e-ISSN : 2320-0847
p-ISSN : 2320-0936

American Journal of Engineering Research (AJER)

Volume 3 Issue 9– September 2014

www.ajer.org ajer.research@gmail.com

Editorial Board

American Journal of Engineering Research (AJER)

Volume-3 Issue-9

American Journal of Engineering Research (AJER)
e-ISSN: 2320-0847 p-ISSN : 2320-0936
Volume-3, Issue-9, pp-01-06
www.ajer.org
Research Paper Open Access

Design of up/down counter based on dual mode logic and Low power Hybrid dual mode dynamic flip-flop

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ABSTRACT *– This paper introduces a 4-b Johnson up-down counter that incorporates low power dual dynamic node pulsed hybrid flip-flop (DDFF) with clock gating technology and a dual mode logic (DML) in the counter. Clock gating disable the clock signal when the input data does not change the stored data. A DML mode logic is introduced here which improves the speed performance of the design, also achieving significant energy consumption reduction. The large capacitance in precharge node is eliminated by the DDFF and DDFF-ELM designs by following a split dynamic node structure. The DDFF offers power reduction. The DDFF-ELM reduces pipeline overhead. 4-b Johnson up-down counter is used to magnify the performance improvement of the designs, to which the DML logic is introduced. An area, power, and speed efficient method is presented here that incorporates complex logic functions into the flip-flop. The DML logic used in DDFF-ELM helps to achieve low power and high speed requirements. The simulation results are compared using T-Spice*

KEYWORDS *- Low power, DDFF, high speed, DML Logic, embedded logic, counter*

I. INTRODUCTION

For VLSI designer's power consumption has become a very important issue. Sequential logic circuits, such as registers, memory elements, counters etc., are heavily used in the implementation of Very Large Scale Integrated (VLSI) circuits [7]. Power dissipation is critical for battery-operated systems, such as laptops, calculators, cell phones and MP3 players since it determines the battery life. Therefore, designs are needed that can consume less power while maintaining comparable performance. Flip-flop is a data storage element. The operation of the flip-flops is done by its clock frequency [3] [7]. When multistage Flip-Flop is operated with respect to clock frequency, it processes with high clock switching activity and then increases time latency. Therefore it affects the speed and energy performance of the circuit [3]. Various classes of flip-flops have been proposed to achieve high-speed and low-energy operation [5]. In the past decades, many works has been dedicated to improve the performance of the flip-flops. Latches and flip-flops are the basic elements for storing information. The flip-flops and latches could be grouped under the static and dynamic design styles. The former type of designs dissipates lower power and the latter type includes the modern high performance flip-flops [11][12]. Several hybrid flip-flop designs have been proposed to reduce the power and delay. Some flip-flops analyzed here are PowerPC 603 flip-flop, Semi-dynamic flip-flop (SDFF), Conditional data mapping flip-flop (CDMFF), Cross charge control flip-flop (XCFF) and Dual dynamic node hybrid flip-flop (DDFF). For a design engineer the trade-off of any of these flip-flops is very important when designing a circuit. Therefore a flip-flop which meets the designer requirements have to be developed.A new dual dynamic based flip-flop is presented in this paper which involves clock gating for further power reduction. The clock gating technique [11] has been developed to avoid unnecessary power consumptions, like the power wasted by timing components during the time when the system is idle.

The rest of this paper is divided as follows. Section II discusses the disadvantages of existing flip-flop structures and challenges in achieving high performance. In section III, the proposed architecture and its operation are provided. Section IV describes 4-b Johnson up/down counter with clock gated dual dynamic flip-flops and DML logic. Section V includes the performance analysis and simulation result comparisons. In section VI, we conclude with the improvements of the proposed designs over the existing modern high performance designs.

II. ANALYSIS OF FLIP-FLOP TOPOLOGIES

PowerPC 603 is one of the most efficient classic static structures. It is a master-slave latch. Its main advantage is low power feedback and short direct path. It is constructed by cascading two identical pass gate latches. This flip-flop is a transmission gate flip-flop. The large D-Q delay and CLK node capacitances make the design inferior in performance. The Hybrid Latch Flip-Flop (HLFF) is not the fastest but has a lower power. The Hybrid Latch Flip-Flop is a high performance flip-flop. It does not have a positive hold time but robust to clock signal slopes. For high performance designs, HLFF is the best solution. But for embedding the logic functions, HLFF is inefficient. This structure is basically a level sensitive latch which is clocked with an internally generated sharp pulse. This flip-flop has small delay and small area. This flip-flop falls under hybrid category with negative setup time [2][6]. Semi Dynamic Flip-Flop (SDFF) is a combination of static and dynamic circuits. They are called as hybrid structures because they consist of a dynamic frontend and a static output. It has the capability of incorporating logic very efficiently, because unlike the true single phase latch (TSPC), only one transistor is driven by the data input [3]. SDFF is the fastest classic hybrid structure. But it has large CLK load, so not efficient as far as power consumption is concerned .The flip-flop also has large pre-charge capacitance. This is still best suited for high performance designs, though its power consumption is moderate. Semi Dynamic flip-flops are a pulse triggered flip-flop which has two main blocks, level sensitive latch and pulse generator [4].

The conditional data mapping flip-flop (CDMFF) is one of the most efficient among them. It is one of the most efficient among the state-of-the-art designs. It uses an output feedback structure to conditionally feed the data to the flip-flop. This reduces overall power dissipation by eliminating unwanted transitions when a redundant event is predicted. But it has additional transistors added for the conditional circuitry which make the flip-flop bulky and cause an increase in power dissipation [9].

A flip-flop architecture which was introduced, named Cross Charge Control Flip-Flop (XCFF) has considerable advantages over SDFF and HLFF in both power and speed. Since only one of the two dynamic nodes is switched during one CLK cycle, the total power consumption is considerably reduced without any degradation in speed. Also XCFF has a comparatively lower CLK driving load. A cross charge control flip flop (XCFF) has considerable advantages over SDFF and HLFF in both power and speed. These transistors being driving large output loads contribute to most of the capacitance at this node. This common drawback of many conventional designs was considered in the design of XCFF. The effect of charge sharing becomes uncontrollably large when complex functions are embedded into the design [8].

The Dual Dynamic node hybrid Flip-Flop (DDFF) eliminates the drawbacks of other designs and presents an area, power, and speed efficient method to incorporate complex logic functions into the flip-flop. The Dual Dynamic node pulsed hybrid Flip- Flop (DDFF) is used to decrease circuit complexity, increasing operating speed and lower power dissipation. The glitch problems resulting from charge sharing could be reduced. An unconditional shutoff mechanism in DDFF overcomes the drawback of XCFF [1].The new dual dynamic flip-flop introduced in this paper has a clock gating technique which reduces further power. The existing design of counter includes static 2-input multiplexer where power consumption is of major concern. In order to magnify the performance improvement, we propose a 4-b Johnson up/down counter with dual mode logic. The normal multiplexer has been replaced by DML multiplexer where the counter could be operated both in static mode as well as dynamic mode.

The DDFF-ELM presents an area, power and speed efficient logic module. [1] .Note that in the revised model, the transistor driven by the data input is replaced by the PDN and the clocking scheme in the frontend is changed.

III. (a) PROPOSED ARCHITECTURE

The proposed hybrid Dual dynamic pulsed flip-flop (DDFF) architecture with clock gating technique acts both as static and dynamic circuits as in Fig.5. The operation of DDFF is based on the dynamic logic principles. This flip-flop requires two phases to operate based on the clock input to the circuit. The architecture and operation of the flip-flop is given in [1]. The architecture of DDFF with clock gating technique is shown in Fig. 1.

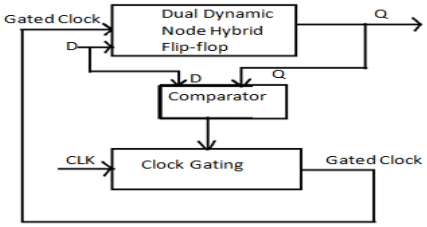


Fig. 1 DDFF with Clock Gating

To avoid unnecessary power consumptions like the power wasted by timing components during the time when the system is idle, the clock gating technique [12] has been developed. Clock gating means disabling the clock signal when the input data does not alter the stored data. The entire functional unit can be selectively set into sleep mode, or from the sequential/combinational circuit level where some parts of the circuit are in sleep mode while the rest of the block are operating.

The block contains two parts, the Dual dynamic flip-flop and the clock gating circuitry. The data signal arrives to the comparator and the DDFF flip-flop simultaneously. The comparator checks the output and the current data input from D.It checks if D and Q are equal, if it is not equal which means that the input has changed since the last comparison, then the clock gating circuitry will generate the active clock gating signal and the gated clock signal will be send to the DDFF flip-flop to trigger the storage. The input data will be passed through to the output. Otherwise, the entire system remains in the previous state.

(b) EMBEDDED LOGIC MODULE

SDFF has the capability to incorporate logic functions efficiently.The advantage of SDFF is fast and small implementation in terms of speed and area.The disadvantage is single node and more power dissipation[4]. But SDFF with embedded logic considered for comparative pulses.Double pulse set-conditional-reset flip-flop is capable of incorporating logic[7],but it has explicit pulse generator to generate two pulses from global clock.It also cause large power consumption even without any data transition.Stacked NMOS can be used in DDFF since no charge sharing.DDFF flipflop with embedded function(eg.OR) shown as in Fig.2.

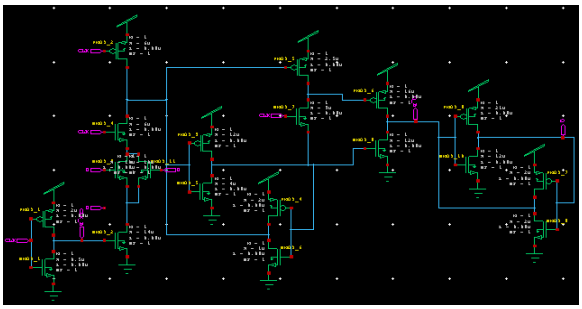


Fig.2 DDFF-ELM

IV. PROPOSED 4-B JOHNSON UP-DOWN COUNTER DML LOGIC

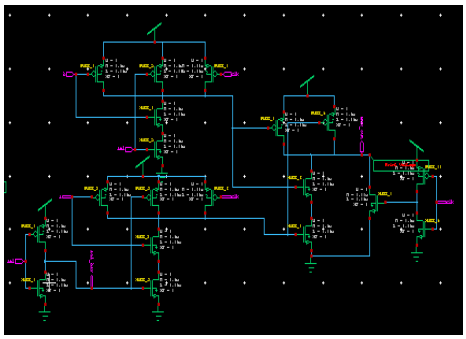


Fig.3 DML MUX

DML gates have a very robust operation in both static and dynamic at low supply voltages. It can be switched between static and dynamic modes of operation according requirements of the system. Thus support applications in which a flexible workload is required as shown in Fig. 10. In the static mode, DML gates consume very low energy with some performance degradation, as compared to standard CMOS gates. Alternatively, dynamic DML gates operation obtains very high performance at the expense of increased energy dissipation.

The basic concept behind the DML is to combine the traditional CMOS logic (or any other static logic) with a dynamic logic. Energy efficiency is achieved in the static DML mode at the expense of slower operation (Low Energy and Low Performance). However, the dynamic mode is characterized by high performance with increased energy consumption (High Energy and High performance).

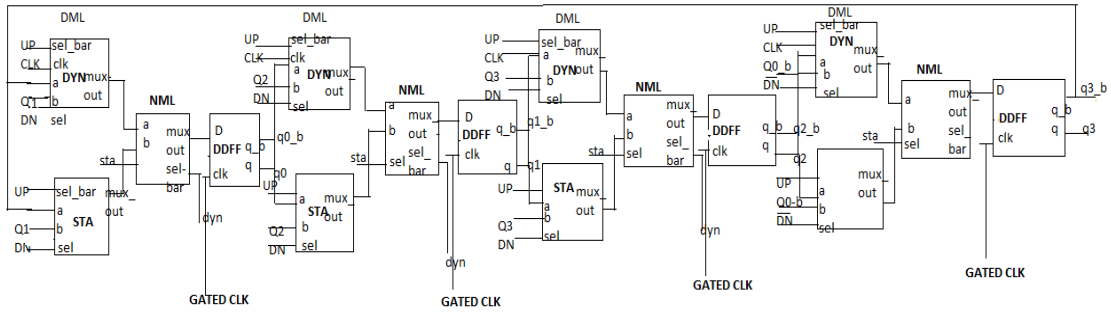


Figure 4: Up/down counter with Dual Mode Logic and Gated DDFF.

The 4-b Johnson up/down counter comprises of four dual dynamic node pulsed hybrid flip-flops (DDFF) and DML multiplexers as in Fig.4. The DDFF serves to be highly energy efficient with reduced delay. Initially all the flip-flops are in a reset condition. During up count, Q3-B is high (‘1’) on both the static and dynamic multiplexers of DML. Depending on the mode of operation been selected through the selection lines i.e, static or dynamic, inputs are given to the D-FF. Q0 is high (‘1’) and passes onto the next DML part of the counter. For each of the dual dynamic flip-flop, a clock gating technique is employed which will disable the clock when in sleep mode thereby reducing further power consumption.

Similarly the process continues depending on the counter operation (up/down).

V. PERFORMANCE ANALYSIS AND SIMULATION RESULTS

Tanner EDA is a leading provider of easy-to-use, PC-based electronic based design automation (EDA) software solutions for the design, layout and verification of analog/mixed-signal integrated circuits, ASICs and MEMS. The result is simulated in TSPICE platform. Power consumption and the speed performances are discussed for HLFF, CDMFF, XCFF, SDFF and DDFF. The data driving power, clock driving power, D-Q delay are the major parameters considered as shown in Table 1. The comparison results show that DDFF serves to be an efficient flip-flop and it is well suited for modern high performance systems. The performance of 4-b Johnson up/down counter was analyzed by incorporating various design styles of flip-flops as shown in Table 2. The analysis reveals that the Dual Dynamic node pulsed hybrid Flip-Flop (DDFF) serves to be an efficient flip-flop structure by means of low power and high speed. DDFF with clock gating reduces further power. The simulation of 4-b Johnson up-down counter is been carried out using S-Edit of T-Spice. The counter with normal multiplexer consumes more power when compared to DML multiplexer. The speed of the counter is also been degraded. While operating the counter in DML (static) mode, it serves to be energy efficient whereas in DML (dynamic) mode, it serves to perform with high speed.The performance analysis of proposed design compared with different flip-flop styles and power consumption of flip-flop with ELM and power consumption of counter with DML logic and clock gating is provides in Table 1,2,3 respectively.

Table 1: Performance Analysis of Various Flip-Flop Structures

Flip-flop	Data driving power(µW)	Clock driving power(µW)	Latching power(µW)	Total power(µW)	D-Q delay(ps)
SDFF	124.5	22	252.18	398.68	295
HLFF	4.37	11.9	197.9	214.17	327.26
CDMFF	133.11	64.4	2.34	199.85	455
XCFF	10.6	7.06	177.01	194.67	351.06
DDFF	8.56	4.03	99.9	112.49	348.5
CG_DDFF (proposed)	0.45	1.1	13.8	15.38	1710

Table 2: Power Consumption of flip-flop with Embedded Logic

Embedded Flipflop	CLK power (µW)	Internal power (µW)	Total power (µW)
SDFF	**7.76**	**803.14**	**810.9**
DDFF-ELM	**3.46**	**642**	**645.46**

The performance of 4-b Johnson up/down counter was analyzed by incorporating various design styles of flip-flops as shown in Table 2.

The analysis reveals that the Dual Dynamic node pulsed hybrid Flip-Flop (DDFF) serves to be an efficient flip-flop structure by means of low power and high speed. The simulation of 4-b Johnson up-down counter is been carried out using S-Edit of T-Spice. The output waveforms generated were shown in fig 5,6.

Table 3: Performance Analysis of Counter with DML

COUNTER	NORMAL MUX	DML MUX(static)	DML MUX(dynamic)
Power(µW)	1022.47	664.73	670.17
Delay(ps)	507	490	486

Table 4: Power Consumption of counter with clock gating

DML	Power without Clock Gating(µW)	Power with Clock Gating(µW)
Static Mode	664.73	658
Dynamic Mode	670.17	664

Fig.4 Simulation waveform of counter with clock gating and DML MUX (dynamic)

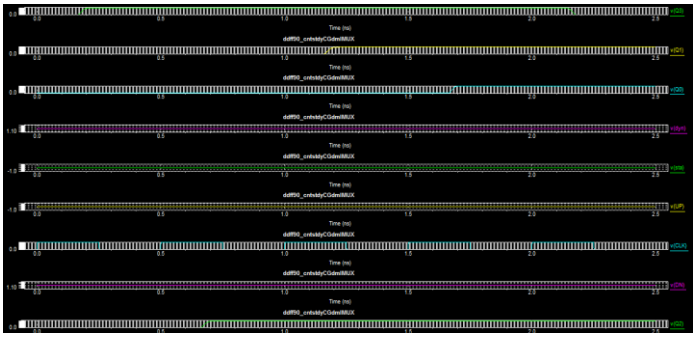
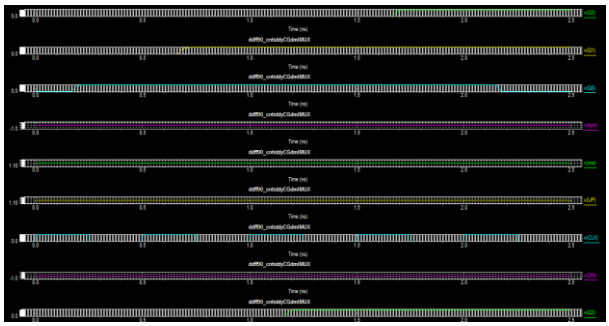


Fig.4 Simulation waveform of counter with clock gating and DML MUX (static)



VI. CONCLUSION

In this paper, a clock gating technique is applied to the dual dynamic flip-flop which reduce further power. To analyze the performance of flip-flop a 4-b Johnson up-down counter is used which uses normal MUX.But in this paper a 4-b Johnson up-down counter used with DML logic. DML logic can be switched between static and dynamic modes of operation according requirements of the system and to improve the speed performance. The power dissipation and speed performances of the flip-flop structures are considered. The DDFF and DDFF-ELM were analyzed. The DDFF eliminates the redundant power dissipation present in XCFF. The simulation result shows an improvement in power and delay parameters. 4-b Johnson up-down counter was used to highlight the performance parameters of the designs and to analyze the data activity at each bit position. Energy efficiency can be achieved by static DML mode and higher performance can be achieved by dynamic DML mode.

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American Journal of Engineering Research (AJER)
e-ISSN : 2320-0847 p-ISSN : 2320-0936
Volume-3, Issue-9, pp-07-14
www.ajer.org
Research Paper Open Access

Design and Implementation of a 3-Phase Automatic Power Change-over Switch

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ABSTRACT : *In this research, a "3-Phase Automatic Power Change Over switch" has been designed and implemented using three voltage Comparators (LM741 AH1883), 3-input-AND gate (4073), two BC 108 transistors and 12V, 30mA relay as well as some biasing resistors. The voltage Comparators (LM741 AH1883) were biased to sense the unregulated voltage - one for each of the three phases (Rø, Yø, Bø) and then couple the analogue outputs to the 3-input-AND gate (4073). The AND gate produces an output of '0' (OFF) when all the three phase input voltages are all within the normal (preset) range, else it produces an output of '1' (ON) implying a voltage drop or phase failure in at least one of the compared phases. The output of the gate when coupled to the base of switching transistors (BC 108) determines their states (OFF or ON). Since the transistors are configured in a Darlington pair arrangement, the second is ON only when the first is OFF. This then triggers the public power supply ON due to normal phase voltage. On the contrary, when the first transistor is ON, the 12V battery produces a potential which triggers ON the alternative power source (Generator) via the 12V, 30mA relays hence breaking contact from the public power supply to the Generator side. The switch is tested to have function optimally within ±5% nominal voltage of 220 or 415V supply at the point of changing over to an alternative power source. Hence this device can be of Industrial or domestic use where 3-phase power supply is available with a stand-by power source.*

KEYWORDS*: Alternative power, Change over Switch, Generator, Relay*

I. INTRODUCTION

Power supply instability in developing countries creates a need for automation of electrical power generation or alternative sources of power to back up the utility supply. This automation becomes necessary as the rate of power outage becomes predominantly high. Most industries and commercial processes are partly dependent on generators and public power supply which is epileptic especially in tropical African countries where Nigeria forms a part. Therefore, if the processes of power change-over between these two power-supplying sources are manual, human error during change-over connections may occur; leading to machine damage, electric shock/electrocution as well as increased down time consequently introducing massive losses [1].

However, if the starting of the generator is automatically done by a relay which switches the battery voltage to ignition coil of the generator while the main power relay switches the load to either public supply or generator, the down time would greatly be reduce thereby maintaining the tempo of production in such industries. A manual change-over switch consists of a manual change over switch box, switch gear box and cut-out fuse or the connector fuse [2].

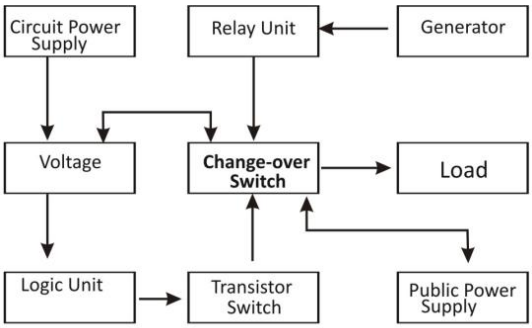

Figure 1: The block diagram of the system

The approach used in this work is the modular approach where the overall design is first broken into functional blocks as shown in the above block diagram. The 3-phase automatic change-over switch has been divided into eight (8) blocks as shown in Fig. 1. Each of these blocks carries out a specific function in the entire system as shown by the interconnections between the blocks.

II. DESIGN EQUATIONS, ANALYSES AND CALCULATIONS

The following design equations have been used in analysing various stages of the Automatic Change-over Switch.

$$C = \frac{5i}{Vpf} \quad (1)$$

where, C is capacitor value, $V_p$is peak voltage (Bridge output max voltage), *f* is frequency of the a.c supply and *i*is the load current [4].

$$V_R = \frac{R_2}{R_1+R_2} V^+ \quad (3)$$

where, V_R is voltage drop across R , V^+ is supply unregulated and rectified voltage from a single phase

$$V_{out} = A_o V_{in} \quad (4)$$

where$A_o$is open loop voltage gain which usually not less than 20,000 [3].

$$V_{in} = V^+ - V^- \quad (5)$$

$$V^+ = I_c R_C + V_{CE} \quad (6)$$

$$V_{IN} = I_B R_B + V_{BE} \quad (7)$$

$$hfe = \frac{I_C}{I_B} \quad (8)$$

where, I_C is collector current, I_B is base current, V_{IN} is input voltage, V^+ is supply voltage, V_{CE} is the collector-emitter voltage, hfe is current gain [4].

$$\text{Relay coil current} = \frac{\text{supply voltage}}{\text{coil resistance}} \quad [2] \quad (9)$$

III. MATERIALS

Three voltage Comparators (LM741 AH1883), 3-input-AND gate (4073), two BC 108 transistors, two 12V; 30mA relays, biasing resistors, 240/12V; 500mA transformer, bridge rectifier (1N4002), two voltage regulators (LM7812 and LM7805), variac, Multimeter plus some other components.

IV. IMPLEMENTATION

4.1 Power Supply

This section is represented in the diagram with two blocks (Public Power Supply and Circuit Power Supply) for the sake of clarity. The Public Power Supply has a nominal three phase or phase-to-phase voltage level of 415 a.c voltage under normal system condition, while the single phase-to-neutral nominal voltage is 240V. The Circuit Power Supply is tapped from the public power Supply and rectified to power the circuitry. The main function of the circuit power supply is to convert *a.c – d.c*. The first stage makes full wave rectification from the a.c signal by employing a bridge rectifier. The rectified d.c voltage is then filtered by using filtering capacitor to smoothen the resulting d.c signal. Finally, appropriate voltage regulators (LM78XX) are then selected to keep the d.c signal within specified ranges.

4.1.1. Transformer Rating

The transformer requirements:

Input voltage = 240Vk
Output voltage = 12V
The maximum output current 500mA = 0.5A
Therefore, power (VA) required = 15 x 0.5= 7.5VA

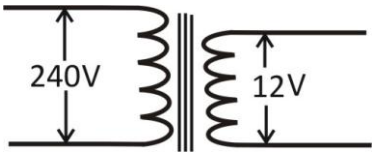

Figure 2: The transformer

4.1.2 Bridge Rectifier

This is achieved using half-wave bridge rectification. Two diodes (1N4002) were chosen due to their low voltage drop (≈0.7V) [2] and ruggedness.

4.1.3 Filtering capacitor:

To calculate filtering capacitance; C, the equation (1) is applied for 10% ripple voltage.

$C = \frac{5i}{Vpf}$

Transformer secondary voltage = 12V,
Ripple voltage = 10% of 12V = 1.2
Bridge rectifier = 1.4V
The expected voltage after rectification = 12 + 1.2+1.4 = 14.6V
V_p= peak voltage = 15V (peak-to-peak, bridge output max voltage)
i= load current = 0.5A
f = frequency of the AC supply = 50Hz;
Therefore; designing of +12V @ 0.5A, the filtering capacitance is:

$C = \frac{5i}{Vpf} = \frac{5 \times 0.5}{15 \times 50}$ = 3333.3333 µF; (2)

Preferred value = 3300µF.

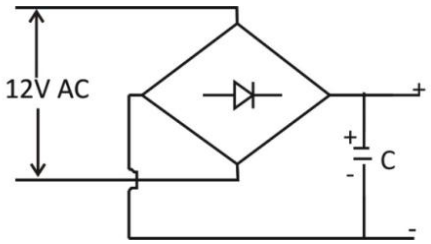

Figure 3: The bridge rectifier

4.1.4 Voltage Regulator

In this design, 7812 and 7805 regulators are used, which can provide up to 2A (guaranteed) with only 1.3V drop-out voltage. Input voltage must be around 15V, otherwise the regulator temperature will increase as input voltage increases [3].

1 = input, 2 = common, 3 = output

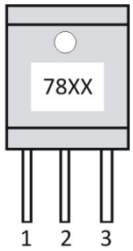

Figure 4: 78 Series regulator

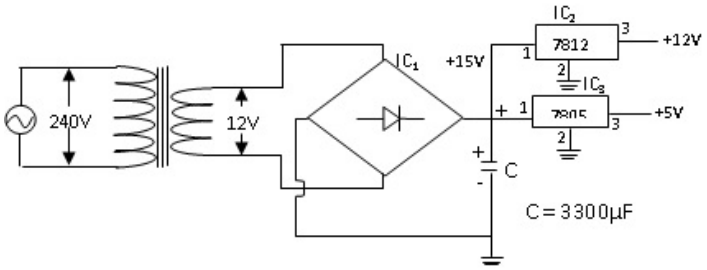

Figure 5: Power supply

4.1.5 Voltage Sensor

The comparator/voltage sensor compares two voltages, one voltage sampled from the unregulated voltage while the other is the regulated +5V voltage from the device power supply. If the two voltage levels are equal, there will be no output from the sensor but if a reasonable discrepancy is experienced, an output will be obtained from the sensor. The comparator stage is used to sense when the public power supply voltage has dropped below a certain preset level. The input public power supply voltage is converted to d.c (rectification) in the power supply stage and is regulated to 12V and 5V for power supply needed in the circuit. The unregulated voltage varies as the public supply input varies.

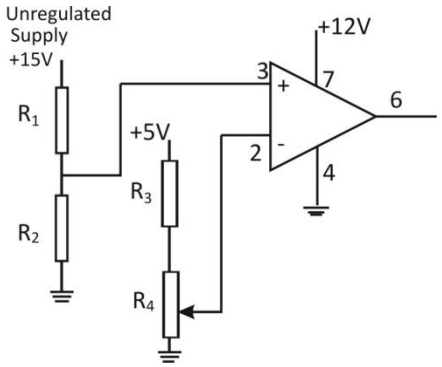

Figure 6: Voltage Sensing Circuit

From Fig. 6, R_1 and R_2 form a potential divider to reduce the unregulated voltage to a low voltage of less than 5V at 180V a.c input. Remember, 180V a.c is sampled single phase voltage to be rectified and compared with the regulated +5V d.c at pin 2 of the comparator. It is being taken as dangerously low voltage for appliances meant to operate with a nominal voltage of 240V a.c single-phase supply. At the 3-phase power supply (415V a.c), it will be as low as 340V a.c.

From equation (3), let V_{R1} = 1.45V = voltage drop across R_1.

But $V_{R2} = \frac{R_2}{R_1+R_2}V^+$ = voltage drop across R_2

From Table 1; at an input voltage of 180V (a.c), the sampled unregulated and rectified voltage from a single phase; V^+ equals 11.6V d.c.

Now, let R_1 = 100kΩ;

i.e. 1.45 = $\frac{R_2 \times 11.6}{100+R_2}$

R_2 = 14.2kΩ but 15kΩ is to be taken as the preferred value So, R_1 = 100kΩ while R_2 = 15.0kΩ.

Looking at Fig. 2, R_3 and R_4 are forming another potential divider for the reference voltage. Assuming a maximum adjustable reference voltage of 2.5V while setting R_3 = 2.2kΩ,

$V_{R_4} = \frac{R_4 \times 5v}{R_4 \times 2.2}$

where V_{R4} = 2.5V, R_3 = 2.2kΩ and V^+ = 5V.

i.e$2.5 = \frac{R_4 \times 5v}{R_4 \times 2.2}$,

Therefore, $R_3 = R_4$ = 2.2kΩ.

Table 1: Variation of D.C Voltage against Input Supply Voltage (Calculated)

AC Input Voltage	Unregulated (DC) Voltage	V_{R2} (DC) Voltage
220	13.60	1.77
210	13.10	1.71
200	12.60	1.64
190	12.10	1.56
180	**11.60**	**1.51**
170	11.10	1.45
160	10.60	1.38
150	10.10	1.32

4.2 The Comparator

From equations (4) and (3), $V_{out} = A_o V_{in}$

whereA_o= open loop voltage gain = 20,000 (chosen from datasheet)
and from equation (5), $V_{in} = V^+ - V^-$
V_{out} will drop to V^+ for the slightest positive difference in voltage since $A_o$is very large (order of 20000). As the Public Power Supply input drops below 1.45V reference voltage, the output of the comparator goes LOW to changeover the relay. As the output goes above 1.45V, the comparator output goes HIGH to switch the Public Power Supply to the load.

4.3 Logic Control Stage

A 3-input AND gate was used to implement the logic control stage. The logic circuit compares the input voltages across A, B, C corresponding to three phases from a public power supply and then gives an output of '1' (ON) when all of A, B and C = 1 (ON) or '0' (OFF) when any of A, B or C is zero.

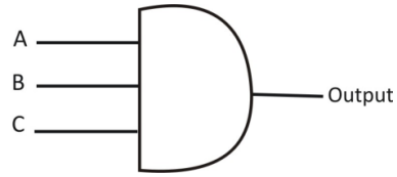

Figure7. 3-input AND Gate (4073)

4.4 Transistor Switching Stage

The switching transistor switches the relay, which selects between the generator and public power supply. A base resistor; R_B is required to ensure perfect switching of the transistor in saturation [4]. Applying equation (9),

$$R_B = \frac{V_{IN} - V_{BE}}{I_B}$$

V_{BE} = 0.6V (silicon); (0.3V-germanium) [4]
The input voltage; V_{IN} = 5V, hfe = 300 (from datasheet for BC 108)
The base current; I_B is therefore calculated from current gain; $hfe = \frac{I_C}{I_B}$

I_B = 100A
The collector current; I_C= 30mA from equation (6)

$$V^+ = I_c R_C + V_{CE}$$

The supply voltage; V^+ = 12V, collector resistor; R_C = 400Ω (chosen with regard to the resistance of the relay coil, used in this work and the collector-emitter voltage V_{CE} = 0V (when transistor is ON).
Therefore, R_B = 44K = 47K (preferred value)

4.5 Change-Over/Electrical Relay Isolation Stage

i.Physical size and pin arrangement: A relay is chose based on the existing PCB to ensure that its dimensions and pin arrangement are suitable for the designed project.
ii. Coil Voltage: The relay coil voltage rating and resistance were taken into consideration.
iii. Coil Resistance: The circuit must be able to supply the current required by the relay coil.
From Ohm's law (equation 9), Relay coil current = $\frac{\text{supply voltage}}{\text{coil resistance}}$

Relay coil current = $\frac{V}{400\Omega} = \frac{12}{400}$ = 30mA

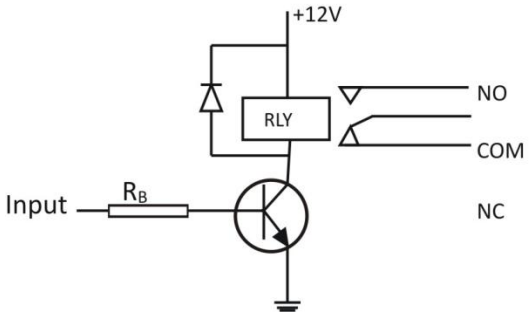

Figure 8: Changeover switch

V. TEST AND RESULTS

After the construction of the automatic voltage change-over system, a variac was used to carry out the measurement and the results in Table 2 were obtained and compared with the calculated values (Table 1). Also, the logic stage implemented in section 4.3 was also tested with a digital multimeter and results presented in Table 3.0.

Table 2: Measured and Calculated and Parameters

Ac Input Voltage (V)	Unreg. (dc) (Measured)(V)	V_{R1}(V) (Measured)	V_{R2}(V) (Measured)	V_{R2}(V) (Calculated)	Dif. BetweenV_{R2}(V)
220	12.60	10.90	1.68	1.77	0.09
210	12.10	10.49	1.60	1.71	0.10
200	11.40	9.82	1.54	1.64	0.10
190	10.65	9.22	1.48	1.56	0.08
180	**10.20**	**8.72**	**1.46**	**1.51**	**0.05**
170	9.72	8.26	1.44	1.45	0.01
160	9.20	7.80	1.35	1.38	0.03
150	8.46	7.10	1.30	1.32	0.02

Key:
A.C Input voltage: This is an a.c voltage sampled from one of the three phases and injected into the circuit.
Unreg. (dc) volt measured: It is the measured value of the sampled a.c voltage, now rectified and reduced to the desired level.

V_{R1} Measured: Measured DC voltage across resistor R_1.
V_{R2} Measured: Measured DC voltage across resistor R_2.
V_{R2} Calculated: Calculated DC voltage across resistor R_2.

Table 3: Truth Table for 3-input AND gate (4073)

Input C	Input B	Input A	Out put
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	1

VI. DISCUSSION

From Table 2, the sampled unregulated voltage reduces alongside with the a.c input voltage; also the comparing voltage (V_{R2}) in pin 3 of the comparator follows the same trend. The result clearly shows the relationship between the input, regulated and the unregulated voltage levels. The result in Table 2 shows a deviation between the practical and calculated values. This is attributed to losses and stray capacitances in the implemented circuit. However, these losses do not affect the performance of the switch.

Table 3 shows the switching sequence of the compared voltages for 3-input AND gate (4073). The sequence (1,1,1) produces an output of '1'. This when coupled to the BC 108 transistors turns them 'ON' thus initiating a switch via the relay. All other sequences from the table are those at which the compared voltages has no or negligible difference. When these sequences with '0' or 'OFF' are coupled to the transistors, no changeover is initiated thus the circuit only monitors.

VII. CONCLUSION

After the implementation of the design, various tests were carried out and the results obtained demonstrated that the 3-phase automatic change over switch achieved its design and construction purpose. The system worked according to specification by monitoring phase failure and under-voltage thereby changing over to the alternative power supply. This automatic electronic system operates without human intervention hence the sluggishness of manual operation is eliminated and production downtime reduced to the barest minimum thereby reducing production losses and costs.

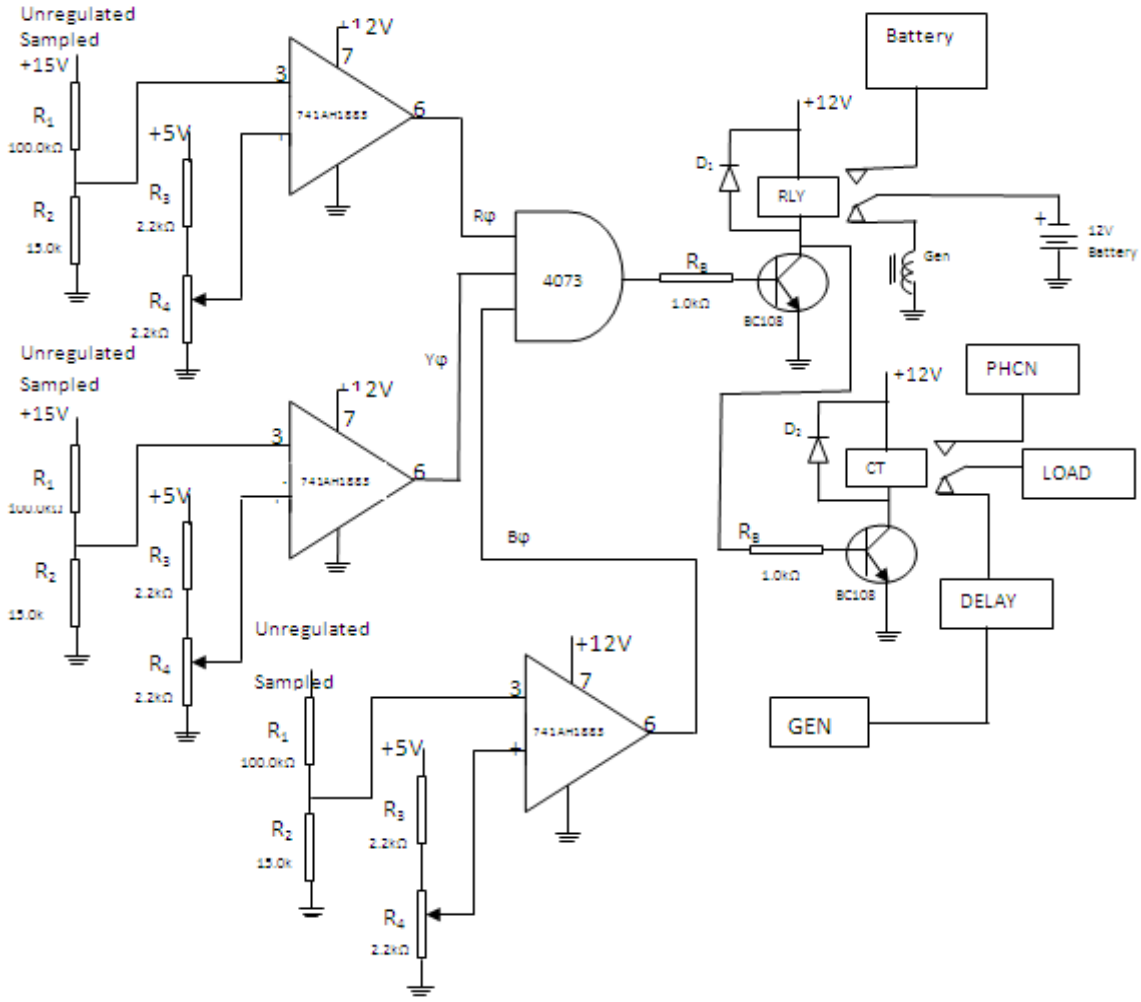

Figure 9: The designed circuit for the automatic power change-over switch

Key:

$D_1 = D_2$: IN4002 | RLY = 12V Relay | CT: Contactor (Load Dependent)

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American Journal of Engineering Research (AJER)
e-ISSN : 2320-0847 p-ISSN : 2320-0936
Volume-3, Issue-9, pp-15-19
www.ajer.org
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Design of a Low Voltage low Power Double tail comparator in 180nm cmos Technology

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ABSTRACT: *The need of analog to digital converters with ultra low power, area efficient and high speed is giving more chance to the use of dynamic regenerative comparators to maximize the speed and power efficiency. In this paper, an analysis on the delay and power of the dynamic comparators will be presented and based on the presented analysis, a new dynamic comparator is proposed, in which the conventional double tail comparator is modified for low power and fast operation even in small supply voltages. Here by adding a few transistors, the power consumptions can be reduced drastically. Post–layout simulation using 180nm CMOS technology confirms the analysis results of the proposed dynamic comparator.*

INDEXTERMS: *Double tail comparator, Power gating technique, Low-power analog design, Tanner EDA tool.*

I. INTRODUCTION

Comparators are the basic buildings elements for designing modern analog and mixed signal systems. A comparator compares the voltages that appears at their input and outputs a voltage representing the sign of net difference between them. For a comparator, speed and power consumptions are two important factors which are required for high speed applications like signal testing, sense amplifiers, data links, ADC etc. High speed comparators while implementing in ultra deep sub micrometer (UDSM) CMOS technologies faces the difficulty of lower supply voltages[1]. As CMOS technology reduces the size of the device smaller and smaller, the supply voltage also gets reduced to avoid the excessive field in the device.

