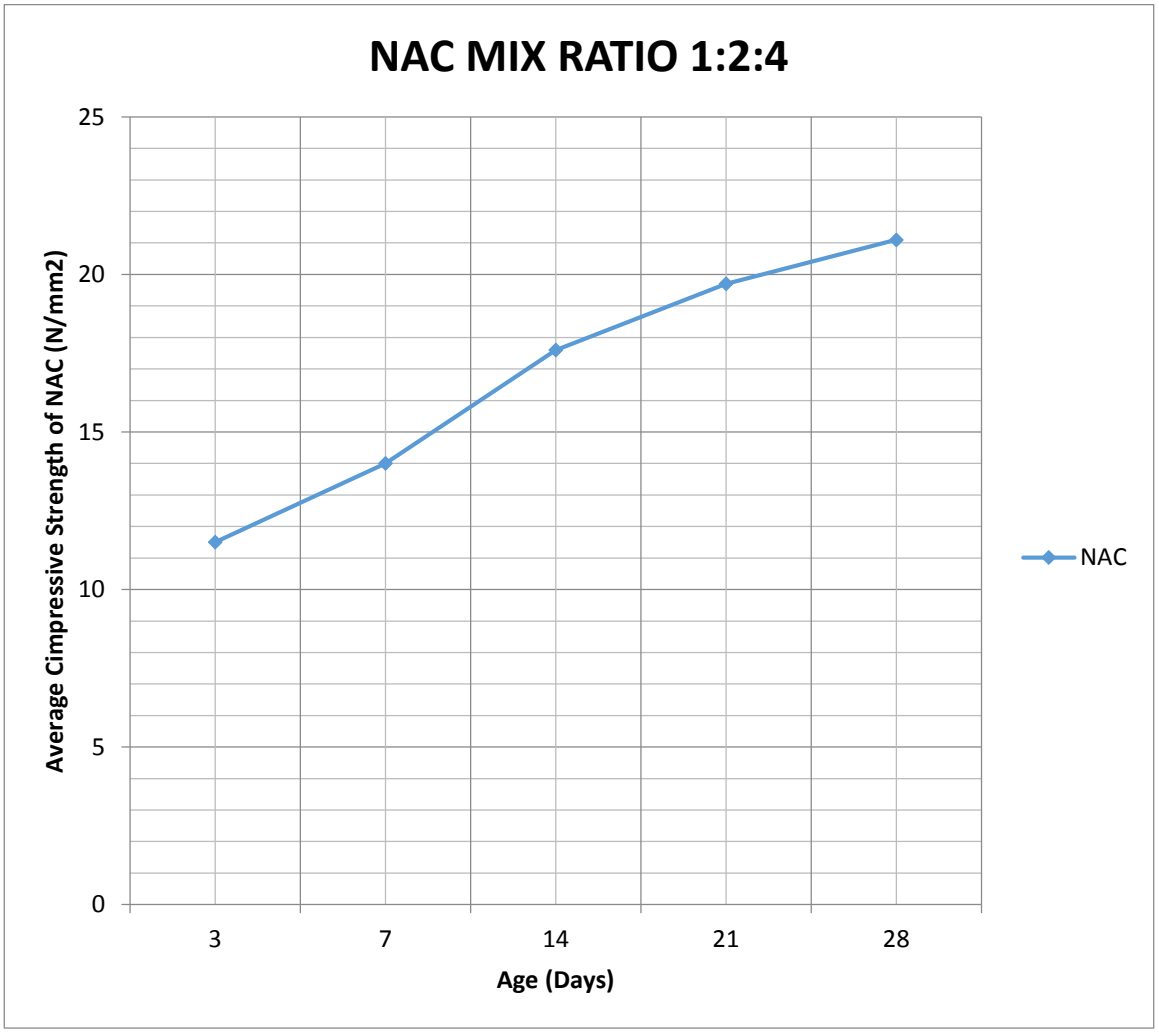

Fig.4.1: Graph of compressive strength versus age for NAC with mix ratio 1:2:4

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Table.4.2: Compressive Strength Test Results Of Recycled Aggregate Concrete RAC for Mix Ratio 1:2:4

Age of Cubes (Days)	Compressive strength in N/mm^2
3	13.0
7	15.3
14	17.2
21	18.9
28	20.5

Figure 4.2 shows the average compressive strength of recycled aggregate concrete (RAC) versus age for mix ratio 1:2:4. As the age increases, the average compressive strength increased.

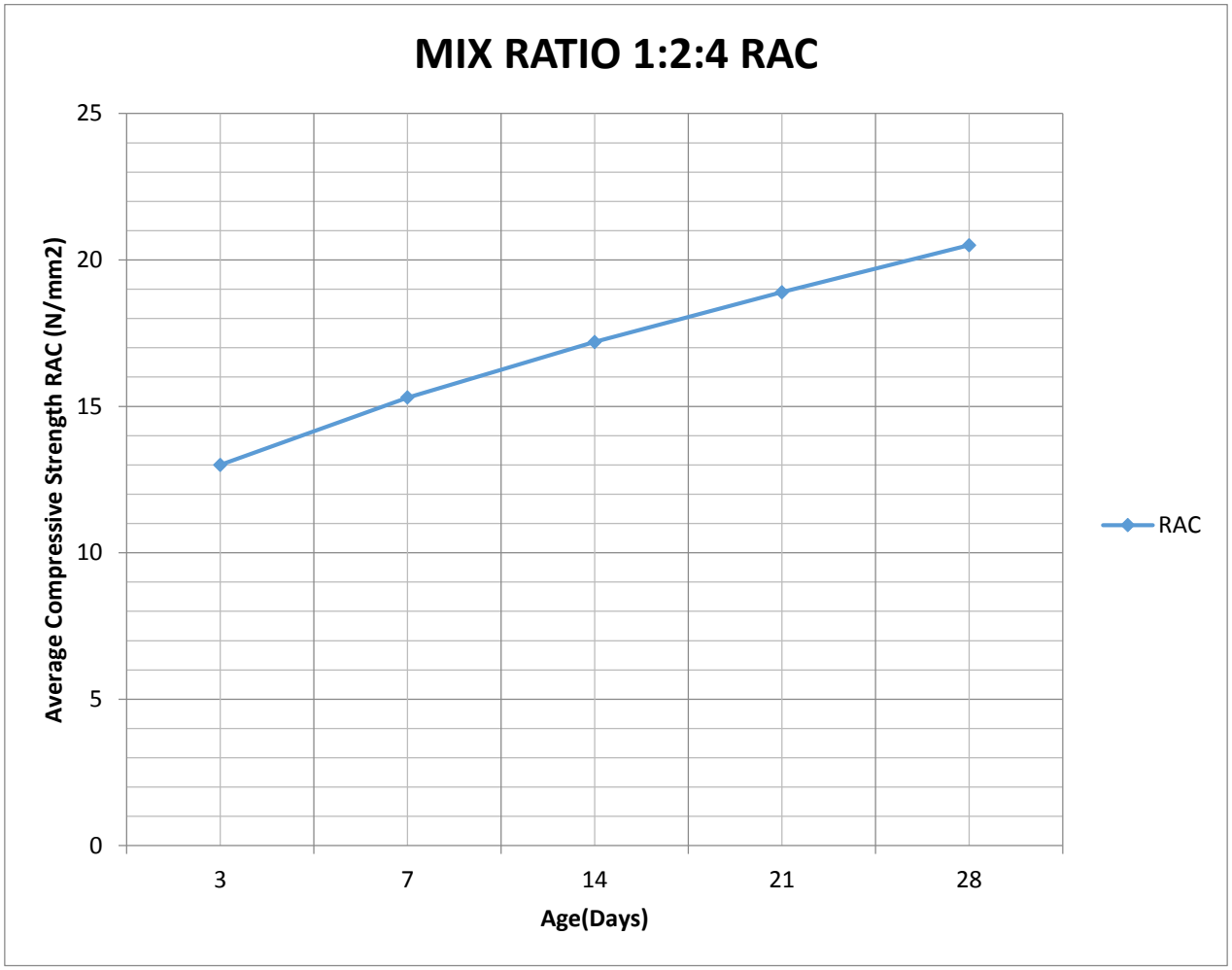

Fig.4.2: Graph of compressive strength versus age for RAC with mix ratio 1:2:4

Table.4.3: Comparison Of NAC And RAC With Mix Ratio 1:2:4

Age of Cubes (Days)	Compressive strength in N/mm^2 for NAC	Compressive strength in N/mm^2 for RAC
3	11.5	13.0
7	14.0	15.3
14	17.6	17.2
21	19.7	18.9
28	21.1	20.5

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Figure 4.3 shows the comparison for mix ratio 1:2:4 for NAC and RAC. In the graph, it is clearly shown that the compressive strength of RAC was higher than those of NAC at the early ages before day 12. At age of 12days, there was an intersection point between RAC and NAC and there was an equal and average compressive strength of about 16.8N/mm^2. After this age of 12 days, it was observed that the average compressive strength of NAC started rising above that of RAC. It can be deduced from the graph that the compressive strength of RAC was higher than that of NAC at early ages while the compressive strength of NAC was higher than that of RAC at later ages. This means that RAC will have better usage in quick set concrete where early strength is desired.