So that, in order to avoid the conflict between the CMOS technology and comparator supply voltage either the threshold voltage of the comparator has to be scaled at the same pace as the supply voltage of the modern CMOS technology or boosting the supply voltages to the comparator requirements. Many methods like employing body driven transistors, supply boosting methods, using dual-oxide processes and current mode design is developed to meet the low voltage design challenges[2]. Boosting and bootstrapping techniques based on augmenting the supply, reference, switching problems and clock voltage, to address input range are effective methods, but implementing them in UDSM CMOS technologies introduced the reliability issues[3].
The threshold voltages requirement by the comparator can be reduced by implementing the body driven technique in the way that body driven MOSFET operates as a depletion- type device. But the body driven transistor suffers from smaller trans conductance compared to its gate-driven counterpart[4].

Apart from all these technological modifications, creating new circuit structures without stacking too many transistors is good for low voltage operations, if it does not increase the complexity of the circuit. According to the methodology, the conventional dynamic comparator can enhance the speed in low supply voltages by adding additional circuitry. Which adding the additional circuitry there arise the problem of component mismatch which effect the performance of the comparator[5]. A solution to this problem leads to the designing of double tail comparator, in which a separate input and cross coupled stage has been developed. And this enables a fast operation over a wide common-mode and supply voltage range[6].

Considering the delay a new dynamic double tail comparator was developed, which does not require boosted voltage or stacking of too many transistors, which resulted in the strengthening of positive feedback during regeneration. In this paper, based on the conventional double tail comparator as proposed previously, a new dynamic comparator is presented, which reduce power consumption drastically by using the power gating technique. By adding a few minimum size transistor to the conventional double tail comparator the power consumption can be reduced profoundly[7].

II. PROPOSED DOUBLE TAIL COMPARATOR

Clocked regenerative comparators can make fast decisions due to the strong positive feedback in the regenerative latch which helps them to find wide applications in many high speed ADCS. Based on different aspects like noise, offset, random decision errors and kick-back noise, several comprehensive, analysis have been presented recently. The working and operation of conventional single tail comparator and the double tail comparator has been presented earlier [8]. From the power and delay analysis study of these regenerative comparators, the proposed double tail comparator has been developed.

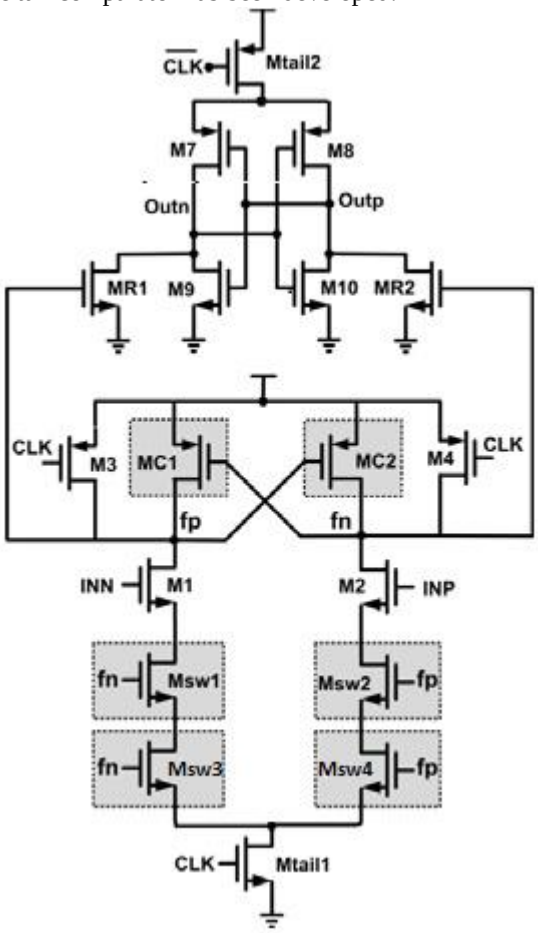

Fig. 1. Schematic diagram of Proposed double tail comparator.

A. *Operation of the Proposed Double Tail Dynamic Comparator*

The main idea of these comparator structures is to increase the voltage difference (ΔVfn/fp). In order to increase the latch regeneration speed two control transistors are added in parallel to M_3 and M_4 transistors in a cross coupled manner. About the operation of this comparator, during the reset phase, when CLK = 0, M_{tail1} and M_{tail2} is off and M_3 and M_4 transistors are on. And these transistors pull fn and fp nodes to VDD and M_{C1} and M_{C2} control transistors are in off stage. When fn and fp nodes get charged, the M_{R1} and M_{R2} intermediate transistors reset both latch output to ground. During the decision phase, when CLK = VDD, M_3 and M_4 transistors are off, M_{tail1} and M_{tail2} transistors are on and the control transistors are still in off condition. During this phase, the fn and fp nodes starts to discharge with different rates depending on the input voltages if VINP > VINN, then fn drops faster than fp which causes the corresponding PMOS control transistor (M_{C1}) starts to turn on, pulling fp node back to VDD. But the advantage of this structure is that, the other control transistor (M_{C2}) remains off and allowing fn to be discharged completely. In this comparator structure the difference between fp and fn has increased in an exponential manner. As soon as the comparator detects the fn node discharges faster, a PMOS

transistor (M_{C1}) turns on and node fp get charged to VDD. Irrespective of all these advantages, this structure helps to reduce the static power consumption. To overcome the static power consumption issue, four NMOS transistors are used below the input transistor. But the issue still continues as the leakage current is not completely stopped by using this technique. That means, the switching transistor cannot completely reduce the leakage current where VDD is drawn to ground via input and tail transistor (eg.M_{C1}, M_1 and M_{tail1}) which resulting in static power consumption.

III. MODIFIED DYNAMIC DOUBLE TAIL COMPARATOR

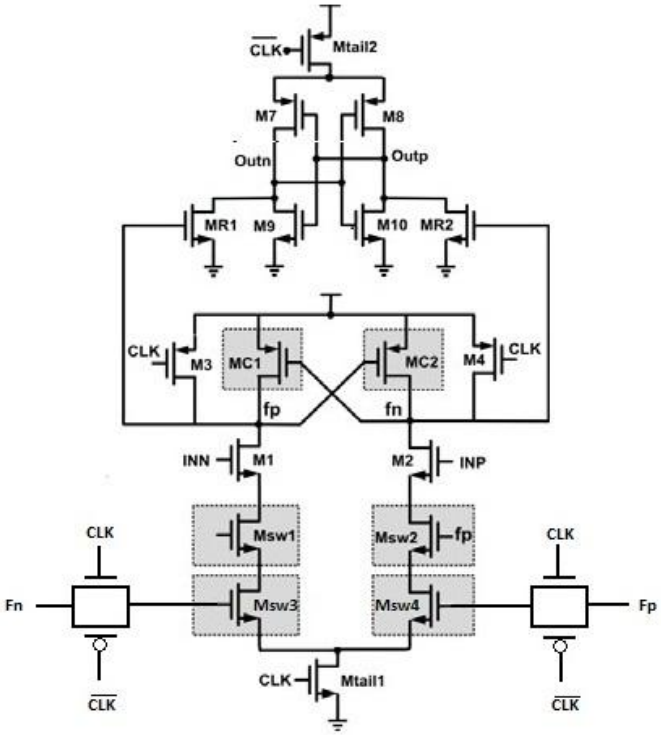

Fig. 2. Schematic diagram of the modified dynamic double tail comparator.

As the proposed double tail comparator architecture shows better performance in low voltage applications, the modified comparator is designed based on the double tail structure. The main idea of the modified comparator is to reduce the static power consumption by completely cutoff the flow of leakage current to the ground. For this purpose, two more switching transistors (M_{SW3} and M_{SW4}) have been added to the M_{SW1} and M_{SW2} transistors in a parallel manner using power gating technique. Here the modified structure can reduce the power consumption drastically.

B. Operation of the Modified Comparator

During the reset phase, when CLK = 0, M_{tail1} and M_{tail2} are off, M_3 and M_4 transistors get on and charge the fp and fn nodes to VDD during this time M_{C1} and M_{C2} are cutoff. Then M_{R1} and M_{R2} intermediate stage transistors reset latch outputs to ground. During the decision making phase, when CLK = VDD, M_{tail1} and M_{tail2} are on, M_3 and M_4 transistors turn off. At the beginning of the phase the M_{C1} and M_{C2} control transistors are still off (since fn and fp are about VDD). According to the input voltage fn and fp nodes starts discharging with different rates. If VINP > VINN ,then fp node discharge faster than fn, which causes the M_{C1} transistor turn on and recharge the fp node to VDD and M_{c2} will continue to be in off condition. So the voltage difference between fn and fp increases, leading to reduction of latch regeneration time. In the proposed idea, as one of the control transistor(eg.M_{c1}) turns on, a current form VDD is drawn to ground through M_{C1}, M_1, M_{SW1} and M_{tail1} which leads to static power consumption. Even the switching transistor M_{SW1} cannot completely reduce the flow of current and solve the static power consumption problem. Solution to the problem is adding two more NMOS switches below the switching transistors (M_{SW1} and M_{SW2}). Using the power gating technique in which domino logic style is implemented. During the decision phase, fn and fp nodes get discharged to ground depending on the input voltage, if INP > INN then fn node discharge faster than fp, which causes the M_{C1} control transistor to turn on and charge the fp node again and make the voltage difference faster. In order to maintain the fp node in charged condition and fn node discharged to ground, the switching transistors M_{SW1} and M_{SW2} are used, where M_{SW1} works

as a open switch as it got the input from fn node and M_{SW2} works as a closed switch, which helps in discharging the fn node completely to ground. In the proposed structure, two more switching transistors (M_{SW3} and M_{SW4}) with power gating technique and domino logic style has been used. This structure supports to pull the fp node up to VDD and discharging the fn node completely. This is possible as both the switching transistor M_{SW1} and M_{SW3} will be opened, at the same time M_{SW2} and M_{SW4} work as closed switches. In this structure power gating technique and using of domino logic style reduce the overall power consumption.

IV. SIMULATION RESULTS

In order to compare the proposed comparator with the single tail comparator and the conventional double tail comparators, all circuits have been simulated in 180 nm CMOS technology, VDD = 0.8v. Tanner EDA Tool is a leading provider of easy to use, PC based electronic based design automation (EDA) software solution for the design, layout and verification of analog – mixed signal integrated circuits. The result is simulated in T-SPICE platform and the circuit has been drawn using S-EDIT and got the output waveform in W-EDIT. Using the Tanner EDA Tool each comparator circuits has been simulated and got the output waveforms, which show the corrective working of the designed circuits. T-SPICE gives the power consumption and delay analysis results.

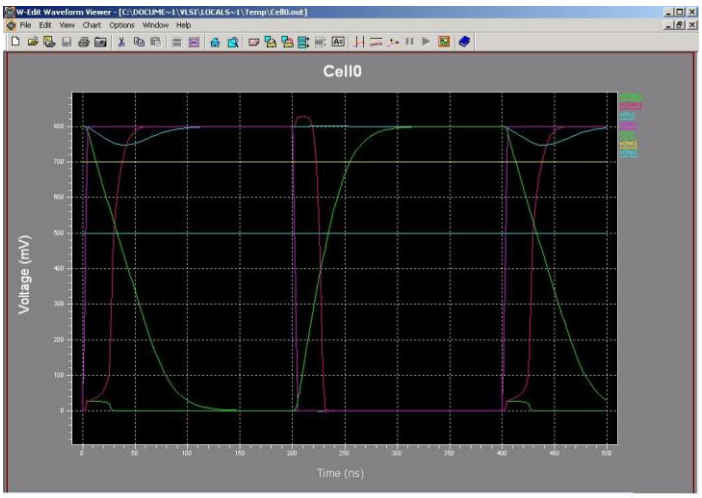

Fig. 6. Simulated output waveform of Proposed double tail comparator with INN = 0.5v, INP = 0.7v and VDD = 0.8v

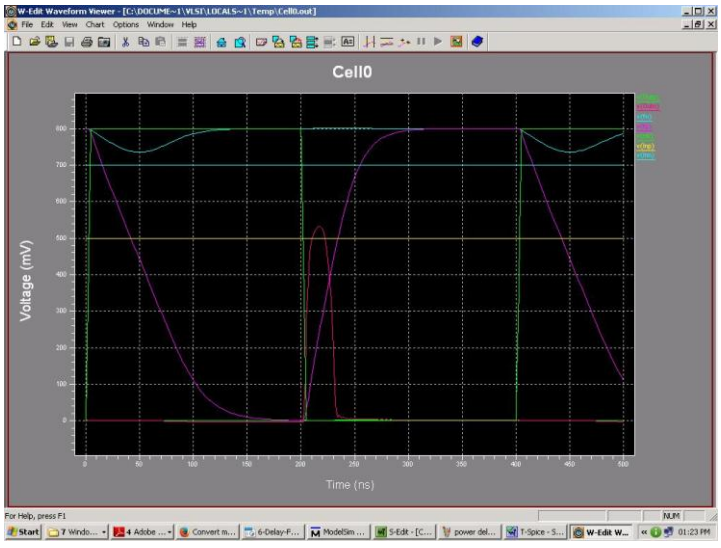

Fig. 7. Simulated output waveform of Modified double tail comparator.

For the simulation of all comparator structures, the supply voltage (VDD) given is 0.8v, the input voltage INP given is 0.7v and INN given is 0.5v. For each circuit structures the number of transistors used varies. The simulation results shows that for the proposed double tail comparator, the power consumption is reduced drastically when comparing all other comparator structures.

TABLE 1 PERFORMANCE COMPARISON

Comparator Structure	Single Tail Comparator	Conventional Double Tail Comparator	Proposed Double Tail Comparator	Modified Double Tail Comparator
Technology CMOS	180 nm	180 nm	180 nm	180 nm
Supply voltage (v)	0.8v	0.8v	0.8v	0.8v
Power Consumption (watts)	7.04×10^{-6} watts	1.50×10^{-5} watts	1.29×10^{-5} watts	9.50×10^{-6} watts
Delay (sec)	6.61×10^{-8} sec	7.51×10^{-9} sec	7.48×10^{-9} sec	4.84×10^{-9} sec

V. CONCLUSION

In this paper, a comprehensive analysis of power and delay for clocked dynamic comparators were done. Based on the analysis, a new dynamic double tail comparator with low voltage, low power capability was proposed to improve the performance of comparator, mainly concerned in power consumption. Post layout simulation results in 180 nm CMOS technology confirm that the power consumption of the proposed comparator is reduced to a great extent in comparison with all other dynamic comparators.

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American Journal of Engineering Research (AJER)
e-ISSN : 2320-0847 p-ISSN : 2320-0936
Volume-3, Issue-9, pp-20-27
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Safety Issues, Considerations, Evaluation and Extrication of Electrical Vehicles Involving Fire Incidents.

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ABSTRACT : *In today s fast paced era as we see the innovations are taking place in a larger amount, at past passenger vehicles had been introduced by using petrol and diesel as a fuel intakes, but today in addition to a Hybrid vehicle even Electrical vehicles had been existed which reduces the effort of travelling and expenditure on fuels but rescue personnel in being exposed to hazardous chemicals such as corrosive chemicals, toxic fumes, fire and electric shock in the event of a crash. Because of these high risk factors manufacturers are understood to develop appropriate procedure for dealing with these crashes.Several evaluation programme s had been carried out by different countries like Australia, Japan for a purpose of evaluating the involvement of crashes. New car Assessment programs have subjected several petrol-electric hybrid vehicles to the 64km/hr frontal offset crash, 50km/hr barrier side impact test and the 29km/hr side pole test. None problems with the electrical systems and batteries were encountered., these tests even involved vehicles with lead acid or NiMH batteries. Lithium – ion batteries which are becoming popular for movement in electrical vehicles and these might introduce different hazards for crash test and rescue personnel.A crash test of an electrical car with a lithium – ion battery was carried out by Australian NCAP and Japan NCAP in a month of October 2010. And euro NCAP has also evaluated a number of vehicles with Li-ion battery . This paper reviews those potential hazards and provides advice for minimizing risks and provides the advices for the crash test.*

I. INTRODUCTION

Several crash tests were performed by different countries named with different programmes. The Australian car Assessment Program, US InsuranceInstitute of high way safety, Euro NCAP, Japan NCAP, and Korean NCAP have conducted frontal offset crash tests since the mid 1900s. They also conducted 29km/hr side pole tests. The tests were carried out by using conventional fuels petrol and diesel. There had been several cases where there has been a fuel leaked due to disturbances in the fuel lines or rupture of fuel tank and after conducting several experiments the Australian Car Assessment program has experienced one minor fire where electrical short ignited some foam plastic insulation near the crushed radiator.This paper reviews with the potential hazards and provides advice for minimizing risks. Today both electric and electric hybrid vehicles potentially introduce new types of post crash products. It is stressed, however, that experience with electrical vehicles is limited and that this advice will need to be reviewed as more information becomes available. It is also acknowledged that the vehicle manufacturers have put considerable resources into developing safe and reliable electrical systems for the current generation of electrical vehicles. A serious incident involving a lithium-ion car battery is considered to be highly unlikely but it is important that crash test organizations understand and are prepared for potential hazards.

II. ELECTRICALLY PROPELLED AUTOMOBILE TECHNOLOGY

Mr. Edison who took an initiative in developing a storage battery to make it useful in propelling vehicles and road vehicles. He saw that there are two viewpoints that of the electrical man with his instruments, his rules of efficient operation and reasonable life of battery, his absolute knowledge that the same care should be given a vehicle battery that is given a valued horse or even a rail road locomotive; and this of the automobile driver, who simply wishes to go somewhere with his car, and who, when he arrives somewhere, wishes to go back. And in the long promised storage battery the highly practical nature of Edison's work is once more exemplified in that he has held uncompromisingly to the automobiles point of view.However the popularity of electric vehicles soon declined when electric batteries could not match the price and energy density of petroleum fuelled vehicles.

Keeping the reduction of fuel consumption in mind an electrical hybrid vehicles were developed in response to the environmental concerns. Most hybrid models have hard nickel metal Hybrid storage. These were tested by NCAP and no problems were associated with electrical systems were encountered. Some operations were developed in consultations with vehicles manufacturers. Recently Li-ion Lithium-ion batteries have been increasingly used for electrical storages in all electrical vehicles but they used negative reputation as the tires associated with aircraft travel were encountered in late 1990s.It was observed that the fires in the laptops are oriented due to ignition of a single cell as laptop is composed of several cells, so ignition of one cell takes place to burning of entire Laptop. At that case the recommended command is to extinguish the flames with a Halon 1211 extinguisher then douse the computer with water . Smothering with ice or some other covering should be avoided as this causes heat to build up and ignite adjacent cells.

Figure 1 – frame from an FAA video

"Extinguishing in-flight laptop computer files"Dosing with copious amount of water does appear to be successful in these cases but it does contravene the normal advice that water should not be used on lithium fires since lithium can ignite when contacts water.

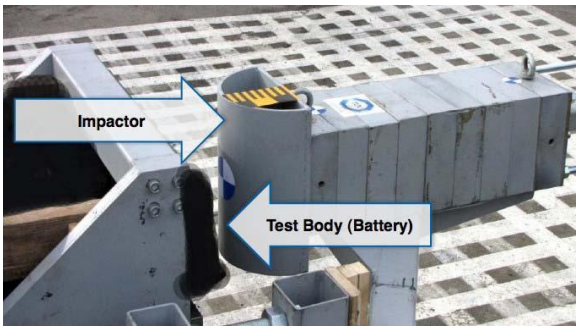
Lithium-Ion vehicle Batteries : Li-ion batteries are much more sophisticated than laptop computer batteries. There are numerous levels of automatically isolating stored electrical energy and they have inbuilt cooling systems to prevent heat build-up under most foreseeable circumstances.Serve testing of Li-ion batteries has been conducted:

Sandia National Laboratories' Battery Abuse Testing Laboratory, which has become the de facto automotive battery-testing shop in the U.S. The lab heats, shocks, punctures and crushes batteries to see how safe they would be in crashes and extreme operating conditions.When lithium-ion cells first came to the laptop market, "the active materials were very energetic. There were some significant field failures," notes Chris Orendorff, the battery lab's team leader. The usual cause was thermal runaway, a chemical reaction that could start from excessive overheating, and then potentially cause a cell to catch fire or explode. Although even extreme driving conditions are unlikely to trigger those problems, a crash could, and so could a sudden overcharge - for example, if lightning struck a charging port while a car was being recharged.Small tweaks in chemistry can make a large difference in how well battery packs resist overheating or exploding. "Half a dozen different chemistries are still being considered as viable" in terms of performance and safety, Orendorff says. Sandia is seeing more designs with lithium iron phosphate cathodes, for example, because they stay cool and suffer little degradation over time. Additionally, batteries with anodes made from lithium titanate seem less likely to overheat even under hot driving conditions. Electrolytes containing different lithium salts are still being tested for greatest stability, too. Manufacturers are also testing a variety of mechanical safety features similar to measures developed to prevent thermal runaway in laptop lithium batteries. (Direct quote from Fischetti 2010)

Orendroff further advises that sandia has studied Li-Ion batteries under various mechanical abuse conditions, including full battery crush. The biggest concern with these systems is the uncertainty about the battery state of health after mechanical abuse. Sometimes connectors can be broken and communication is lost to a part of all of the battery with an unknown amount of energy remaining in the system. Handling and disposal become a significant concern.Issues related to the battery failure upon abuse would be evidence of venting, leaking electrolyte (carbonate water are highly flammable), thermal hazards (Sandia observed battery temperature in excess of 1200 C for high order thermal runway upon failure) and particular hazards.TÜV SÜD Automotive in Germany has also conducted impact testing of Li-ion car batteries. Figure 2 shows a test rig with a cylindrical

impactor. Dr L Wech (personal correspondence) advises that the organization carries out tests that simulate severe deformation of the battery pack in a crash. They use

Figure 2. Li-ion battery test to be conducted by TÜV SÜD



Different geometrical forms of the impactor, different masses of the impactor and different impact velocities tests are performed in the open air. Staff are equipped with protective clothing and trained fire-fighting personnel are available. The temperature inside the battery is monitored during the tests and for a long time the test.

CRASHES THAT MIGHT CHALLENGE BATTERY INTEGRITY : ANCAP and Euro NCAP have conducted 64km/h offset crash tests of the Mitsubishi i-MiEV electric car. No problems with the battery or high-voltage electrical system were encountered in either crash test and the automatic safety systems operated as designed. In the ANCAP tests (conducted at JARI in Japan) the peak vehicle body deceleration was 38g, measured at the base of the driver-side B-pillar. This deceleration is typical for a small car in this type of crash test (Paine 2009).

Euro NCAP also conducted a 29km/h pole test of the i-MiEV. Again no problems with the battery or high-voltage electrical system were encountered. However, Figure 7 illustrates that the vehicle body deformation came close to the exterior of the battery pack, which is mounted under the rear floor.

Figure 3. 64km/h offset crash test conducted by JARI for ANCAP

Figure 4. Post crash electrical tests

Figure 5. Visual indicator of active high voltage used by JARI during the ANCAP

The 29km/h pole impact test places severe demands on the vehicle structure. The majority of casualty crashes involving side impacts with narrow objects occur at impact speeds no more than this (Otte 2009**)**. However, higher speed impacts do occur in real-world crashes and it is appropriate to consider the possible consequences of such a crash.

Figure 6. Overhead view at peak of 29km/h pole impact test on i-MiEV

Figure 7. Post crash underside view of vehicle deformation. Battery pack is under the plastic panel at left

ANCAP recently conducted a research crash test where a medium size (non-electric) sedan was subjected to a side pole crash test with the impact speed increased to 50km/h. A side pole test at 29k/h had already been conducted and so the vehicles could be compared. Figures 8-11 show the comparisons.It is evident that there is substantially more intrusion in the 50km/h impact, including the rear floor area, compared with the 29km/h impact. Of course, no battery was present in this test and so no conclusion can be drawn about the likelihood of battery damage. However the test does suggest that further research should be conducted into this mode of crash with electric vehicles.A50km/h side pole impact is a very severe crash and there is a high likelihood of occupant fatality (based on Otte 2009). The main concern with electric vehicles is the potential danger to rescuers and other road users.

Figure 8. ANCAP research crash test at 50km/h

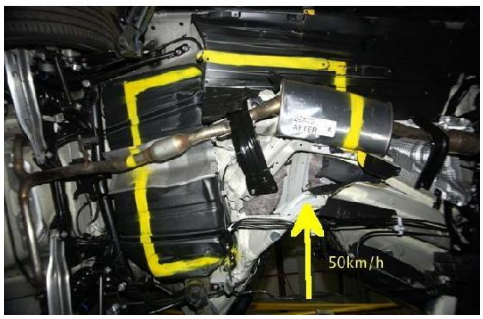


Figure 9. Underside of 50km/h vehicle. The yellow rectangle shows the approximate location of the rear floor area.

Figure 10. Same model in 29km/h impact

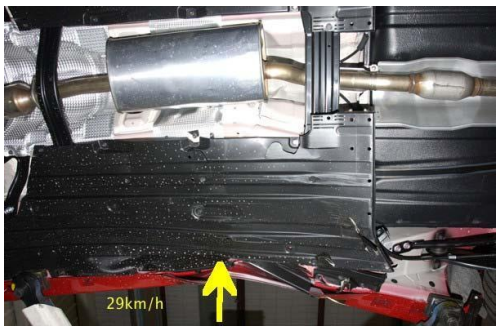


Figure 11. Underside of 29km/h vehicle. Rear is to right

In a multi-vehicle crash the other issue to consider is the risk of the other vehicle catching fire and the fire spreading to the electric vehicle. Digges (2009) reports that in 1% of vehicle fatalities in the USA fire is recorded as the most harmful event. Fires are recorded in 0.2% of NASS cases (weighted). A provisional assessment is therefore that the probability of an electric vehicle with an Li-ion battery colliding with a conventional vehicle that catches fire is extremely low.

POST-CRASH PROCEDURES : The Appendix sets out possible procedures for dealing with crashes involving vehicles with Li-ion batteries. This is based on a review of available documentation from manufacturers and emergency rescue organizations. It was found that information was somewhat sketchy and was sometimes contradictory. Some examples are given below.Vehicle manufacturer A: "In case of vehicle fire, inform fire department immediately and start extinguishing the fire if possible.

[1] By fire extinguisher. Use the type of fire extinguisher which is suitable for flammable liquid or electrical equipment fires.

[2] By water. NEVER EXTINGUSH BY SMALL VOLUME OF WATER. It is quite dangerous. This is only possible if you can use a large volume of water (e.g. from fire-hydrant), otherwise wait for fire department to arrive on the scene."

Vehicle manufacturer B: "In case of vehicle fire, contact the fire department immediately and extinguish the fire if possible... In case of extinguishing fire with water, large amounts of water from a fire hydrant (if possible) must be used. DO NOT extinguish fire with a small amount of water. Small amounts of water will make toxic gas produced by a chemical between the Li-ion battery electrolyte and water. In the event of small fire, a Type BC fire extinguisher may be used for an electrical fire caused by wiring harness, electrical components, etc. or oil fire"A manual for vehicle rescuers: "*Do not use water* or foam to extinguish lithium-ion battery fires. Extinguish lithium-ion battery fires with dry sand, sodium chloride powder, graphite powder, or copper powder.

Copious amounts of water and/or foam can be used on electric vehicle fires with no danger to response personnel of electrical shock. Cleanup lithium-ion electrolyte spills with dry sand or other noncombustible material and place into container for disposal."

III. CONCLUSIONS

Further research should be conducted into the robustness of Li-ion batteries in a crash situation. In particular, investigation should consider the types and severities of crash that can be expected to place severe demands on in the in-built safety systems of electric vehicles and their batteries.Further research is also needed to develop appropriate and consistent post-crash procedures for dealing with electric vehicles, including fires. A draft for such procedures is provided in the Appendix.In the case of crash test organisations, there are several extra pre-crash arrangements that should be put into place in preparation for an electric vehicle crash test (also set out in the Appendix). Based on this initial research, consideration should be given to having available special fire-fighting equipment, as well as thermal imaging equipment, to remotely check for hot-spots around key vehicle components, and a gas monitor to check for flammable or toxic gases) near the crashed vehicle.

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APPENDIX - DRAFT PROCEDURES FOR CRASHES INVOLVING ELECTRIC VEHICLE WITH LITHIUM-ION BATTERIES

Caution: There are inconsistencies in the referenced advice for dealing with fires that involve lithium-ion batteries. Further research is necessary to resolve these inconsistencies. The following procedures are provided as a basis for development of an international procedure for this purpose and are not intended to be applied in real-world situations in their current form.

PRE-CRASH PREPARATIONS

[1] Train staff in use of a (recommended) thermal imaging equipment to locate hot spots in the vehicle after the crash

[2] Train staff in use of a (recommended) gas monitor unit for detecting flammable and toxic gases

[3] Conduct a trial run of manufacturer's rescue manual, including operation of the (manual) battery isolation switch, backup procedures (if any) if the isolation switch is not operable (e.g. due to crash damage), identification of high voltage components, identification of battery fluid leaks and external battery damage and, if available, procedures to safely discharge the battery (which should be fully charged for the crash test)

[4] Measure the electrical resistance at key points, in accordance with ECE/TRANS/WP .29/2010/122 (the same points are also measured after the test, when the vehicle has been declared safe for post-crash assessment). Also fit an external indicator in a prominent exterior location (such as the C-pillar) to show when the high voltage circuit is active.

[5] Assess evacuation routes for all personnel who will attend the crash test. From every observation area there must be an evacuation route that does not involve approaching the crash test area. Also determine evacuation assembly points and head-count procedures.

[6] Train appropriate staff in fire fighting procedures and ensure there is suitable fire-fighting equipment, including high volume water hoses that will reach the crash test area and protective clothing/equipment.

[7] Develop and implement a plan for containment of leaked hazardous fluid

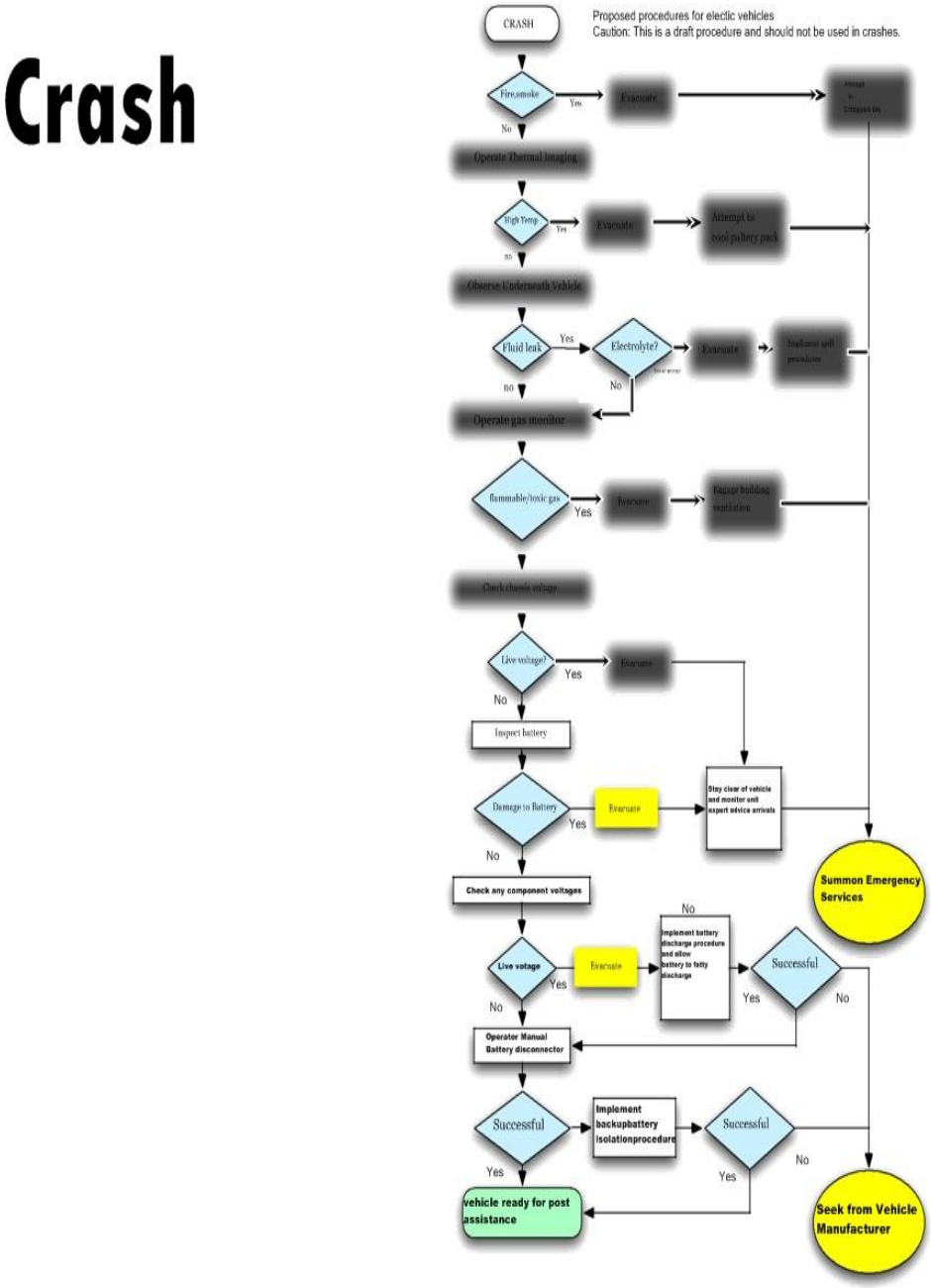
[8] Notify local emergency services of the proposed crash test date and time and provide them with necessary information, including the circumstances under which they might be summoned (see flow chart). Where possible, emergency service personnel should attend the crash test (this can be useful experience for these personnel).

[9] Notify the vehicle manufacturer and determine a contact person with appropriate technical knowledge who will be available (preferably in person) at the time of the crash test

[10] Prior to the crash test inform all observers about the potential hazards (fire, smoke, toxic gases, hazardous liquids), the signal for evacuation, the evacuation routes and the assembly points

POST-CRASH PROCEDURES

The draft flow diagram overleaf indicates the step to be taken to ensure that it is safe to conduct a post-crash inspection of the vehicle.



American Journal of Engineering Research (AJER)
e-ISSN : 2320-0847 p-ISSN : 2320-0936
Volume-3, Issue-9, pp-28-34
www.ajer.org
Research Paper Open Access

Designing Human and Kitchen Waste Based Biogas & Solar Plant for PabnaUniversity of Science & Technology (PUST)Campus and Cost Benefit Analysis after Renewable Energy Interconnection on PUST Campus's Grid Network

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ABSTRACT : *Bangladesh is facing serious energy crisis which is a great barrier for development and poverty alleviation. Shortage of electric power generation causes a significant amount of load shedding and which causes a great loss, discomfort and inconvenience in Domestic life. Students suffer most as it hampers their studies, examination and regular activities. Important University activities remain halted during load shedding, which have a severe effect in overall national development. Some of the Universities in Bangladesh use Gas or Diesel generators to alleviate this irritate situation and expense a lot of money, whereas most of the Universities all works come to a halt during load shedding hours. But there is a huge opportunity to backup load shedding using renewable energy sources (Solar energy, human and kitchen waste to generate biogas energy). This paper presents a design and analysis of solar plant and human and kitchen waste based biogas plant for load shedding backup at PabnaUniversity of Science and Technology (PUST), Bangladesh. And the cost analysis focus that the system is economically feasible for not only a University campus but also whole Country.*

KEYWORDS: *Renewable energy, Load shedding backup, Biogas plant, Cost analysis, Electricity Generation.*

I. INTRODUCTION

Electricity is the most convenient form of energy thatis needed for basic household appliances and cannotbe replaced by other forms of energy. In Bangladesh, only about 47%of the populations have access to electricity [1]. Thepresent installed electricity generation capacity isabout 6837.50 MW. The per capita electricityconsumption in Bangladesh is 182 kWh p.a. that isstill among the lowest in the world [1]. The solution is to use renewable energy.The Renewable energy is generally defined as energy that comes from resources which are naturally replenished on a human timescale such as sunlight, wind, rain, tides, waves and geothermal heat [2]. Renewable energy replaces conventional fuels in four distinct areas: electricity generation, hot water/space heating, motor fuels, and rural (off-grid) energy services [3].About 16% of global final energy consumption presently comes from renewable resources, with 10% of all energy from traditional biomass, mainly used for heating [4]. New renewables (small hydro, modern biomass, wind, solar, geothermal, and bio-fuels) account for another 3% and are growing rapidly [5]. At the national level, at least 30 nations around the world already have renewable energy contributing more than 20% of energy supply. National renewable energy markets are projected to continue to grow strongly in the coming decade and beyond [6]. Solar energy, radiant light and heat from the sun, is harnessed using a range of ever-evolving technologies such as solar heating, solar photovoltaics, solar thermal electricity, solar architecture and artificial photosynthesis [7][8].Solar technologies are broadly characterized as either passive solar or active solar depending on the way they capture, convert and distribute solar energy. Active solar techniques include the use of photovoltaic panels and solar thermal collectors to harness the energy. Passive solar techniques include orienting a building to the Sun, selecting materials with favorable thermal mass or light dispersing properties, and designing spaces that naturally circulate air. Biomass is biological material derived from living, or recently living organisms. It most often refers to plants or plant-derived materials which are specifically called lignocellulosic biomass [9].

As an energy source, biomass can either be used directly via combustion to produce heat, or indirectly after converting it to various forms of bio-fuel. Conversion of biomass to bio-fuel can be achieved by different methods which are broadly classified into: thermal, chemical, and biochemical methods. Energy demand in Bangladesh is more than generation. So shortage of electricity is meeting by load shedding. Load shedding creates a lot of problem where some important loads is present such as Medical Centre, Research Centre, School, colleges and Universities. In University, Load shedding hampers regular schedule lab works, research activities, and some other examination activities which is necessary to meet up in time. Students also cannot continue their studies due to load shedding. Some universities try to solve this irritate situation by taking some special steps such as taking high cost power line (i,e 11 kV/ 33 kV), special feeder with continuity of power supply. But they can think different with available resources. The aim of the study is to investigate availability, feasibility of biogas energy (human and kitchen waste) and solar energy in Pabna Science & Technology University. This study will also analyze cost benefits after renewable energy interconnection on university grid network and try to focus how introduced energy alleviates irritate situations which is occurred during load shedding.

OVERVIEW OF PABNA UNIVERSITY OF SCIENCE AND TECHNOLOGY (PUST)

The government passed the Act in 15 July 2001 to establish a science and technology university in Pabna. The university will be located in the district head quarter of Pabna. Pabna is a central district town in northern Bangladesh having long historical and cultural heritage. The academic curriculum of the Pabna University of Science and Technology was started on 15 July 2008. This university will play an innovative role in providing need-based higher education, training and research. The university offers education in science- and technology-based subjects for undergraduate and post graduate levels. This newly established university will occupies an area of about 30 acres, with a number of multi-storied buildings. Because of its location (position: 24.0100° N, 89.1800° E) is suitable for solar energy, it has also suitable weather Average maximum temperature 33.9°C, minimum 9.6°C for producing Biogas. It have several multistoried buildings i,e; Two Academic Building, One Administrative Building, Four Student Hall, Two Teachers and staff Dormitory , One VC Bungalow, One Mosque.