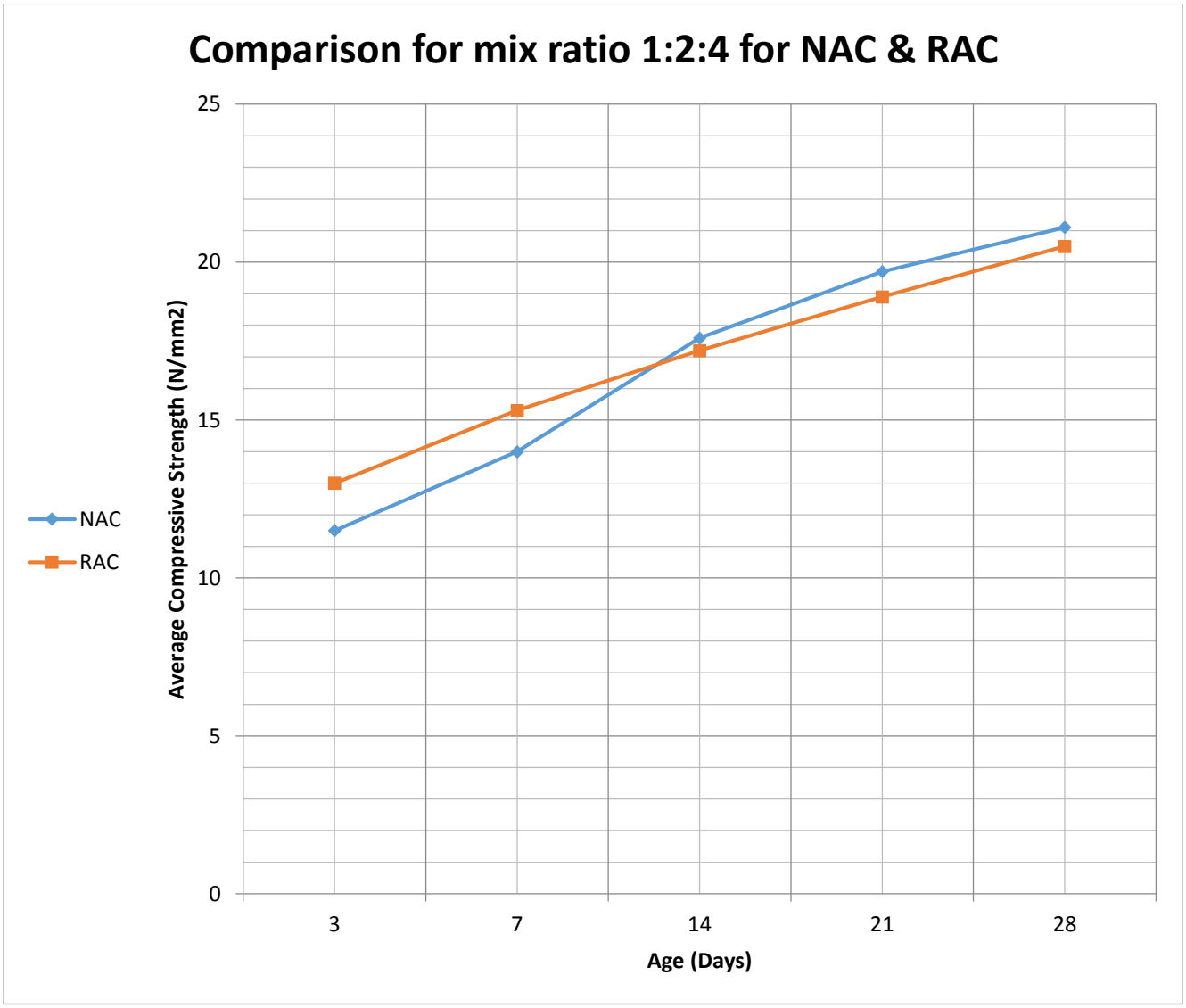

Fig.4.3: Graph of compressive strength versus age for RAC and NAC versus age for mix ratio 1:2:4

Table.4.4: Compressive Strength Test Results of NAC With Mix Ratio 1:1.5:3

Age of Cubes (Days)	Natural Aggregate Concrete (NAC)
3	14.8
7	18.3
14	20.5
21	24.9
28	29.8

Figure 4.4 below shows the average compressive strength of natural aggregate concrete (NAC) versus age for mix ratio 1:1.5:3. As the age increases, the average compressive strength increased.

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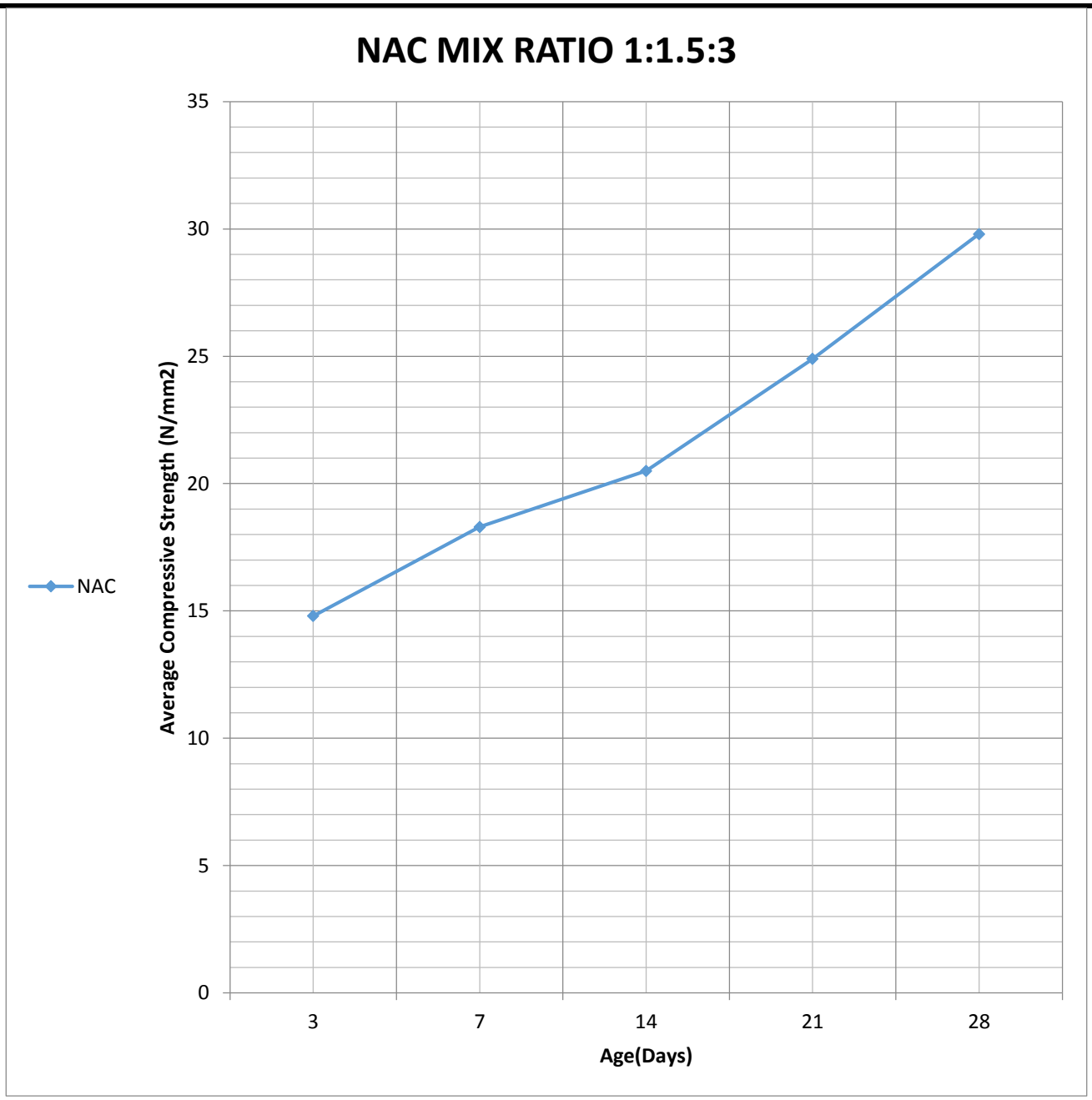

Fig.4.4: Graph of Average Compressive Strength versus Age (Days) for NAC with mix ratio 1:1.5:3

Table.4.5: Compressive Strength Test Result OfRAC With Mix Ratio 1:1.5:3

Age of Cubes (Days)	Recycled Aggregate Concrete (RAC)
3	14.5
7	19.5
14	21.0
21	24.5
28	30.2

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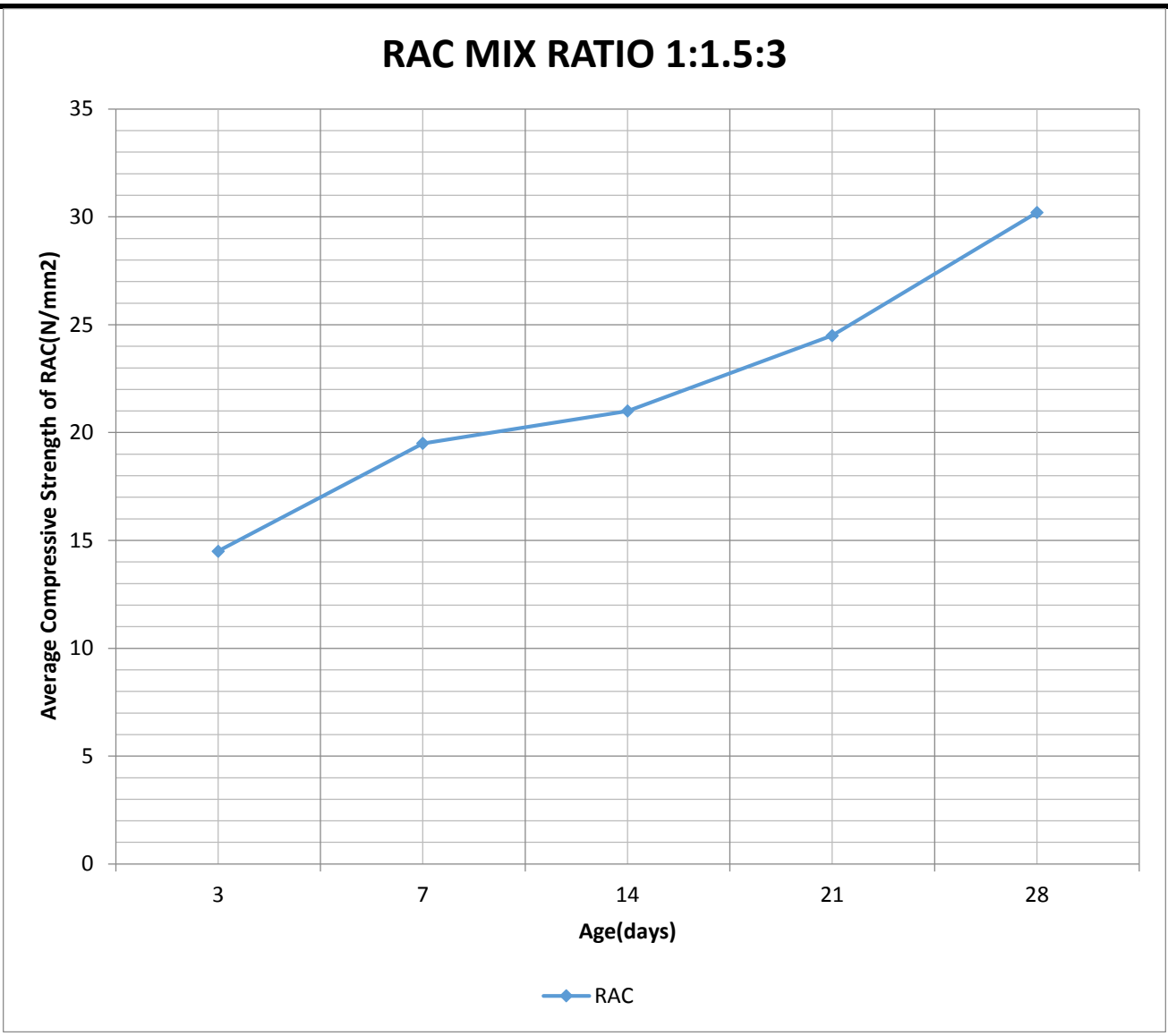

Fig.4.5: Average Compressive Strength versus Age (Days) for Recycled Aggregate Concrete (RAC) for mix ratio 1:1.5:3

Table.4.7: Comparison Of Compressive Strength Test Result For RAC and NAC, Mix Ratio 1:1.5:3

Age of Cubes (Days)	Natural Aggregate Concrete (NAC)	Recycled Aggregate Concrete (RAC)
3	14.8	14.5
7	18.3	19.5
14	20.5	21.0
21	24.9	24.5
28	29.8	30.2

At the early stage, compressive strength for RAC was higher than NAC. In figure 4.6, at age of 12 days, there was an intersection between RAC and NAC at an average compressive strength of about 16.8N/mm^2 and at that point. It can be deduced from the graph that the compressive strength of RAC was higher than that of NAC at early ages while the compressive strength of NAC was higher than that of RAC at later ages. This means that RAC will have better usage in quick set concrete where early strength is desired.

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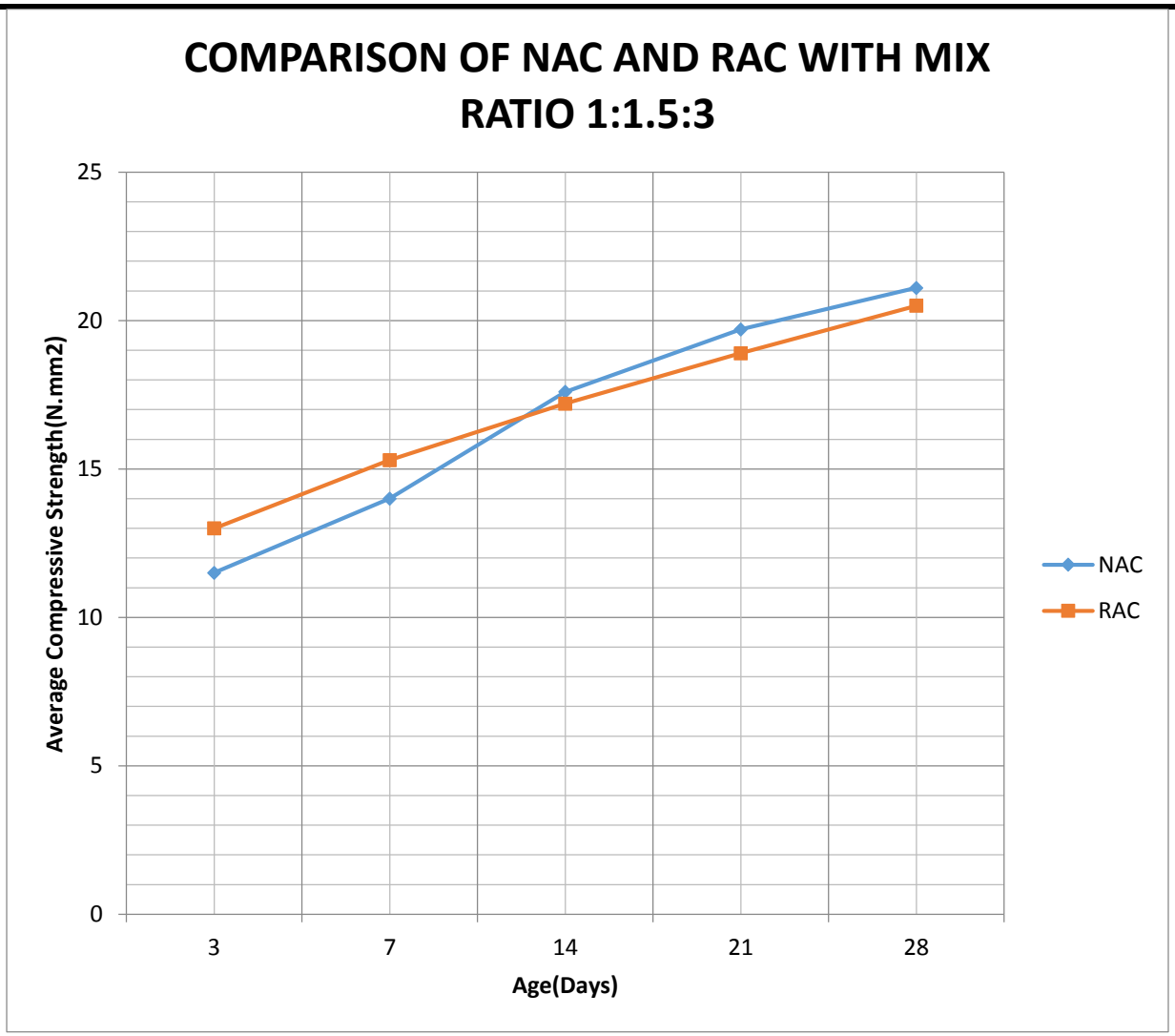

Fig.4.6: Comparison Of Average Compressive Strength versus Age (Days) for RAC and NAC with mix ratio 1:1.5:3

V. CONCLUSION AND RECOMMENDATION

5.1Conclusion

The following conclusions can be drawn from the results of experimental study to compare the compressive strength of concrete made with recycled aggregate and natural aggregate:

With constant water cement ratio and mix design, the early compressive strength of RCA concrete is higher than that of NCA concrete. However, at later ages, the compressive strength of NCA concretes were slightly greater than those of RCA by a little margin of about 10%. It was observed that the performance of concrete with RCA was slightly lower than NCA.