II. METHODOLOGY

This paper will investigate available renewable energy resources; calculate Potential of Energy (watt) based on experts opinion, Design energy plant according to used model and analysis its feasibility for Pabna University of Science and Technology University (PUST) Campus. This paper also analysis energy cost savings after renewable energy interconnection on University campus grid network.

III. POTENTIAL OF SOLAR ENERGY AT PABNA UNIVERSITY OF SCIENCE AND TECHNOLOGY (PUST)

Photovoltaic is a system which is convert energy from the sun directly into electricity. The combination of photovoltaic cells that generate a small current when sunlight strikes them. Building integrated photovoltaic systems are rapidly incorporated into new university and other buildings as a principal or catalog source of electrical power. Photovoltaic arrays are often associated with buildings either integrated into them, mounted or, them or mounted nearby on the ground. From used data of 100 watt solar panel, It is measured that panel have length, l = 3.36 ft , Width, w= 2.20 ft , Area = Length × Width = 3.36×2.20 = 7.392 square ft.

Assuming a small portion of total roof space of some Buildings: Administrative Building 01 = 4000 sq. ft. So, Calculation of watt from available area can be measured:

7.392 square ft. equal to = 100 Watt

1 square ft. equal to = (100 / 7.392) Watt

4000 square ft. equal to = (100 × 4000) / 7.392 Watt

= 54.11 Kilo-Watt = 54 KW (Approximately)

So, Total panel required in every hostel = 540 pieces (Because of each of the panel wattage is 100 Watt). So, by assuming available multistoried buildings, we can calculate total solar output power. Potential of Solar Energy in Pabna University of Science and Technology –

Building Name	Assume sq.m	Potential of Energy (kW)
ADMINISTRATIVE BUILDING 01	4000	54
ACCADEMIC BUILDING 01	4000	54
ACCADEMIC BUILDING 02	4000	54
STUDENT HALL 01	7000	94
STUDENT HALL 02	10000	135
STUDENT HALL 03	7000	94
STUDENT HALL 04	10000	135

Total Potential of Energy (kW) from solar energy is 620 kW.

IV. POTENTIAL OF BIOGAS ENERGY

Every university has sufficient renewable energy which can act as rising part to reduce the load shedding problem of that university. By considering these, we are presenting a biogas plant with respect to human waste and kitchen waste of hostel 1,2,3,4 dormitory building of a campus where these wastes are used as raw materials.

For Human waste:

Building Name	Capacity of Population
STUDENT HALL 01	500
STUDENT HALL 02	1000
STUDENT HALL 03	500
STUDENT HALL 04	1000
Teachers and Staff Dormitory	300

STUDENT HALL 01: Total capacity of Populations is 500 people.
On an average each person's human waste is = 0.5Kg.

So, Total Human waste = (0.5×500) = 250 Kg.

An ordinary temperature (30° C) biogas obtained from human waste = 0.365 m^3 / Kg TS (estimated).

Again TS value of human = 20%.

So, the total biogas from 500 peoples = (0.5×500×0.2×0.365) = 18.25 m^3 .

Each cubic meter (m3) of biogas contains the equivalent of 6 kWh of calorific energy. However, when we convert biogas to electricity, in a biogas powered electric generator, we get about 2 kWh of useable electricity, and the rest turns into heat which can also be used for heating applications.

So, Electricity from biogas in kW = 18.25 × 2 kWh = 36.5 kWh

According to above calculation, it can be calculate from all Buildings:

Building Name	Capacity of Population	Resources of Biogas	Potential of Energy (kWh)
STUDENT HALL 01	500	Human waste	36.5
STUDENT HALL 02	1000	Human waste	73
STUDENT HALL 03	500	Human waste	36.5
STUDENT HALL 04	1000	Human waste	73
Teachers and Staff Dormitory	300	Human waste	21.9
Total Population of university campus	3300	Kitchen Waste	325

Total Potential of Energy from Biogas Energy is 565.9 kWh.

TOTAL GENERATION CAPACITY FROM HUMAN WASTE, KITCHEN WASTE AND SOLAR ENERGY

The total generation capacity from human waste, kitchen waste and solar energy that is calculated is given below in the following table:

Building Name	Assume sq.m	Energy Type	Potential of Energy (kW)
ADMINISTRATIVE BUILDING 01	4000	Solar	54
ACCADEMIC BUILDING 01	4000	Solar	54
ACCADEMIC BUILDING 02	4000	Solar	54
STUDENT HALL 01	7000	Solar	94
STUDENT HALL 02	10000	Solar	135
STUDENT HALL 03	7000	Solar	94
STUDENT HALL 04	10000	Solar	135
		Total DC Energy	620
Building Name	Capacity of Population	Resources of Biogas	Potential of Energy (kWh)
STUDENT HALL 01	500	Human waste	36.5
STUDENT HALL 02	1000	Human waste	73
STUDENT HALL 03	500	Human waste	36.5
STUDENT HALL 04	1000	Human waste	73
Teachers and Staff Dormitory	300	Human waste	21.9
Total Population of university campus	3300	Kitchen Waste	325
		Total AC Energy	565.9

V. IMPORTANT LOADS

According to the demand of power we have separated the total generation on the basis of renewable energy. The demand of electricity is varying with respect to time. When we required a huge amount of power then connects the required energy with respect to some units (Renewable energy). We are maintaining the total generation and BPDB supply by using control unit and substation. With respect to renewable energy source and BPDB we can fulfill the total demand of university campus.

Identifying Important Loads Which Needs Continuous Supply:

Building Name	Load (kW)	Quantity of Light	Rating per light (Watt)	Quantity of Fan	Rating of Fan (Watt)
ADMINISTRATIVE BUILDING 01	6	80	40	40	70
ACCADEMIC BUILDING 01	3.35	40	40	25	70
ACCADEMIC BUILDING 02	3.35	40	40	25	70
STUDENT HALL 01	8.35	200	40	5	70
STUDENT HALL 02	18.70	450	40	10	70
STUDENT HALL 03	8.35	200	40	5	70
STUDENT HALL 04	18.70	450	40	10	70
Some other important loads (Servers, security system, Research Lab)	30				
Teachers and Staff Dormitory	6.8	100	40	40	70
Vice-chancellor Bungalow	1.5	20	40	10	70
Central Mosque	1.85	20	40	15	70
Total	106.95				

VI. AVAILABLE RENEWABLE ENERGY DISTRIBUTION

Here load can be grouped based on load characteristics with respect to time so that load management will be easier. Load groups also indicate when those loads have higher priority.

Load Group	Total Load (kW)	Building Name	Load	Quantity	Rating	Quantity	Rating
A	6	ADMINISTRATIVE BUILDING 01	6	80	40	40	70
B	6.7	ACCADEMIC BUILDING 01	3.35	40	40	25	70
		ACCADEMIC BUILDING 02	3.35	40	40	25	70
C	54.1	STUDENT HALL 01	8.35	200	40	5	70
		STUDENT HALL 02	18.7	450	40	10	70
		STUDENT HALL 03	8.35	200	40	5	70
		STUDENT HALL 04	18.7	450	40	10	70
D	30	Some other important loads (Servers,	30				
E	6.8	Teachers and Staff Dormitory	6.8	100	40	40	70
F	1.5	Vice-chancellor Bungalow	1.5	20	40	10	70
G	1.85	Central Mosque	1.85	20	40	15	70

Important Load Duration Table based on regular load Characteristics:

Time of day	00:00 – 05:00	05:00 – 08:00	08:00 – 14:00	14:00 – 17:00	17:00 – 19:00	19:00 – 24:00
Running Load			Load A			
			Load B	Load B		
	Load C					Load C
	Load D	Load D	Load D	Load D	Load D	Load D
	Load E	Load E			Load E	Load E
	Load F	Load F	Load F	Load F	Load F	Load F
		Load G		Load G	Load G	
Total Load (KW)	92.4	40.15	44.2	40.05	40.15	92.4

From available renewable energy resources of Pabna University of Science and Technology campus, It is observe that 620 kW Power can be obtained from Solar Energy. Solar Energy in the form of DC. So, it is necessary to convert this energy to AC and supplied to grid. To get continuous power from solar energy, it is necessary to use storage device. Power can also be obtainable directly during day time. Here it is assume that a few amount of power (55 kW) can be get from storage device and 400 kW power can be obtainable directly. According to these assumptions, Power from Solar Energy is distribute among all day. Total Biogas energy 567 kWh is in the form of AC and it can be directly obtainable from different size of Gas-generator. 40 kWh power can be obtainable by load management with 12 hour. By assuming these criteria, Renewable Energy can be distributing among all day as shown:

Time of day	**00:00 – 05:00**	**05:00 – 08:00**	**08:00 – 14:00**	**14:00 – 17:00**	**17:00 – 19:00**	**19:00 – 24:00**
Solar Energy supplied to PUST Campus grid Network (kW)	**55**	**55**	**400**	**400**	**100**	**55**
Bio-gas Energy supplied to PUST Campus grid Network (kW)	**40**	**0**	**0**	**0**	**40**	**40**
Total renewable Energy supplied to PUST Campus (kW) power grid	**95**	**55**	**400**	**400**	**140**	**95**
Important Loads of PUST Campus (kW)	**92.4**	**40.15**	**44.2**	**40.05**	**40.15**	**92.4**

From this table, It is also observed that important loads can be easily run by using renewable energy.

VII. COST BENEFIT ANALYSIS AFTER RENEWABLE ENERGY INTERCONNECTED ON UNIVERSITY GRID

Pabna University of Science and Technology can consider renewable energy sources as alternative sources of energy. Though it is necessary to take Electricity supply from national grid, It is also necessary to consider renewable energy as a backup source of power in order to maintain continue of Electricity. Self producing energy can play as cost saving way to maintain academic development of university. Both national grid supply and renewable energy supply play a vital role in order to maintain continuity of energy supply and energy cost savings.

Time of day	00:00 – 05:00	05:00 – 08:00	08:00 – 14:00	14:00 – 17:00	17:00 – 19:00	19:00 – 24:00
Solar Energy supplied to PUST Campus grid Network (kW)	55	55	400	400	100	55
Bio-gas Energy supplied to PUST Campus grid Network (kW)	40	0	0	0	40	40
Total renewable Energy supplied to PUST Campus (kW) power grid	95	55	400	400	140	95
Renewable Energy (kWh)	475	165	2400	1200	280	475

Total Renewable Energy supplied to PUST power grid Network is 4995 kWh.

If Energy cost is 5 Tk per kWh, Then Total Energy cost is Tk 24975 per day.

Pabna University of Science and Technology can save Tk 749250 per month for energy cost.

VIII. CONCLUSION

Bangladesh has a great opportunity to generate biogas and solar with the help of human waste, kitchen waste and sun shine. This renewable energy sources can be used for generating electricity and removing load shedding problems in Bangladesh. As the load shedding problems may not be removed in near future, this is the best alternative source to generate electricity. Our thesis paper represents the back-up source during load shedding at a University Campus according to biogas and solar based where human waste, kitchen waste and sun-shine is used as new materials. Complete design including system specification has been worked out. To remove load shedding problem, our represented thesis paper can be used as an ideal model for every University Campus in Bangladesh.

IX. FURUTE WORK

We will investigate about more detail regarding interconnected grid system, reliability and system failure and management of load. We will try to implement for this new concepts to our university not only to save cost but also reliable electric supply. So our thesis objectives not only focus for one campus but also community based power generation as well as development of our country through green energy.

X. ACKNOWLEDGEMENTS

The authors would like to thank 'University of Oldenburg, Germany',and'Pabna Science and Technology University(PSTU), Bangladesh', for giving the chance to use differentequipments of Photovoltaic and Nano technology lab to givevarious ideas and knowledge successfully.

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American Journal of Engineering Research (AJER)
e-ISSN : 2320-0847 p-ISSN : 2320-0936
Volume-3, Issue-9, pp-35-40
www.ajer.org

Research Paper Open Access

A New Technique to Produce Electricity Using Solar Cell in Aspect of Bangladesh: Dye Sensatized Solar Cell (Dssc) and It's Prospect

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ABSTRACT: *The Bangladesh is a developing country where electricity crisis is the most serious problem now-a-days. In order to meet electricity demand of our country we need to change the procedure of electricity production. For that we have to implement our renewable energy resources properly like solar cell. The dye sensitized solar cell (DSSCs) is another new method to produce electricity which is more cost effective and also efficient comparing conventional silicon solar cell. When the visible light is absorbed by the thin film such as TiO2, an electron is injected by the excited sensitizer molecules into the conduction band of that thin film (TiO2). These electrons are then transported toward and collected by a back-contact electrode which travel in a big circle and create an electrical circuit which powers a device. In this paper we tried to describe the new DSSCs technology compared to conventional silicon solar cell according to the electricity demand of Bangladesh.*

Keywords *-Nanotechnology; Thin film; Dye; Nanoporous; Light's wavelength*

I. INTRODUCTION

Solar energy is another topic that becomes increasingly hot over recent years as the fossil and mineral energy sources are approaching inevitable exhaustion in the coming fifty years. The supply of energy from the sun to the earth is gigantic; it is estimated to be 3×1024 J/year, which is 104 times more than what mankind consumes currently [3]. In other words, covering only 0.1% of the earth's surface with a conversion efficiency of 10% would suffice to satisfy our current needs [4]. The conversion of solar energy into electricity relies on photovoltaic devices, i.e., so-called solar cells, which have undergone three generations with an evolution from the initial single silicon solar cells [5] to the second generation solar cells based on semiconductor thin films [6,7] and, now, the third generation solar cells represented by dye-sensitized solar cells (DSCs) and organic semiconductor solar cells [8-11].

A dye sensitized solar cell (DSSC) is a low cost solar cell belonging to the group of thin film solar cells [1]. It is based on a semiconductor formed between a photo-sensitized anode and an electrolyte, a photo electrochemical system. The dye-sensitized solar cells (DSC) provide a technically and economically credible alternative concept to present day p–n junction photovoltaic devices [2]. The word photovoltaic means to convert the photo (sunlight) into voltage e.g. power. The DSSC has a number of attractive features; it is simple to make using conventional roll-printing techniques, is semi-flexible and semi-transparent which offers a variety of uses not applicable to glass-based systems, and most of the materials used are low-cost. Although its conversion efficiency is less than the best thin-film cells, in theory its price/performance ratio should be good enough to allow them to compete with fossil fuel electrical generation by achieving grid parity. However, DSSCs take obvious advantages in several aspects, such as higher efficiency, better stability, longer life time, and less dependence on the manufacturing equipments comparison with others solar cell. There are good prospects to produce these cells at lower cost than conventional devices. Here we present the current state of the field, discuss new concepts of the dye-sensitized nanocrystalline solar cell (DSCs) including heterojunction variants and analyze the perspectives for the future development in Bangladesh [12].

II. EFFECT OF LIGHT'S WAVELENGTH ON DSSCS

Solar cells can only absorb specific wavelengths of light. In both, light that isn't absorbed is either transmitted through or reflected back. Whether a certain wavelength of lights gets absorbed depends on its energy. Different colors of light have different wavelength and different energies. So, all wavelengths of light are not absorbed by the solar cell's atom or molecules. We have a formula that

$$\lambda = 1.24/Eg \quad (nm)$$

where, Eg= band gap energy/ energy of incident light

λ= wavelength of incident light

So, the light which has higher wavelength occupies lower energy or vice versa. A little background on light is given bellow in Fig 1.

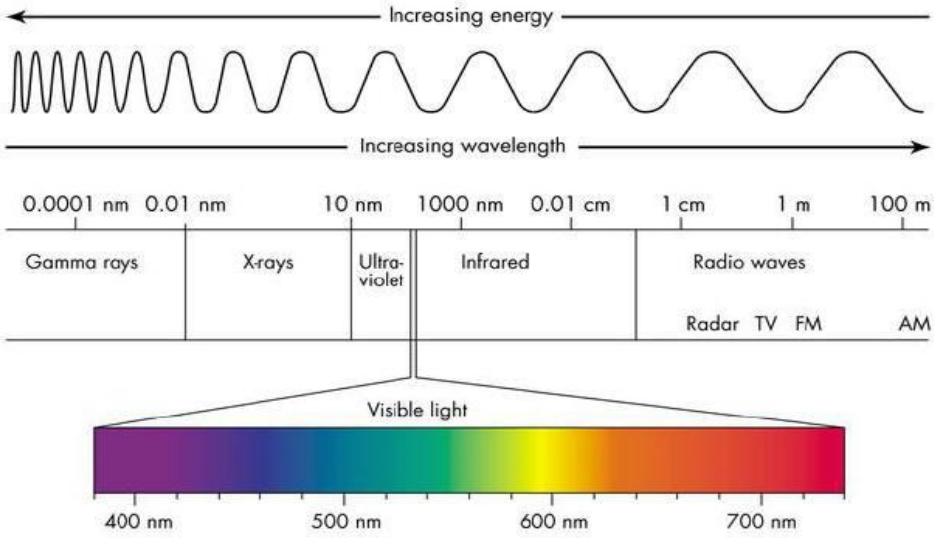

Fig 1. Little background on light [13]

Absorption of light energy occurs only when the energy of the light equals the energy of transition of an electron [13]. Molecules have multiple atoms bonded together. So, there are more energy states in molecules than atom. However, in molecules more electron "jumps" possible when light with a range of frequencies are absorbed. For ionic compound, electrons can jump between the valence band and conduction band. The gap between these two bands is known as band gap or energy gap. When the energy of incident light is greater than or equal to the band gap energy, then this light's energy can be used to excite the electrons from the valence band to conduction band.

III. COMPONENTS USED IN DSSCS

There are various types of components used in DSSCs. Among them the Granular TiO_2, dye, redox, solvent, F-SnO2glass slides, Iodine and Potassium Iodide, Mortar/Pestle, Air Gun, Surfactant (Triton X 100 or Detergent), Colloidal Titanium Dioxide Powder, Nitric Acid, Blackberries, raspberries, green citrus leaves etc., Masking Tape, Tweezers, Filter paper, Binder Clips, Various glassware, Multi-meter etc. The granular TiO_2 formed ananoporous structure.A dye, which is a light sensitive substance spread on the TiO_2 surface.A redox couple (I^-/I_3^-), located in the space between the dye and the cathode.A solvent for the redox couple, e.g. a Room temperature Ionic Liquid.The glass substrates are coated with a transparent conducting oxide (TCO). Fluorine doped tin oxide (SnO2:F), FTO is most commonly used. The nanoporous metal-oxide semiconductor electrode prepared on FTO glass substrate, called working electrode (WE). The thickness of the metaloxide semiconductor layer is about 10 μm; the resulting effective surface is about 1000 times larger as compared to a dense, compact metal oxide layer [14]. The FTO at the counter electrode is coated with few atomic layers of platinum (Pt), in order to catalyze the redox reaction with the electrolyte. On the surface of the metal oxide electrode, a monolayer of dye molecules is adsorbed [15]. The huge nanoporous surface of metal-oxide electrode allows for adsorbing sufficiently large number of dye molecules for efficient light harvesting. The employed dye molecule is usually a ruthenium (Ru) metal-organic complex. The spectral absorption of the dye lies between 300 nm and 800 nm [12]. The DSSC structure is given in Fig 2. Here Two transparent conducting oxide (TCO) substrates.(FTO (SnO_2:F)) are used as electrodes. TiO_2/ZnO is Highly porous metal-oxide semiconductor. Ru-complexes (N3-dye) isa monolayer of a sensitizing dye.

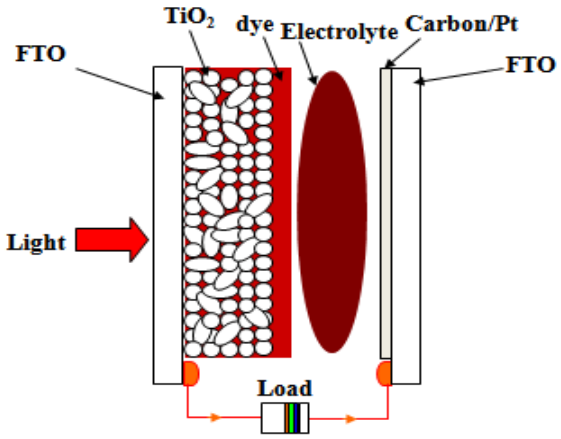

Fig 2. The DSSC structure

Carbon/ Platinum is a counter electrode (CE). DSSC: KI/I2, and CdS sensitized solar cells: Polysulfide (Na2S/S) is an electrolyte. After that a load is connected between two FTOs. The light is given at working electrode (WE). Then the cell is ready to supply the power to the load by absorbing the energies from the sunlight.

IV. WORKING PRINCIPLES OF DSSCS

The schematic diagram of DSSCs is given in Fig 3 where we will explain how a DSSC is really worked. The DSCs is based on the mechanism of a regenerative photo electrochemical process. It consists of five steps:

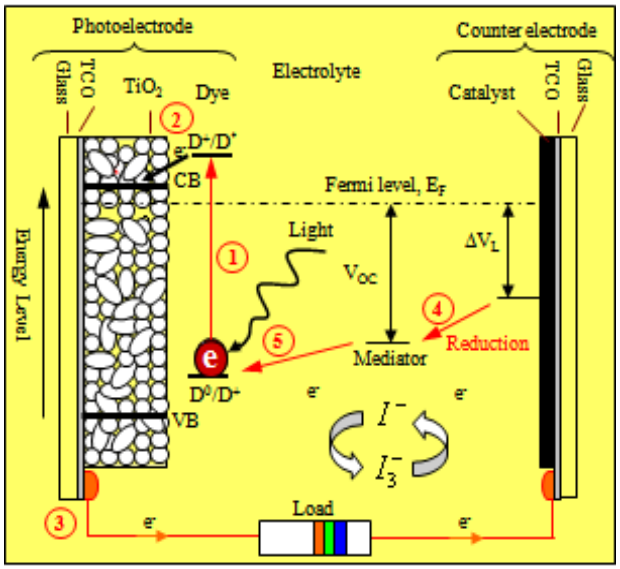

Fig 3. Schematic diagram of DSSCs

1.The dye (Do) absorbs a photon from the light and an electron is transferred to a higher lying energy level.dye is in excited state (D*).

2.Injection of the excited electron into the conduction band of the metal-oxide.

$$D^{0} + h\nu \rightarrow D^{*}$$

3.The electron percolates through the porous metal-oxide layer to the FTO and passes the external load to the counter electrode.

$$D^{*} \rightarrow D^{+} + e^{-}$$

4.At the counter electrode the electron is transferred to I3- to yieldI-.

5. The I- reduces the oxidized dye (D+) to its original state (Do).

$$I_3^{-} + 2e^{-} \rightarrow 3I^{-}$$

$$2D^{+} + 3I^{-} \rightarrow 2D^{0} + I_3^{-}$$

The operating cycle can be summarized in chemical reaction technology as (Mathews et. al. 1996)

Anode: S+hν →S* (Absorption)

$S^{*} \rightarrow S^{+} + e^{-}(TiO_2)$(Electron injection)

$2s^{+} + 3I^{-} \rightarrow 2S + I_3^{-}$(Regeneration)

Cathode: $I_3^{-} + 2e^{-}(Catalyst) \rightarrow 3I^{-}$

Cell: $e^{-}(Catalyst) + h \rightarrow e^{-}(TiO_2)$ [12]

V. FABRICATION PROCESS OF DSSCS

A piece of transparent glass that conducts electricity is used as an electrode in the solar cell. It is taped down with the conducting side facing up worlds using two piece s of tape. The gap between the tape is covered with a paste containing small particle of TiO2 using a process called doctor blading. A blob of paste is put into the glass and spread over the surface using a glass rod. The tape is removed and the electrode heated ata high temperature. The electrode is put into a dye bath containing dye molecules and left over night.

The dye molecules attach to the surface of the TiO2 particles with a chemical bond. This process is called sensitization which is why these solar cells are called dye sensitized solar cell. When the electrode is removed, the TiO2 is now colored which allows it to absorb sunlight better. Another piece of conduction glass is used to make the other electrode of the cell. Two holes are drilled into it and then platinum metal is sprayed onto one side to help the cell conduct electricity better. The two electrodes are now put together with a square of easy-melt plastic. When heated, the plastic melts and glues the two electrodes together. The cell is filled with a liquid electrolyte by injecting it through the drilled holes.

A piece of sticky tape then seals the holes and stops the electrolyte leaking out. The solar cells are now complete and can be tested in the sun. When sunlight falls on the cell a flow of small particles called electrons(e-) is created. This is called a current and can power an electrical device. Inside the cell, a particle of light called a photon hits the dye molecule. This gives an electron enough energy to escape the molecule and move to the TiO2 Nano-particles. When this happens, a hole is left behind. A mediator (M), for example iodide, in the liquid electrolyte fills the hole with one of its own electrons. The electrons travel in a big circle and create an electrical circuit which powers a device. All that is required is a bit of energy from the sun to start it off.

VI. ADVANTAGES OF DSSCS

The DSSCs have the following advantages over the conventional silicon solar cell:

- Relatively inexpensive
- Made in non-vacuum setting mainly at room temperature
- Relatively simple manufacturing process
- Need little TLC
- Thin, lightweight, flexible
- Short return on investment
- Takes approx 3 months to produce energy savings equivalent to cost of production

VII. CONCLUSION

Although there are few disadvantages in DSSCs, yet it is more effective and efficient system to produce electricity. This Solar Energy is inexhaustible and pollution free i.e. green product. Bangladesh is expecting very much power according to its electricity demand and DSSCs is one of the important, prosperous and effective processes to produce electricity in the near future. We hope that it will play an important role to fulfill the power crisis of Bangladesh in the nearest future.

VIII. ACKNOWLEDGEMENTS

The authors would like to thank ‘University of Oldenburg, Germany’, ‘RajshahiUniversity of Engineering & Technology (RUET), Bangladesh’ and‘Pabna Science and Technology University(PSTU), Bangladesh’, for giving the chance to use differentequipments of Photovoltaic and Nano technology labto givevarious ideas and knowledge successfully.

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American Journal of Engineering Research (AJER)
e-ISSN : 2320-0847 p-ISSN : 2320-0936
Volume-3, Issue-9, pp-41-53
www.ajer.org

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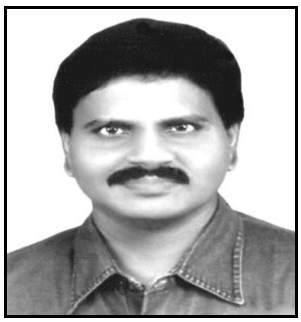
RAMAR PALAM?... (A New theory on " RAMAR CODE")



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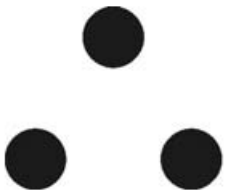
ABSTRACT: This scientific research Article focus that "**RAMAR**", "**MARI-e**" shall be considered as "**HUMAN ANCESTORS**" lived in "**MARS PLANET**" in the **Early Universe** much before human population started living on "**EARTH PLANET**".

It is further speculated that MARS Ancestors used to communicate through **Coded Form** called as "**RAMAR CODE**" (or) "**AKKI-e CODE**" rather than "**Alphabet**". Alphabet shall be considered as the "**System of languages**" originated on **Earth Planet**. The Ramar Code shall also be called in proto Indo-Europe language as AKKI-e Code or AKKANNA.



RAMAR CODE
(AKKANNA)

It is further focused that "**RAMAR**", "**MARI-e**" shall be also be called as "**AKKANNA**", "**AKKILA**" based on language identity just like "**TAMILIAN**", "**SINGALESH**", "**KANNADIKAS**", "**MARATHI**", etc identified by their language.

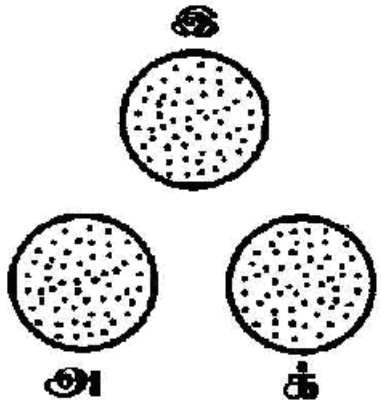
It is speculated that this research shall pave way and **enlighten** about **origin of life, human ancestors, human diversity, and Human caste system** for further in depth research in this area for the benefit of Global populations.

Key Words:
a) Philosophy of "**RAMAR**"?...
b) Philosophy of "**PALAM**"?...
c) Philosophy of "**AKKI-e**?...
d) Philosophy of Acronym "**MGR**"?...

I. INTRODUCTION:

In this article the Philosophy of human shall be considered as having **more genetic value** and having more wisdom on origin in the early universe.

Human originated from Apes family?... NO… NO… NO… It is focused that the populations of Earth shall be considered as descended from ancestors "**RAMAR**", "**MARI-e**" of MARS Planet.



(AKKANNA RACE)

Billions of human race of Earth planet shall be considered as parented to "**AKKANNA**" population or AKKANNA race.

*"**AKKANNA POPULATIONS**" shall mean single large **joint family** of Earth populations in ancient time."*
- Author

II. HYPOTHESIS AND NARRATION

Philosophy of "RAMAR"?...

It is hypothesized that the philosophy of word "**RAMAR**" shall mean **first name** associated with "**Suffix**" of word "**MAR**".

[1]. "**RAM**" shall mean "**First name**"
[2]. "**MAR**" shall mean "**Nation**" (**Mars**)
[3]. "**RAMAR**" shall mean "**Mars Ancestor**".

It is hypothesized that Mars populations shall be considered as having first name "**Suffix**" with the Nation as the matter of honors to their Nation (e.g.) **ANU MAR**, **GURU MAR, NAYAN MAR**, **THAI-e MAR**.

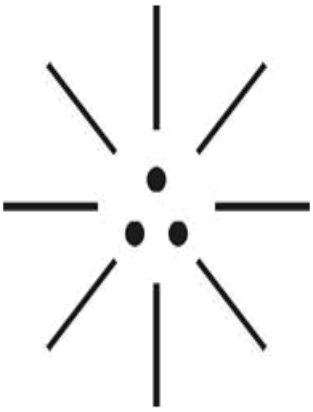
a) Philosophy of "PALAM" (Bridge)?...

Case study shows that the etymology of word palam originated from old Armenian language meaning **earth, soil**.

It is hypothesized tat "**PALAM**" shall be considered as the origin of first "**LAND MASS**" on the earth planet. Before formation of "**Land mass**", the Earth Planet shall be considered as **submerged** with full of **OCEAN WATER**. The "**PALAM**" shall able be considered as "**VIRGIN LAND**" (**WHITE CLAY**) composed of only ions of **Photon, Electron, Proton** and free from Atomic matters **Hydrogen, Carbon, Nitrogen, Ozone**. The various rocks, soils such as Sand, Black soil, Red Soil, other Minerals shall be considered as composed of atomic matters evolved at later stage of **geological periods**. Further PALAM shall be considered as "Pie**ce of Land Mass**" descended from mars planet to **Earth Planet** due to growth of

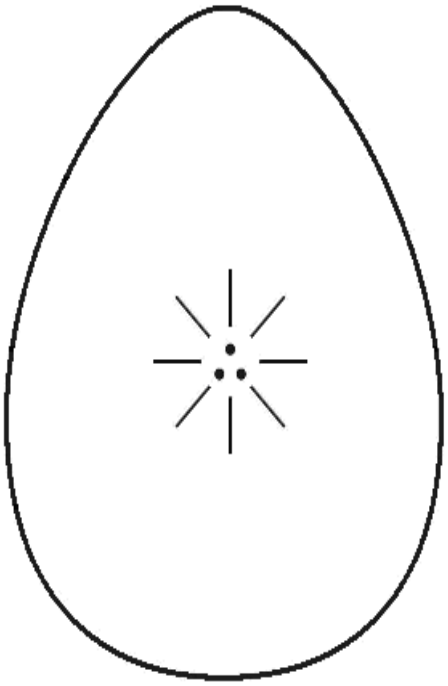
GRAVITY. In proto Indo Europe language family the "**PALAM**" shall also mean "**TRANSFORMATION**". The virgin land mass region shall be called "**KACHCHA THEEVU**". The philosophy of "**PALAM**" shall be described as below.

(i)



(PALAM LOGO)

(ii)

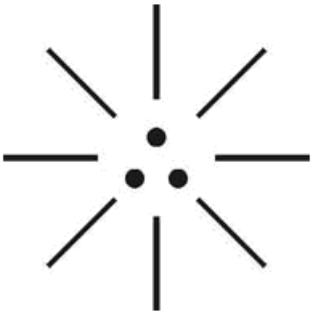


PALAM
(Kachcha Theevu)

b) Philosophy of RAMAR CODE?...

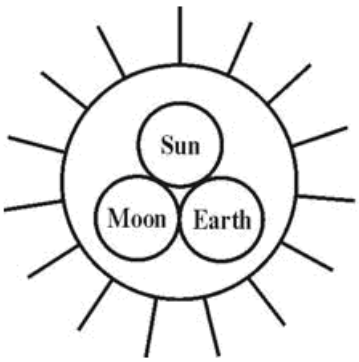
It is hypothesized that the Mars ancestors shall be considered as expert in **Astrophysics, Astronomy** and used to communicate in "**Code from**" (or) "**logo form**" for remote controlling of planetary system.

(i)



(MARS LOGO)

(ii)



(AKKI-e)

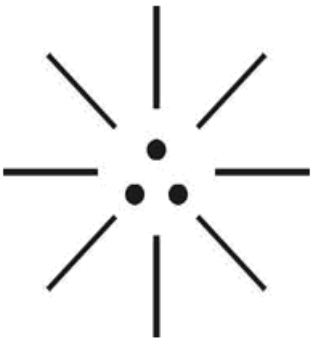
It is further focused that they formulated the relative position of **SUN, EARTH, MOON** in the early Universe called AKKI-e and arranged in code form called "**MARS CODE**".

*"**AKKI-e**" shall mean **DARK FLAME** composed of Dark matter, Dark energy, Dark logic"*

- Author

c) Philosophy of Acronym "MGR"?...

Case study shows that there are so many meanings for the acronym MGR such as **Monsignor** meaning my lord, Major Genome Resistance. Further in Tamil film the famous super star hero known as **MGR** (**Marudhur Gopalan Ramachandran**). The Philosophy of MGR that whenever enemy attacks he will patiently wait for **three times** and after that he will give left and right. The Philosophy of three times might be derived from the philosophy of **MARS Logo**.

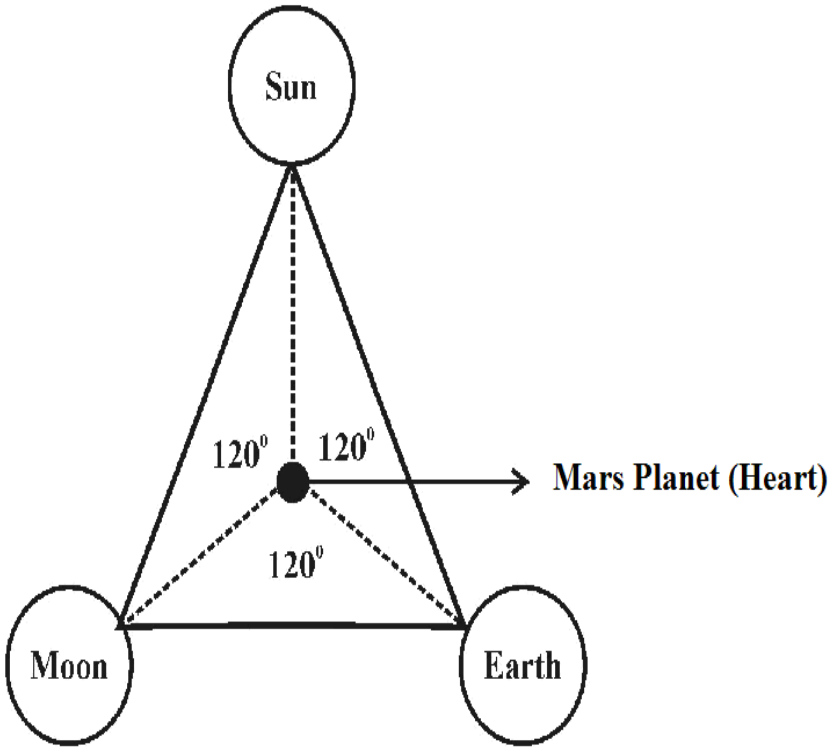


(MGR)

It is hypothesized that in MARS logic "**MGR**" shall be considered as "**MARS GEO RULER**"

i. Right dot shall mean "**MOON**"
ii. Left dot shall mean "**EARTH**"
iii. Centre dot shall mean "**SUN**"

It is further focused that MARS shall be considered as the **MOTHER** of all planets as described below.

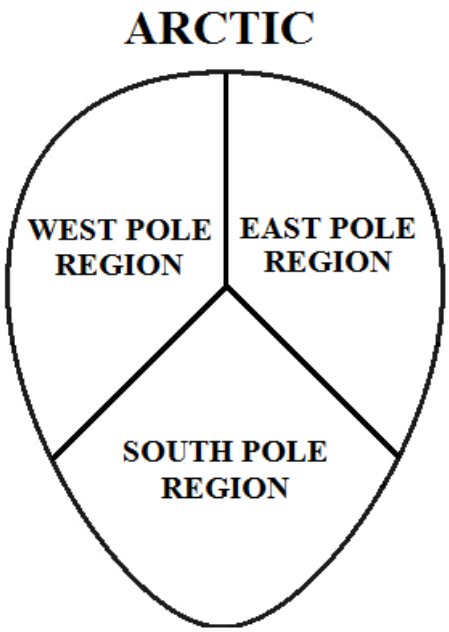


(MODEL MATERIAL UNIVERSE)

d) Philosophy of Early Arctic / Antarctic Polar Region?...

Case study shows that Arctic Polar Region located at the Northern part of Earth consists of ocean and parts of Canada, Russia, US, Denmark, Norway, Sweden, Finland and Island. Antarctic region is a south most part of Earth opposite to Arctic region.

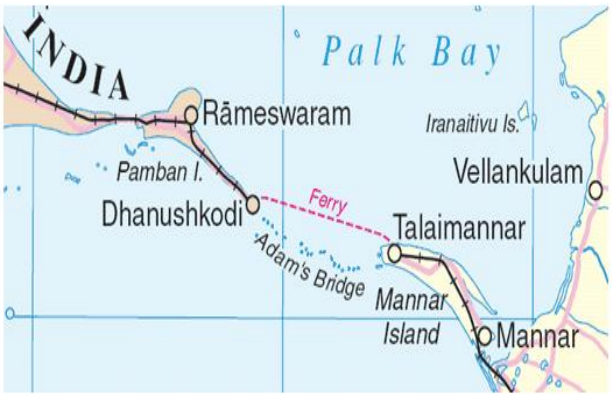
It is hypothesized that the whole world nations covered under two pole of earth say North pole, South pole might be descended from fundamental **white clay landmass** of MARS Planet. Further it is focused that the entire global nations considered as covered under "**THREE POLE**" region on the earth planet rather than two pole region as described below.