It was also observed that the concrete manufactured with RCA provided less compressive strength as compared to NCA. However, this reduction is considerably small, as such; RCA can be used comfortably in concrete structures with modifications to meet specific and desired purpose.

5.2 Recommendation

The following recommendations can be made from the research:

- Concretes made with RCA have equivalent compressive strength with those made from NCA provided the mix ratio and water cement ratio are not varied.
- Concretes made from RCA have higher early compressive strength compared to those made from NCA
- The use of RCA in concrete should be encouraged by legislation to solve environmental problems of disposal and depletion of natural aggregates.
- The process of preparation of recycled aggregate plays a significant role in determination of the strength of the recycled aggregate concrete. If not properly crushed and washed to remove the adhered mortar, the concrete density will be low thus reduction in strength.

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Structural and Dielectric Properties of Polyurethane Palm Oil Based Filled Empty Fruit Bunch

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Abstract— *This paper presents the structural and dielectric properties of polyurethane palm oil based filled empty fruit bunch. Polyurethane filled with empty fruit bunch (PU-EFB) composite was prepared through hot press process. The crystal structure of PU-EFB has been studied using X-ray diffraction technique. The effect of EFB filler content on the microwave dielectric properties of the PU-EFB composites was studied in the X-Band frequency region using Vector Network Analyzerat room temperature. A Kraszewski model showed good correspondence with measured dielectric constant of PU-EFB composite, especially at the higher loading level.*

Keywords—dielectric properties, PU-EFB composite, polyurethane palm oil based.

I. INTRODUCTION

With the rapid development of modern microwave communication systems, microwave dielectric ceramics have attracted much scientific and commercial attention. The main demand for technology is the use of low cost and produce high-performance product. Dielectric materials play an important role in leading this industry. A small ceramic component made from a dielectric material is fundamental to the operation of filters and oscillators in several microwave systems[1]. The selections of dielectric samples are a major problem in fabricating microwave substrate[2].

The process to produce microwave substrate with high performance gives an impact to the environment. Most of them are thermoset resin-based systems[2].High cost is one of the problems in bringing high frequency personal communication equipment to the consumer market. Materials that provide superior microwave performance for the realization of active devices and passive elements are typically very expensive[3].

Polyurethane (PU) plays an important role in modern life and its global demand is growing every year. To date, there are many researches on renewable resources for polyurethane. It has been reported that polyurethanes are a polymer that can be prepared using natural product such as palm oil[4].

This research presented the designing of microwave substrate using palm oil based polyurethane and empty fruit bunch (EFB) as filler. EFB is a waste material from palm tree. The ingredients used in the processes of preparing oil based polyurethane were ingredients used in the manufacturing of polyurethane, namely *p*-MDI and palm oil based glycerol. The polyurethane-EFB (PU-EFB) composite was prepared by using hot press method. The structural characterization of PU-EFB composite and the effect of filler loading on dielectric properties were reported.

II. EXPERIMENT

2.1 Material

The raw materials used in this study were glycerol palm oil based with molecular weight 92.09380which was obtained from FPG OleochemicalSdn. Bhd. Kuantan, Pahang and Diphenylmethane-4, 4'-diisocyanate (p-MDI), Sigma-Aldrich with molecular weight: 250.25200. The empty fruit bunch was obtained from Kilang Kelapa Sawit Felda Neram, Kemaman, Terengganu.

2.2 Preparation of empty fruit bunch powder

The obtained EFB fibre was air-dried for 1 week before being ground. The ground EFB was then sieved using 70 µm a sifterto separate the powder to different particle sizes. Soaked using distilled water for24 hours to remove ash[5]. The EFB then dried at 90^{o}C until the mass was constant.

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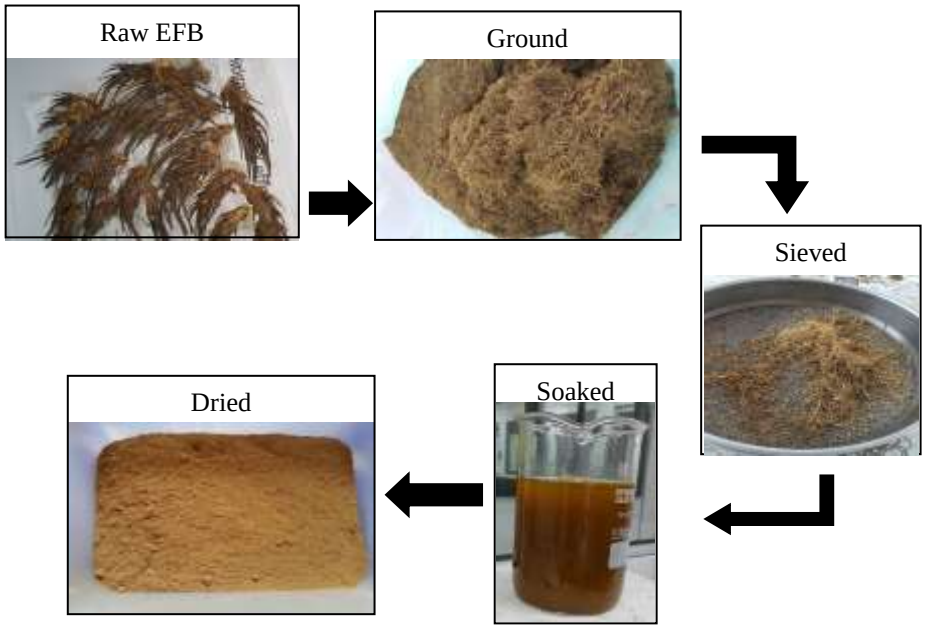

Fig.1: Preparation of empty fruit bunch powder

2.3 Preparation of polyurethane using glycerol palm oil based

The formation of polyurethane foam in this study resulted from the exothermic reaction between glycerol palm oil based and Diphenylmethane-4,4'-diisocyanate (*p*-MDI). Figure 2 represented the chemical reaction between glycerol palm oil based and isocyanates.2

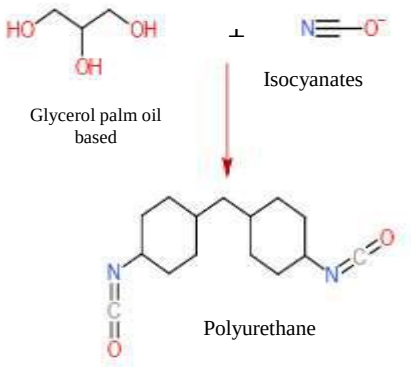

Fig.2: Chemical reaction of polyurethane

The amount of glycerol and *p*-MDI were fixed at 3g and 6g respectively with ratio 1:0.5[6]. Glycerol palm oil based was first weighed in a beaker and gently stir 5 minutes. The *p*-MDI mixed and stirred vigorously for 10 seconds, poured in aluminium for self-rising. The foam was conditioned at room temperature for at least 24 hours and preceded with curing process until the mass of the polyurethane was constant.

2.4 Preparation of PU-EFB composite

Figure 3 shows the process to prepare PU-EFB composite. Polyurethane was finely ground and mixed with EFB powder. The powder mixture was mixed thoroughly within 30 seconds and was put in a mould the size of 22.86 x 10.16 mm (x-band dimension mould size). The PU-EFB compositewas heatedat 40 ^{o}C and 20 kgcm^{-2}with hotpress methods within 15 minutes. PU-EFB composite sheet was cooled for 1 hour and then removed from the mould. The curing process was carried out by heating PU-EFB composite sheets at a temperature of 70^{o}Cand placed in a vacuum pump until they reached constant mass.The composites were polished to ensure a good quality surface and parallel surfaces.