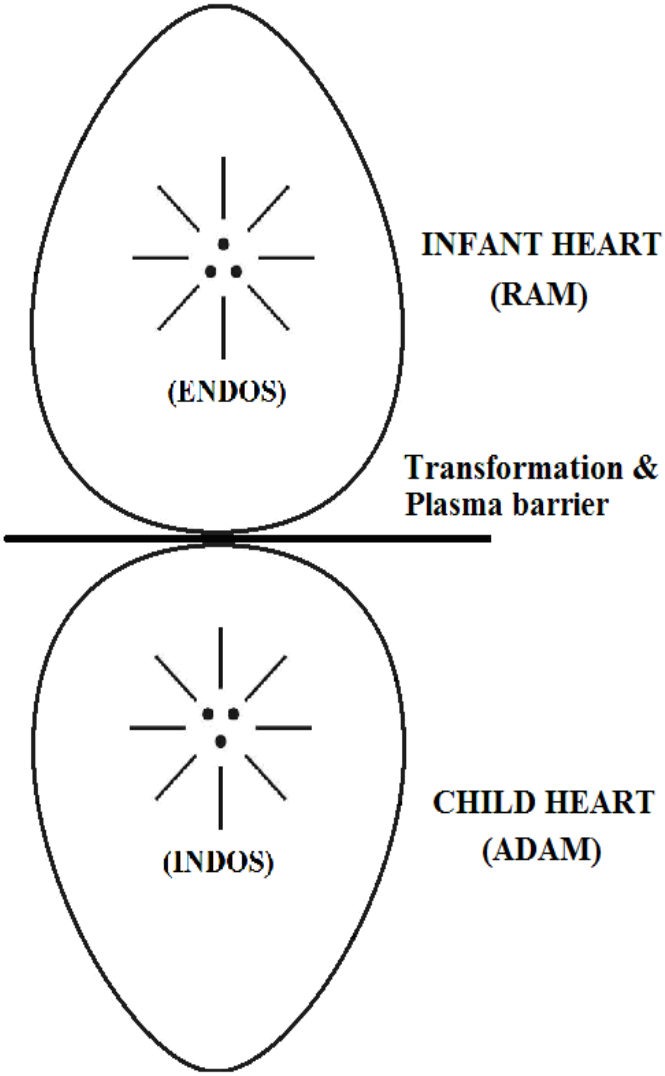
It is speculated that during **TRIASSIC PERIOD** the single continent might be evolved into three pole region of scattered nations. It is further focused that the Philosophy of **DHANUSKODI** recently destroyed during 1964 cyclone might be derived from the proto Indo-Europe language root "**THENKODI**". THENKODI shall mean **Antarctic region**.

e) Philosophy of Ram Setu?...

Case study shows that Ram Setu is considered as **BRIDGE** connecting Thalaimannar and Rameswaram. Ram Setu is also called as **RAMAR BRIDGE, ADAM'S BRIDGE**.



It is hypothesized that Ram Setu shall be closely associated with **HEART** and Transformation. "**RAM**" shall mean **infant heart**. "**ADAM**" shall mean **child heart.** The passage of transformation shall be called as **Ram Setu** (**Bridge**)



f) Case study on Project Rameswaram?...

Case study shows that in a programme called **project Rameswaram** the geological survey of Indiia (GSI) concluded through the dating of corals that Rameswaram island evolved beginning 1,25,000 years ago. Radio carbon dating of samples in this study suggest that the domain between Rameswaram and Talaimannar may have been exposed around 18,000 years ago. It is hypothesized that **KATCHCHA THEEVU** (Thenkodi) shall be considered as the **FIRST VIRGIN LANDMASS** formed on the surface of Earth planet descended from **MARS Planet**.

g) Adam, Eve lived in Rameswaram?...

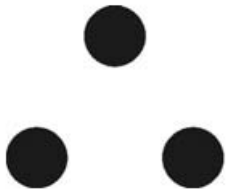
Case study from **BIBLE** shows that Adam, Eve are first human created by God. It is hypothesized that Adam and family might have lived on **Katchcha Theevu** (Rameswaram region) in ancient time. Adam had three sons **CAIN, ABEL, SEITH**. During the course of time Cain and Abel died on the land of Rameswaram and buried in Rameswaram. The place of buriel still available in Rameswaram is shown below.

TOMB OF ADAM'S SONS IN RAMESWARAM

It is hypothesized that the etymology of word **RAM, ADAM** might be closely related concerned with **HUMAN ANCESTOR** descended from **MARS PLANET.**

h) Case study on Morse code?...

It is hypothesized that the philosophy of **Morse code** in Telegraphy Electromagnet code consists or **dot (.), dash (-), space** might be derived from the philosophy at "**RAMAR CODE**".



RAMAR CODE (AKKANNA)

[1]. Right dot shall mean **dash (-)**
[2]. Left dot shall mean **dot (.)**
[3]. Centre dot shall mean **Space**.

(Ancient Tamil Code)

i) Case study on Boolean code?...

It is hypothesized that the Philosophy or "**Boolean logic**" in computer digital language might be derived from the philosophy of "**RAMAR CODE**"

[1]. Right dot shall mean **"1" (+ve)**
[2]. Left dot shall mean **"." (-ve)**
[3]. Centre dot shall mean **"O" (Neutral)**

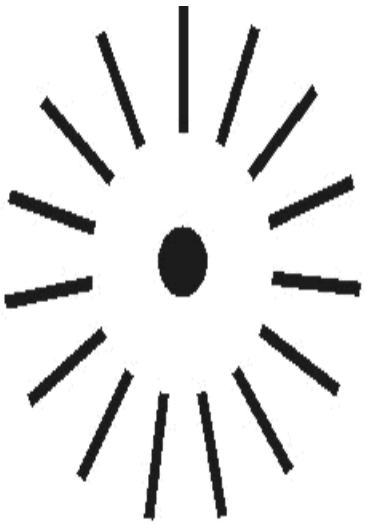
The Philosophy of Random Access Memory (**RAM**) in computer digital language might be derived from the philosophy of Ramar Code.

j) RAMAR CODE has gender effect?...

It is hypothesized that the philosophy of "**gender**" in biological science might be derived from the philosophy or "**RAMAR CODE**"

[1]. Right dot shall mean **"MALE" (-)**
[2]. Left dot shall mean **"FEMALE" (.)**
[3]. Centre dot shall mean **"NEUTRAL" (space)**

It is focused that in Indian culture wearing **POTTU** (Bindi) on forehead is an important culture. This culture is being practiced many parts of the world also. It is hypothesized that wearing of "**BLACK BINDI**" might be derived from ancient Indian culture. In **Sanskrit** it is called Bindi and in **Hindi** it is called as Tilak.



POTTU
(Thilakam)

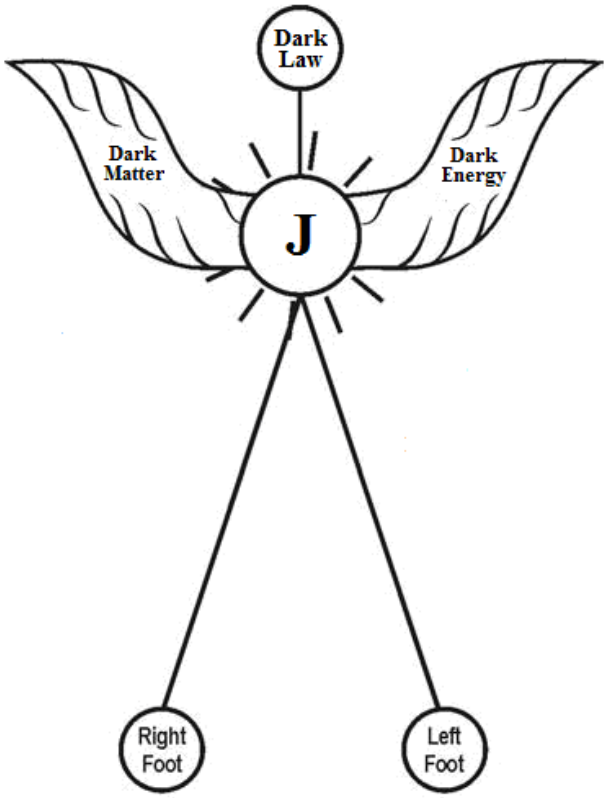
*"The philosophy of "**Black Bindi**" wear culture on **forehead of female** shall be considered as descended from **Kachcha theevu culture**"*

- Author

k) Philosophy of word "RAMJI"?...

It is hypothesized that the **Mars Ancestor** (**RAMAR**) shall be considered as spontaneously evolved due to impact of "**J-RADIATION**" (Virgin light) originated near "**White hole region**" of Universe in the early Universe just like spontaneous origin of **mushroom** due to impact of lightning. The **J-RADIATION** shall also be called as "**ZERO HOUR RADIATION**" of the Universe. **"Ramji" is Tamil based?... yes…yes…yes…** RAMJI (**RAMJEE**) shall be considered as native of **Kachcha theevu. JAYARAM** shall mean "**lord RAM**".

(i)



THAMIL BASED INDIAN (RAMJEE)

(ii)

AKKILA (Mother of Kachcha Theevu)

III. CONCLUSION:

The philosophy or "**RAMAR PALAM**" shall be considered as the origin of first land mass (**Virgin Island**) on the Earth Planet also called as "**EASTERN GARDEN HOLY LAND**" (also called as **e-garden (or) J-garden**) It is further focused that **e-GARDEN**, **J-GARDEN** shall be considered as the huge **joint family** of Kachcha theevu. During the course of expanding Universe the **RAMAR ANCESTOR POPULATIONS** (**Akkanna population**) might be diversified and split into different family such as Thai-e mar, Nadakka-mar, Naicka mar, Theva mar, Pillai mar, Kudumba mar, Maller mar, Paller mar, Paraiar mar etc.

Previous Publication: The philosophy of origin of first life and human, the philosophy of model Cosmo Universe, the philosophy of fundamental neutrino particles have already been published in various international journals mentioned below. Hence this article shall be considered as **extended version** of the previous articles already published by the same author.

[1] Cosmo Super Star – IJSRP, April issue, 2013

[2] Super Scientist of Climate control – IJSER, May issue, 2013

[3] AKKIE MARS CODE – IJSER, June issue, 2013

[4] KARITHIRI (Dark flame) The Centromere of Cosmo Universe – IJIRD, May issue, 2013

[5] MA-AYYAN of MARS – IJIRD, June issue, 2013

[6] MARS TRIBE – IJSER, June issue, 2013

[7] MARS MATHEMATICS – IJERD, June issue, 2013

[8] MARS (EZHEM) The mother of All Planets – IJSER, June issue, 2013

[9] The Mystery of Crop Circle – IJOART, May issue, 2013

[10] Origin of First Language – IJIRD, June issue, 2013

[11] MARS TRISOMY HUMAN – IJOART, June issue, 2013

[12] MARS ANGEL – IJSTR, June issue, 2013

[13] Three principles of Akkie Management (AJIBM, August issue, 2013)

[14] Prehistoric Triphthong Alphabet (IJIRD, July issue, 2013)

[15] Prehistoric Akkie Music (IJST, July issue, 2013)

[16] Barack Obama is Tamil Based Indian? (IJSER, August issue, 2013)

[17] Philosophy of MARS Radiation (IJSER, August 2013)

[18] Etymology of word **"J"** (IJSER, September 2013)

[19] NOAH is Dravidian? (IJOART, August 2013)

[20] Philosophy of Dark Cell (Soul)? (IJSER, September 2013)

[21] Darwin Sir is Wrong?! (IJSER, October issue, 2013)

[22] Prehistoric Pyramids are RF Antenna?!... (IJSER, October issue, 2013)

[23] HUMAN IS A ROAM FREE CELL PHONE?!... (IJIRD, September issue, 2013)

[24] NEUTRINOS EXIST IN EARTH ATMOSPHERE?!... (IJERD, October issue, 2013)

[25] EARLY UNIVERSE WAS HIGHLY FROZEN?!... (IJOART, October issue, 2013)

[26] UNIVERSE IS LIKE SPACE SHIP?!... (AJER, October issue, 2013)

[27] ANCIENT EGYPT IS DRAVIDA NAD?!... (IJSER, November issue, 2013)

[28] ROSETTA STONE IS PREHISTORIC "THAMEE STONE" ?!... (IJSER, November issue, 2013)

[29] The Supernatural "CNO" HUMAN?... (IJOART, December issue, 2013)

[30] 3G HUMAN ANCESTOR?... (AJER, December issue, 2013)

[31] 3G Evolution?... (IJIRD, December issue, 2013)

[32] God Created Human?... (IJERD, December issue, 2013)

[33] Prehistoric "J" – Element?... (IJSER, January issue, 2014)

[34] 3G Mobile phone Induces Cancer?... (IJERD, December issue, 2013)

[35] "J" Shall Mean "JOULE"?... (IRJES, December issue, 2013)

[36] "J"- HOUSE IS A HEAVEN?... (IJIRD, January issue, 2014)

[37] The Supersonic JET FLIGHT-2014?... (IJSER, January issue, 2014)
[38] "J"-RADIATION IS MOTHER OF HYDROGEN?... (AJER, January issue, 2014)
[39] PEACE BEGINS WITH "J"?... (IJERD, January issue, 2014)
[40] THE VIRGIN LIGHT?... (IJCRAR, January issue 2014)
[41] THE VEILED MOTHER?... (IJERD, January issue 2014)
[42] GOD HAS NO LUNGS?... (IJERD, February issue 2014)
[43] Matters are made of Light or Atom?!... (IJERD, February issue 2014)
[44] THE NUCLEAR "MUKKULAM"?... (IJSER, February issue 2014)
[45] WHITE REVOLUTION 2014-15?... (IJERD, February issue 2014)
[46] STAR TWINKLES!?... (IJERD, March issue 2014)
[47] "E-LANKA" THE TAMIL CONTINENT?... (IJERD, March issue 2014)
[48] HELLO NAMESTE?... (IJSER, March issue 2014)
[49] MOTHERHOOD MEANS DELIVERING CHILD?... (AJER, March issue 2014)
[50] E–ACHI, IAS?... (AJER, March issue 2014)
[51] THE ALTERNATIVE MEDICINE?... (AJER, April issue 2014)
[52] GANJA IS ILLEGAL PLANT?... (IJERD, April issue 2014)
[53] THE ENDOS?... (IJERD, April issue 2014)
[54] THE "TRI-TRONIC" UNIVERSE?... (AJER, May issue 2014)
[55] Varied Plasma Level have impact on "GENETIC VALUE"?... (AJER, May issue 2014)
[56] JALLIKATTU IS DRAVIDIAN VETERAN SPORT?... (AJER, May issue 2014)
[57] Human Equivalent of Cosmo?... (IJSER, May issue 2014)
[58] THAI-e ETHIA!... (AJER, May issue 2014)
[59] THE PHILOSOPHY OF "DALIT"?... (AJER, June issue 2014)
[60] THE IMPACT OF HIGHER QUALIFICATION?... (AJER, June issue 2014)
[61] THE CRYSTAL UNIVERSE?... (AJER July 2014 issue)
[62] THE GLOBAL POLITICS?... (AJER July 2014 issue)
[63] THE KACHCHA THEEVU?... (AJER July 2014 issue)
[64] THE RADIANT MANAGER?... (AJER July 2014 issue)
[65] THE UNIVERSAL LAMP?... (IJOART July 2014 issue)
[66] THE MUSIC RAIN?... (IJERD July 2014 issue)
[67] THIRI KURAL?... (AJER August 2014 issue)
[68] THE SIXTH SENSE OF HUMAN?... (AJER August 2014 issue)
[69] THEE… DARK BOMB?... (IJSER August 2014 issue)
[70] RAKSHA BANDHAN CULTURE?... (IJERD August 2014 issue)
[71] THE WHITE BLOOD ANCESTOR?... (AJER August 2014 issue)
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American Journal of Engineering Research (AJER)
e-ISSN : 2320-0847 p-ISSN : 2320-0936
Volume-3, Issue-9, pp-54-61
www.ajer.org
Research Paper Open Access

Optimization of Health Care Service under a Changing Climate

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Abstract: Climate change poses a serious threat to public health and well-being worldwide. Disease incidence and mortality can be affected, both directly and indirectly by climate change across a wide range of conditions. The long-term good health of populations depends on the continued stability and functioning of the biosphere's ecological and physical systems, often referred to as life-support systems. Effects of climate change on health will impact on most populations in the coming decades and put the lives and well-being of billions of people at increased risk. IPCC states that "climate change is projected to increase threats to human health". Humans have successfully adapted to environmental change over time, from evolving natural physiological responses to the use of science, technology, and knowledge to improve our lives and advance our health. From the dawn of the industrial age, people have made great strides in improving health, and enjoy a markedly improved quality of life. However, these improvements have come at a cost that must now be understood and addressed. Climate change will force humans to negotiate with their changing environment as never before to find ways to reshape it both for short-term protection and long-term alleviation of health consequences.

Keywords **-** Intergovernmental Panel on Climate Change (IPCC), Mortality, Physiological, Ecology, Paleoclimatology

I. INTRODUCTION

The ecology and environment of the world are changing due to the shifting patterns of meteorological factors. This is obvious from the 10 warmest years on record since 1998. Among them 2010 was the warmest since the global records began in 1850. Such changes in meteorological variables are already adversely affecting health. This might limit some of the existing plans & policies and capacity of health care facilities (e.g., Hospital, health care centres) and logistics.The overall state of the global climate is determined by the amount of energy stored by the climate system, and in particular the balance between energy the Earth receives from the Sun and the energy which the Earth releases back to space, called the global energy balance. How this energy balance is regulated depends upon the flows of energy within the global climate system. Major causes of climate change involve any process that can alter the global energy balance, and the energy flows within the climate system. Causes of climate change include changes in the Earth's orbit around the Sun, changes in the amount of energy coming from the Sun, changes in ocean circulation or changes in the composition of the atmosphere. Large volcanic eruptions can affect the global climate over only a few years. By contrast, the movement of continents around the world over hundreds of millions of years can also affect global climate, but only over these much longer scales. Climate change affects every aspect of society, from the health of the global economy to the health of our children. It is about the water in our wells and in our taps. It is about the food on the table and at the core of nearly all the major challenges we face today.

Climate is the long-term statistical expression of short-term weather. Climate can be defined as "expected weather". When changes in the expected weather occur, we call these climate changes. They can be defined by the differences between average weather conditions at two separate times. Climate may change in different ways, over different time scales and at different geographical scales. In recent times, scientists have become interested in global warming, due to mankind's impact on the climate system, through the enhancement of the natural greenhouse effect. Throughout the Earth's history climate has fluctuated between periods of relative warmth and relative cold. Palaeoclimatology is the study of climate and climate change prior to the

period of direct measurements. Direct records of temperature and other climatic elements span only a tiny fraction of the Earth's climatic history, and so provide an inadequate perspective on climatic change and the evolution of the climate today and in the future. A longer perspective on climate variability can be obtained by the study of natural phenomena which are climate-dependent. Such phenomena provide a record of past climates, and are revealed through the study of, amongst other techniques, tree rings, ice cores and sediments. Causes involve any process that can alter the global energy balance between energy coming from the Sun and energy leaving the Earth. There are many natural causes of climate change, but recently we have become concerned with the effect mankind's pollution of the atmosphere may be having on the global climate.

II. COMPARATIVE EFFECTS OF CHANGING CLIMATE

The Earth has a natural greenhouse effect which keeps it much warmer that it would be without an atmosphere. Greenhouse gases in the atmosphere trap infrared heat energy trying to escape back to space. In doing so they raise the temperature of the lower atmosphere and the Earth's surface in contact with it. During the last 200 years, mankind has been releasing substantial quantities of extra greenhouse gases to the atmosphere, through the burning of fossil fuels and deforestation. These extra gases are trapping more heat in the atmosphere, and it is now suspected that the observed warming of the Earth by about 0.6°C since the late 19th century is due to this man-made enhancement of the natural greenhouse effect. This climatic trend has become known as "global warming", and may be distinguished from historical and prehistorical climate changes that have occurred naturally. The term "global warming" is usually reserved for the observed global climate change during the last 100 to 150 years that is believed to be related to mankind's enhancement of the greenhouse effect. In the last 100 years or so, the Earth's surface and lowest part of the atmosphere have warmed up on average by about 0.6^{o}C. During this period, the amount of greenhouse gases in the atmosphere has increased, largely as a result of the burning of fossil fuels for energy and transportation, and land use changes, for food by mankind. In the last 20 years, concern has grown that these two phenomena are, at least in part, associated with each other. That is to say, global warming is now considered most probably to be due to the man-made increases in greenhouse gas emissions. Whilst other natural causes of climate change, including changes in the amount of energy coming from the Sun and shifting patterns of ocean circulation, can cause global climate to change over similar periods of time, the balance of evidence now indicates that there is a discernible human influence on the global climate.

Recognition that human health can be affected by a wide range of ecological disruptions, consequent upon climate change, is a recent development, reflecting the breadth and sophistication of modern scientific knowledge. Nevertheless, the simpler idea that human health and disease are linked to climate probably predates written history. The Greek physician Hippocrates (about 400 BC) related epidemics to seasonal weather changes, writing that physicians should have "due regard to the seasons of the year, and the diseases which they produce, and to the states of the wind peculiar to each country and the qualities of its waters". He exhorts them to take note of "the waters which people use, whether they be marshy and soft, or hard and running from elevated and rocky situations, and then if saltish and unfit for cooking," and to observe "the localities of towns, and of the surrounding country, whether they are low or high, hot or cold, wet or dry and of the diet and regimen of the inhabitants". Two thousand years later, Robert Plot, Secretary to the newly-founded Royal Society in England, took weather observations in 1683–84 and noted that if the same observations were made "in many foreign and remote parts at the same time" we would "probably in time thereby learn to be forewarned certainly of divers emergencies (such as heats, colds, deaths, plagues, and other epidemical distempers)".There is now widespread consensus that the Earth is warming at a rate unprecedented during post hunter-gatherer human existence. The last decade was the warmest since instrumental records began in the nineteenth century, and contained 9 of the 10 warmest years ever recorded. The causes of this change are increasingly well understood. The Third Assessment Report of the Intergovernmental Panel on Climate Change, published in 2001, goes further than its predecessors, stating that *"There is new and stronger evidence that most of the warming observed over the last 50 years is likely to be attributable to human activities",* most importantly the release of greenhouse gases from fossil fuels. Stresses on the climate system are already causing impacts on Earth's surface. These include not only rising surface temperatures, but also increasingly frequent floods and droughts, and changes in natural ecosystems, such as earlier flowering of plants, and poleward shifts in the distribution of several species. All of these changes are inextricably linked to the health of human societies. Climatic conditions affect human well-being both directly, through the physical effects of climatic extremes, and indirectly, through influences on the levels of pollution in the air, on the agricultural, marine and freshwater systems that provide food and water, and on the vectors and pathogens that cause infectious diseases.

As it is now widely accepted that humans are influencing global climate, decision makers are now focusing on the type and timing of actions to limit the rate of change. Attention is shifting to the balance between the possible impacts of climate change, and the economic costs, technological advances and societal adaptations that are necessary for mitigation.

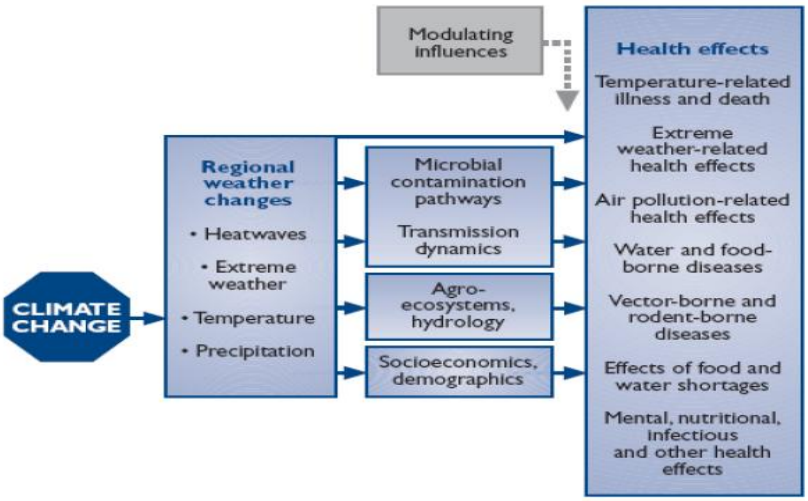
International agreements, supported by hard science, are proving effective in combating wide-ranging environmental threats such as ozone depletion and long-range trans boundary air pollution. Can similar agreements be implemented to address the more complex risks posed by global climate change? Scientific analysis in general and the health sector in particular, need to inform and help advance ongoing policy discussions. Firstly, the scientific community must produce rigorous and balanced evidence not only of the breadth and magnitude of climate change effects, but also of how they are distributed across populations, and over time. Just and equitable decisions on appropriate responses to climate change can only be reached by giving consideration to all those affected by policy actions (or inactions), including future generations. Secondly, as some degree of continued climate change is now inevitable, it is necessary to identify vulnerable populations, and formulate policies and measures to help them adapt to changing conditions.

III. THE IMPACTS OF CLIMATIC CHANGE ON HUMAN HEALTH

i. Climate Change and Human

Climate change affects population health via a host of factors with complex interrelationships, including exposure, socio-economic status, the built environment and cultural practices, as depicted that result in diverse health consequences, most of which are adverse (Maibach et al, 2011; McMichael et al, 2003; Patz, 2000). Modulating influences which can help to buffer the impact of extreme weather events include access to good health care, proper urban planning, and proactive Surveillance and monitoring systems

Figure 1: Pathways by which climate change affects population health



Source From: (McMichael, A. J et al, 2001).

ii. Health Consequence of Climate Change

Climate-related ecosystem changes: It can increase the range, seasonality, and infectivity of some waterborne diseases, such as cholera and diarrhoea diseases, malaria fever, many of which are highly sensitive to temperature and rainfall. Changing temperatures and patterns of rainfall are expected to alter the geographical distribution of insect vectors that spread infectious diseases.

Rising temperatures and more frequent droughts and floods: It can compromise food security. Increased malnutrition is expected to be especially severe in countries where large numbers of the population depend on rain-fed subsistence farming.

Malnutrition, much of which is caused by periodic drought, is already responsible for an estimated 3.5 million deaths worldwide each year. This has severe implications for child growth and development (Intergovernmental Panel on Climate Change, 2007) and could negatively affect the achievement of the Millennium Development Goals. More frequent extreme weather events: They are linked to a potential increase in the number of deaths and injuries caused by storms and floods. In addition, flooding can be followed by outbreaks of disease, such as cholera, especially when water and sanitation services are poor, or where these have been damaged or destroyed. Storms and floods are already among the most frequent and deadly forms of natural disasters (IPCC, 2007; WHO, 2008).

Water scarcity (due to droughts) and excess water (due to more frequent and torrential rainfall): They are both expected to increase the burden of diarrhoea disease, which is spread through contaminated food and water (IPCC), 2007a; World Health Organization (WHO)/World Meteorological Organization (WMO)/ United Nations Environment Programme (UNEP), 2003). Downpours of rain can trigger sewage overflows, contaminating groundwater that is often used for crop irrigation and as a source of drinking water, causing diarrhoea diseases which are already the second leading infectious cause of childhood mortality, accounting for a total of around 1.8 million deaths worldwide each year. Heat waves can directly increase morbidity and mortality, mainly in elderly people, with Cardiovascular (heart) of respiratory disease (IPCC, 2007). Apart from heat waves, higher temperatures can increase levels of ground-level ozone and hasten the onset of the pollen season, contributing to respiratory problems, such as asthma attacks.

Table 1: Potential health effects of climate change

Manifestation of climate change	Health determinant due to climate change	Health outcome
Climate-related ecosystem changes	Temperature, humidity, rainfall effects on vector-borne (and rodent-borne) diseases	Increased vector-borne disease such as West Nile virus, equine encephalitis, Lyme disease, Rocky Mountain spotted fever, hantavirus, malaria, dengue fever, leptospirosis
	Changes in air pollution and aeroallergen levels	Increased allergies caused by pollen; increased cases of rashes and allergic reactions from toxic plants such as poison ivy, stinging nettle, and other weeds; deaths and disease cases associated with air pollution, allergies
	Emergence or spread of pathogens via climate-change-driven biodiversity loss	New cases of infectious disease
Rising temperatures and erratic rainfall patterns	Effects of extreme rainfall and sea-level rise on flooding (attributed to coastal floods, inland floods and landslides)	Fatal injuries; non-fatal injuries and mental health effects; death from drowning; increased waterborne diseases from pathogens and water contamination from sewage overflows; increased food-borne diseases
	Temperature effects on food and waterborne disease	Increased food-borne diseases, such as Salmonella poisoning, diarrhoea and gastroenteritis
	Temperature and precipitation effects on incidence and intensity of forest fires and dust storms	Death from burns and smoke inhalation; eye and respiratory illnesses due to fire-related air pollution; fatal and non-fatal injuries
	Increased average temperature	Increased strain on regional drinking water supplies; increased vulnerability to wildfires and associated air pollution
Water scarcity (drought)	Changing patterns of agricultural yield due to water shortages and increasing temperatures	Disruptions in food supply; changing patterns of crop, pest and weed species; water shortages; malnutrition food-borne and waterborne diseases; emergence of new vector-borne and zoonotic diseases
	Sea-level rise and reduced snowmelt impacts on freshwater availability	Water-related diseases in resident and displaced populations
Heat waves	Direct impact of heat waves	Premature death due to heat-related illnesses such as heat stroke, heat exhaustion and kidney stones; Cardiovascular disease /deaths
Extreme events	Destruction of health infrastructure in floods and storms	Increases in mortality and morbidity in affected areas
	Increased intensity of hurricanes due to higher sea surface temperature	Deaths by drowning; injuries; mental health impacts such as depression and post-traumatic stress disorder; increased carbon monoxide poisoning; increased gastrointestinal illnesses; population displacement/homelessness

Source From: (Campbell-Lendrum, D. H., & Woodward, R. 2007).

IV. APPROACHES TO ESTIMATING CLIMATE CHANGE IMPACT ON HEALTH

The relationship between climate change and health is complex, as climate change is not a typical 'health exposure' variable, since it does not directly display a cause to effect nexus as is sometimes seen in other determinants of health. The complexity of the relationship is compounded by the interrelationship between health and factors such as socio-economic status, disease susceptibility, cultural practices and the immediate built environment.

Methods Available for Estimating the Effects of Climate Change on Health

There are several methods available for estimating the effects of climate change on health [14]:
(i). Partial analogue studies that project future aspects of climate change.
(ii). Observing early evidence of changes in health status linked to changes in climate.
(iii). Using existing empirical knowledge and theory to conduct predictive modeling or other integrated assessment of likely future health outcomes.
A simplistic example is our natural response to heat. If climate change causes extreme heat, people may choose to stay in a cool place (e.g. an air-conditioned room), thereby reducing their exposure to heat stress. The ability of human beings to adapt to their environment adds to the uncertainty of future health impacts on climate change.

Dose-Response Approach to Projecting Climate Change Impacts

A linear dose-response approach may be used to project and value the excess disease burden caused by climate change in cases where data are scarce. This approach assumes that, for every unit change in a climate variable, there will be specific unit change in the incidence of disease. The relationships are assumed to be linear since the rate of change in disease incidence will not vary across different climate change values.

Recognising the Complexity of Systems upon which Life Depends – An Ecological Perspective

As a human-generated and worldwide process, global climate change is a qualitatively distinct and very significant addition to the spectrum of environmental health hazards encountered by humankind. Historically, environmental health concerns have focused on toxicological or microbiological risks to health from local exposures. However, the scale of environmental health problems is increasing and various larger-scale environmental hazards to human population health have begun to appear.
Appreciation of this scale and type of influence on human health entails an *ecological* perspective. This perspective recognises that the foundations of long-term good health in populations reside in the continued stability and functioning of the biosphere's life-supporting ecological and physical systems. It also brings an appreciation of the complexity of the systems upon which we depend and moves beyond a simplistic, mechanistic, model of environmental health risks to human health.

V. RESULTS AND DISCUSSION

The figures 2, 3, 4 and 5 displayed below shows the analysis of ailments frequency over a given period using the three methods of estimating and optimizing climatic change impact on health. The application was developed using the data collected from the medical hospital taken as a case study. The different ailments treated over a range of changing climatic conditions, symptoms and causative agent of such ailment over specific period of time.

Table and Figures

Ailment	No. of Patient / Frequency	Season
Malaria Fever	20	Dry
Typhoid Fever	15	Dry
Rheumatism	8	Wet
Dysentry	18	Dry
Diarrhea	5	Dry

Table 2: Frequency of Ailment

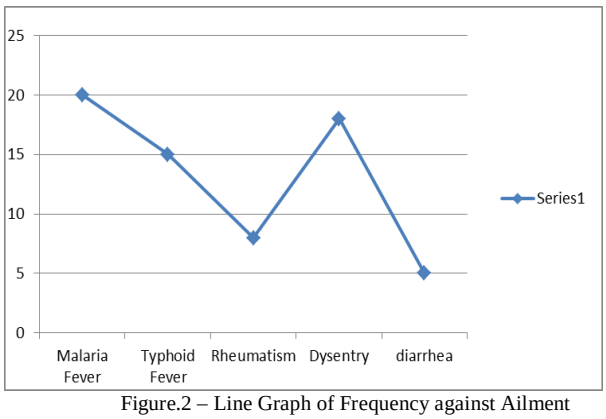


Figure.2 – Line Graph of Frequency against Ailment

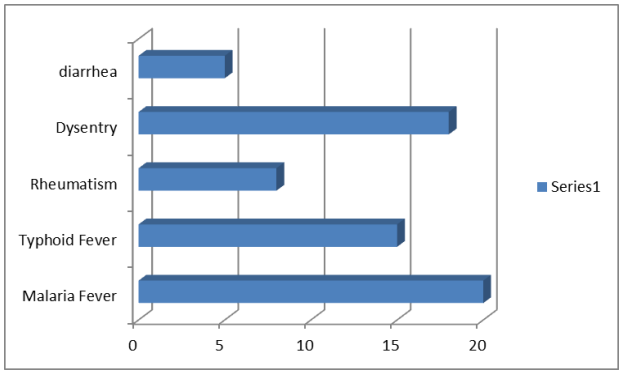


Figure.3 – Bar chart of Ailment over a period

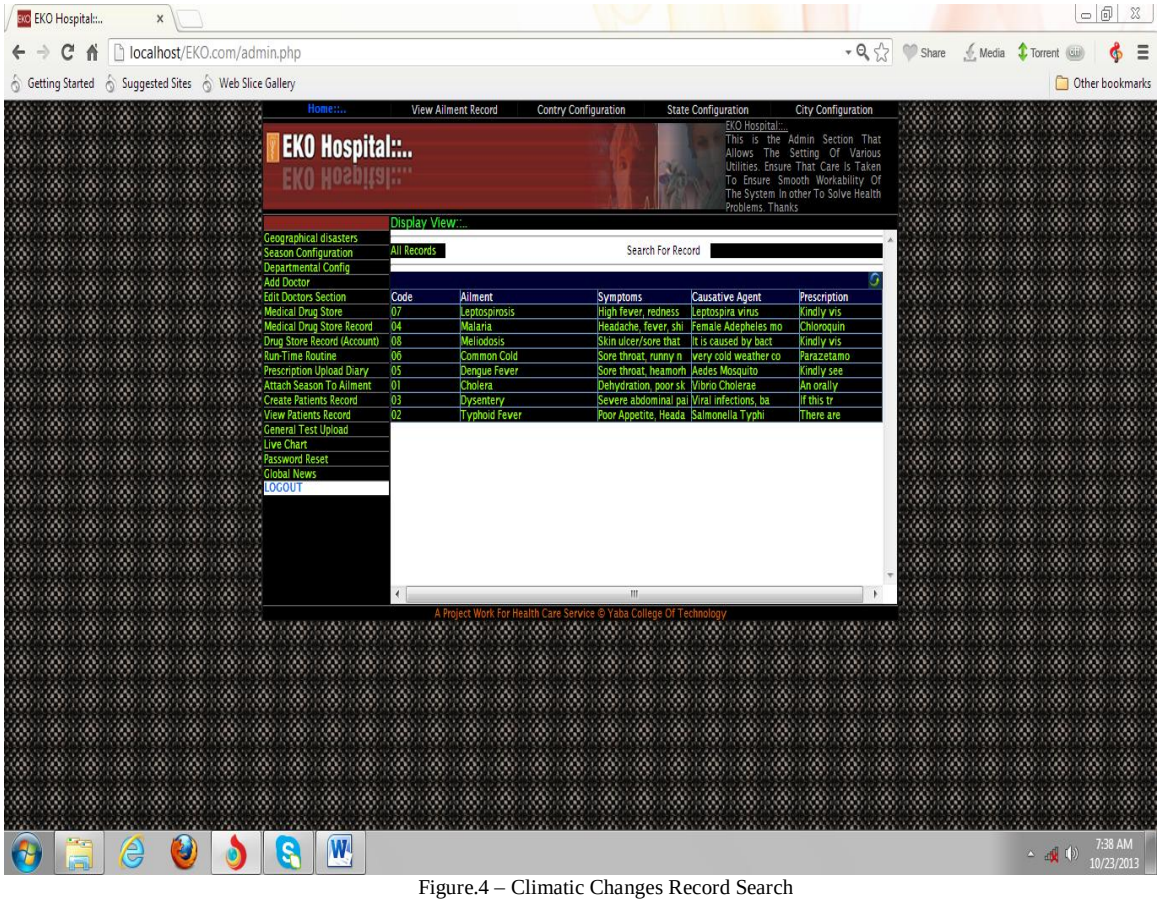


Figure.4 – Climatic Changes Record Search

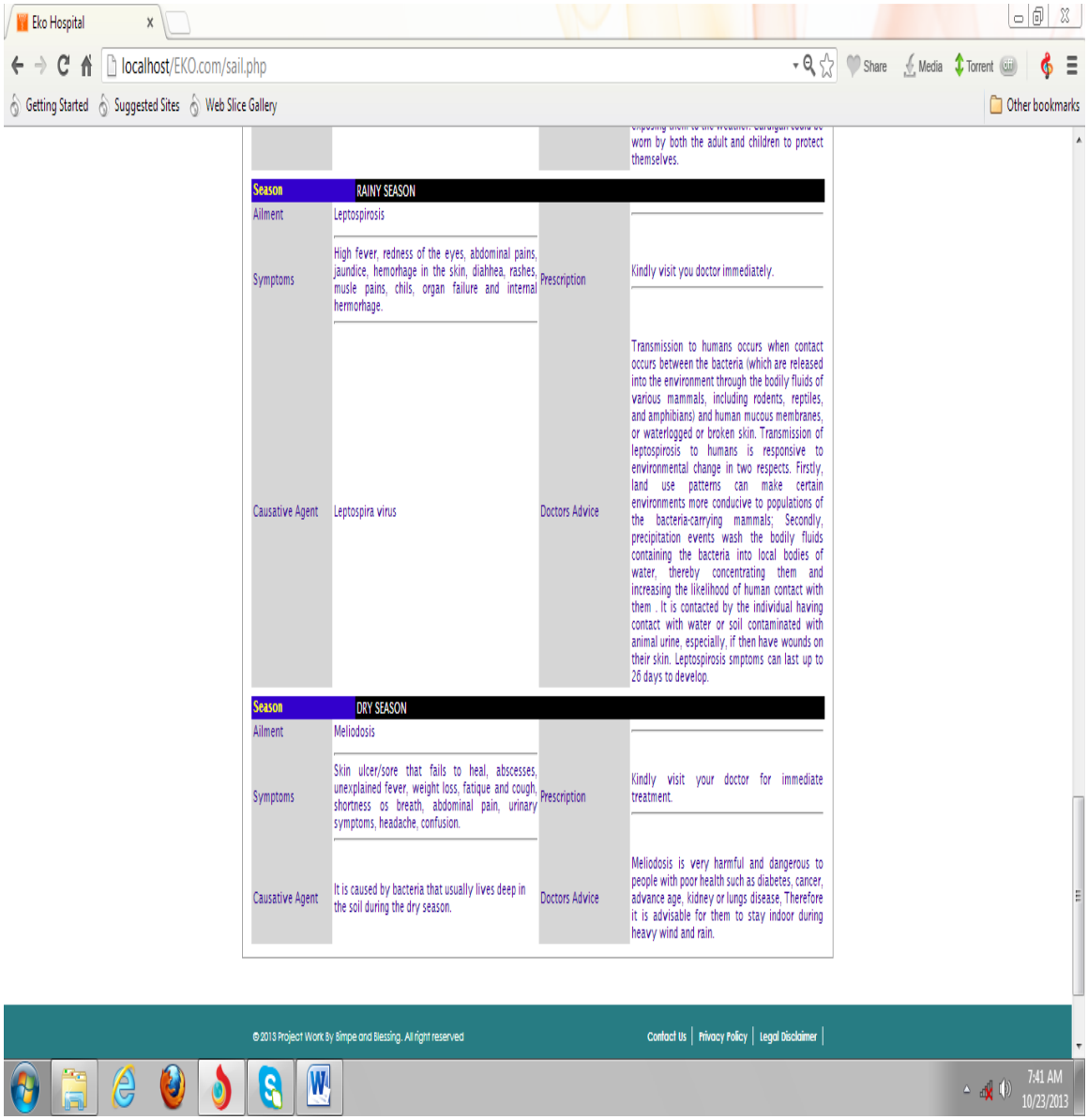


Figure.5 – Aliment, Symptom and Causative Agent

VI. CONCLUSION

According to research carried out on this study, it can be deployed and adapted for use in the healthcare sector of the society due to the fact that it helps the individual to stabilize his/her health status with respect to the changing climate. There is widespread scientific consensus that the world's climate is changing. Mounting evidence suggests current and future effects on human health, including injuries and illnesses from severe weather events, floods, and heat exposure; increases in allergic, respiratory, vector-borne, and waterborne diseases; and threats to food and water supplies. Indirect effects may include anxiety and depression and the consequences of mass migration and regional conflicts. Addressing these occurrences is a pressing challenge for public health. Although the scope and complexity of the challenge are unprecedented, the conceptual framework for responding draws on long-standing public health thinking. An effective public health response to climate change is essential to preventing injuries and illnesses, enhancing public health preparedness, and reducing risk. Science-based decision making, informed by public health ethics, will help manage uncertainty and optimize health, environmental, and economic outcomes.

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American Journal of Engineering Research (AJER)
e-ISSN : 2320-0847 p-ISSN : 2320-0936
Volume-3, Issue-9, pp-62-72
www.ajer.org
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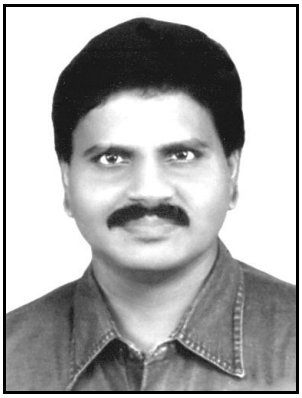
THE UNIVERSAL TERRORIST?... *(A New theory on "MARSISM")*



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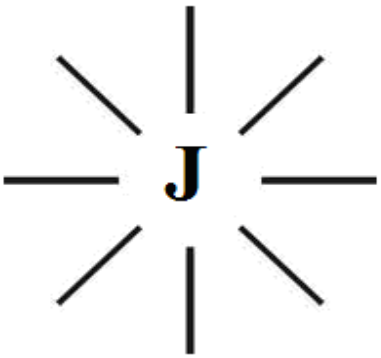
ABSTRACT: *This scientific research article focus that "**HUMAN ANCESTOR**" shall be considered as "**TERRORIST**" evolved from "**Dark Cloud of Stardust**". The human Ancestor shall be considered as lived in "**MARS PLANET**" in the **early Universe** under "**Perfect law and order**" (kingdom Rule, absolute ideology) under the influence of "**Zero hour radiation**" environment also called as "**J-RADIATION**".*

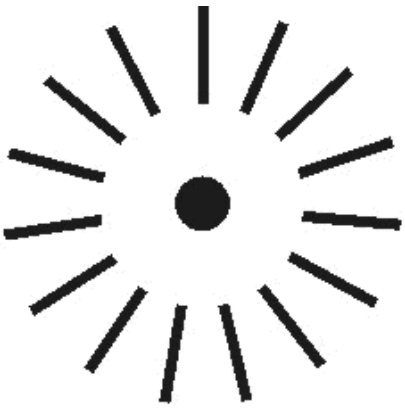


PERFECT LAW AND ORDER
(Kingdom Rule)

It is speculated that the stardust cloud (as stipulated in (**Big-bang theory**) shall be considered as composed of three-in-one ions of **Anti-photon, Anti-Electron, Anti-Proton**. The supernatural star dust shall

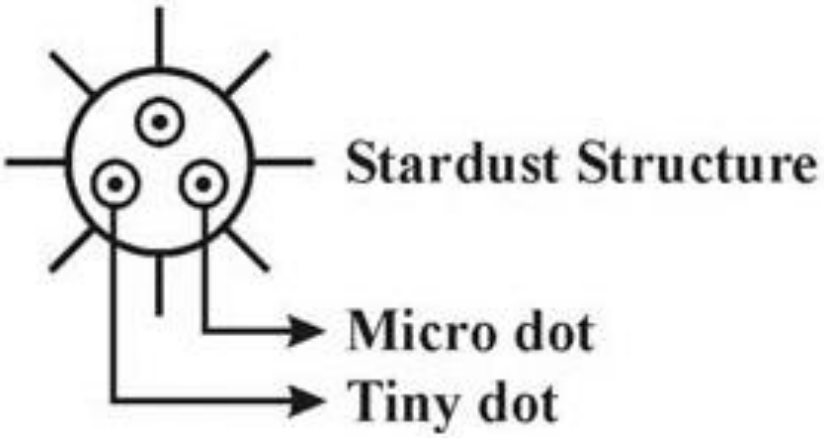
also be considered as having "**Terrorist Behavior**" in the early Universe. The Philosophy of dark cloud and star dust shall described below.

(i)



(DARK CLOUD)

(ii)



It is further speculated that in the "**expanding universe**" the environmental condition of universe consider consistently changed into three distinguished behavior in **three Nuclear ages** as described below.

[1] Terrorism environment phase
[2] Revolutionism environment phase
[3] Evolutionism environment phase

During the course of time the "**Mars populations**" do not want to live under "**Strict law and order**" considered descended to "**EARTH PLANET**" for more freedom and become "**Revolutionist**", "**Evolutionist**" thereafter. The concept of various Ethnicism, Racism, shall be considered as cultures developed on the **Earth Planet** subsequently.

செவ்வாய்
ரசிகன்!

செவ்வாய் கிரகத்தில்
நாசாவின் விண்கலம் தரையி
றங்கிய நாள் முதலாக அது
பற்றிய செய்திகளில் அதிக
ஆர்வம் காட்டி வருகிறார்
அமெரிக்க அதிபர் ஒபாமா.
செவ்வாய் கிரகம் பற்றி
ஆய்வு மேற்கொண்டு வரும்

நாசாவின் 'மார்ஸ் கியூரியா
சிட்டி ரோவர்' அணியினரிடம்
அடிக்கடி பேசுகிறார்.

'செவ்வாய் கிரகத்தில்
உயிரினங்கள் வசிப்பதாக
தகவல் கிடைத்தால்,
உடனே அதுபற்றி எனக்குத்
தெரியப் படுத்துங்கள்.
அது எந்த நேரமாக
இருந்தாலும், நான் எத்தனை
பிசியாக இருந்தாலும்
கவலைப்பட வேண்டாம்.
இப்போதைக்கு நான்
இந்த விஷயத்திற்குத்தான்
முன்னுரிமை கொடுக்கிறேன்'
என்று அந்தக் குழுவினரிடமும்
கூறியிருக்கிறாராம் அதிபர்
ஒபாமா. ■

11

(Curiosity in Searching the Terrorist)

*"Expanding Universe shall mean consistent variation in environment condition with respect to varied relative position of **SUN, EARTH, MOON** and varied angle of its rotation on their axis".*

- Author

KEY WORDS:
a) Philosophy of "Terrorism"?...
b) Philosophy of "Revolutionism?...
c) Philosophy of "Evolutionism"?...
d) Philosophy of "Ethnicism"?...
e) Philosophy of "Racism"?...
f) Philosophy of word "ISM"?...
g) New definition for terrorism?...

I. INTRODUCTION:

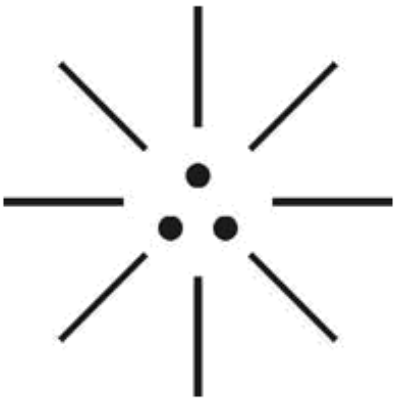
In the present day, "**Terrorism**" become so popular across various global nations and thousands of innocent people are died and crores of valuable Assets are damaged and destructed everyday. In American context the term international terrorism, domestic terrorism shall mean activities that involves violent act or acts **dangerous to human life** and **violation of criminal laws** of the United States or of any States.

"Terrorism" means killing the people?... Terrorism means destruction of Assets?... NO… NO… NO… what is the ultimate ideology of Terrorism?... what Terrorism really means?...

It is focused by the author that the philosophy of "**Terrorism**" shall be considered closely associated with **environmental condition** of early universe and violent behavior of **Dark clouds** when Human ancestor, and other elementary planets, living organisms, considered evolved due to impact of "**J-RADIATION**".

Further the philosophy of Terrorism (also called as Marsism) shall be defined within the following scope.

[1] Terrorism (Marsism) shall mean **act of creation not** "**destroy**"
[2] Terrorism (Marsism) shall mean **act of promoting life not** "**death**"
[3] Terrorism (Marsism) shall mean **law of perfection and 100%** "**idealism**"



(IDEOLOGY LOGO)

a. Right dot is like "**DNA**" (Love)
b. Left dot is like "**HORMONE**" (Mercy)
c. Centre dot is like "**RNA**" (Hope)

*"Terrorism (Marsism) shall be considered as **law of ethics** and ideal Divine rule. Various concepts such as Maoism, Ethnicism, Racism, Patriotism, Communism, Socialism, Marxism, Confucianism, Taoism, Mohism, Gandhism, Humanism, Reformism etc are derivatives of Terrorism on the Earth planet".*

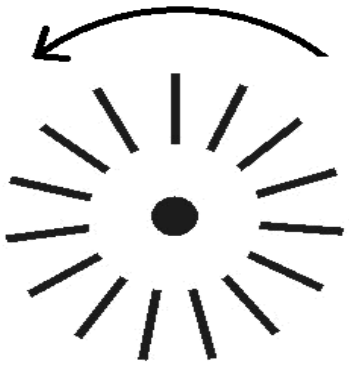
Author

II. HYPOTHESIS AND NARRATION

a) Philosophy of Terrorism, Revolutionism, Evolutionism?...

It is hypothesized that Revolutionism shall be considered as the plasma state of Terrorism and before evolution state of early universe. Revolution State of Universe shall be considered as the origin of first populations on the **earth planet** after **TRANSFORMATION** from Mars planet. Evolution state of Universe shall be considered as referred to living of human Ancestors considered lived under three distinguished radiation environment condition say, **Gamma, Beta, Alpha** radiation family. The philosophy of Terrorism, Revolutionism, Evolutionism shall be described as below. Terrorism shall be considered as the state of anticlockwise direction and evolutionism shall be considered as the state of clockwise direction. Revolutionism shall be considered as the state of transformation from anticlockwise to , clockwise direction.

(i)

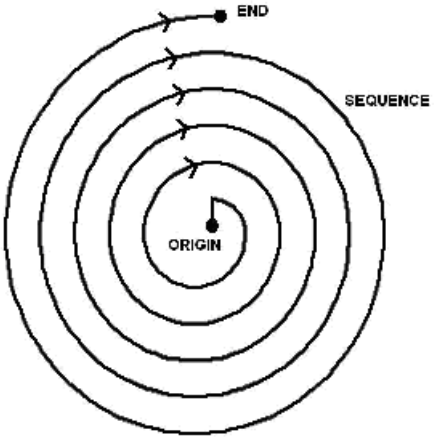


TERRORISM
(CHULARCHI)

(ii)

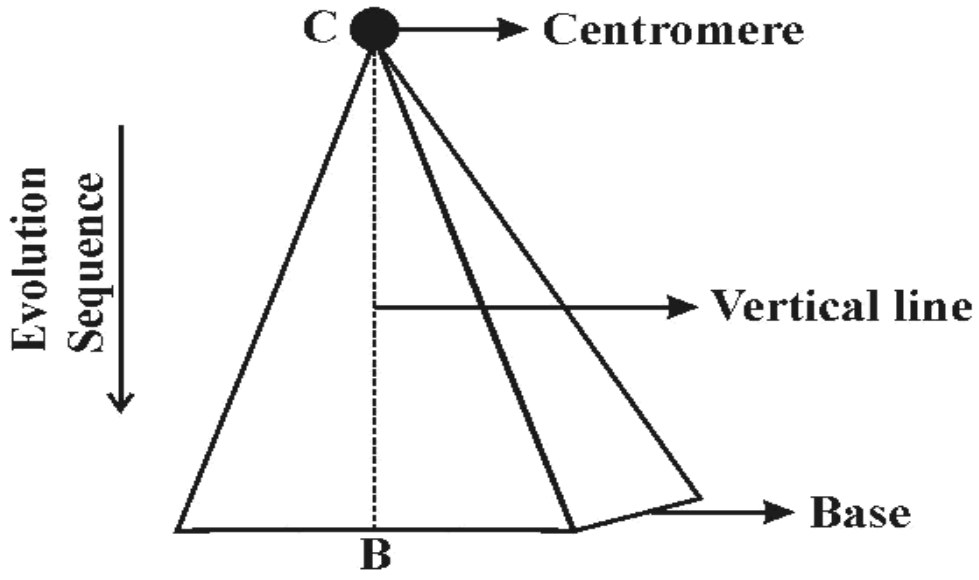
REVOLUTIONISM
(PURACHI)

(iii)



EVOLUTIONISM
(VALARCHI)

It is further hypothesized that the growth of gamma, Beta, Alpha radiation shall be considered as the source of three fundamental Ethnic family and Racism shall be considered sub family. Further it is hypothesized that the **downward vertical growth** shall be considered as billions of subfamilies and the **lateral horizontal growth** shall be considered as billions of **RACES** under each subfamily described as below.



(MODEL ETHNIC, RACES GROWTH)

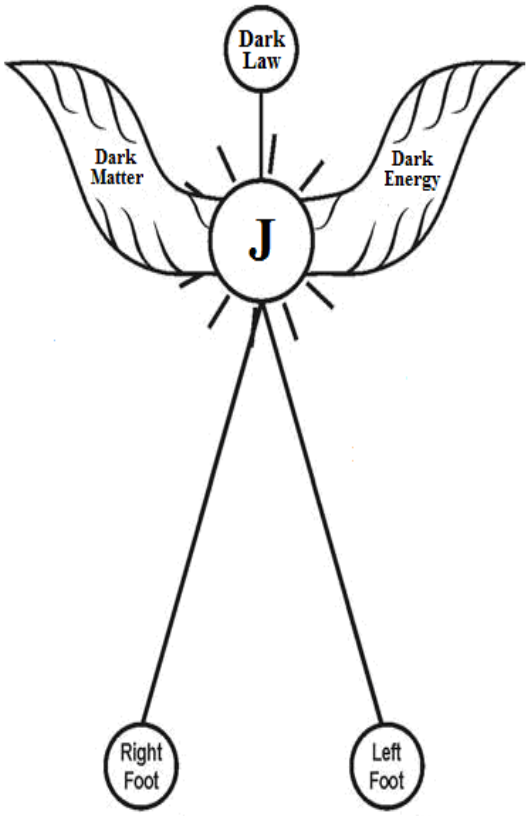
b) Philosophy of Ideal Rule?...

Case study shows that thousands of "**ethics and morals**" exist all over world and the leaders of the nations consider running their show for betterment of global populations as a whole according to their environmental condition. **Is there any standard global ethics?...**

[1] Can we say **Marxism** is ideal rule?...
[2] Can we say **Communism** is ideal rule?...
[3] Can we say **Socialism** is ideal rule?...
[4] Can we say **Maoism** is ideal rule?...
[5] Can we say **Taoism** is ideal rule?...

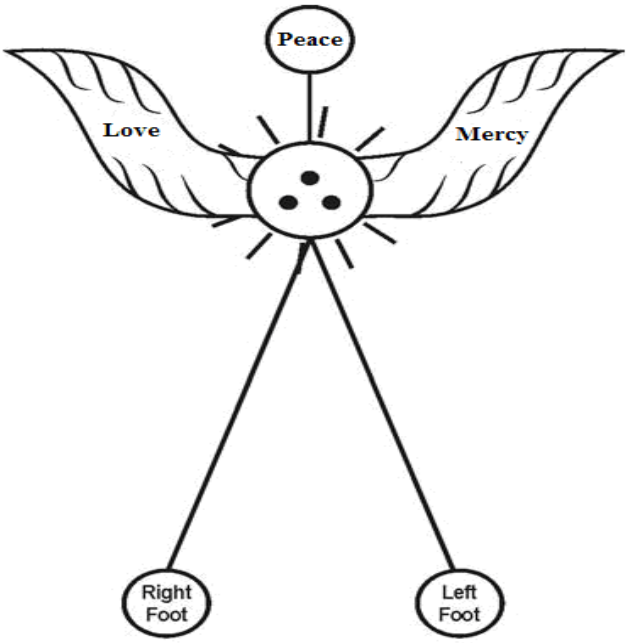
It is hypothesized that **Terrorism** (**Marsism**) shall be considered as **Ideology and law of Perfect rule**. In proto Indo Europe language the philosophy of Terrorism (Marsism) shall also the called as "**AETHEISM**". The mars populations shall also be called as "**ATHEIST**". It is further speculated that the philosophy of "**MARXISM**" of earth planet might be derived from the philosophy of "**MARSISM**" of the Mars planet.

(i)



UNIVERSAL TERRORIST
(Kingdom Rule)

(ii)



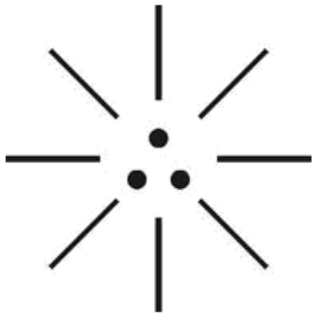
MARSIST
(Marsism)

The philosophy of "**MARSIST**" shall be defined within the following scope

[1] **Marsist** shall mean free from "**Ethnicism**"
[2] **Marsist** shall mean free from "**Racism**"
[3] **Marsist** shall mean free from "**Casteism**"
[4] **Marsist** shall mean "**Godly person**"
[5] **Marsist** shall mean "**Creator**"
[6] **Marsist** shall mean do not have any account with "**Swiss Bank**"

c) Etymology of word "ISM"?...

It is focused that the English word "**ISM**" is used as **Suffix** to represent specific meaning scaly Ethnicism, Racism, Patriotism. The Acronym "**ISM**" as considered as used in "**Astronomy**" to represent the meaning as "**Interstellar Medium**" It is hypothesized that the word Ism might be derived from Proto Indo Europe language word "**Theesam**", "**Theism**". Theesam, Theism shall mean "**Godly**".



STAR DUST
(Photon, Electron, Proton)

d) Ideology and terrorism?...

Case study shows that ideology considers as set of conscious or unconscious ideas which constitute one's goals, expectation and action. Ideology varies from person to person and society to society. In the context of "**marxism principle**", socialism and communism are being viewed in different ideological concept.

Socialism aimed only to socialize **production**. But communism aimed to socialize both **production and consumption**.

It is emphasized by the Author that terrorism shall be considered "**ideological concept**" descended from **Mars Planet** (Human ancestor) and all the ideological concepts on the earth planet shall be considered as derived from the fundamental **terrorism ideology**.

[1] Freedom Fighters are terrorist?... **No… No…No…**
Freedom Fighters shall be considered as "**REFORMIST**" and not terrorist.

[2] Politicians are terrorist?... **No… No…No…**
Politicians shall be considered as "**ARTIST**" and not terrorist.

[3] Scientists are terrorist?... **No… No…No…**
Scientists shall be considered as "**RATIONALIST**" and making betterment of human life and not terrorist.

[4] Religious Leaders are terrorist?... **No… No…No**…
Religious Leaders shall be considered as "**ETHNICIST**" and not terrorist.

[5] Individuals are considered as terrorist?... **No… No…No…**
Individuals shall be considered as "**RACIST**" and not terrorist.

[6] Doctors are terrorist?... **No… No… No…**
Doctors shall be considered as "**PATHOLOGIST AND DENTIST**" and not terrorist.

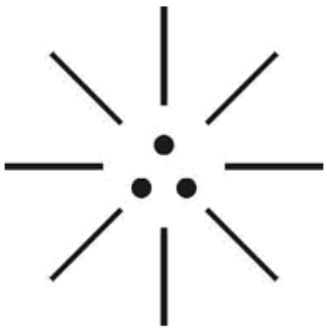
[7] Engineers are terrorist?... **No… No… No…**
Engineers shall be considered as "**MATERIALIST AND PRODUCTIONIST**" and not terrorist.

[8] God (Human ancestor) is terrorist?... **Yes… Yes… Yes…**
God shall be considered as "**TERRORIST**" and not Revolutionist, Ethnicist and Racist.

III. CONCLUSION:

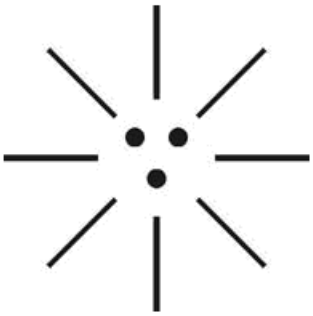
It is focused that the philosophy of "**MAN**", "**MANNERISM**" might be derived from the philosophy of **HUMAN**, **HUMANISM.** Man shall be considered as descended from Human. Human is like "**INFANT**". Man is like "**CHILD**".

(i)



HUMAN
(ATHEIST)

(ii)



MAN
(ETHICIST)

*"Human shall be considered as having different genetic characteristics to man. Human shall mean "**Atheist**". Man shall mean "**Ethicist**".*

- Author

Previous Publication: The philosophy of origin of first life and human, the philosophy of model Cosmo Universe, the philosophy of fundamental neutrino particles have already been published in various international journals mentioned below. Hence this article shall be considered as **extended version** of the previous articles already published by the same author.

[1] Cosmo Super Star – IJSRP, April issue, 2013

[2] Super Scientist of Climate control – IJSER, May issue, 2013

[3] AKKIE MARS CODE – IJSER, June issue, 2013

[4] KARITHIRI (Dark flame) The Centromere of Cosmo Universe – IJIRD, May issue, 2013

[5] MA-AYYAN of MARS – IJIRD, June issue, 2013

[6] MARS TRIBE – IJSER, June issue, 2013

[7] MARS MATHEMATICS – IJERD, June issue, 2013

[8] MARS (EZHEM) The mother of All Planets – IJSER, June issue, 2013

[9] The Mystery of Crop Circle – IJOART, May issue, 2013

[10] Origin of First Language – IJIRD, June issue, 2013

[11] MARS TRISOMY HUMAN – IJOART, June issue, 2013

[12] MARS ANGEL – IJSTR, June issue, 2013

[13] Three principles of Akkie Management (AJIBM, August issue, 2013)

[14] Prehistoric Triphthong Alphabet (IJIRD, July issue, 2013)

[15] Prehistoric Akkie Music (IJST, July issue, 2013)

[16] Barack Obama is Tamil Based Indian? (IJSER, August issue, 2013)

[17] Philosophy of MARS Radiation (IJSER, August 2013)

[18] Etymology of word **"J"** (IJSER, September 2013)

[19] NOAH is Dravidian? (IJOART, August 2013)

[20] Philosophy of Dark Cell (Soul)? (IJSER, September 2013)

[21] Darwin Sir is Wrong?! (IJSER, October issue, 2013)

[22] Prehistoric Pyramids are RF Antenna?!... (IJSER, October issue, 2013)

[23] HUMAN IS A ROAM FREE CELL PHONE?!... (IJIRD, September issue, 2013)
[24] NEUTRINOS EXIST IN EARTH ATMOSPHERE?!... (IJERD, October issue, 2013)
[25] EARLY UNIVERSE WAS HIGHLY FROZEN?!... (IJOART, October issue, 2013)
[26] UNIVERSE IS LIKE SPACE SHIP?!... (AJER, October issue, 2013)
[27] ANCIENT EGYPT IS DRAVIDA NAD?!... (IJSER, November issue, 2013)
[28] ROSETTA STONE IS PREHISTORIC "THAMEE STONE" ?!... (IJSER, November issue, 2013)
[29] The Supernatural "CNO" HUMAN?... (IJOART, December issue, 2013)
[30] 3G HUMAN ANCESTOR?... (AJER, December issue, 2013)
[31] 3G Evolution?... (IJIRD, December issue, 2013)
[32] God Created Human?... (IJERD, December issue, 2013)
[33] Prehistoric "J" – Element?... (IJSER, January issue, 2014)
[34] 3G Mobile phone Induces Cancer?... (IJERD, December issue, 2013)
[35] "J" Shall Mean "JOULE"?... (IRJES, December issue, 2013)
[36] "J"- HOUSE IS A HEAVEN?... (IJIRD, January issue, 2014)
[37] The Supersonic JET FLIGHT-2014?... (IJSER, January issue, 2014)
[38] "J"-RADIATION IS MOTHER OF HYDROGEN?... (AJER, January issue, 2014)
[39] PEACE BEGINS WITH "J"?... (IJERD, January issue, 2014)
[40] THE VIRGIN LIGHT?... (IJCRAR, January issue 2014)
[41] THE VEILED MOTHER?... (IJERD, January issue 2014)
[42] GOD HAS NO LUNGS?... (IJERD, February issue 2014)
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[44] THE NUCLEAR "MUKKULAM"?... (IJSER, February issue 2014)
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[52] GANJA IS ILLEGAL PLANT?... (IJERD, April issue 2014)
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American Journal of Engineering Research (AJER)
e-ISSN : 2320-0847 p-ISSN : 2320-0936
Volume-3, Issue-9, pp-73-86

www.ajer.org
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A Systematic Exploration of Mutation Space in a Hybridized Interactive Evolutionary Programming for Mobile Game Programming

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ABSTRACT : *In this study, a systematic exploration of mutation space in interactive evolutionary programming was conducted to investigate the effects of the game synthesis process using different mutation rates. Evolutionary programming is the core Evolutionary Algorithm (EA) used in this study where it is hybridized with Interactive Evolutionary Algorithm (IEA) to generate different rulesets that was played on a custom arcade-type mobile game. The experiment was initially conducted by utilizing different mutation rates of 10, 20, 30, 40, 50, 60, 70, 80, and 90 percent. From the optimization results obtained, the single best individual was selected from each mutation rate to further analyze its quality. It was discovered that higher mutation rates were able to yield faster and better solutions and lower mutation rates generally yielded results that were below average.*

KEYWORDS : *Mutation space, Evolutionary Programming (EP), Interactive Evolutionary Algorithm (IEA), mobile games, arcade-type game*

I. INTRODUCTION

EAs are optimization algorithms with operational processes that are inspired by nature. There are four different classes of EAs which are Genetic Algorithms (GA), Evolutionary Programming (EP), Evolution Strategies (ES), and Genetic programming (GP) [10].Interactive Evolution Algorithms (IEAs) are a branch of EAs where it uses human users to evaluate the quality of the individual solutions [9] as opposed to the traditional EAs, where the quality of the solutions are based on mathematical formulas and objective calculations that relate explicitly to the problem being solved. Music [6], games [7], graphical arts [8], are among problem domains that have used IEAs as the evaluation paradigm to solve the optimization problem. The major operating systems for smartphones are Apple iPhone Operating Systems (iOS), Android OS, Palm OS, Blackberry OS, and Microsoft Windows Mobile. The Android OS open features has enabled different device manufactures to use it as their device's operating systems. Moreover, Android has also opened up its resources for applications developer to develop applications with zero to a small minimal fee if they decided to post their application into the Android market. Hence, this was the motivation for this investigation to develop the custom arcade-type game using the Android OS platform.

To investigate the effects from the usage of different mutation rates, an Android mobile game was created and incorporated with the hybridized Evolutionary Programming (EP) with Interactive Evolutionary Algorithm (IEA) method. The time needed for the optimization result to converge [9] is one of the primary concerns in IEA due to its effect on users' fatigue. Thus, by searching for a suitable mutation rate that can yield a faster convergence, or in this case, the identification of a better game rule set, is the main objective in this paper. By identifying a suitable mutation rate, the time needed to get a good quality of novel rules set for the games is decreased and hence it will lower the users' fatigue level as well since users' fatigue level is dependent on the time invested in the interactive evolution process [9].The organization of this paper is as follows. Section II draws out the methods that we have used in this study, a more in-depth explanation of the game mechanism and how EP and IEA are implemented into the game. Section III describes the experimental setup that we have used and the results and discussion will be given in Section IV. We will conclude our study and discuss some future work recommendations in the last section.

II. METHOD

Procedural content generation (PCG) is a method that has been used to automatically generate game contents. Contents that are involved here does not count the creation of artificial intelligence for non-player character (NPC) [3] but it is more on the terrain, stories, maps, and others elements that made up the game. Studies have been done using PCG on generating platform levels [5] and even some used it to generate maps in a large scales game like Real-time strategy (RTS) game genre [3]. Togelius and Schmidhuber [4] had conducted a study that involved generating a game rules instead of the environments. This has given us the idea to create a game that contains no rules and hence letting the PCG to work on the rules generations.

Game Design : This game is created to be able to run on Android OS 2.2, the screen size of the game is set to fit in a HVGA mobile display with a dimension of 430 x 320 pixels. The game is built upon a few components such as elements, walls, collision, and scoring. Below are the details of elements and walls as follow.

- Elements
  - Red elements
  - Blue elements
  - Green elements
  - Cyan elements
  - Yellow elements
- Walls
  - 20 x 320 pixels upper and lower border
  - 430 x 10 pixels left and right border
  - 30 x 30 pixels of square walls

Each element is in a round image with their respective colors, and the size of the image is 30 x 30 pixels. The yellow element is used by the users to navigate in the game environment. As for the position of each element is place randomly at the beginning of the game except for yellow element's position is fixed in the center of the environment. Walls served as a restriction for all the elements, upper, lower, left, and right border walls will restrict elements and player from moving out from the game environment. The 30 white square walls will be place as shown in Fig. 1 it will form a simple moving obstacle. Fig. 2 shows how these elements and walls placement looks like when they are place together into a mobile environment.

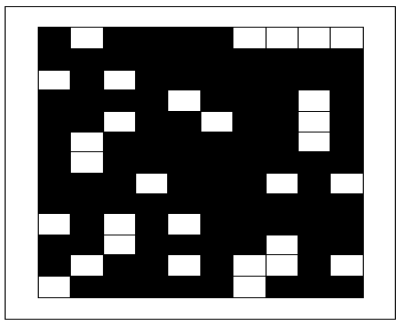

Figure. 1 Walls Placements

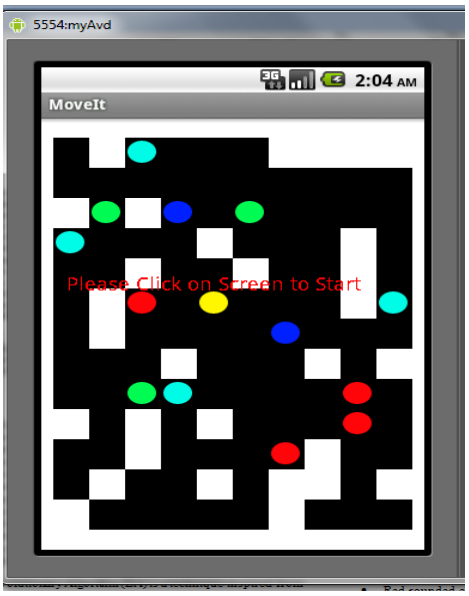

Figure. 2 Elements Wall Placement in Mobile Environment

Each element's movement has been set accordingly where red and blue will be static while green element can only move in vertical directions and cyan elements can only move in vertical directions. Table 1 shows the overall movement for the elements in the game.

Table 1 Elements Movement.

Elements	Movement
Yellow	Vertical and horizontal
Red	Static
Blue	Static
Green	Vertical
Cyan	Horizontal

Moving to the collision component, there are three events that might occur after each elements collide with each other.

- None (no effect) – 0
- Death (elements is deleted from the environment) – 1
- Teleports (elements get teleport back to a locations) – 2

Notice that the number at the end of 0, 1, and 2 it represents the effect in our chromosome. In order for these collisions to take effect, we have structured a collision effect table that will enable a lookup for each collision that happens and hence giving the proper effects that associate with it. Table 2 shows the collision structure that we have created.

Table 2 Collision Effect.

Elements	Yellow	Red	Blue	Green	Cyan
Yellow		C1	C2	C3	C4
Red.	C1			C5	C6
Blue	C2			C7	C8
Green	C3	C5	C7		C9
Cyan	C4	C6	C8	C9	

C1: Yellow and Red element collision

C2: Yellow and Blue element collision

C3: Yellow and Green element collision

C4: Yellow and Cyan element collision

C5: Green and Red element collision

C6: Cyan and Red element collision

C7: Green and Blue element collision

C8: Cyan and Blue element collision

C9: Green and Cyan element collision

The black square represent collision effect that has been taken out, the reason that we took it out is due to the movement of the elements for example, is not possible for red and blue to collide with each other since they are in a static position. Another important component for the game is the scoring systems. Each collision will have a score linked to it as shown in Table 3. The score are 0, 1, or -1.

Table 3 Elements Movement Link to Score.

Elements	**Movement**
C1	S1
C2	S2
C3	S3
C4	S4
C5	S5
C6	S6
C7	S7
C8	S8
C9	S9

Evolutionary Algorithm : The EA method that we have applied in this study is evolutionary programming. Number of elements that can presented in the game, the collision effect, the score of each collision, and the winning point, the losing point of the game and the number of each elements in the game. As mention earlier that collision effect will be represented by 0, 1 and 2 while score of each collision is between -1, 0 or 1. Winning point range is from 1 to the maximum of available elements presents in the game as well as the losing point. The number of elements of each type is range from 1 to 5 meaning that each color elements will have none to a maximum of 5 that can be present in the game. Population size is set to three as we do not want to increase the fatigue of the human tester (Takagi, 2001) as the larger the population size increase, more evaluation has to be done by a tester in order to complete a full run. The same goes to the number of generations as we want to keep the time durations lower, hence the number of generations is set to be 20. Below is the flow of the overall EP:

1.0 Start

2.0 Random initialization for parent chromosome. The value of the each phenotype is illustrate below

2.1 Phenotype value for position from 0 to 8 – range from 0 to 2

C1	C2	C3	C4	C5	C6	C7	C8	C9

2.2 Phenotype value for position from 9 to 17 – range from 0 to 2

S1	S2	S3	S4	S5	S6	S7	S8	S9

2.3 Phenotype value for position from 18 to 21 – range from 0 to 5

R	B	G	C

2.4 Phenotype value for position from 22 to 23 – range from 0 to max number of total elements

W	L

3.0 Parent is loaded into the game environment and evaluated

3.1 Repeat step 1.0 to 3.0 until the number of individual parent reach 3

4.0 Select the best individual parent to seed for next generations offspring

5.0 Generate offspring from parent

6.0 Offspring is loaded into the game environment and evaluated

6.1 Step 5.0 to 6.0 is repeated until the number of offspring reaches 3

7.0 Select the best offspring from the populations pool to be parent for next generations

Step 5.0 to 7.0 is repeated until the number of generations reached 20

Interactive Evolutionary Algorithm : IEA has two different evaluation methods which is reactive and proactive feedbacks. In reactive feedbacks algorithms, it requires human evaluator to give their feedbacks after the game or it can also allow the human evaluator to intervene the autonomously running algorithm [2]. Proactive feedbacks algorithm allows human evaluator to pause the algorithm at stagnation stage and alters the parameters in the algorithm before allowing it to continue with its process [2]. Reactive feedback has been chosen to be the IEA feedback method in this paper. Human evaluator has been given a score range of 0 to 7 where 0 represent the lowest score value and 7 represent the highest score value for the particular individual.

III. EXPERIMENT SETUP

The experiment has been conducted with the help from a human tester from a faculty. The tester has been brief with the information of how to play the game and how to assign a score for each game generated. Below is the procedure that he needs to go through to complete a full run of the game

[1] Start
[2] A game rules is loaded into the game environment
[3] Tester played with the game rules and assign score at the end of the game.
[4] Step 1.0 to 3.0 will be repeated 60 times since each generation has 3 individuals and the number of generations has been set to be at 20.

Nine different experiments will be conducted with different mutation rate. The first experiment is start off with a 10 percent mutation rate and the following experiment mutation rate will be increase to another 10 percent which mean experiment 2 will have 20 percent, experiment 3 with 30 percent and so forth. In addition, an individual chromosome was selected from each mutation rate. The criteria for the individual to be selected are:-

- It has to belongs to the user that has the highest average rating in the particular mutation rate
- It is the last highest score attain from the 20 generations

10 different players were asked to test on these selected individual.

EXPERIMENT RESULTS

Table 4 below is a summary of the results of the average score given by each human evaluator for each mutation rate.