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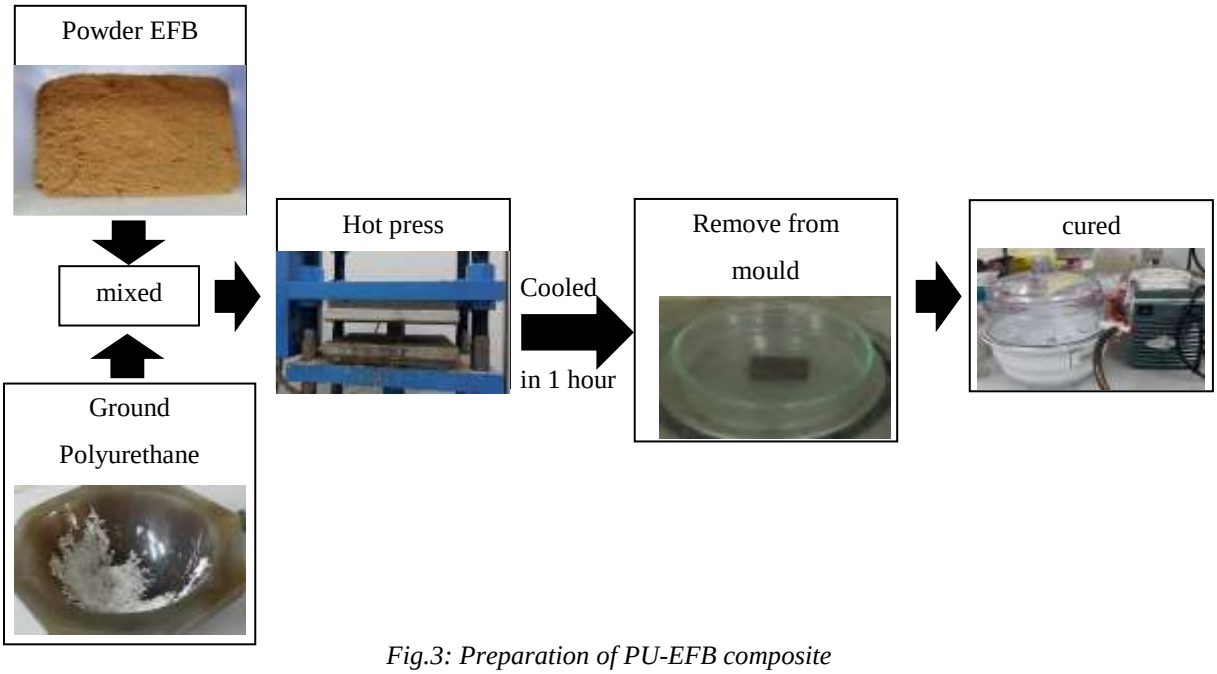

Fig.3: Preparation of PU-EFB composite

III. RESULTS AND DISCUSSION

3.1 Structural Properties

The structural of crystallinity of PU-EFB composite was studied using X-ray diffraction technique at room temperature with monochromatic Cu Kα (λ=1.540562Å) in the scan range of 10º and 80º. Figure 2 shows the X-ray diffraction pattern of 0% EFB (pure PU), 40% EFB, 60% EFB and 80% EFB. The powder diffractograms from X-ray diffraction exhibits broad peaks at 2θ angles around 22.72º, 18.86º and 41.5º.These indicate that some degree of crystallinity of polyurethane.

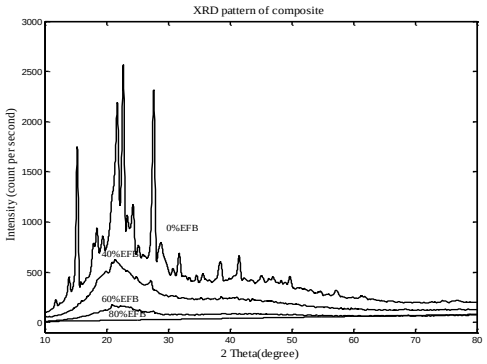

Fig.4: XRD pattern of composite

The graph also shows a decrease in the peak as a percentage of filler loading that entered into the PU matrix increased. At 80% filler loading, it was found that almost no peak occurred. This phenomenon concluded that the crystallinity of the composite was controlled by the presence of filler loading percentage in the composite.

3.2 Dielectric Properties

The dielectric properties of composite were studied using Agilent E5071C Network Analyzer in conjunction with Agilent 85070E dielectric probe. The dielectric measurement was conducted over a frequency range from 8 GHz to 12 GHz (X-band) at room temperature. Figure 2shows the variation of dielectric constant for composite at x-band frequency. The value for polyurethane (0% EFB) was between 2.5 to 2.6. The dielectric constant had slightly decreased when polyurethane was mixed with the EFB. Overall, the value for dielectric constant for composite was within the range of 2.1- 2.5.

Crystallinity of the composite effects the value of dielectric constant. When the crystalline was at high value, the dielectric constant was higher than when the structure of the composite was amorphous. The optimum value for dielectric constant was obtained when the composite contained 40% EFB.

The loss factor for polyurethane (0% EFB) was high compared to loss factor of the composites. The loss factor of each composite was low and it approached the value zero as shown in figure 4. At the frequency of 9.8GHz to 10.3GHz it slightly increased the value of loss factor.

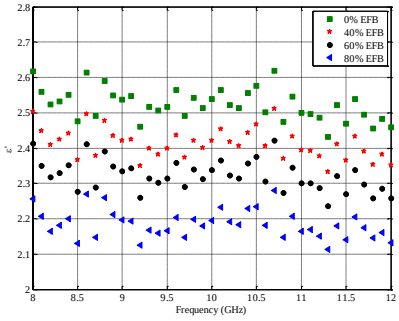

Fig.5: Relationship between dielectric constant and frequency for different percentage of EFB.

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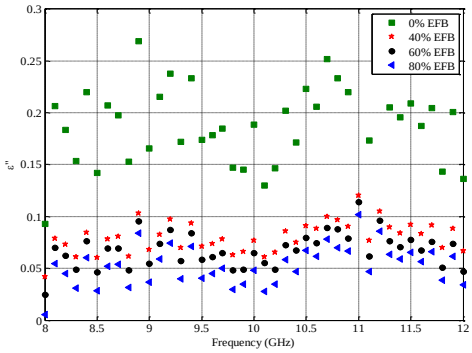

Fig.6: Relationship between loss factor and frequency

Variation of dielectric constant and loss factor as a function of percentage EFB loading in polyurethane is shown in figure 7a to figure 7e. For dielectric constant at 8 GHz, the gradient at 0.4 % to 0.6 % was –0.45 and the gradient at 0.6 % to 0.8 % was -0.078. For dielectric constant at 9 GHz, the gradient at 0.4 % to 0.6 % was -0.043 and the gradient at 0.6 % to 0.8 % was-0.069. For dielectric constant at 10 GHz, the gradient at 0.4 % to 0.6 % was --0.0418 and the gradient at 0.6 % to 0.8 % was-0.0713. For dielectric constant at 11 GHz, the gradient at 0.4 % to 0.6 % was -0.0468 and the gradient at 0.6 % to 0.8 % was-0.0685. For dielectric constant at 12 GHz, the gradient at 0.4 % to 0.6 % was -0.0468 and the gradient at 0.6 % to 0.8 % was -0.0631.For loss factor at 8 GHz, the gradient at 0.4 % to 0.6 % was -0.0087 and the gradient at 0.6 % to 0.8 % was -0.0095 .

For loss factor at 9 GHz, the gradient at 0.4 % to 0.6 % was -0.0067 and the gradient at 0.6 % to 0.8 % was-0.009. For loss factor at 10 GHz, the gradient at 0.4 % to 0.6 % was -0.0062 and the gradient at 0.6 % to 0.8 % was-0.0083. For loss factor at 11 GHz, the gradient at 0.4 % to 0.6 % was -0.003 and the gradient at 0.6 % to 0.8 % was-0.0062. For loss factor at 12 GHz, the gradient at 0.4 % to 0.6 % was -0.0097 and the gradient at 0.6 % to 0.8 % was-0.0064. From the trend of the gradient of dielectric constant and loss factor graph, the graph had decreased linearly at range of 0.4 % to 0.6 % and 0.6 % to 0.8 %. At range of 0.4 % to 0.6 % the gradient is lower than the slope of the graph at range 0.6 % to 0.8 %. At low filler loading, the dielectric constant high, where at this point the composite was introduced to the PU matri**x.**

PU filled EFB composite exhibited stable dielectric properties with respect to frequency and minimum dielectric anisotropy. There were some defects such as air gap, water and the interface phase between EFB and PU in composites materials, which can influence the relative dielectric constant and the dielectric loss of the composites.

Using hot press technique in production of the substrate composite, the interface region occurred between the filler and matrix. At higher filler loading, where a high amount of EFB, the interface region was reduced in between the filler and matrix and this couldinfluence the dielectric constant and loss factor. It was reported that the interface region hadprofound influence on deciding the effective dielectric properties of the composite systems [7]–[9].

The increasing addition of filler in the composite turn the composite system increases leading to poor packing and formation of porosity occur. This resulted in the existence of increased airspace and led to more air and water in the composite[7].

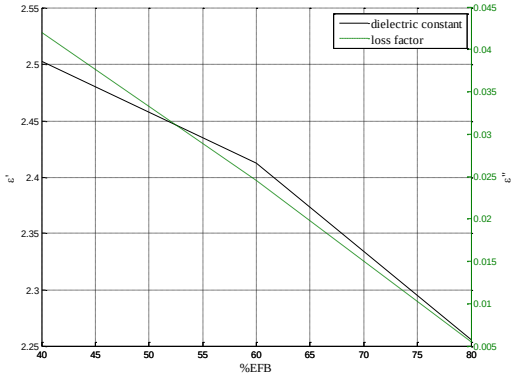

Fig.7a. Variation of dielectric constant and loss factor as a function of filler loading at frequency 8GHz

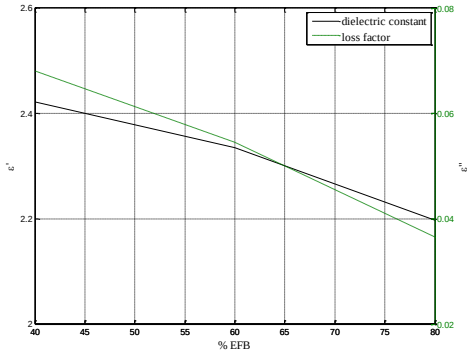

Fig.7b. Variation of dielectric constant and loss factor as a function of filler loading at frequency 9GHz

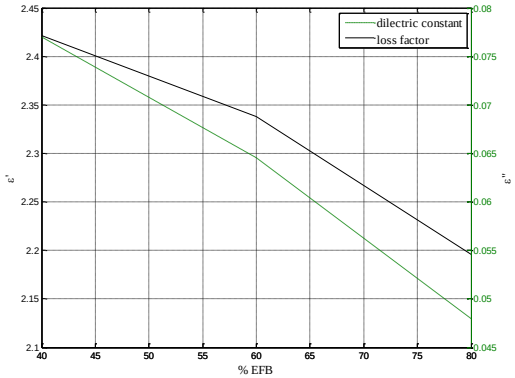

Fig.7c. Variation of dielectric constant and loss factor as a function of filler loading at frequency 10 GHz

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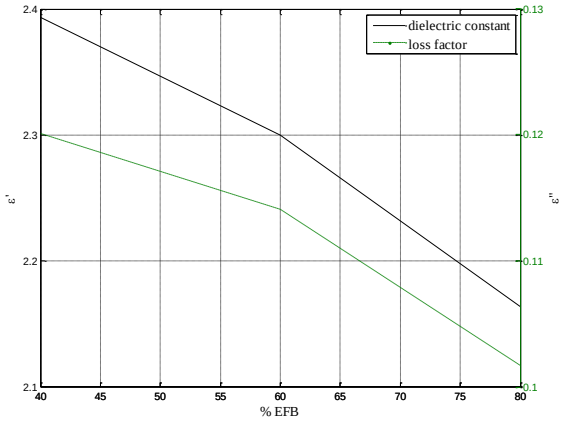

Fig.7d. Variation of dielectric constant and loss factor as a function of filler loading at frequency 11 GHz

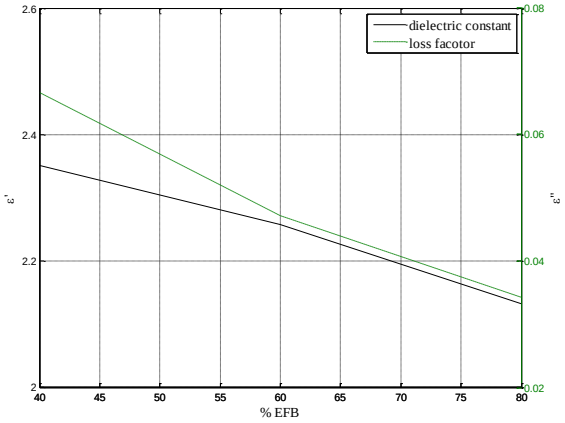

Fig.7e. Variation of dielectric constant and loss factor as a function of filler loading at frequency 12 GHz

Dielectric mixture model is the most commonly used theoretical model to calculate the complex dielectric constant of heterogeneous materials. The dielectric mixture is describedin terms of the fractional volume and dielectric constant of each constituent. For a composite system consisting of a mixture heterogeneous, dielectric constant optimum value is between the DC and the DC filler matrix. Nowadays models that are widely used are the Maxwell-Wagner-Sillar [9],Kraszewski [11] and Licthtenecker [8,11]as in Equations (1)–(3). These models enable material scientists to reach at novel composite systems without much experimental iterations[8].

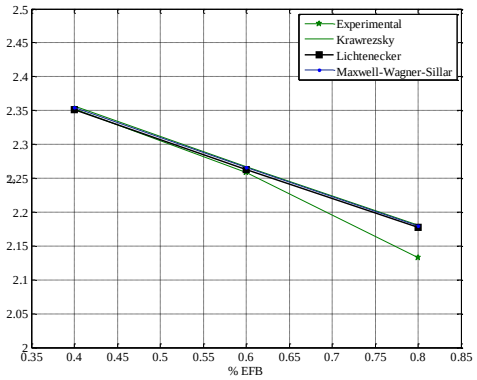

Fig.8: Comparison of theoretical predicted and experimental dielectric constant of composite

$$\log \varepsilon^* = V_f \log \varepsilon_f + V_m \log \varepsilon_m \quad (1)$$

$$\varepsilon^* = \varepsilon_m \frac{2\varepsilon_m + \varepsilon_f + 2V_f(\varepsilon_f - \varepsilon_m)}{2\varepsilon_m + \varepsilon_f - V_f(\varepsilon_f - \varepsilon_m)} \quad (2)$$

$$\sqrt{\varepsilon^*} = V_f\sqrt{\varepsilon_f} + V_m\sqrt{\varepsilon_m} \quad (3)$$

The notation used here applies to two components composite which are filler and matrix where ε^*represent the complex dielectric constant of composite, $\varepsilon_f$is the dielectric constant of filler and $\varepsilon_m$is the dielectric constant of matrix. The $V_f$and $V_m$are the volume ratio of the filler and matrix, respectively where$V_f + V_m = 1$ as the composite consist of two components. The theoretically predicted dielectric constant using these models was compared with that of experimental results. According to figure 6, all models almost matched the experimental data especially at lower filler loading. Comparing all the three models with the experimental results, it can be inferred that Kraszewski model has the best matching than other models. At the higher filler loading, all models have the same trend which deviates from the experimental results. This slight variation may be due to the porosity present in the samples.

IV. CONCLUSION

The PU-EFB composite was prepared with different volume of EFB filler through mixing and hot pressing. The crystallinity of the composite was finalized by powder X-ray diffraction studies. The microwave dielectric properties of the PU-EFB composites at X-band had been measured using vector network analyzer. Among different theoretical modelling studies attempted, Kraszewski model showed the best matching with experimental data.

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VLSI Implementation of Eye Detection System

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Abstract— *The eye detection is one of the most challenging problems in many applications such as image processing, pattern recognition and computer vision. This paper introduces efficient vlsi implementation of eye detection system. Face detection is a very important part of the developed eye detection algorithm. Face detection is done by using skin detection method. Skin detection is an extraction of skin color pixels and regions from an image. In this method, first input image is converted from RGB image to YUV image. With YUV domain, the skin pixels in an image are extracted. Then Morphological operation is done by using erosion method through which noise of an image is also eliminated. From this image, face region is extracted by identifying the skin pixels. Then eye detection is done according to rules of human face proportion. The eye detection system is implemented using Verilog-HDL and simulation is done by using Xilinx ISE.*

Keywords— Face Detection, Eye Detection, RGB, YUV.

I. INTRODUCTION

Eye detection is one of the most challenging problems in disciplines such as image processing, pattern recognition and computer vision [1]. One of the major application for eye detection is iris detection. Other application of eye detection algorithm can be used in cell phone, security system, safe driving etc. Eye portion in an image is identified as low illumination, higher density edges, more contrast in comparison with rest part of the face. Face detection is a very important part of the developed algorithm. Face detection is done by using skin detection method [2]. Skin detection method is an extraction of skin color pixels and regions from an image.