Table 4: Average Score for Each Mutation Rate

Mutation Rate / User	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
1	2.17	2.28	1.75	2.07	2.28	1.95	2.75	2.67	1.85
2	1.97	1.97	2.00	1.92	1.67	2.00	2.93	1.85	1.77
3	2.65	1.73	1.92	1.98	1.95	1.92	1.75	2.22	2.22
4	2.18	2.08	2.05	2.07	2.13	**1.58**	2.53	1.77	1.85
5	2.13	2.32	2.23	1.70	1.83	1.80	1.80	1.77	**3.17**
6	1.88	2.05	1.95	1.95	2.25	1.90	1.92	2.13	2.08
7	1.98	2.18	2.15	1.98	1.85	1.83	2.33	2.00	2.35
8	1.77	2.05	2.07	2.07	1.93	2.00	2.12	2.17	2.07
9	1.95	1.62	2.35	2.07	1.85	1.70	2.18	1.88	1.62
10	2.17	1.95	2.15	2.10	2.03	1.67	1.78	2.18	2.53
Average	*2.09*	*2.00*	*2.06*	*1.99*	*1.98*	*1.83*	***2.21***	*2.06*	***2.15***

Table 5: Highest Score of Each Generation in Mutation Rate 0.9 for User No.5

Generations	Score
1	**5**
2	**5**
3	**5**
4	3
5	4
6	**5**
7	**5**
8	**5**
9	**5**
10	4
11	3
12	1
13	4
14	**5**
15	4
16	3
17	4
18	4
19	4
20	3

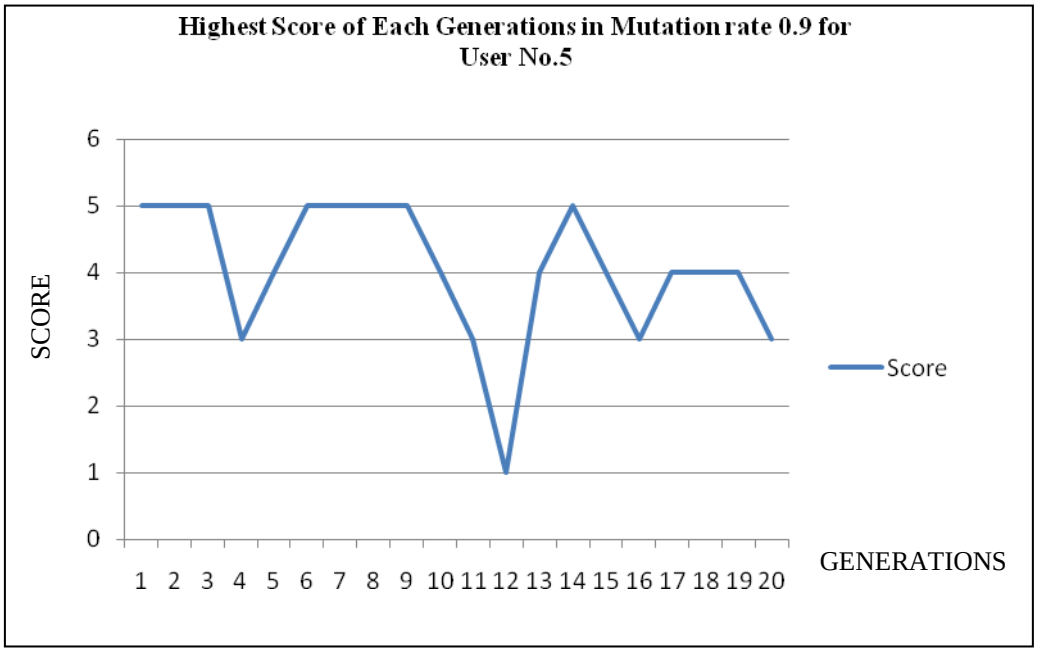

Figure 3: Graph for Highest Score of Each Generation in Mutation Rate 0.9 for User No.5

Table 6: Highest Score of Each Generation in Mutation Rate 0.7 for User No.2

Generations	Score
1	1
2	4
3	3
4	5
5	4
6	3
7	5
8	3
9	4
10	5
11	3
12	4
13	4
14	5
15	5
16	3
17	4
18	5
19	5
20	5

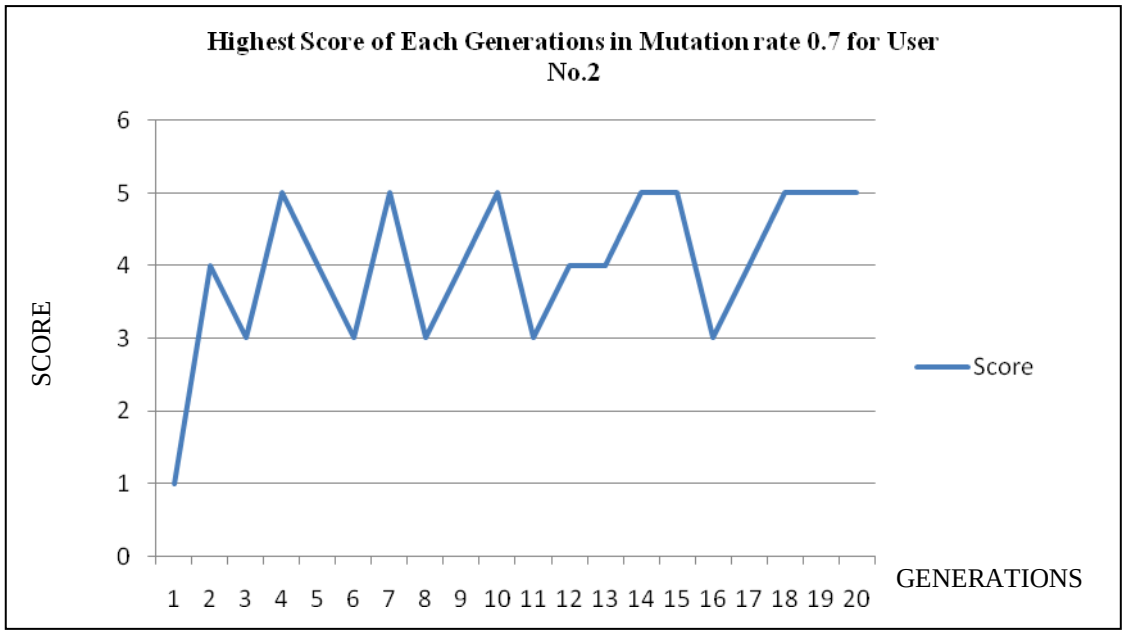

Figure 4: Graph for Highest Score of Each Generation in Mutation Rate 0.7 for User No.2

Table 7: Highest Score of Each Generations in Mutation Rate 0.6 for User No.4

Generations	Score
1	3
2	3
3	2
4	2
5	2
6	1
7	3
8	2
9	3
10	2
11	3
12	1
13	3
14	1
15	1
16	3
17	4
18	3
19	2
20	1

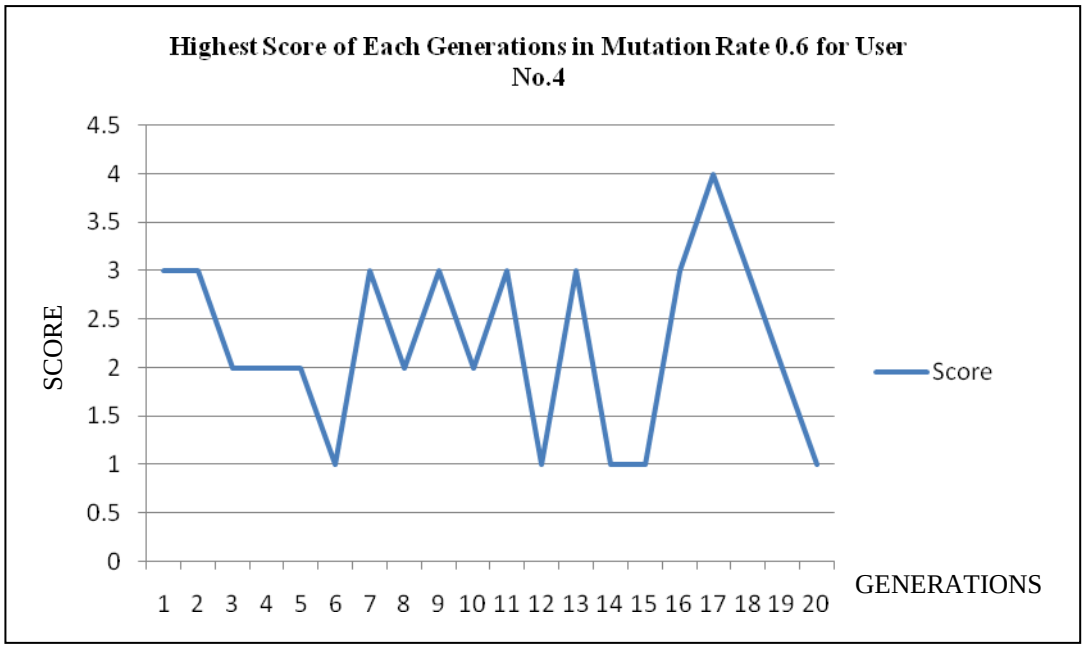

Figure 5: Graph for Highest Score of Each Generations in Mutation rate 0.6 for User No.4

Table 4 show the average results obtained where the highest average score obtained was 3.17 by user No.5 and is under the mutation rate of 0.9 while the lowest is 1.58 by user No.4 obtained from mutation rate of 0.6. Mutation rate of 0.9 has shown the best result compared to the other mutation rates. From Table 8, 9 out of 10 evaluators gave the highest score before the 10th generation and it reflects that by using mutation 0.9 the solutions can propel out of local optima and hence achieving a higher score from the evaluator. Table 5 and Figure 3 graph shows the highest score given by user No.5 in each generation for mutation rate 0.9. It is observed that 8 out of 20 generations have a high score of 5 and most of the other generations' score are at least 3 or more except for the 12th generation where the highest score in that generation is only 1. This reflects that most generation can generate good ruleset. Meanwhile Table 7 and Figure 5 graph shows the highest score in each generation for mutation rate 0.6 for user No.4. Most of the scores are below 3 hence this future supports that mutation rate 0.6 could not generate ruleset that reaches the user's satisfactory level.

Mutation rate 0.7 has the second best average score given by the 10 evaluators where 6 out of 10 average scores are over 2.00 and Table 9 shows in which generations the first highest score was attained. Sixty percent of the time the evaluators assigned the maximum score within the 10th generation. This proves that the individuals generated reached the evaluator's satisfactory level very quickly. Table 6 and Figure 4 graph shows highest score for each generation in mutation 0.7 given by user no.2. All except the first generation's score were more than 3 with a significant number of ruleset scoring the maximum of 5. Hence this further supports that the ruleset generated reached the user's satisfactory level.

Table 8: High Score Given by Each User in Mutation Rate 0.9

Evaluator	Highest Score	Generation
1	5	9th
2	4	6th
3	5	16th
4	5	2nd
5	5	1st
6	5	2nd
7	5	2nd
8	4	3rd
9	5	5th
10	5	1st

Table 9: High Score Given by Each User in Mutation Rate 0.7

Evaluator	Highest Score	Generation
1	5	2nd
2	5	3rd
3	5	2nd
4	5	3rd
5	5	18th
6	5	15th
7	5	4th
8	5	13th
9	5	1st
10	5	15th

Table 10: High Score Given by Each User in Mutation Rate 0.6

Evaluator	Highest Score	Generation
1	5	16th
2	5	10th
3	5	6th
4	4	16th
5	5	11th
6	5	6th
7	5	20th
8	4	2nd
9	5	14th
10	4	11th

Although in mutation rate 0.9 contains one of the highest average score, the total sum of all the scores attained for mutation rate 0.9 is only 1290 while for mutation rate 0.7 is 1326. The individual created by mutation rate 0.7 shows a higher and consistent score compared to mutation rate 0.9 based on this observation. Mutation rate 0.6 contains the lowest average score for this experiment and its total score is 1101 and Table 10 lists the highest score it receive from each evaluator. Table 10 very clearly shows that most of the evaluator only gives the first highest score at the very late stage of the generation.Throughout this experiment, it was found that the higher the mutation rate, the probability of generating a better result increases. In other words, the possibility of leaving locally-optimal solutions increases. By having three individuals in each population also helps to decrease the searching time for a good set of novel game rules and yet maintaining good individuals through each generation. Since the number of individual has increased significantly from the previous total of 20 individuals to 60 individuals, it has affected the human fatigue in this experiment. As the fatigue increased, it probably decreased the accurate judgment of the human evaluator. Hence, the overall lower averages obtained as compared to the preliminary experiment. Figures 6 to 32 below are some screenshots of each mutation rate experiment with a table summarizing each rule set generated.

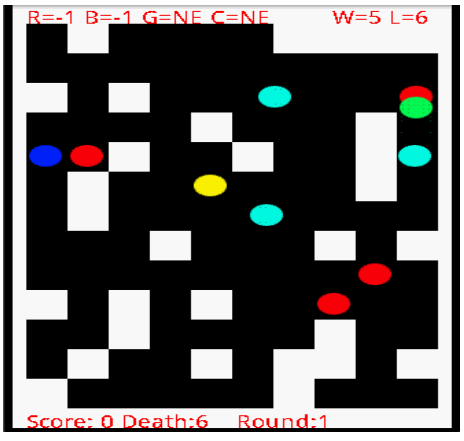

Figure 6: Screenshot for Mutation Rate 0.1

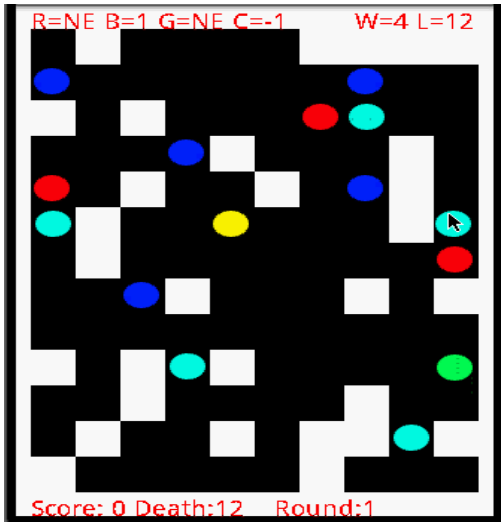

Figure 7: Screenshot for Mutation Rate 0.2

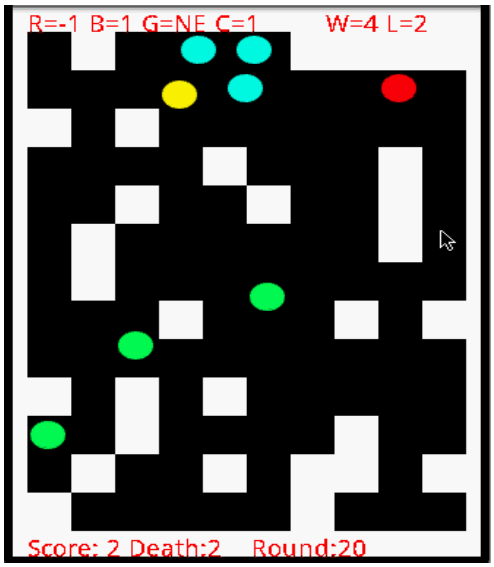

Figure 8: Screenshot for Mutation Rate 0.3

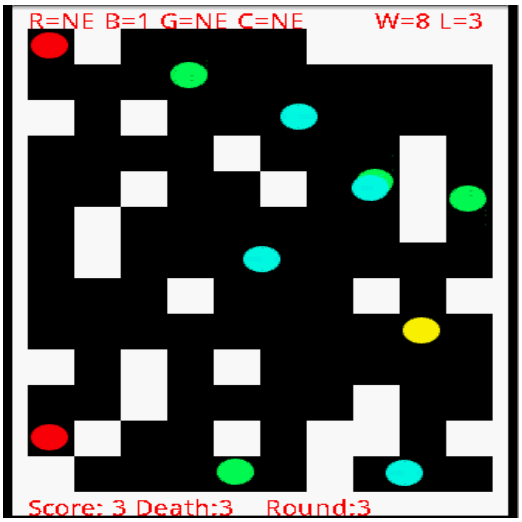

Figure 9: Screenshot for Mutation Rate 0.4

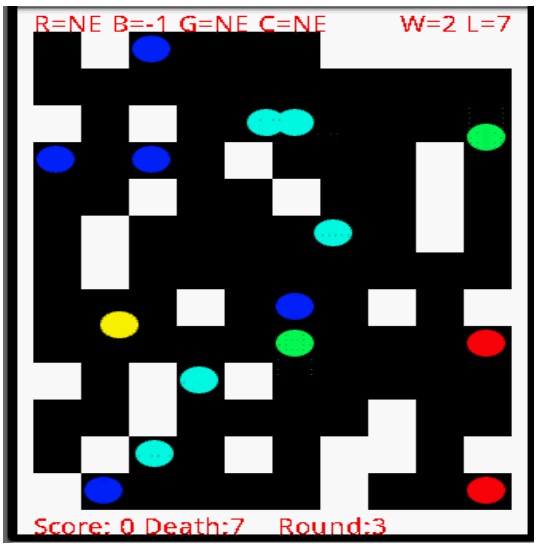

Figure 10: Screenshot for Mutation Rate 0.5

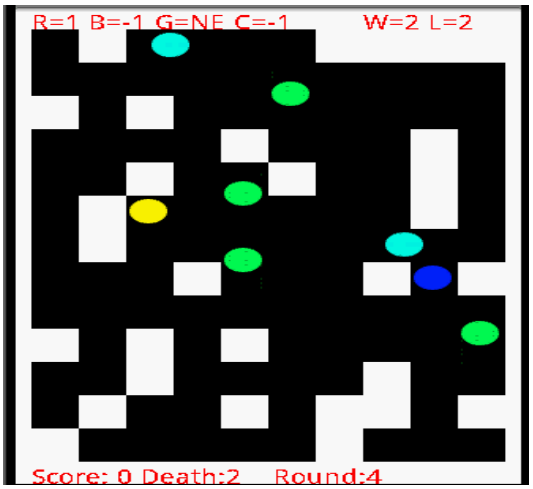

Figure 12: Screenshot for Mutation Rate 0.6

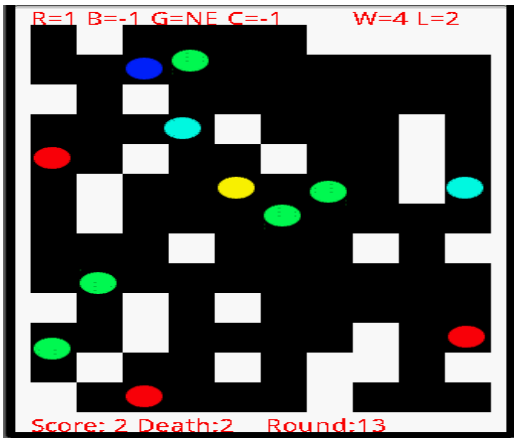

Figure 13: Screenshot for Mutation Rate 0.7

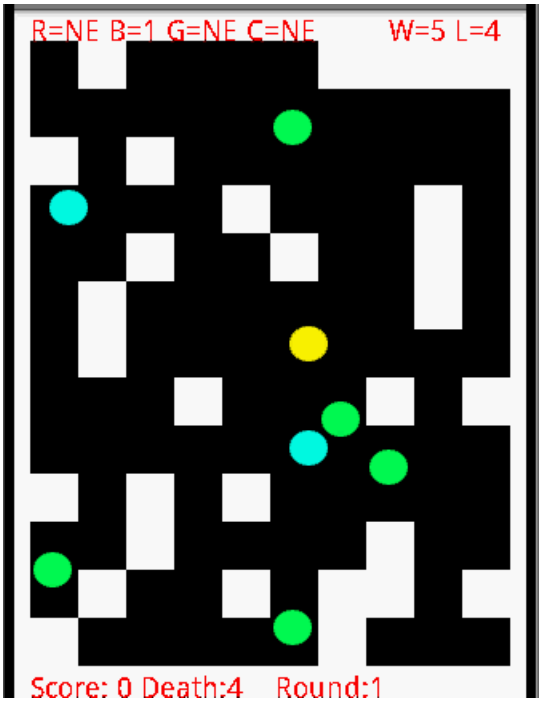

Figure 14: Screenshot for Mutation Rate 0.8

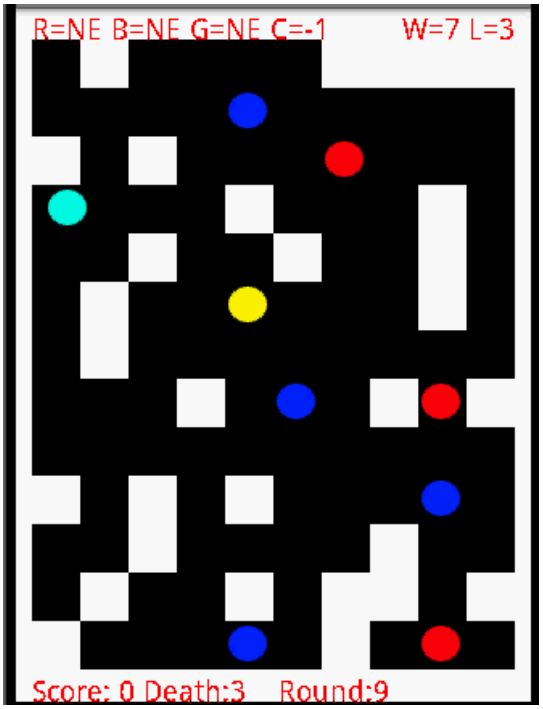

Figure 15: Screenshot for Mutation Rate 0.9

IV. CONCLUSION AND FUTURE WORK

Implementation of IEA in mobile games has been introduced in this paper. Searching for a suitable mutation rate in the main concern in this paper and from the results obtained, it shows that using a higher mutation rate will tend to result in better solutions. Since IEA involves a human evaluator and we have to keep this process running fast and timely, getting a suitable mutation rate will help to yield a faster and better convergence rate. Future work for this research is to extend the preliminary results to a larger pool of human evaluators to get a more statistically significant result. Another aspect that should be looked into for future work is searching for a better population size that is suitable with IEA and also the score rates.

V. ACKNOWLEDGEMENTS

This research is funded by the FRGS Research project FRGS0213-TK-2010 granted by the Ministry of Science, Technology and Innovation, Malaysia.

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American Journal of Engineering Research (AJER)
e-ISSN : 2320-0847 p-ISSN : 2320-0936
Volume-3, Issue-9, pp-87-90

www.ajer.org

Research Paper Open Access

Effect of Titanium Dioxide Treatment on the Properties of 100% Cotton Knitted Fabric

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ABSTRACT : *Titanium dioxide (TiO_2) is a white, water insoluble pigment. It is used in paints, plastics, foods, pharmaceuticals and cosmetics. Its main application on textile materials as an ultraviolet ray protecting agents. Titanium dioxide can reflect, scatter or absorb ultraviolet ray. Besides Titanium dioxide also modify the properties of fabrics. In previous research, titanium dioxide was applied mainly by padding mangle method. This paper presents an approach to observe the effect of titanium dioxide treatment 100% cotton knitted (plain jersey) fabric applied by exhaustion method followed by curing and washing. The treated fabrics were then analyzed by Scanning Electron Microscope (SEM) and the tensile strength, p^H value and absorbency of the treated and untreated fabrics were checked. It is found that titanium dioxide impairs the better hand feel and absorbency (wetting time) of all treated fabrics increased gradually than untreated fabrics. The treatment increases the strength and keeps the p^H of the fabric in acidic medium.*

KEYWORDS:*Bursting strength, Cotton fiber, Knitted fabric, Exhaustion method, Titanium dioxide (TiO_2)*

I. INTRODUCTION

The history of clothing is the history of civilization. By the development of science and technology, peoples begin to use cloth in the form of garments. The development of clothing was depended on the development of fiber, which is the only one raw material of making fabric. Natural fibers such as cotton, silk, wool etc. was the major natural sources for making cloth. Among different types of fibers, cotton receives the supreme places by considering different factors of various fibers. Today, cotton is the most used textile fiber in the world. At present, current market share of cotton fiber is 56 percent for all fibers used for garments and home furnishing. It is generally recognized that most consumers prefer cotton personal care items to those containing synthetic fibers. Today, the world's cotton fiber production is around 90 million bales per year. Cotton is a natural fiber that comes from the seed pod of the cotton plant and is used to make many fabric types. The fiber is hollow in the center and under the microscope, resembles a twisted ribbon [1]. Cotton can be knit or woven into cloth. A plain weave or jersey fabric is used to make a wide range of wearing apparel including blouses, shirts, T shirts, children's wear, swimwear, skirts, ladies hosiery etc.

Cotton fabric is popular because it's easy to care and comfortable year round. In hot, humid weather, cotton breathes. Cotton fibers can absorb up to 27 times its own weight in water [2]. As the body perspires, cotton fibers absorb the moisture and release it on the surface of the fabric, so it evaporates. In cold weather, if the fabric remains dry, the fibers retain body heat, especially napped fabrics. Another characteristic of cotton fiber is that it can be blended with synthetic fibers such as cotton/polyester, cotton/nylon, cotton/acrylic, cotton/wool blends etc. Cotton/polyester blend are the most common. By blending with polyester wrinkles and shrinkage problem of cotton fibers can be reduced. Functional finishes such as mildew, flame and stain resistance have added to cottons appeal. Another functional finish, anti-ultraviolet finish is also demanded properties on cotton fabric. Too much ultraviolet (UV) ray of sunlight is harmful to human being, especially for human skin. Exposing of UV ray causes sun burn, suntan, skin ageing, eye inflammation and cataract. Excessive exposures of ultraviolet ray damage the DNA of skin cell and results malignant skin cancers. So, to protect the

human skin from the excessive exposure of UV ray, anti UV ray finish is necessary on cotton fabric. Titanium dioxide (TiO_2) and zinc oxide (ZnO) is widely used as ultraviolet protecting agent [3-4]. Because both of these chemicals can effectively absorb, reflect and scatter the UV ray from the exposing sunlight. These particles not only rendering the UV protecting function on cotton fabrics but also affect their properties. Especially cotton fabrics absorbency, pH, hand feel and strength are important requirements for wet processing treatment and in normal uses. But the performance of titanium dioxide treatment on absorbency, pH and strength of 100% cotton fabrics are not yet studied in versatile range. The present investigation deals with the treatment of 100% cotton knitted fabric with titanium dioxide and followed by checking the properties of it. In this work normal plain jersey was used as a knitted fabric. A chemical can be applied on fabric by either exhaustion method or padding method. Already many research of titanium dioxide treatment have done by padding method. In this investigation, titanium dioxide was applied by exhaustion method by following a recipe to find out effectiveness of exhaustion method for penetration of titanium dioxide particles through fiber chain. After treatment, properties were checked to found the effect of titanium dioxide on cotton fabric. Properties mean surface investigation by Scanning Electron Microscopy (SEM), hand feel, strength and elongation at break, pH and absorbency of knitted fabrics were checked.

II. MATERIALS AND METHODS

2.1 Raw materials: In this experimental exertion, plain jersey fabric was used as knit fabric. The fabric was 140 GSM (Gram per Square Meter) and made from 100% cotton 30's yarn.

2.2 Chemical: The major chemical in this work is titanium dioxide (TiO_2, Merck Specialties Private Ltd, Mumbai). Besides this, wetting agent (Kieralon XC-J) sequestering agent (Lufibrol MSD) and distilled water are also used in this experiment.

2.3 Machines and Instruments: The following machines and instruments were used in this experimental work

a. High temperature high pressure (HT/HP) sample dyeing machine
b. Electrical oven
c. Hand dryer
d. James heal pneumatic bursting strength tester
e. Scanning electron microscope
f. p^H Universal indicator

2.4 Application of titanium dioxide: In exhaustion method, knitted fabrics were treated with three different quantities of titanium dioxide at 80°C for 20 min in the presence of wetting agent and sequestering agent in a HT/HP sample dyeing machine. The liquor ratio of exhaustion bath was 1:10. After 20 min of exhaustion, the titanium dioxide contained fabric was cured at 140°C for 10 min in an electrical oven. Finally treated fabrics were washed at 60°C for 20 min followed by drying. Three different quantities (0.5%, 1% and 2%) of titanium dioxide were used to treat the fabric. As a result, three fabric samples were obtained which was treated with different quantities of titanium dioxide.

2.5 Measurement of bursting strength: Bursting strength and Elongation at break of every knitted fabric samples were measured with James-Heal Pneumatic Bursting strength tester by following the method of ISO – 13938-2. Five readings were taken for each sample and the average was taken as the final value [5].

2.5 Surface investigation by Scanning Electron Microscope (SEM): The basic function of SEM is to produce an image of three dimensional appearance of any surface structure at micro meter to nanometer scale. In this experimental work, the surface analysis of titanium dioxide treated knitted fabric was done by InspectTM scanning electron microscope.

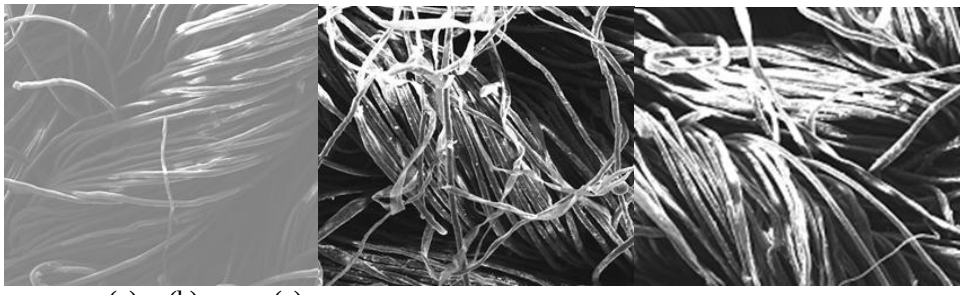
2.6 Measurement of absorbency: Absorbency is one of several factors that influence textile processing such as fabric preparation, dyeing and the application of finishes. In this thesis work, absorbency of the treated and untreated fabric samples was measured by the AATCC test method 79-2007. In the test method of AATCC 79-2007, a drop of water is allowed to fall from a fixed height onto the taut surface of the test specimen. The time required for the water drop to disappear is measured and recorded as wetting time. In this experimental work, the testing temperature was 22°C to 24°C. Five time readings were taken for each sample and the average was considered for the final wetting time of the tested specimen. The shorter the average time, the more absorbent the fabric [6].

2.7 Measurement of fabric p^H: p^H is a dominant factor to determine the use of a fabric material in daily life. Extreme acidity or basicity is not accepted. To make a quantitative determination of textile fabric p^H, the chemicals which influence p^H must be removed from the textile specimen, collected as water extract and then accurately measured by a p^H indicator. In this experimental work, p^H of the titanium dioxide treated and untreated fabrics were measured by AATCC test method 81-2006. In the test method of AATCC 81-2006, the textile specimen (10 gm) is boiled in distilled water. The water extract is cooled to room temperature and the p^H is determined by p^H Universal Indicator. In this experimental work, the testing temperature was 22°C to 24°C. Three readings were taken for each sample and the average was considered for the final p^H of the tested specimen [7].

III. RESULTS AND DISCUSSION

3.1 Observation of fabric appearance: After visual investigation the surface of the treated fabrics, it is obvious that the surface is rough and not smooth than the untreated fabric. Fabric surface becomes harsh and powdery in compared with original untreated fabric samples. The harshness and powdery affect are increased with the increases of amount of titanium dioxide.

3.2 Surface investigation by SEM: The SEM images of knit fabric treated with different concentration of $TiO_2$are given below



(a) (b) (c)

Fig. 1: SEM (Scanning Electron Microscope) image of untreated (a) treated with 0.5% TiO_2 (b) and treated with 1% TiO_2 (c) knit fabric.

Figure 1 shows the fiber surface topography of the knitted fabric samples after 500 times of magnification. By comparing the three images we can see that the untreated fiber surface (in figure, a) is smooth and delicate. But in treated fabric (in figure, b and c) it is thoroughly possible to recognize the TiO_2 particles on the surface of all samples. The TiO_2 particles are well dispersed on the fiber surface of the treated fabric and in some areas some aggregated TiO_2 particles are still visible. From the images of treated knit fabric (in figure, b and c), it is also observed that TiO_2 deposited on fiber surface in a consecutive way i.e. the amount of TiO_2 particles on fiber surface increases with the increasing of amount of TiO_2 in treatment time. The white and bright appearance of the treated fabric SEM images, proven the presence of white TiO_2 particles on the fabric surface.

3.3 Effect on burstingstrength: Comparative values of bursting strength are shown in figure 2 and elongations at breaking point are shows in figure 3. The data express that bursting strength of treated knitted fabric is more than the untreated fabric. Bursting strength increased rapidly in case of 0.5% and 1% treated fabric. In case of 2.0% treated fabric, bursting strength increased slightly than previous two. So it can be concluded that treatment of 100% cotton knitted fabric with TiO_2 will enhance the bursting strength of fabric. From the figure 3, it reveals that, elongation of the treated fabric at breaking point decreased gradually than the untreated fabric

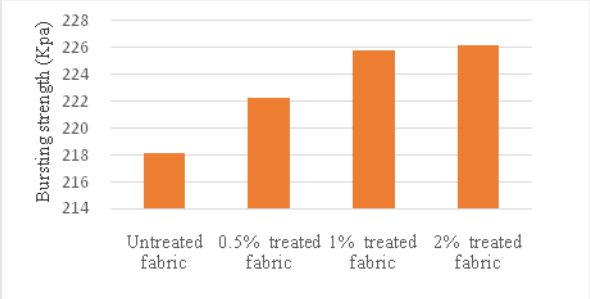


Fig. 2: Effect of TiO_2 on bursting strength of the treated anduntreated fabric samples

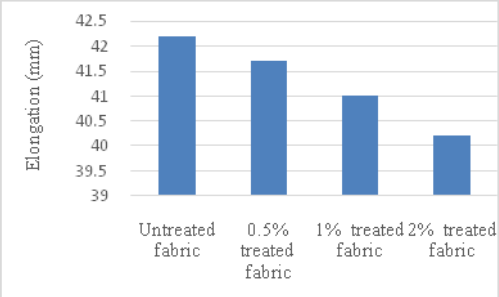


Fig. 3: Effect of TiO_2 on elongation of the treatedand untreated fabric samples

3.4 Observation of absorbency: The figure 4 represents the comparative study of wetting time of TiO_2 treated and untreated knit fabrics. The graph reveals that, titanium dioxide impaired the absorbency of knit fabric. Wetting time of all samples increases gradually with the increasing amount of TiO_2.

3.5 Observation of p^H of the fabric: From the figure 5, it is obvious that presence of titanium dioxide makes the fabrics slightly acidic. In the case of untreated fabric the p^H was 7 i.e. very much neutral. But treatment with TiO_2shifts the p^H to the slightly acidic condition and it reaches to the p^H value 6 in fabrics treated with 1.0% and 2.0% TiO_2.

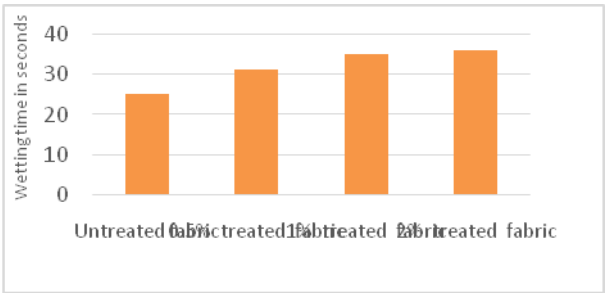


Fig. 4: Effect of TiO_2 on absorbency of the treated and untreated fabric samples

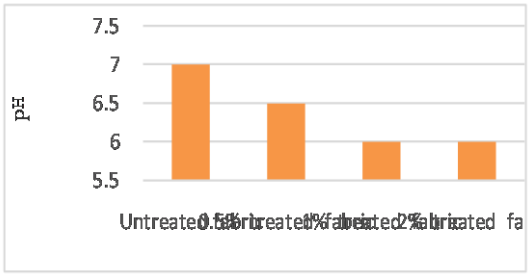


Fig. 5: Effect of TiO_2 on pH of the treated and untreated fabric samples

IV. CONCLUSION

By analyzing the test results, it is found that treated fabric surfaces become harsh and powdery due to the presence of titanium dioxide. Fabrics surfaces lose its smoothness in compared with untreated fabric. From scanning electron microscopy (SEM), it is obvious that titanium dioxide particles remain on treated fabric polymer chain. It clarifies that treatment by exhaustion method at 80°C capable of penetrating titanium dioxide particles through polymer chains of cotton fiber. Tensile strength (bursting strength) of fabric is increased while elongation at breaking point decreased. It is also observed that treatment with titanium dioxide impaired the absorbency of fabric and the p^H of the treated fabric is found in slightly acidic.

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American Journal of Engineering Research (AJER)
e-ISSN : 2320-0847 p-ISSN : 2320-0936
Volume-3, Issue-9, pp-91-96

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A Review On The Development And Application Of Methods For Estimating Head Loss Components In Water Distribution Pipework

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ABSTRACT: *The historical development of the common methods of estimating the frictional loss and the loss through pipe fittings in water distribution systems (respectively, the Hazen-Williams and D'Arcy-Weisbach equations) are briefly reviewed. Furthermore, the methods of applying these equations to index pipe runs are outlined.*

KEYWORDS: *Hazen-Williams, D'Arcy-Weisbach, Index Pipe Runs*

I. INTRODUCTION

The available pressure at any point in a fluid flow conduit is progressively reduced away from the pressure source (such as the elevated storage, or the pump, in a water distribution system) due to frictional losses through conduit fittings (such as elbows, tees and reducers) and valves. Thus, the determination of the required source pressure requires the calculation of the system loss components. This paper outlines the historical development and application of the common methods of estimating the head loss components in water distribution systems.

II. EQUATIONS FOR CALCULATING HEAD LOSS COMPONENTS AND THEIR HISTORICAL DEVELOPMENT

The equations for calculating the head loss components in water distribution systems, namely the friction loss and the loss through pipe fittings are discussed as follows:

Frictional Loss : The empirical Prony equation (Wikipedia, 2013b) was the most widely used equation in the 19th century. It is stated as

$$h_f = \frac{l}{d} \cdot (av + bv^2) \qquad ------(1)$$

where h_f = frictional loss
l = pipe length
d = pipe internal diameter
v = mean flow velocity
and a and b are empirical friction coefficients.

Later empirical developments brought about the D' Arcy – Weisbach equation (D'Arcy, 1857; Weisbach, 1845; Brown, 2000; Haktanir and Ardiclioglu, 2004) which is considered more accurate than several other methods of calculating the frictional head loss in steady flow by many engineers (Giles, 1977; Douglas et al, 1995; Walski,

2001). This equation is expressed as

$$h_f = \frac{4fl}{d} \cdot \frac{v^2}{2g} \quad ------(2)$$

where f = friction coefficient of the internal pipe wall

g = gravitational acceleration = 9.81m/s^2

The major effort in the application of Eqn. 2 is the determination of the pipe friction coefficient which is a function of the flow Reynolds number Re, this number being given as (Reynolds, 1883; Langan, 1988)

$$Re = \frac{\rho v d}{\mu} \quad ------(3)$$

where ρ = fluid density

μ = fluid dynamic viscosity

For Re $\leq$ 2000, which is the laminar flow regime, f is obtained from the Hagen – Poiseuille equation (Poiseuille, 1841; Klabunde, 2008; Wikipedia, 2013a) as

$$f = \frac{16}{Re} \quad ------(4)$$

For the determination of f in the turbulent flow regime 3000 $\leq$ Re $\leq$ 100000, Blasius in 1913 proposed through experiments the relation (Blasius, 1913; Kiijarvi, 2011)

$$f = 0.079\ Re^{-0.25} \quad ------(5)$$

Nikuradse later in 1933 showed by experiments the dependence of f on ϵ the average size of the pipe internal surface imperfections, through the relation (Nikuradse, 1933; Yang and Joseph, 2009)

$$f = \phi\left(Re, \frac{\epsilon}{d}\right) \quad ------(6)$$

where ϕ represents a function.

For all pipes, many engineers consider the Colebrook-White equation (Colebrook and White, 1937; Keady, 1998; Schroeder, 2001; Douglas et al, 1995) more reliable in evaluating f. The equation is

$$\frac{1}{\sqrt{f}} = -4log_{10}\left\{\frac{\epsilon}{3.7d} + \frac{1.26}{Re\sqrt{f}}\right\} \quad ------(7)$$

Equation 7 is difficult to solve as f appears on both sides of the equation. Typically, it is solved by iterating through assumed values of f until both sided become equal. The hydraulic analysis of pipelines and water distribution systems, using the equation, often involves the implementation of a tedious and time-consuming iterative procedure that requires the extensive use of computers. Empirical head loss equations have a long and honorable history of use in pipeline problems. The use of such empirical equations preceded by decades the development of the Moody diagram (Moody, 1944) which gives the relation between f, Re and relative roughness $\frac{\epsilon}{d}$. Another of such developments are the Hunter Curves due to Hunter Rouse, 1943. The Moody diagram and old empirical equations are still commonly used today.

An alternative method of calculating the frictional head loss to the D' Arcy – Weisbach equation is the Hazen-Williams formula (Hazen and Williams, 1920), expressed in terms of readily measurable variables as (Sodiki, 2002)

$$h_f = \frac{10.62l}{C^{1.85}} d^{-4.867} q^{1.85} \quad ------(8)$$

where c = Hazen – Williams Coefficient of relative roughness of the pipe material

q = mean flow rate (m^3/s)

The Hazen – Williams Coefficient C of Eqn. 8 subsumes the friction factor f of Eqn. 2. Also, the flow rate q subsumes the velocity v of Eqn. 2 as

$$v = \frac{4q}{\pi d^2} \quad ------(9)$$

For the circular pipe section, values of C for common pipe materials (obtained empirically) are listed in Table 1 (Giles, 1977). It had been noted that C-values obtained from different sources have some differences due to the differing experimental conditions (Keller and Bliesner, 1990).

Applying Eqn. 8, with a particular choice of pipe material, the frictional head loss per metre run of pipe can be calculated from the diameter d and the flow rate q. For instance, for a plastic pipe material (C =140), the loss per metre run is given by Eqn. 8 as

$$\frac{h_f}{l} = 1.1374\ x10^{-3} d^{-4.867} q^{1.85} \quad ------(10)$$

The use of the Hazen-Williams formula avoids the use of Eqn. 7 and as pointed out by Larock et al, 2000, many engineers prefer to use it due to the difficulties of determining f. Also, Usman et al, 1998 had noted: "it is easier to apply the Hazen-William formula than to obtain f from the Colebrook-White equation and then utilizing f in the D'Arcy -Weisbach equation to obtain the frictional loss". The Hazen-Williams formula is also accurate over a wide range of Reynolds numbers.

Graphical presentations of the form of Eqn. 10 (the so-called 'Pipe Sizing Graphs') (Institute of Plumbing, 1977; Barry, 1984; Mueller, 1987; Fluid Handing Inc, 2008; Construction Knowledge, 2010) are more commonly used in engineering practice than the foregoing equations. In particular, pipe sizes are easily selected with knowledge of the flow rate q and a permissible maximum head loss per metre pipe run, h_f /*l*. One of such graphs is shown in Fig. 1 (Institute of Plumbing, 1977). Also, nomograms which represent Eqn. 10 (www.heatweb.com, 2010) are sometimes used for pipe sizing.

Furthermore, can (2005) derived model equations for calculating friction head losses in some commercial pipe materials by first creating a dimensional grid of 25 pipe diameters (selected in equal increments in the interval of 0.1m to 1.2m) and 25 flow velocities (selected in equal increments in the interval of 0.5 m/s to 3.1 m/s), and then obtaining f values using the Colebrook-White equation for each pipe material in an iterative process. The f values, so obtained, were then applied in the D'Arcy – Weisbach equation to obtain a set of head loss values. These values were used to develop a model equation for each pipe material in the form

$$h_f = \frac{alq^b}{d^c} \quad ------(11)$$

where a, b and c are model parameters, values of which were obtained using multivariable regression analysis.

2.2 Head Loss through Pipe Fittings

The loss through fittings h_p is usually expressed in terms of a loss coefficient k of the fitting as (Roberson and Crowe, 1975; Giles, 1977)

$$h_p = k \cdot \frac{v^2}{2g} \quad ------(12)$$

Substituting for v from Eqn. 9 and writing $9.81 m/s^2$ for g yields

$$h_p = 0.08256k\, d^{-4} q^2 \quad ------(13)$$

Values of k (which are empirically determined) are usually listed in tabular form such as Table 2 (Giles, 1977). Graphical presentations are also common (Hydraulic Institute, 1990; Heald, 2002). Furthermore, several correlations had been done to obtain equations useful in predicting losses in pipe fittings (Hooper, 1981; Crane Co., 1991; Darby, 1999; Rahimi, 2011; Yurdem et al, 2008).

It has been observed that k -values obtained from different sources have some differences due to the differing empirical conditions (Ding et al, 2005; Muklis, 2011). Furthermore, experiments performed at the Department of Mechanical Engineering of Indian Institute of Technology, Bombay had shown variations of k with the flow Reynolds number, Re (www.mc.iitb.ac.in, 2013). Variations of k with size of fitting had also been observed (Rahimi, 2011). Thus, the k-value for a particular fitting is not universally constant. It is, however, useful for arriving at a reasonable estimate of the head loss through the pipe fitting.

In consideration of the uncertainties in loss calculations resulting from uncertainties in k -values and the Hazen-Williams C- values, Keller and Bliesner, 1990 recommend a 20% addition to the total head loss in water distribution systems, as a safety margin.

An alternative method of estimating head loss through fittings uses the concept of 'equivalent length l_e' of pipe which would result in the same frictional loss as the loss through the fitting (Muklis, 2011; www.engineeringtoolbox.com, 2012; Schulte, 2010). By this concept, the appropriate form of Eqn. 2 is equated

to Eqn. 12:

$$h_p = \frac{4f l_e}{d} \cdot \frac{v^2}{2g} = k\frac{v^2}{2g}$$

and $$l_e = \frac{k}{4f} \cdot d \qquad ------(14)$$

The equivalent length l_e of the fitting is, thus, expressed as a number of pipe diameters to be added to the actual pipe length in Eqn. 2 to account for the loss in the fitting. Hence, the total loss (frictional and through the fitting) in a given pipe section is

$$h = h_f + h_p = \frac{4f\ (l+l_e)}{d}\frac{v^2}{2g} \qquad ------(15)$$

Values of l_e for common types of fitting are as listed in Table 3 (Barry, 1984).

2.3 Application of the Head Loss Equations to Index Pipe Runs

As the foregoing equations apply to each pipe section along an index pipe run having several branches, the additive forms of the head loss equations, namely Eqns. 2, 8, 10, 11, 12, 13 and 15 should be applied along the index run. Eqns. 8 and 13 would, for instance, then take the respective forms

$$h_f = \frac{10.62}{C^{1.85}} \sum_{j=1}^{n} l_j d_j^{-4.867} q_j^{1.85} \qquad ------(16)$$

and $$h_p = 0.08256 \sum_{j=1}^{n} d_j^{-4} q_j^{2} \left(\sum_{i=1}^{m} K_{ij}\right) \qquad ------(17)$$

where j denotes the j^{th} pipe section, n is the number of pipe sections in the index pipe run, i denotes the i^{th} fittings in a given pipe section and m is the number of fittings in the section.

III. CONCLUDING REMARKS

The paper outlined the development of the Hazen-Williams and D'Arcy-Weisbach equations which are applicable in the analysis of frictional loss and the loss through pipe fittings in water distribution systems. Their application in the analysis of index pipe runs has also been discussed.

Table 1: Some Values of Hazen-Williams Coefficient C

Types of Pipe	C
Smooth pipes	140
New cast iron pipe	130
Average cast iron, new riveted steel pipes	110
Vitrified sewer pipes	110
Cast iron pipes, some years in service	100
Cast iron pipes, in bad condition	80

Table 2: Typical *K* values through common fittings

Pipe fitting	K
45° bend	0.35 to 0.45
90° bend	0.50 to 0.75
Tees	1.50 to 2.00
Gate valve	about 0.25
Non-return valve	about 3.0

Table 3: Equivalent lengths of pipe fittings

Pipe fittings	Equivalent length of pipe in pipe diameters
90 elbows	30
Tees	40
Gate valves	20
Globe valves and taps	300

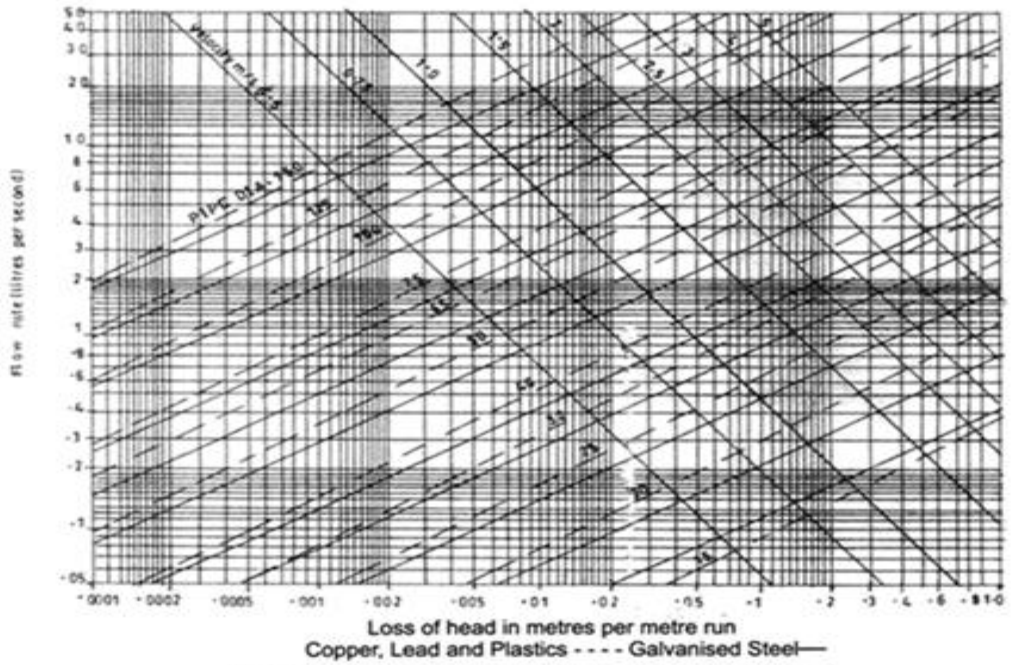

Fig. 1. Pipe Sizing Graph (Institute of Plumbing, 1977)

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American Journal of Engineering Research (AJER)
e-ISSN : 2320-0847 p-ISSN : 2320-0936
Volume-3, Issue-9, pp-97-109
www.ajer.org
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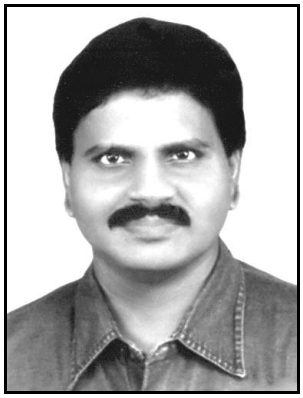
THE "J-CLOCK"!... (A New theory on "Cosmo clock")



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ABSTRACT: It is focused that global level offices and parliaments are having their own clock in their office for time keeping culture. Different clocks show different time. Sometime clocks are not at all working due to exhaust of "**Battery Energy**". If so… **which clock shows correct time?... which clock is so accurate and precise?...**Scientists believe that the "**AGE**" of origin of Universe itself could be precisely estimated through "**ATOMIC CLOCK**", and "**CARBON DATING**". As such based on **Big Bang theory** the origin of universe was so precisely estimated as "**13.7 billion years**" even to the accuracy level of **decimal digit**.

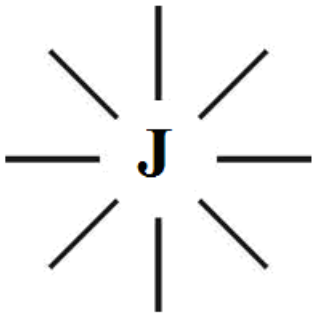
It is focused that before commencement of any event "**CLOCK**" is required and to be switched on for measuring the total time of event occurred.

Is there any inbuilt clock mechanism during origin of early universe?...

[1] Can "**Atomic clock**" precisely measure and predict the age of origin of **Dark matters**?... (Ionic behaviour)
[2] Can "**Atomic clock**" precisely measure and predict the age of origin of **Nuclear matters**?... (particle behaviour)
[3] Can "**Atomic clock**" precisely measure and predict the age of origin of **Biological matters**?... (pulse behaviour)
[4] Can "**Atomic clock**" preciously measures and predict the age of origin of **Atomic matters**?... (field and wave behaviour)

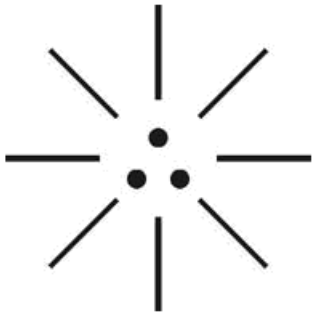
This scientific research focus that "**cosmo clock**" shall be considered as the universal precise clock and "**J-clock**" shall be considered as the clock exactly measure the absolute age of origin of all non-biological matters and biological matters of "**early universe**". The philosophy of "**clock**" and "**clock elements**" shall be represented as below.

(i)



(ABSOLUTE STABLE CLOCK)

(ii)



(FUNDAMENTAL CLOCK ELEMENTS)

The clock shall be considered as having inbuilt **oscillatory circuit** (vibration) and the clock elements shall be considered as having '**three-in-one**' in built parameters for precise measurement of '**TIME**' and '**SPACE**' since **dark age**.

[1] Right dot shall mean **minutes** measurement
[2] Left dot shall mean **seconds** measurement
[3] Centre dot shall mean **hours** measurement

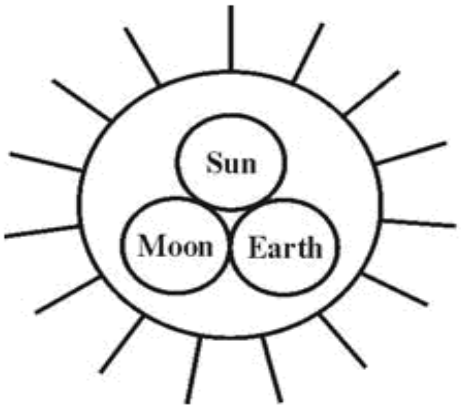
*"The philosophy of atomic clock, conventional quartz clock, biological clock, master clock, water clock, pendulum clock, digital clock, blue clock, 12 hour clock, 24 hour clock, o'clock, optical clock, International atomic time, Greenwich mean time, coordinated universal time, atomic beam standard, fountain standard, Ion trap standard, NIST-F1, NIST-F2 standard might be generically derived from the philosophy of "**J-CLOCK**" and "**COSMO CLOCK**".*

- Author

KEY WORDS:
a) Philosophy of word "**clock**"?..
b) Philosophy of word "**Age**"?
c) Philosophy of **Dark age**?...
d) Philosophy of **Nuclear age**?
e) Philosophy of **Biological age**?
f) Philosophy of **Plasma age**?
g) Philosophy of **Atomic age**?
h) Philosophy of **Evolution age**?

I. INTRODUCTION:

Scientists focus that **SUN, EARTH, MOON** are considered as part of planetary bodies in the solar system. **Do sun, earth, moon constitute part of solar system? No… No … No…** It is focused that sun, earth, moon shall be considered as the '**three-in-one**' '**PRESET CLOCK ELEMENTS**' for precise measurement of growth of ions, anti particles, god particles, biological matters, atomic matters for measurement of '**time**' and '**space**' since origin of universe. **What is the source of energy for running the clock?...** It is speculated that the immense of '**DARK ENERGY**' of universe available shall be considered as the source of energy for running the clock elements till the end of '**universe cycle**'. The philosophy of '**cosmo clock**' (Three-in-one parameter) shall be indicated as below:



(COSMO CLOCK)

[1] Right dot is "**Moon**" (Just like minute needle)
[2] Left dot is "**Earth**" (Just like second needle)
[3] Center dot is "**Sun**" (Just like hour needle)

"The expanding universe shall mean relative position of Sun, Earth, moon rotating on its axis and relative angular displacement of motion on its axis in different ages say dark age, nuclear age, biological age, plasma age, atomic age"

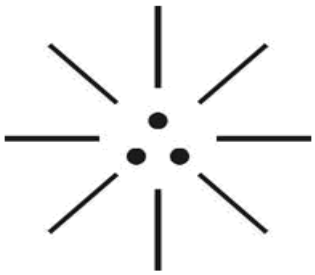
- Author

II. HYPOTHESIS AND NARRATION

a) Philosophy of "Age"?...

It is focused that the English word '**age**' refers to indicate the period of origin of various events (or) incidence. It is hypothesized that word "**age**" shall be considered as closely associated with cosmic **origin and evolution** and shall be meant as **three-in-one** cosmo clock elements **sun, earth, moon**.

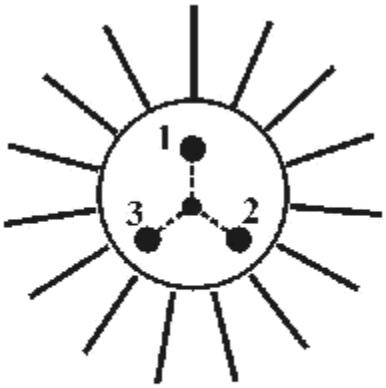
It is hypothesized that during origin of universe the sun, earth, moon shall considered as having at the **set scale** of '**imaginary position**' (say below zero level scale). At one stage when "**DARK RADIATION**" begins the clock elements sun, earth, moon start moving on its axis and recording the origin and growth of **billions of dark ions**, **dark particles** (say anti-photons, anti-electrons, anti-protons)



(AGE)

[1] Right dot is like "**A**" (Anti – proton)
[2] Left dot is like "**G**" (Anti-Electron)
[3] Centre dot is like "**E**" (Anti-photon)

The philosophy word "**Age**" might be derived from the philosophy of proto Indo Europe language word "**AKKI-e**". Akki-e shall mean "**Dark Flame**".

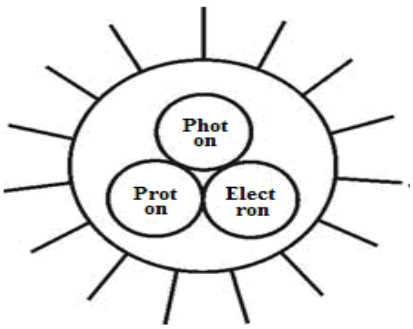


1. Dark Genome
2. Dark Energy
3. Dark Matter

(DARK FLAME)

Philosophy of word 'CLOCK'?... It is hypothesized that the philosophy of '**Clock**' shall be considered closely associated with '**White hole**' and origin of "**J-Radiation**" (also called as zero hour radiation). The "**Clock Age**" (or) "**Biological Age**" shall be considered as the relative position of sun, earth, moon on its axis during origin of various "**Biological matters**" (also called as Virgin white matters (or) **e-matters**)

It is speculated that **Billions of organisms** shall be considered as originated **spontaneously** on single occasion due to impact of **J-Radiation** just like spontaneous origin of "**Billions of mushrooms**" due to impact of **Lightning**. It is hypothesized that Billions of rays emitted from "**J-Beam**" (white hole) consider consists of **three-in-one** fundamental ions of photon, electron, proton. Further each ray shall be considered distinguished evolved in micro level of "**time duration**" having distinguished '**mass**', definite **charge properties**, and varied **electric, magnetic, optic properties**. The philosophy of "**J-clock**" and biological matters properties shall be described as below:

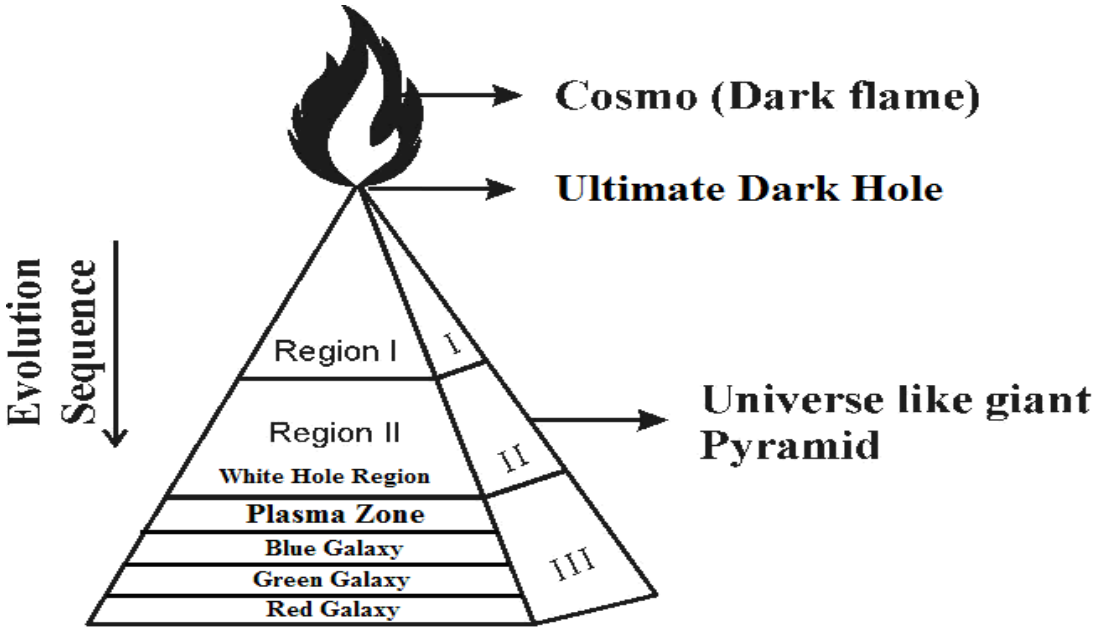


J-CLOCK
(e-Matters)

Further the clock position of sun, earth, moon shall be consistently changed in every **micro micro seconds** measuring the state of micro micro evolution of each organism and become white, black, blue, green, red colour state of sun, earth, moon in various ages of **cosmic evolution** as stipulated below. As such every age shall be considered as the state of distinguished '**clock age**' as described below:

Sl.No.	Cosmic age	Clock age	Clock Reference
1.	Dark age	Dark clock	Dark sun, Dark Earth, Dark Moon
2.	Nuclear age	J-Clock (White Clock)	White sun White Earth White moon
3.	Plasma age	Black clock	Black sun Black earth Black moon
4.	Atomic age	Brown clock	Brown sun Brown Earth Brown Moon
5.	Gamm-age (UV) (1st generation evolution)	Blue clock	Blue sun Blue Earth Blue Moon
6.	Beta age (RF) (2nd generation evolution)	Green clock	Green sun Green Earth Green Moon
7.	Alpha age (IR) (3rd generation evolution)	Red clock	Red sun Red Earth Red Moon

It is further focused that the whole cosmo Universe shall be considered as having definite structure just like "**TRIPOD HOUSE**" having inbuilt THREE-IN-ONE clock elements **SUN, EARTH, MOON** on the base of Universe as stipulated below. Various matters of the Universe evolved in different ages shall be considered as distinguished pressure, temperature, density environment and equilibrium condition. The different region of material Universe shall be considered as different galaxies say white galaxy, plasma galaxy, blue galaxy, green galaxy, red galaxy.



(Model Universe With inbuilt Clock Element)

[1] Region-I – Perfect Vacuum Region (Anti-particles region)
[2] Region-II – Partial Vacuum Region (Particles & white hole region)
[3] Region-III – Observable Vacuum Region (EMR, Einstein region)

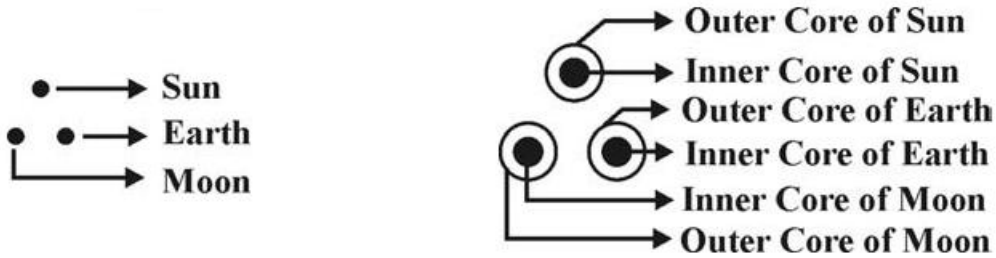
Philosophy of J-clock?...

It is hypothesized that the philosophy J-clock age environment shall be considered as **highly stable** exist under endothermic environment even before millions of years before evolution of '**atomic matters**'.

[1] '**J-clock**' shall mean '**Absolutely stable clock**'
[2] '**J-clock**' shall mean exist under **zero gravity**
[3] '**J-clock**' shall mean free from **Atomic matters**
[4] '**J-clock**' shall mean free from impact of **pressure, temperature, viscosity**
[5] '**J-clock**' shall mean "**perfect biological clock of universe**"

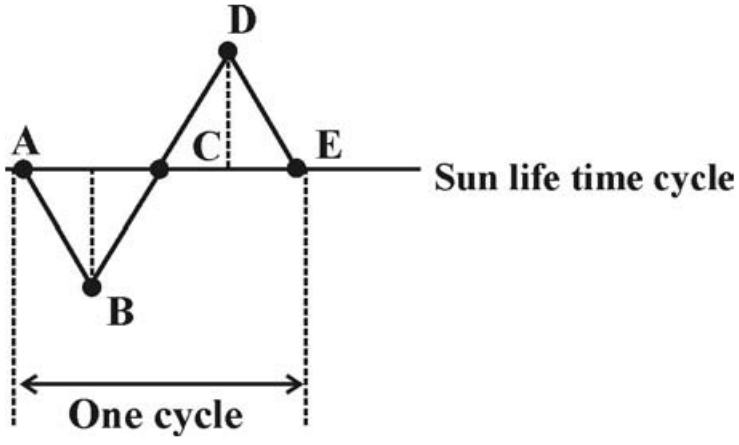
b) Philosophy of Expanding Universe?...

It is hypothesized that the philosophy of expanding Universe shall mean relative position of sun, earth, moon in various ages of cosmic evolution. Various stages of evolution shall be considered as **various stages of clock** say dark age, nuclear age, plasma age, atomic age, gamma age, beta age, alpha age. The philosophy of "**Clock evolution**" shall be narrated as below. It is speculated that during **dark age** the **SUN, EARTH, MOON** might have rotated in **anticlockwise direction** and during nuclear age (**J-Clock age**) the SUN, EARTH, MOON might have started rotating in **clockwise direction** thereafter due to growth of **downward gravity**.



c) Philosophy of Life cycle of Sun?...

It is hypothesized that the Sun shall be considered as rotating on its axis and having one revolution in the entire cosmic life period. As such it is focused that every micro second the relative position of Sun with respect to Moon and Earth and making micro micro level cosmic evolution on biological, non-biological matters of Universe. The Philosophy of Sun life time cycle is described as below.

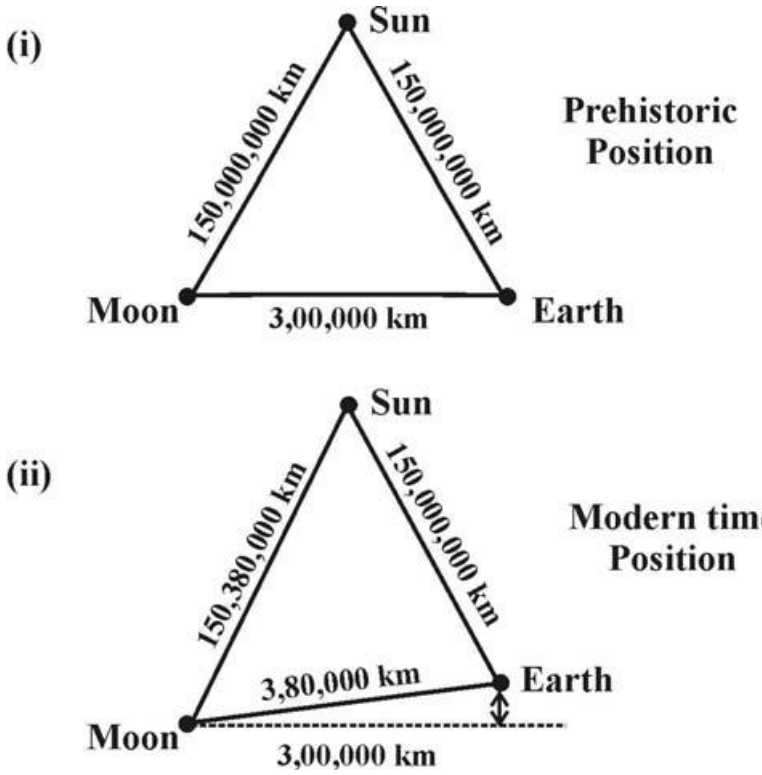


Below reference line it shall be considered as "**negative gravity**" and above reference line it shall be considered as "**positive gravity**".

[1] Phase **AB** – **Dark age** (origin of anti neutrino particles)
[2] Phase **BC** – **Nuclear age** (origin of neutrino particles and J- Radiation)
[3] Phase **CD** – **Plasma age** (transformation)
[4] Phase **DE** – **Atomic age** (Evolution phase)

d) Philosophy of relative position of SUN, EARTH, MOON?...

It is hypothesized that in the early Universe the THREE-IN-ONE clock element SUN, EARTH, MOON shall be considered as **perfectly aligned.** During space and time the alignment becomes variant consistently in three evolutionary period as described below.



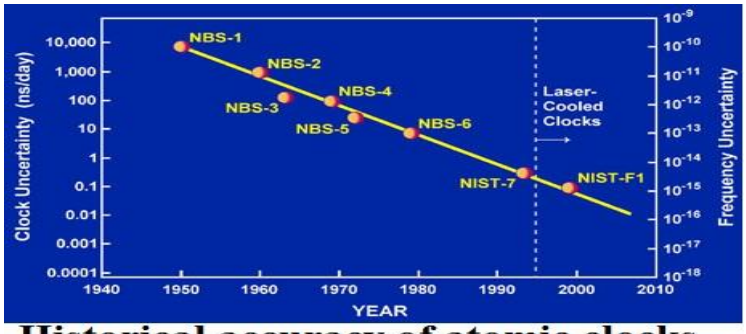
> At the time of the dinosaurs, earth completed one rotation about 23 hours says Macmillan, who is a member of the VLB1 team at **NASA** Goddard. In the year 1820, a rotation looks exactly 24 hours or 86,400 standard seconds. Since day has increased by about 2.5 milliseconds.
>
> **- Case Study**

Case studies:

a) Case study on atomic clock?...

Case study shows that the philosophy of use of clock considered originated about **6000 years ago** in Ancient Mesopotamian culture, Egyptian culture based on movement of sun, moon, with day time, night time reference.

Now scientists focus that the latest version of Atomic clocks (cesium standard) NIST-F1, NIST-F2 for standard as International atomic time (TAI) and coordinated universal time (UTC). The latest accuracy level of atomic clocks shifted from "**9192631770**" seconds to the second level of $\mathbf{10^{-19}}$



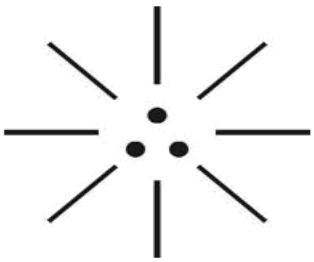
Historical accuracy of atomic clocks from NIST

Can atomic clock work in the range of **zero gravity** environment range? **No… No… No…** It is hypothesized that the Atomic clock is limited to the range of **microwave range** and shall not function at '**Zero gravity**" region (J-Radiation region).

It is hypothesized that "**J-CLOCK**" shall consider function at Zero gravity environment and free from the impact of external pressure, external temperature, external viscosity or density.

b) Case study on Human heart beat pulse?...

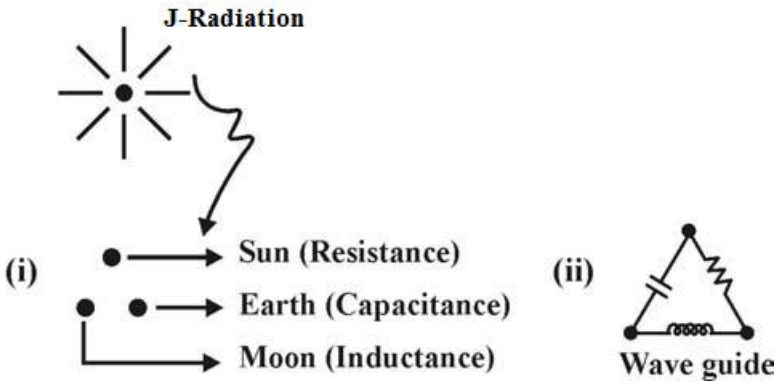
It is focused that the so called modern human (**3rd Generation**) considered having **standard heart pulse** rate of 90 pulse per minute. In the early Universe the standard pulse rate might be very low, say **60 pulse per minute** and during the course of expanding Universe the pulse rate might be **consistently increased** in different ages which might lead to genetic variation in heart structure. Case study shows that **Schumann resonance** focus that the natural oscillation of Earth consistently varies from 7.83Hz to 13Hz which may be due to impact of relative position of **SUN, EARTH, MOON**. It is focused that there is no scientific evidence that when the first heart beat of human originated?... but the human heart pulse might be originated during origin of first human population during **J-Clock age** (i.e. during pulse behaviour of matters in the early Universe near white hole region). It is focused that in the atomic clock **second** is defined with base of **9192631770** frequency of oscillations. But during origin of human life in the early Universe the oscillation rate of human pulse rate shall be taken as only **1.0Hz** (say 60 pulse per minute) which shall be considered as super state of accuracy when compare to atomic clock reference. Further the frequency observed in atomic clock shall be considered as pertains to the **atomic age** which shall be considered as the far below the phase of nuclear age in the Universe evolution.



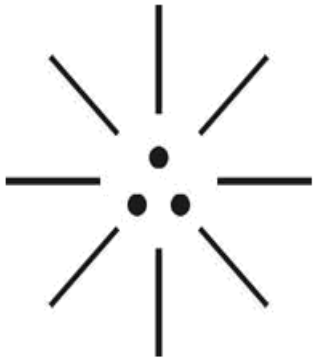
(Human Soul)

c) Case study on mathematical constants?...

It is focused that the mathematical constants **i, e, π** shall be considered as closely associated with **COSMO CLOCK, J-CLOCK** and these constants shall be described as below (i.e. i shall be associated with Sun, e shall be associated with Earth, π shall be associated with Moon characteristics).



In the early Universe the origin of J-Radiation near white hole shall be considered as due to impact of resonance called as "**TAMIL RESONANCE**". It is further focused that the observation of Schumann resonance shall be closely associated with **TAMIL RESONANCE.**



TAMIL RESONANCE
(Ammuuuooo...)

d) Case study on Biological clock?...

[1] Animals have biological clock?...
[2] Plants have Biological clock?....
[3] Microbes have Biological clock?....

Case study shows that "**CLOCK**" (Circadian Locometer output cycles kaput) is a '**gene**' encoding basic helix-loop- helix PAS transcription factors that affects both persistence and period of circadian rhythms. Researchers recently made some major progress in understanding the neural mechanisms of "**circadian clock**" resetting. Adjustments in circadian rhythms are necessary forms of behavioural adoption to a change in the environment. It is hypothesized that "**J-clock**" shall be considered as the mother of "**Circadian clock**".

(i)

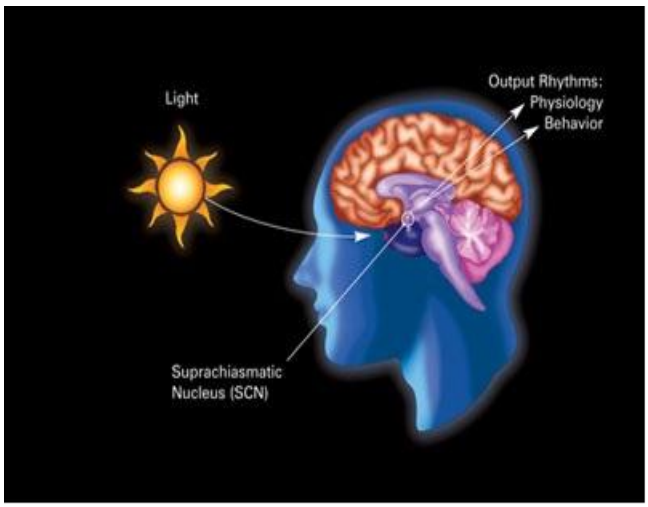
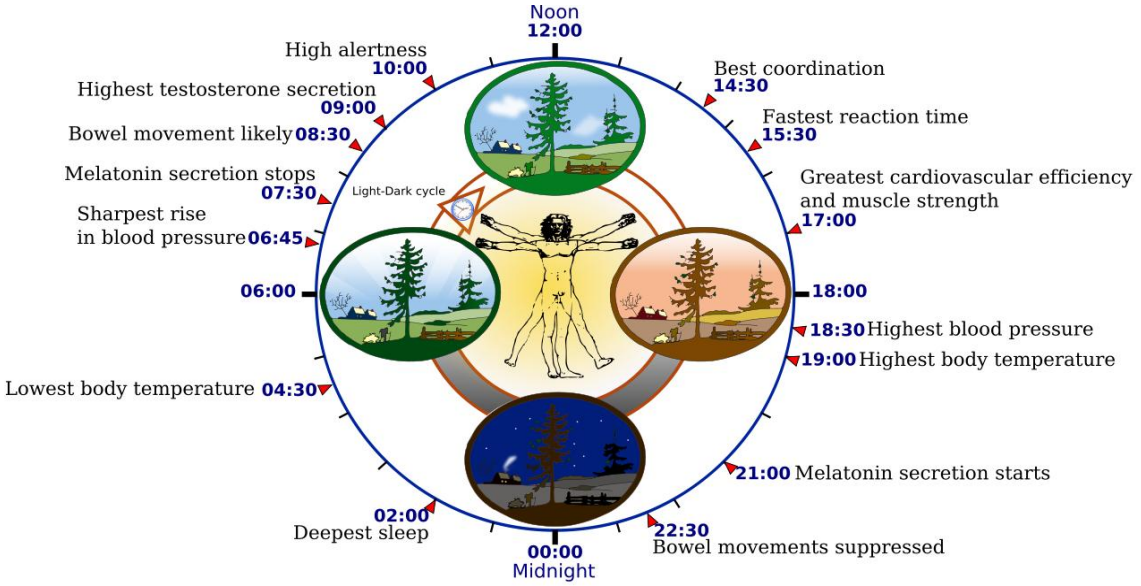


Diagram illustrating the influence of light and darkness on circadian rhythms and related physiology and behaviour through the suprachiasmatic nucleus in humans.

(ii)



Some features of the human circadian (24-hour) biological clock

e) Case study on O'clock?...

It is focused that normally when talk about time say **3 O'clock, 4 O'clock** what it means?... **What "0" stands for?...** Some experts believe that '0' mean for the abbreviation of 'of the'.

It is hypothesized that '0' shall mean '**Zero Hour**' when "**J-radiation**' originated near '**white hole**' region of Universe.

III. CONCLUSION:

It is focused that "**J-CLOCK**" shall alternatively mean "**SOUL OF UNIVERSE**". Further **CLOCK** is like the soul of **watch and timepiece**.

Previous Publication: The philosophy of origin of first life and human, the philosophy of model Cosmo Universe, the philosophy of fundamental neutrino particles have already been published in various international journals mentioned below. Hence this article shall be considered as **extended version** of the previous articles already published by the same author.

[1] Cosmo Super Star – IJSRP, April issue, 2013

[2] Super Scientist of Climate control – IJSER, May issue, 2013

[3] AKKIE MARS CODE – IJSER, June issue, 2013

[4] KARITHIRI (Dark flame) The Centromere of Cosmo Universe – IJIRD, May issue, 2013

[5] MA-AYYAN of MARS – IJIRD, June issue, 2013

[6] MARS TRIBE – IJSER, June issue, 2013

[7] MARS MATHEMATICS – IJERD, June issue, 2013

[8] MARS (EZHEM) The mother of All Planets – IJSER, June issue, 2013

[9] The Mystery of Crop Circle – IJOART, May issue, 2013

[10] Origin of First Language – IJIRD, June issue, 2013

[11] MARS TRISOMY HUMAN – IJOART, June issue, 2013

[12] MARS ANGEL – IJSTR, June issue, 2013

[13] Three principles of Akkie Management (AJIBM, August issue, 2013)

[14] Prehistoric Triphthong Alphabet (IJIRD, July issue, 2013)

[15] Prehistoric Akkie Music (IJST, July issue, 2013)
[16] Barack Obama is Tamil Based Indian? (IJSER, August issue, 2013)
[17] Philosophy of MARS Radiation (IJSER, August 2013)
[18] Etymology of word **"J"** (IJSER, September 2013)
[19] NOAH is Dravidian? (IJOART, August 2013)
[20] Philosophy of Dark Cell (Soul)? (IJSER, September 2013)
[21] Darwin Sir is Wrong?! (IJSER, October issue, 2013)
[22] Prehistoric Pyramids are RF Antenna?!... (IJSER, October issue, 2013)
[23] HUMAN IS A ROAM FREE CELL PHONE?!... (IJIRD, September issue, 2013)
[24] NEUTRINOS EXIST IN EARTH ATMOSPHERE?!... (IJERD, October issue, 2013)
[25] EARLY UNIVERSE WAS HIGHLY FROZEN?!... (IJOART, October issue, 2013)
[26] UNIVERSE IS LIKE SPACE SHIP?!... (AJER, October issue, 2013)
[27] ANCIENT EGYPT IS DRAVIDA NAD?!... (IJSER, November issue, 2013)
[28] ROSETTA STONE IS PREHISTORIC "THAMEE STONE" ?!... (IJSER, November issue, 2013)
[29] The Supernatural "CNO" HUMAN?... (IJOART, December issue, 2013)
[30] 3G HUMAN ANCESTOR?... (AJER, December issue, 2013)
[31] 3G Evolution?... (IJIRD, December issue, 2013)
[32] God Created Human?... (IJERD, December issue, 2013)
[33] Prehistoric "J" – Element?... (IJSER, January issue, 2014)
[34] 3G Mobile phone Induces Cancer?... (IJERD, December issue, 2013)
[35] "J" Shall Mean "JOULE"?... (IRJES, December issue, 2013)
[36] "J"- HOUSE IS A HEAVEN?... (IJIRD, January issue, 2014)
[37] The Supersonic JET FLIGHT-2014?... (IJSER, January issue, 2014)
[38] "J"-RADIATION IS MOTHER OF HYDROGEN?... (AJER, January issue, 2014)
[39] PEACE BEGINS WITH "J"?... (IJERD, January issue, 2014)
[40] THE VIRGIN LIGHT?... (IJCRAR, January issue 2014)
[41] THE VEILED MOTHER?... (IJERD, January issue 2014)
[42] GOD HAS NO LUNGS?... (IJERD, February issue 2014)
[43] Matters are made of Light or Atom?!... (IJERD, February issue 2014)
[44] THE NUCLEAR "MUKKULAM"?... (IJSER, February issue 2014)
[45] WHITE REVOLUTION 2014-15?... (IJERD, February issue 2014)
[46] STAR TWINKLES!?... (IJERD, March issue 2014)
[47] "E-LANKA" THE TAMIL CONTINENT?... (IJERD, March issue 2014)
[48] HELLO NAMESTE?... (IJSER, March issue 2014)
[49] MOTHERHOOD MEANS DELIVERING CHILD?... (AJER, March issue 2014)
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[52] GANJA IS ILLEGAL PLANT?... (IJERD, April issue 2014)
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[63] THE KACHCHA THEEVU?... (AJER July 2014 issue)
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[65] THE UNIVERSAL LAMP?... (IJOART July 2014 issue)
[66] THE MUSIC RAIN?... (IJERD July 2014 issue)
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[72] THE PHILOSOPHY OF "ZERO HOUR"?... (IJERD August 2014 issue)
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American Journal of Engineering Research (AJER)
e-ISSN : 2320-0847 p-ISSN : 2320-0936
Volume-3, Issue-9, pp-110-118
www.ajer.org
Research Paper Open Access

The Efficiency Level in the Estimation of the Nigerian Population: A Comparison of One-Stage and Two-Stage Sampling Technique (A Case Study of the 2006 Census of Nigerians)

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ABSTRACT:*This research work compares the one-stage sampling technique (Simple Random Sampling) and two-stage sampling technique for estimating the population total of Nigerians using the 2006 census result of Nigerians. A sample size of twenty (20) states was selected out of a population of thirty six (36) states at the Primary Sampling Unit (PSU) and one-third of each state selected at the PSU was sample at the Secondary Sampling Unit (SSU) and analyzed. The result shows that, with the same sample size at the PSU, one-stage sampling technique (Simple Random Sampling) is more efficient than two-stage sampling technique and hence, recommended.*

KEYWORDS:*Population, Simple Random Sampling, Cluster withSampling, Mean Square Error.*

I. INTRODUCTION

Our knowledge, our attitudes, and our actions are based to a very large extent on samples. This is equally true in everyday life and in scientific research.This work contains an account of the body of theory that has been built up to provide a background for good sampling methods. For most application for which this theory was constructed, the aggregate about which information is desired is finite and delimited. In some cases, it may seem feasible to obtain the information by taking a complete enumeration or census of the aggregate.