Different approaches that are used to detect human faces are feature based, appearance based, and color based. The feature based method detects a human's face depends on human facial features [3]. Because of its complexity, this method requires lots of computing and memory resources. Color based method is more reasonable for applications that require low computational effort. In general, each method has its own advantages and disadvantages. More complex algorithm typically gives very high accuracy rate but also requires lots of computing resources [4]. Skin detection method is an effective method to detect face regions due to its low computational requirements and ease of implementation. Compared to the featured based method, the skin detection method required very little process [5]. This paper focuses on algorithm of the Eye Detection System by using Hardware Description Language.

Software used in this implementation is Xilinx Synthesis Tool version 14.1. XST comes with provision of implementing the design using hardware description language. Verilog HDL has been chosen as implementing language as it has some additional features in designing as well as verification. Isim simulator is used for functional simulation of the design. Functional simulation is done using test bench for each and every block individually. In the test benches, images are required to be given as an input. Input images are stored in a text file which contains all pixel values. Matlab 2014a is used to convert an image into text file so that the pixel values can be passed in the design. Verilog HDL does contain system task that can read a text file. Read text file can be loaded into a memory defined inside the design. Simulation result is observed in the waveform available in the Isim simulator. Test bench is also written using Verilog HDL.

II. PROPOSED ALGORITHM

The input image is converted into text values using MATLAB program. Those values are stored in files and these are passed through test bench.

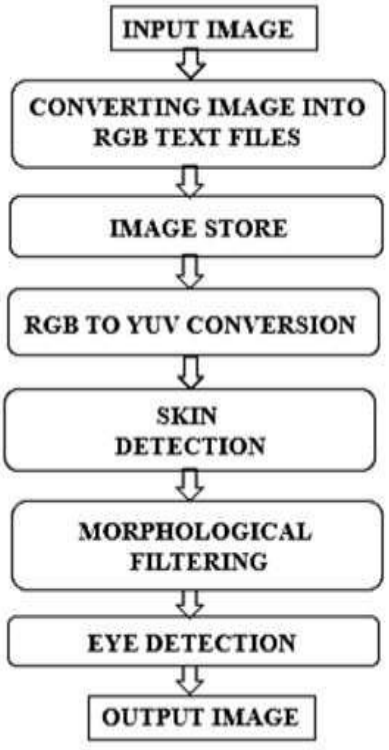

Fig. 1. Eye Detection System

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To store the text file, memory is created. Then image is converted into luminance and chrominance domain to detect the skin pixels. Face is extracted using skin detection method. Then image is converted into a binary image. Morphological operation is performed to remove the unnecessary pixels. Horizontal location of eye is always at a fixed position with respect to face. Eye portion can be extracted by using face proportion rules to detect the status of eye. The flow chart of eye detection system is shown in Fig. 1.

A. Input Image

The Input image is taken in the form of three separate Red, Green and Blue (RGB) images. The RGB is an additive color model used to detect RGB values differently. The original image and RGB images are shown in Fig. 2.

Fig. 2(a). Original Image

Fig. 2(b). RGB Images

Fig. 2: Original Image and RGB Images

B. Converting Image into Text File

Matlab is used to convert an image into text file so that the pixel values can be passed into the Verilog. Matlab is capable of converting an image into text file with the help of predefined functions. Converted RGB text files are shown in Fig. 3.

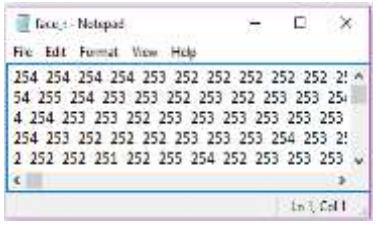

Fig. 3(a): Red Text File

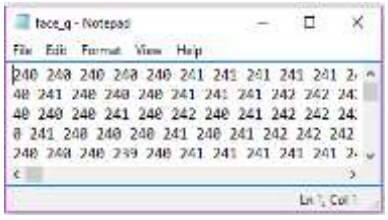

Fig. 3(b): Green Text File

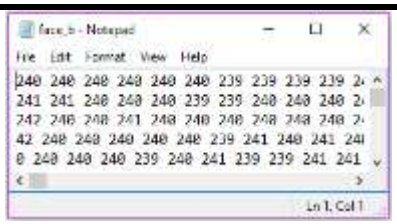

Fig. 3(c): Blue Text File

Fig. 3. RGB Text Files

The text file contains all pixel values of an image and when it stored into test bench then only image processing will be done. After image is converted into text files, these files are stored in Verilog directory path because we can't read image directly in Verilog HDL. By seeing scroll bar in text file, can identified as a large text file.

C. Reading a Large Text File using Verilog

In Verilog, to read a large text files and stored in to memory having two commands/functions. Where $readmemh command is used to read the text files which consists of hexadecimal values and $readmemb command is used to read text files which consists of binary values.

III. FACE AND EYE DETECTION METHODS

I. FACE DETECTON METHOD

Skin detection is important part of many applications such as face detection, face tracking, gesture analysis, bio-metric, surveillance, facial image coding compression, emotional computing, and face attribute classification and human computer interaction. To detect skin pixels, RGB image is converted into YUV image.

A. RGB to YUV Conversion

The RGB is an additive color model in which red, green, and blue colors are added together in various ways to produce a broad array of colors. In YUV color model, Y is Luminance, U and V are Chrominance blue and Chrominance red components. Luminance is very similar to the grayscale version of the original image. By YUV image, the skin color pixels clearly can be detected. The RGB to YUV Conversion is done by using the following equations.

$$Y = (R+2G+B) / 4$$
$$U = R - G$$
$$V = B - G$$

B. Skin Detection

The text files are created by using YUV image. The skin pixels can be segmented based on the following range

$$10 < U < 74$$
$$-40 < V < 11$$

In V range, skin pixels cannot be detected clearly so considering only U range. This stage detects skin pixels and converts it into binary image. Binary image contains black and white pixel where white pixels are taken for the face pixel and other pixel are kept as black so that it is easy to detect face region. Detection of skin pixel is done only with U component

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where impact of other component was not participating much for skin pixel detection.

C. Morphological Operation

In morphological operation, erosion method used to remove the redundant pixels. The original image is converted into black & white image and into text file. Morphological operation is performed to remove the redundant pixels which are available in any image. Morphological operation basically works with intended window of relevant shape moved all along the image to find and remove the redundant pixel. The intended window is termed as structuring element. Structuring elements is small binary image with pixels value of one's and zero's. Dimension of the structuring element gives the size of the structure element. Pattern of one's and zero's provides shape of the structuring element.

Erosion method has been done on the image to remove the residual pixels. Erosion process is mainly used for bringing shape of the image more precise by removing the redundant pixel. Here considering Diamond shaped 3 * 3 element, shown in Fig. 4.

0	1	0
1	1	1
0	1	0

*Fig. 4: Diamond shaped 3 * 3 element*

Checking each 3*3 matrix, which will be taken from image if matches with diamond shaped 3*3 element then centre element will become 1 or else 0. After checking each 3*3 element, image gets ready without any noise produced in the background.

II. EYE DETECTON METHOD

Eye portion is detected by using rules of human face proportions [6]. Position of eye with respect to the face is fixed for every normal face [7]. Ratio of human face proportion rules is shown in Figure 5.

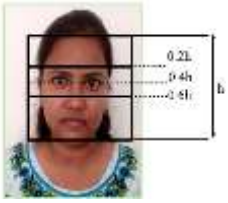

Fig. 5: Rules of Human Face Proportions

The eye portion is extracted from 0.2h to 0.6h from the whole face [8,9,10]. Extracted Eye portion is shown in Fig. 6. Eye extraction image is used to create the text file which contains eye pixels. The pixel range is then applied to detect eye portion of the face. According to the text file, eye status can be performed.

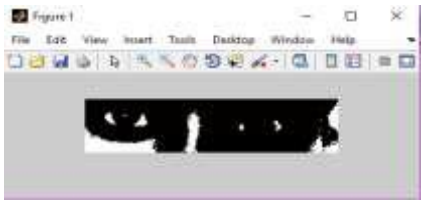

Fig. 6: Eye Extraction

VI. RESULTS

The design is done using Verilog HDL and simulation is carried out in Xilinx ISE tool 14.1. Different Verilog construct such as behavioural, dataflow, gate level and structural modelling style are available for both design and verification. Design of the RTL diagram contains behavioural, dataflow, structural modeling style. Xilinx synthesis tool is used that converts RTL description in HDL to RTL design.

Simulated Output of RGB Pixels are shown in Fig. 7. For storing the RGB pixels, ram memory has been created. RAM memory consists of both read and write options. When read_write option becomes one, it reads all the pixel values into input stages(red_in, green_in and blue_in) and output stages(red_out, green_out and blue_out) will be in an impedance state. This can be clearly seen in Fig. 7(a). When read_write option becomes zero, it writes/stores all the pixels values into output stages(red_out, green_out and blue_out). This can be clearly seen in Fig. 7(b). Simulated Output of RGB to YUV Conversion are shown in Fig. 8. In image, according to the U range the skin pixels are detected by producing one and zero in the output stage. Simulated Output of skin detection are shown in Fig. 9. According to the open and close text files, generating the eye status by producing one and zero in an output stage. If eye status output is one, its reading open eye image text file and eye status is open. If output is zero, it means its reading the close text file and eye status is closed. Simulated Output of Eye Detection is shown in Fig. 10.

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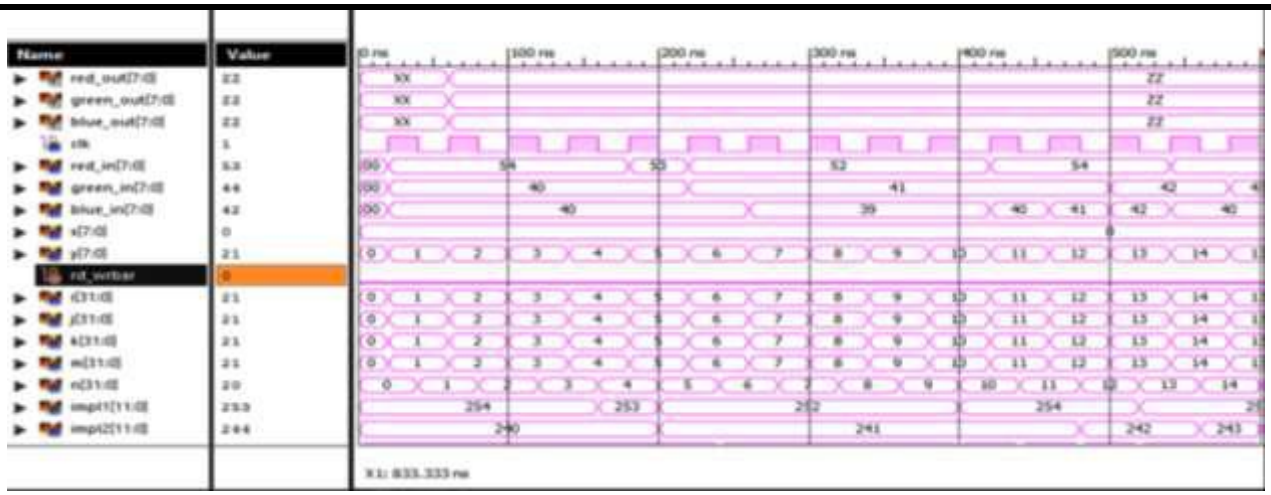

Fig. 7(a): Waveform of RGB Pixels when read write bar = 0

Fig. 7(b). Waveform of RGB Pixels when read write bar = 1

Fig. 7: Simulated Output of RGB Pixels

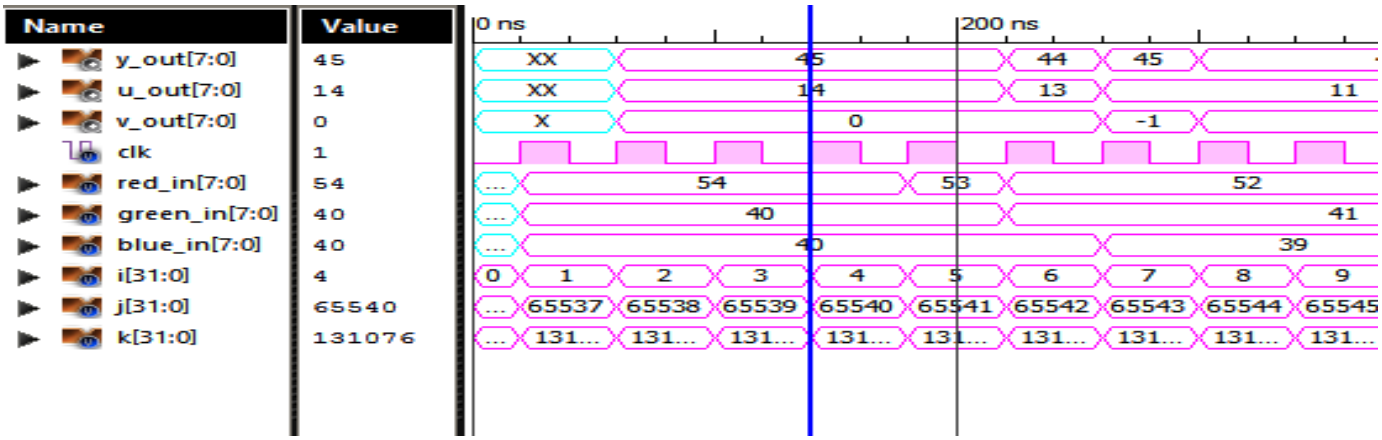

Fig. 8: Simulated Output of RGB to YUV Conversion

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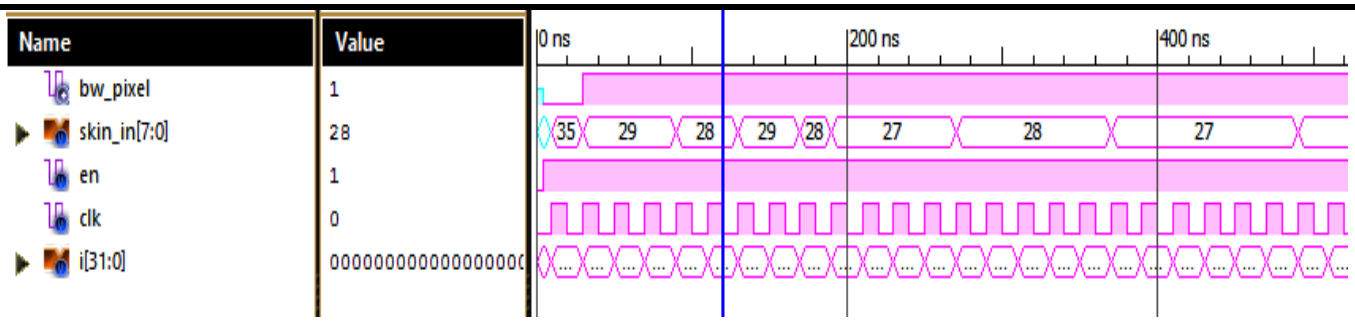

Fig. 9: Skin Pixels

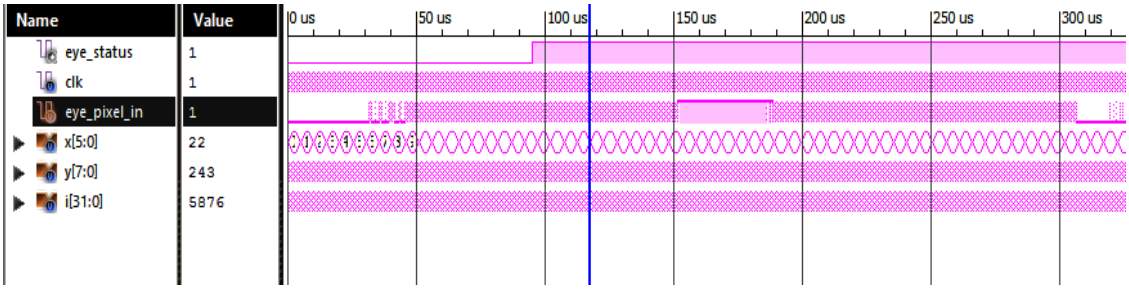

Fig. 10: Eye Detection

VII. CONCLUSION AND FUTURE SCOPE

This paper can be used in many applications such as gesture understanding, disabled-helping domain, and so on. Hence, this project has been successfully implemented using Matlab and Xilinx ISE tools.

Future work of this paper can be on FPGA's available in the market. Xilinx FPGA's are available in market that can be chosen for hardware implementation of proposed concept. Xilinx Spartan3, spartan3E, spartan6 are some of the FPGA that can be taken to implement it on the hardware level. Spartan series FPGA does have ample no. of gates to implement. Hardware implementation requires interfacing of physical memory to store image. As a real-time application, camera can be chosen as an input device to the design.

Moreover efficiency, power, operating frequency are the parameters which can be taken for making the system more enhanced. Although hardware implementation is a challenge but its Implementation gives better opportunities on research area in the field of image processing using ASIC design.

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