The purpose of sampling survey theory is to make sampling more efficient. It attempts to develop methods of sample selection and of estimation that provide, at the lowest possible cost, estimate that are precise enough for our purpose. This principle of specified precision at minimum cost recurs repeatedly in the presentation of theory.In order to apply this principle, we must be able to predict, for any sampling procedure that is under consideration, the precision to be expected. So far as precision is concerned, we cannot foretell exactly how large an error will be present in an estimate of any specific situation, for this would require knowledge of the true value for the population. Instead, the precision of a sampling procedure is judged by examining the frequency distribution generated for the estimate if the procedure is applied again and again to the same population. This is, of course, the standard technique by which precision is judge in statistical theory.

The aim and objective of this research work is to determine the most efficient sampling technique in the comparison between one-stage and two-stage sampling technique with the same sample size and to estimate the population total of the Nigerian.

Definition of Terms used

- **BIAS**: In general terms, it is the deviation of results or inferences from the truth, or process leading to such deviation. In estimation, it is usually measured by the difference between a parameter estimate θ and its expected value.
- **EFFICIENCY**: it is a term applied in the context of comparing different method of estimating the same parameter; the estimate with the lower variance being regarded as the most efficient.
- **ESTIMATION**: the process of providing a numerical value for a population parameter on the basis of information collected from a sample. If a single figure is calculated for the unknown parameter, the process is called point estimation. If an interval is calculated which is likely to contain the parameter, then the procedure is called interval estimation.

- **ESTIMATOR**: A statistic used to provide an estimate for a parameter. The sample mean for example, is an unbiased estimator of the population mean.
- **FRAME**: a list element of the population from which a sample could be drawn. It properties are completeness, up-to-date, non-duplicate, adequacy and clear identifiability.
- **INFERENCE:** the process of drawing conclusion about a population on the basis of measurements or observations made on a sample of individuals from the population.
- **PRECISION**: it is the measure of how close an estimate is to it average value over all possible samples. An estimate is said to be précised if it has a smaller variance.
- **SAMPLE**: it is the sub set of a population obtained with the objective of investigating the population.
- **SAMPLING ERROR**: the difference between the sample result and the population characteristic being estimated. In practice, the sampling error can rarely be determined because the population characteristic is not usually unknown. With appropriate sampling procedures, however, it can be kept small and the investigator can determine its probable limits of magnitude.

Symbolic Notification
In course of data analysis, the following statistical notations were used:
N= the total number of states in Nigeria.
n=the number of state selected.
$\boldsymbol{M_i}$= the total number of elements (LGAs) in state i.
$\boldsymbol{m_i}$= the number of element (LGAs) selected in an SRS from state i
$\boldsymbol{M} = \sum \boldsymbol{M_i}$= the total number of element (LGAs) in Nigeria
$\boldsymbol{X_{ij}}$= the jth element (LGA) total in the sample from the ith state
$\bar{\boldsymbol{x}}_{\boldsymbol{i}}$= the sample mean for the ith state.
$\boldsymbol{f_i}$ = The population correction factor (p.c.f.)
$\boldsymbol{f_{2,i}}$ = The sample correction factor or the second stage correction factor.
$\boldsymbol{S_b^2}$ = The variance between the sample states or variance in the first stage.
$\boldsymbol{S_i^2}$ = The variance within each unit (state) sampled.

Sampling Survey: Sampling theory deals with the study of the relationship between population and samples drawn from the population. It is important in most application. For instant, it is used in the estimation of parameters from knowledge of the correspondent sample statistics. Also, Survey sampling, or population sampling, deals with methods for selecting and observing a part (sample) of the population in order to make inferences about the whole population.Sample survey theory deals with the process of sample data collection of the population characteristics using the sample data collection and determine the accuracy of the estimates.

Survey Design and SampleDesign: Designing a survey is the most important stage of a survey since design deficiencies cannot always be compensated for when editing and analyzing the data.
Kish, (1965) state that sample design has two aspects: a selection process, the rules and operations by which some members of the population are included in the sample; and an estimate of the population values.
For a sample survey to be conducted, its objectives must be clearly spelt out along with the manner in which the results are going to be used. It is visualize as comprehensively as possible the nature of the statistical data required to satisfy the current and the future needs of the users.
Raj, (1972) stated that the surveyor (a person or an establishment in charge of collecting or recording data) or researcher initial task is to formulate a rational justification for the use of sampling in his research. If sampling is found appropriate for a research, the researcher then;

[1] Identifies the target population as precisely as possible, and in a way that make sense in terms of the purpose of the study.
[2] Put together the list of the target population from which the sampling will be selected. This list is termed as
a frame (more appropriately list frame) by many statisticians.
[3] Selects the samples and decide on a sampling technique and
[4] Makes an inference about the population.

All these four steps are inter-related and cannot be considered isolated from one another.

PURPOSE OF SAMPLE SURVEY: There are a wide variety of reasons why sampling is important. In most situations, a study of an entire population is impossible; hence sampling may represent the only possible or practice able method to obtain the desired information.

Mahalanobis,(1965) summarize the advantages of sampling surveys: "large scale sample surveys, when conducted in the proper way within a satisfactory survey design, can supply with great speed and low cost information of sufficient accuracy for practical purposes and with the possibility of ascertainment of the satisfactory survey design".

Cochran, (1977); Ali, (2010); Okafor,(2002) and many other scholars summarize the purpose of sample survey in terms of its advantages compared to complete enumeration (census) as:

[1] **It reduces cost**: if data are secured from only a small fraction of the aggregate, expenditures are smaller than if a complete census is attempted. With large populations, result accurate enough to be useful can be obtained from the samples that represent only a small fraction of the population.

[2] **Greater Speed:** Data can be collected and summarized more quickly with a sample than with a complete count. This is a vital consideration when the information is urgently needed.

[3] **It has greater scope:** in certain types of inquiry, highly trained personnel or specialized equipment, limited in availability, must be used to obtain the data. A complete census is impracticable; the choice lies between obtaining the information by sampling or not at all. Thus, surveys that rely on sampling have more scope and flexibility regarding the types of information that can be obtained.

[4] **It has greater accuracy**: because personnel of higher quality can be employed and given intensive training, and because more careful supervision of the field work and processing of results becomes feasible when the volume of work is reduced, a sample may produce more accurate results than the kind of complete enumeration that can be taken.

[5] Sometimes, it is the only alternative as in destructive sampling of a finite population e.g. in the test of the life-span of light bulb, it is highly advantageous to test few of the bulb light than testing the complete population of the bulb life.

Types ofSampling: Basically, we have two types of sampling namely; Non-probability sampling and Probability sampling techniques. Non-probability sampling is the type of sampling in which the probability of choosing a sample unit of the population is not known and may not be easily determined. Therefore, measurement of sample error or bias becomes almost impossible. Examples of Non-probability sampling are:

[1] Purposive sampling.
[2] Haphazard sampling.
[3] Quota sampling.
[4] Capture recapture.
[5] Convenience sampling.
[6] Judgmental sampling.

Probability sampling (Random sampling)-: under this, each element, unit or member of the population has a known probability of being included in the sample. Here, sampling bias is eliminated as no particular unit favored. It is then possible to assess the risk of erroneous conclusion and incorrect decision by the use of probability theory. Examples of probability sample are:

[1] Simple random sampling.
[2] Multi-stage sampling.
[3] Cluster sampling.
[4] Systematic sampling.
[5] Stratified sampling.

Salant et al,(1994) stated that complex sampling techniques are used only in the process of large experimental data sets, when efficiency is required, and, while making precise estimates about relatively small groups within large population.

One-stage Sampling Technique (Simple Random Sampling) : One-stage sampling technique is a technique that involves sampling in only one stage. Examples one one-stage sampling technique may be Simple Random Sampling, Cluster sampling, stratified etc.In this research work, the simple random sampling technique was adopted as the one-stage sampling technique.Simple random sampling is a probability selection scheme where each unit in the population is given equal probability of selection, and thus every possible sample of a given size has the same probability of being selected. Simple random sampling can involve the units being selected either with or without replacement. With replacement sampling allows the units to be selected multiple times whilst without replacement, only allows a unit to be selected once. Without replacement, sampling is by far the more commonly used method and hence, it is been adopted in this work. The advantage of simple random sampling lies in its simplicity and ease of use, especially when only a small sample is taken.

Simple random sampling does, however, require a complete list of all population units as each unit needs to have a unique number associated with it to enable random selection. This sampling scheme also becomes unwieldy for large sample sizes and can be expensive if the sample is spread over a wide geographic area.
In practice, simple random sampling is rarely used because there is almost always a more efficient method of designing the sample (in terms of producing accurate results for a given cost).Nevertheless, simple random sampling forms the basis of a number of the more complex methods of sample design, and is used as a benchmark to which other designs are compared.

Two-stage Sampling : Two-stage sampling is a type of multi-stage sampling which involve sampling in two stages namely first stage sampling (primary sampling unit) and the second stage sampling(second sampling unit). It involves two stage clustering with sampling be made at each stage.Cochran, (1977), Raj, (1972) and Neyman,(1938), stated that the procedure of first selecting clusters and then choosing specified number of elements from each selected cluster is known as two-stage sampling or double sampling or sub sampling. Mahalanobie,(1944) called this design two-stage sampling because the sampling is taken in two stages. The first is to select a sample of units, often called the primary units and the second stage is called the secondary sampling units (SSU).Kish, (1967); Hansen et al, (1975); Fink, (2002); and Tate et al, (2007) stated that the criteria for selecting a unit at a given stage typically depend on attributes observed in the previous stage.

Cochran,(1977);Kalton,(1983); and Okafor,(2002) stated that in designing a study, it can be advantageous to sample units in more than one stage.

The above view show that two-stage sampling is highly advantageous when compared with some single stage sampling like simple random sampling, systematic sampling and cluster sampling. Alfredo et al, (2006) pointed out some of these advantages of two-stage sampling. Some of these advantages are:

[1] It provides good coverage.
[2] It is simple to implement, and
[3] It allows for control of field-work quality.

Adams et al, (2003) opines that if it cost little to determine the attribute that are necessary to classify the units, it can be cost efficient to sample in stage one and then in stage two to subsample the cluster at different stages

Efficiency of anEstimator: Efficiency is a term applied in the context of comparing different method of estimating the same parameter; the estimate with the lower variance being regarded as the most efficient. It is also used when comparing competing experimental designs; with one design being more efficient than another if it can achieve the same precision with fewer resources.If we have more than one consistence estimators of a parameter Y, then efficiency is the criterion which enables us to choose between them by considering the variances of the sampling distribution of the estimators. Thus, if $\hat{Y}_1$, $\hat{Y}_2$,$\hat{Y}_3$ ... $\hat{Y}_n$ are consistence estimator of parameter Y such that $Var(\hat{Y}_1) < Var(\hat{Y}_2) < Var(\hat{Y}_3) < \cdots < Var(\hat{Y}_n)$; for all n, then$\hat{Y}_1$ is said to be more efficient than $\hat{Y}_2$,$\hat{Y}_3$ ... $\hat{Y}_n$. In other words, an estimator with lesser variability is said to be more efficient and consequently more reliable than the others.
Gupta, (2004) write that, if there exist more than two consistent estimators for a parameter Y, then, considering the class of all such possible estimators, we can choose the one whose sampling variance is minimum. Such an estimator is known as the most efficient estimator and provides a measure of the efficiency of the other estimators.

Comparison of One-stage Sampling Technique (Simple Random Sampling) with Two-stage Sampling Technique in Terms of their efficiency : Cochran,(1977);Kalton,(1983); and Okafor,(2002) stated that in designing a study, it can be advantageous to sample units in more than one stage. From the above, the advantage explained by those scholars is majorly in terms of the efficiency of the stages of a multi-stage sampling technique. From this, we can infer that as the stage increases, the precision of that estimate also increases.
Typically, a multi-stage sample gives less precise estimates than a simple random sample of the same size. However, this view was opposed by Nafiu, (2012) who said that multi-stage sample is often more precise than a simple random sample of the same cost.From the above argument, it is seen that under the same sample size, one-stage sample (simple random sampling) is more precise than two-stage sampling technique. But in opposition, if the cost levels are the same, two-stage sampling technique will be more efficient than the sampling random sampling. It is for this reason that this method is been investigated in this work.

Population Census : Census is the total process of collecting, compiling, analyzing, evaluating, publishing and disseminating demographic, economic, social and housing data pertaining at a specified time to all persons and all buildings in a country or in a well delineated part. Censuses are the most elaborate and detail and are supposed to be conducted every 10 years to provide up-to-date data in population characteristics and dynamics.
UNECE, (2006) defined population census as "the operation that produces at regular intervals the official counting (or benchmark) of the population in the territory of a country and in its smallest geographical sub-territories together with information on a selected number of demographic and social characteristics of the total population". The essential features of a census, as specified by the commission (UNECE), include Universality, Simultaneity of information, and individual enumeration.
Yates, (1960) pointed out the special advantages of complete census. These advantages are:-
(1). Data for small units can be obtained.
(2). Public acceptance is easier to secure for complete data.
(3). Public compliance and response may be better secured.
(4). Bias of coverage may be easier to check and reduce.
(5). Sampling Statisticians are not required.
A population census is exposed to different types of errors, including Coverage, Content, and Operational errors.

II. METHODOLOGY AND DATA PRESENTATION

The area of study of this research work is the population of Nigerian. The study covers the population of peoples in the 774 Local Government Areas (LGAs) across the 36 States in Nigeria.Sample Selection procedure: The country, Nigeria consists of N=36 number of states out of which a simple random sample of n=20 number of state is selected using "table of random number". Each state consists of a total of M_i number of Local Government Area (LGA) out of which a sample size of m_i number of LGA is selected from each sampled state at the PSUs using the Loitering method. $m_i$is one-third of each sampled state at the PSUs.

Population Total

- For one-stage,
  The population total, $\hat{X}= N\bar{x}$,
  Where the sample mean $\bar{x}=\frac{\sum \hat{x}_i}{n}$
- For two-stage sampling technique,$\bar{x}_i = \frac{1}{m_i}\sum_{j=1}^{m_i} x_{ij}$

The total population in the ith state,
$\hat{x}_i = M_i\bar{x}_i$
The sample mean $\bar{x}=\frac{\sum \hat{x}_i}{n}$
The estimated population total is
$\widehat{\bar{X}} =\frac{N}{n}\sum_{i=1}^{n} \bar{x}_i=\frac{N}{n}\sum_{i=1}^{n} M_i\,\bar{x}_i$
$\hat{X} = N\hat{x}$

Variance of the Population Total

- For one-stage sampling technique,
  The sample variance $Var(\bar{X}) = (1-f)\frac{S^2}{n}$ where $S^2 = \frac{1}{n-1}\left[\sum X_i^2 - \frac{(\sum X_i)^2}{n}\right]$
  Therefore, the population variance,$Var(\hat{X}) = N^2 Var(\bar{X})$.
- For the two-stage sampling technique,
  For the population variance, $\hat{V}(\hat{X})= N\left(\frac{1-f_1}{f_1}\right)S_b^2 + \sum M_i\left(\frac{1-f_{2,i}}{f_1 f_{2,i}}\right)S_i^2$

Standard Error of the Population Total

$$S.E.\left(\hat{X}\right) = \sqrt{\hat{V}\left(\hat{X}\right)}$$

Coefficient of Variation of the Population Total

$$C.V.\left(\hat{X}\right) = \frac{S.E.\left(\hat{X}\right)}{\hat{X}} \times 100\%$$

Confidence Interval of the Population Total

$$\hat{X} \pm Z_{\alpha/2} S.E.\left(\hat{X}\right)$$

Bias of the Population Estimate

Bias $(\hat{Y}) = \left|(\hat{Y} - \mu)\right|$

Mean square Error of the Population Estimate

$$M.S.E.\left(\hat{Y}\right) = \hat{V}\left(\hat{Y}\right) + \left(Bias\right)^2$$

III. DATA ANALYSIS

3.1 *One stage technique (Simple Random Sampling)*

$$\sum X_i = 85,810,417 \text{ and } \sum X_i^2 = 4.412541867 \times 10^{14}$$

$$Sampling\ fraction,\ f = \frac{n}{N} = \frac{20}{36}$$

$$= 0.556$$

$$Sample\ mean,\ \bar{X} = \frac{\sum X_i}{n}$$

$$= \frac{85,810,417}{20}$$

$$= 4,290,520.85$$

$$Variance, V\left(\bar{X}\right) = (1 - f)\frac{S^2}{n}$$

$$where\ S^2 = \frac{1}{n-1}\left[\sum X_i^2 - \left(\sum X\right)^2\right]$$

$$= 3.846463321 \times 10^{12}$$

$$V\left(\bar{X}\right) = 8.546841497 \times 10^{10}$$

$$Population\ total,\ \hat{X} = N\hat{X} = 36 \times 4,290,520.85$$

$$= 154,458,750$$

$$Population\ variance = N^2 V\left(\bar{X}\right) = 36^2 \times 8.546841497 \times 10^{10}$$

$$= 1.10767065 \times 10^{14}$$

Standard error of the population estimate

$$S.E.\left(\hat{X}\right) = \sqrt{V\left(\hat{X}\right)} = \sqrt{1.10767065 \times 10^{14}}$$

$$= 10,524,593.37$$

Coefficient of variation of the population estimate

$$C.V.\left(\hat{X}\right) = \frac{S.E.\left(\hat{X}\right)}{\hat{X}} \times 100\%$$

$$= \frac{10,524,593.37}{154,458,750} \times 100\%$$

$$= 6.81\%$$

Confidence interval of the population estimate

$$C.I.\left(\hat{X}\right) = \hat{X} \pm Z_{\alpha/2} S.E.\left(\hat{X}\right)$$

$$= 154,458,750 \pm (1.96)(10,524,593.37)$$

$$= 154,458,750 \pm 20,628,203.08$$

$$= (133,830,546.7; 175,086,953.08)$$

Bias of the population estimate

$$Bias\left(\hat{X}\right) = \left|\left(\hat{X} - \mu\right)\right|$$

$$= \left|(154,458,750 - 140,003,542)\right|$$

$$= 14,455,208$$

Mean square error of the population estimate

$$MSE\left(\hat{X}\right) = V\left(\hat{X}\right) + (Bais)^2$$

$$= \left(1.10767065 \times 10^{14}\right) + (14,455,208)$$

$$= 3.197201031 \times 10^{14}$$

3.2 *Two stage Technique*

$$Sample\ mean, \overline{X} = \frac{\sum \hat{X}_i}{n}$$

$$= \frac{84,802,984.34}{20}$$

$$= 4,240,149.217$$

$$Population\ total, \hat{X} = N\overline{X} = 36 \times 4,240,149.217$$

$$= 152,645,371.8$$

Variance of the population total

$$variance, \hat{V}\left(\hat{X}\right) = N\left(\frac{1-f_1}{f_1}\right)S_b^2 + \sum M_i\left(\frac{1-f_{2,i}}{f_1 f_{2,i}}\right)S_i^2$$

$$but\ N\left(\frac{1-f_1}{f_1}\right)S_b^2 = 36\left(\frac{1-0.556}{0.556}\right) \times 4.33172783 \times 10^{12}$$

$$= 1.247381673 \times 10^{14}$$

$$and \sum M_i\left(\frac{1-f_{2,i}}{f_1 f_{2,i}}\right)S_i^2 = 1.1041288 \times 10^{13}$$

$$Therefore, \hat{V}\left(\hat{X}\right) = \left(1.247381673 \times 10^{14}\right) + \left(1.1041288 \times 10^{13}\right)$$

$$= 1.357794553 \times 10^{14}$$

Standard error of the population total

$$S.E.\left(\hat{X}\right) = \sqrt{\hat{V}\left(\hat{X}\right)} = \sqrt{\left(1.357794553 \times 10^{14}\right)}$$

$$= 11,652,444.17$$

Cofficient of variation of the population total

$$C.V.\left(\hat{X}\right) = \frac{S.E.\left(\hat{X}\right)}{\hat{X}} \times 100\%$$

$$= \frac{11,652,444.17}{152,645,371.8} \times 100\%$$

$$= 7.63\%$$

Confident interval of the population total

$$C.I.\left(\hat{X}\right) = \hat{X} \pm Z_{\alpha/2} S.E.\left(\hat{X}\right)$$

$$= 152,645,371.8 \pm (1.96)(11,652,444.17)$$

$$= 152,645,371.8 \pm 22,838,790.57$$

$$= (129,806,518.2; 175,484,162.3)$$

Bias of the population estimate

$$Bias\left(\hat{X}\right) = \left|\left(\hat{X} - \mu\right)\right|$$

$$= \left|(152,645,371.8 - 140,003,542)\right|$$

$$\square\ 12,641,830$$

Mean square error population estimate

$$MSE\left(\hat{X}\right) = \hat{V}\left(\hat{X}\right) + (Bias)^2$$

$$= \left(1.357794553 \times 10^{14}\right) + (12,641,830)^2$$

$$= 2.95595321 \times 10^{14}$$

Summary of the results

	Sampling Technique	One-stage	Two-stage
Population Total	$\hat{X}$	154,458,750	152,645,372
Variance	$\hat{V}\left(\hat{X}\right)$	$1.107670665 \times 10^{14}$	$1.357794553 \times 10^{14}$
Standard error	$S.E.\left(\hat{X}\right)$	10,524,593	11,652,444
Coefficient of variation	$C.V.\left(\hat{X}\right)$	6.81%	7.63%
Confident interval	$C.I.\left(\hat{X}\right)$	(133,380,547;175,086,953)	(129,806,581;175,484,162
Bias	$Bias\left(\hat{X}\right)$	14,455,208	12,641,830
Mean square error	$MSE\left(\hat{X}\right)$	$3.197201031 \times 10^{14}$	$2.95595321 \times 10^{14}$

IV. DISCUSSION

From the above table, it was observed that the one-stage technique has the least for the variance, standard error and the coefficient of variation of the population except for bias and mean square error of the population total which two-stage has the least while confidence interval for both techniques shows that the population total fall within the computed interval as expected.

V. CONCLUSION

From the comparison of the results obtained so far, it shows that with the same sample size, one-stage sampling technique (simple random sampling) is more efficient than two-state sampling technique and hence, recommended.

Recommendation : For efficient result in the estimation of population total, one-stage sampling technique (simple random sampling) gives a more precise result than two-stage sampling technique with the same sample size and hence, recommended.

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American Journal of Engineering Research (AJER)
e-ISSN : 2320-0847 p-ISSN : 2320-0936
Volume-3, Issue-9, pp-119-126
www.ajer.org
Research Paper Open Access

Optimization of enzymatic digestibility of sodium hydroxide-hydrogen peroxide oxidative pretreated siam weed for reducing sugar production

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ABSTRACT: *This study evaluated the enzymatic conversion of alkaline peroxide oxidative pretreatment of an invasive lignocellulosic biomass (siam weed) to reducing sugar, amenable to further microbial effects at the downstream processing. Using a statistical design of experiments approach (response surface methodology), optimum pretreatment conditions of 43.7 ^oC, 9.3 h, and 0.4% H_2O_2 , and enzymatic hydrolysis conditions of 25 FPU cellulase/g treated biomass, 50 ^oC hydrolysis temperature, 2% biomass loading, and 72 h hydrolysis period, 391.3 mg/g reducing sugar yield was achieved and validated. At the optimized pretreatment and enzymatic conditions, the conversion of treated biomass to untreated biomass was about a 6-fold increase.*

KEYWORDS: *enzymatic hydrolysis, oxidation, pretreatment, reducing sugar, response surface methodology*

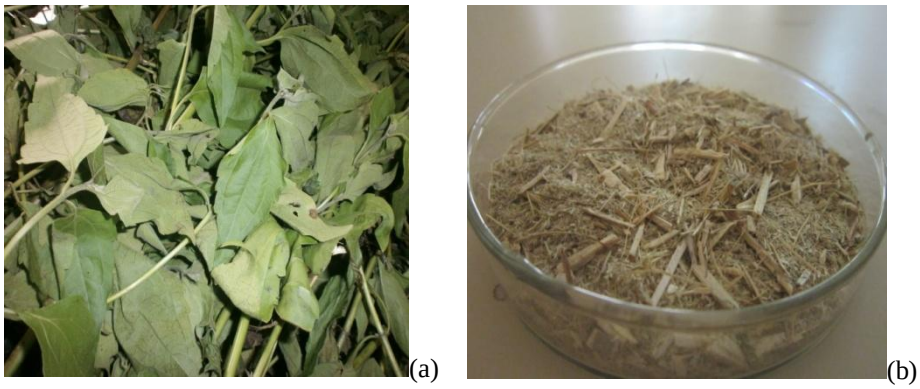
I. INTRODUCTION

Concerns about exhaustion of the world's reserves of fossil fuels and about the negative impacts, such as greenhouse gas emissions associated with the combustion of these fuels have resulted in an increasing worldwide interest in using fuels from renewable resources, for instance ethanol [1]. However, a reduction of the ethanol production cost is desirable to improve the competitiveness. As the sugar and starch-containing feedstock's traditionally used for ethanol production represent the largest share of the total production cost [2], the use of cheaper and more abundant raw materials is desirable for increasing the production. In recent years, the worldwide trends toward scientific and technological advances in the field of new fuels point to the importance of more efficient utilization of cellulosic feedstock's (agro-industrial and other residues) as raw material in the ethanol production process. Lignocellulosic biomass (cellulosic biomass) is favourable because of its high abundance, low cost, and high-energy potential. Lignocellulose consists of three major components: cellulose, hemicellulose, and lignin [3,4]. These components are contained within the primary and secondary cell walls of plants. A huge diversity of lignocellulosic wastes is available around the world. Sugarcane bagasse, rice hulls, peanut shells, and cassava stalks are agricultural and agro-industrial residues that could be considered for bioconversion in tropical countries. These lignocellulosic residues are available on a renewable basis as they are generated during harvesting and processing of agricultural and forest products; sugar cane, rice, peanuts, cassava, wood residues (including sawdust and paper mill discards), grasses, waste paper, straws of different grains, stover, peelings, cobs, stalks, nutshells, non food seeds, domestic wastes (lignocelluloses garbage and sewage), food industry residues, municipal solid wastes [5]. Pretreatment and enzymatic conversion of lignocellulosics are crucial steps to overcome lignocelluloses recalcitrance in the conversion to ethanol [6]. Lignocellulosic materials contain polymers (cellulose and hemicelluloses) needed to be broken down through hydrolysis (pretreatment and enzymatic) in other for the monosaccharides and other chemicals to be accessible. Alkaline peroxide oxidation pretreatment has been studied extensively for mostly agricultural residues and very few woody residues [7–14]. Scientific literature also reported the treatment of siam weed using different chemical methods as mild sulphuric acid, alkaline, and peracetic acid [15]. The hydrolysis of cellulolytic materials with diluted acids is well known, but this process generates toxic products of hydrolysis. Other negatives factors related to the acid hydrolysis are the corrosion and the high amounts of salts resulting from the acid neutralization. Enzymatic hydrolysis is preferred because of the higher conversion yields and less corrosive, less toxic conditions compared to an acid hydrolysis.

This study investigated the effect of alkaline sodium hydroxide under oxidative conditions (using hydrogen peroxide) on pretreatment of siam weed in order to cause appreciable enzymatic digestibility of treated biomass. Optimum conditions were predicted and validated for the enzymatic conversion of the alkaline peroxide oxidation pretreated siam weed. Furthermore, at the optimized enzymatic conditions, effect of the variation in hydrolysis temperature (at 45 ^{o}C) was also evaluated.

II. MATERIALS AND METHODS

Raw material: The Siam weed (*Chromolaena odorata*), is an invasive exotic weed [15], is typically a fast growing perennial herb. Raw material preparation from the field to the laboratory before compositional analysis was carried out by harvesting the shoots (leaves and stems) in late October, 2012 from an open fallow land around Ota town (6^{o}40'N 3^{o}08'E), South west, Nigeria **(**the growth period of the plant on the land was monitored to be 5 months). The leaves were chopped off from the branches manually. The stems were cut to 5±1 cm equal lengths and dried in an open space (35±2 ^{o}C) for 3 days (8 h each day)(Ayeni et al 2014; under review). Size reduction was further performed on the dried mass by knifing and milling. Samples were sieved to yield different size particles [16**],** and dried in a convection oven at 105 ^{o}C for 3 h to a dry matter content of 88%. Milled Siam weed stem was screened in the size range of 0.25 to 1 mm. The screened sample within the size range of 1 mm and 0.5 mm were retained while smaller particles were discarded because they corresponded mainly to sand. The bigger size fractions were manually mixed for 10 min to obtain an homogeneous equal proportions of sizes (Fig. 1). The raw biomass was stored in plastic bags and kept in a refrigerator until ready for use.



(a) (b)

Fig. 1: Harvested siam weed (a), and milled siam weed stem (b)

Experimentation: MINITAB 15 statistical software (PA, USA) was used for the design of the pretreatments (DOE) using response surface methodology (RSM)(2^{3}-central composite design (CCD) [17]. Design of experiments with MINITAB [18**]** was made up of 20 base runs (8 cube points, 4 centre points in cube, 6 axial points, and 2 centre points in axial, 2 base block, all in duplicate, resulting in a total of 40 experiments. The objective was to evaluate the influence of reaction temperature (X_1; Low level: 50 ^{o}C and High level: 70 ^{o}C), pretreatment time (X_2; Low level:4 h and High level: 8 h), and hydrogen peroxide concentration (X_3; Low level:1% and High level: 3%) on enzymatic digestibility of treated biomass. Table 1 shows the experimental design matrix.

Raw biomass pretreatment: 5 g of dried siam weed biomass were mixed with different concentrations of 100 mL hydrogen peroxide-water solution in a 500 mL beaker at pH 11.5. The distilled water contained H_2O_2 volume per volume distilled water of 0.32%, 1.00%, 2.00%, 3.00%, and 3.68%. The pH of solution was maintained to 11.5 by adding equivalent amount of sodium hydroxide pellets. Agitation of mixtures was made to occur by using a magnetic stirrer. Pretreatment occurred by varying the reaction temperature and reaction time. After each pretreatment time, the slurry was cooled to room temperature and separated into liquid and solid fractions by vacuum filtration. The solid part was washed with distilled water until it reached neutral pH. A portion of the solid was dried to a constant weight in a convention oven at 105 ^{o}C in order to estimate percent total solids [19]. The remaining wet treated materials were kept in the refrigerator for further determination of the extent of enzymatic hydrolysis and the optimum reducing sugar yields. Material balance for the residual total solids and solubilized fraction after pretreatment was evaluated. Each experiment was carried out in duplicate.

Compositional analysis of raw biomass: Extractives were determined by means of the Soxhlet extractor on 2.5 g of dry biomass using 150 mL acetone as solvent. The Soxhlet extractor was set up with the boiling flask

positioned on the heating mantle set at 70 ^{o}C. Each cycle on the extractor was maintained at 23 min for 4 h. At the end of each periods, the samples were air dried for few minutes at room temperature and further dried to constant weight at 105 ^{o}C in a convection oven. The extractives content was calculated as the difference in weight between the raw and extracted material [20–21]. The hemicellulose content was determined by weighing 1 g of dried biomass from the extractive analysis into a 250 mL Erlenmeyer flask and then 150 mL of 500 mol/m^3 NaOH solution was added. The mixture was boiled for 3 h and 30 min with distilled water [7, 22]. The hemicellulose content was obtained as the difference between the sample weight before and after boiling the extracted biomass with NaOH. Lignin composition was determined by weighing into glass test tubes 0.3 g of dry extracted biomass and adding 3 mL of 72% H_2SO_4. Acid hydrolysis was made to occur by keeping the samples at room temperature for 2 h with mixing of samples every 30 min. 84 mL of distilled water was added to each test tube after the 2 h acid hydrolysis step bringing the total volume to 87 mL. The samples were autoclaved for 1 h at 121 ^{o}C. After the second weak acid hydrolysis step, the hydrolyzates were cooled to room temperature and separated by vacuum filtration. The acid insoluble lignin was determined by drying the residue at 105 ^{o}C for 4 h and accounting for ash by burning the insoluble residue at 575 ^{o}C in a muffle furnace. The difference in weight of the acid insoluble residue when ash content was subtracted is the acid insoluble lignin [23]. The acid soluble lignin fraction was determined by measuring the absorbance of the acid hydrolyzed samples at 320 nm [23]. The lignin content was calculated as the summation of acid insoluble lignin and acid soluble lignin. The cellulose content was calculated by difference, assuming that extractives, hemicellulose, lignin, ash, and cellulose are the only components of the entire biomass [22]. The composition of the raw siam weed(wt.%) was estimated as; extractives content –4.82%, hemicellulose content –29.94%, acid insoluble lignin content –23.70%, soluble lignin content –0.52%, Ash content –0.97%, cellulose content –40.05%.

Enzymatic digestibility: The pretreated washed solid fractions were hydrolyzed by enzymes to determine the efficiency of substrate conversion. Enzymatic conversion was performed at 2% dry biomass content of total saccharification volume. 5 ml sodium citrate buffer at 0.1 M concentration and pH of 4.8 was added to the wet materials in 50 ml culture tubes. A preparation of *Trichoderma reesei* cellulase enzyme system with an activity of 57.8 filter paper unit (FPU)/ml was added at a loading of 25 FPU/g dry biomass. A total volume of 20 ml mixture was attained by adding an appropriate volume of distilled water to the citrate buffer and wet biomass. After an hydrolysis period of 72 h, 0.5 ml aliquot was sampled and analysed for reducing sugar. Experiments were conducted at 50 ^{o}C in a non-shaking incubator. To quench the hydrolysis, the samples were boiled for 15 min and then cooled in an ice bath. After hydrolysis, the samples were centrifuged at 4000 revolution/min for 5 min to remove residual solids. Fermentable sugars were estimated as reducing sugar with 3,5, dinitrosalicylic acid method [24] using glucose as standard. Reducing sugar yields from enzymatic hydrolysis was calculated based on mg equivalent glucose per g dry substrate (based on equivalent glucose in the hydrolyzed sample) [25].

$$Y = S \times D \times \frac{V}{W} \qquad \ldots(1)$$

where Y = reducing sugar yield (mg equivalent glucose/g dry biomass)
S = sugar concentration in diluted sample (mg equivalent glucose/mL)
D = dilution factor
V = working volume (mL)
W = weight of dry treated biomass (g)

Design of experiments: The objective was to evaluate the influence of reaction temperature (X_1), pretreatment time (X_2), and hydrogen peroxide concentration (X_3) on the APO process such that the pretreatment will enhance enzymatic hydrolysis of treated materials to reducing sugars. They were chosen for study as these parameters can influence the fractionation of the solid material. Table 2 shows the design matrix and both the experimental and predicted results of the reducing sugar. Temperature, time, and oxidation have been reported to have profound effects on ligno-cellulosic materials pretreatment [9,26]. The order in which the experiments were carried out was randomized. Each experiment in this study was replicated twice; reported results indicate the mean values of the replicated experiments.

The model generated as a function of X_1 (Temperature), X_2 (Time), and X_3 (% H_2O_2) variables (factors) on the predicted response of the reducing sugar yield (Y) is a second-order polynomial and is represented as follows:

$$Y = \alpha_0 + \alpha_1 X_1 + \alpha_2 X_2 + \alpha_3 X_3 + \alpha_{1,1} X_1^2 + \alpha_{2,2} X_2^2 + \alpha_{3,3} X_3^2 + \alpha_{1,2} X_1 X_2 + \alpha_{1,3} X_1 X_3 + \alpha_{2,3} X_2 X_3 \qquad \ldots(2)$$

The predicted responses Y (reducing sugar yields) associated with each factor level combinations; α_0 to $\alpha_{2,3}$ are coefficients to be estimated from regression, they represent the linear, quadratic and cross-products of

X_1, X_2, X_3 on the responses. The MINITAB 15 (PA, USA) was used for regression analysis of experimental data, plotting of response surfaces and to optimize the process parameters. The coefficients in the second-order polynomial (equation 1) were calculated by multiple regression analysis, based on the experimentally obtained data, and then the predicted responses were obtained using equation (1). Analysis of variance (ANOVA) was used to estimate statistical parameters.

III. RESULTS AND DISCUSSION

Hydrolysis of treated biomass: The enzymatic digestibility of biomass is affected by the pretreated methods used and the structural modification of the biomass (e.g. lignin content, acetyl group content, and crystallinity) (27). The results of experiments obtained by utilizing a central composite design were analyzed by considering reducing sugar yields (RS) after enzymatic hydrolysis of pretreated siam weed samples. Table 1 shows the design matrix with the experimental and predicted RS yields for a 72 h terminal hydrolysis period. Reducing sugar yields did not follow a particular trend. The experimental maximum reducing sugar yield was 223 mg/g dry biomass. However, increasing temperature with longer pretreatment time produced more of the reducing sugar. For example, at temperature of 50 ^oC, 8 h, and 1%H_2O_2 (Run 20), reducing sugar yield was 205.92 mg/g. Also, at 60 ^oC, 6 h, and 0.4%H_2O_2, 223 mg/g reducing sugar was produced (Run 5), while at 70 ^oC, 4 h, and 3% H_2O_2, 194.34 mg/g RS was produced. In our previous work, comparable results were obtained on both screened and unscreened sugarcane bagasse under same pretreatment conditions (Ayeni et al 2014; under review), maximum reducing sugar attained was 285 mg/g for screened sugarcane bagasse (pretreatment conditions of 70 ^oC, 4 h, and 1%H_2O_2) and 297.56 mg/g for unscreened sugarcane bagasse (pretreatment conditions of 50 ^oC, 4 h, and 1%H_2O_2).

Optimization and validation of operating conditions: Following the result obtained from enzymatic hydrolysis of siam weed, the statistical software MINITAB 15 was also used to determine the coefficients of the second-order polynomial by multiple regression analysis as well as to build the quadratic model and the 3D response surface plots. The experimental results were analyzed by regression analysis consisting of the linear, quadratic and interaction effects which gave the following regression equation with reducing sugar yields (Y) as a function of pretreatment temperature, time and %H_2O_2.
The model equation generated for the enzymatic hydrolysis process is given as:

$$Y = 482.780 - 11.946X_1 + 30.577X_2 - 165.788X_3 + 0.160X_1^2 + 4.558X_2^2 + 49.111X_3^2 - 1.087X_1X_2 + 0.326X_1X_3 - 10.854X_2X_3$$

$$R^2 = 0.9568 \quad \ldots(3)$$

When the values from X_1 to X_3 were substituted in equation (3), the predicted responses were obtained (Table 1). The *P*-values (probability values) are used as tools to check the significance of each of the coefficients in the models, which in turn, may indicate the patterns of the interaction among the variables. The larger the magnitude of *T* and smaller the *P*-value the more significant is the corresponding coefficient. From Table 2, temperature is statistically significant on enzymatic hydrolysis (P = 0.049), hydrogen peroxide concentration is also significant (P = 0.002). All the square effects are significant while only the interaction effect between temperature and hydrogen peroxide concentration is not statistically significant.

Table 1: Design matrix of the experimental and predicted yields of reducing sugar of the pretreated siam weed

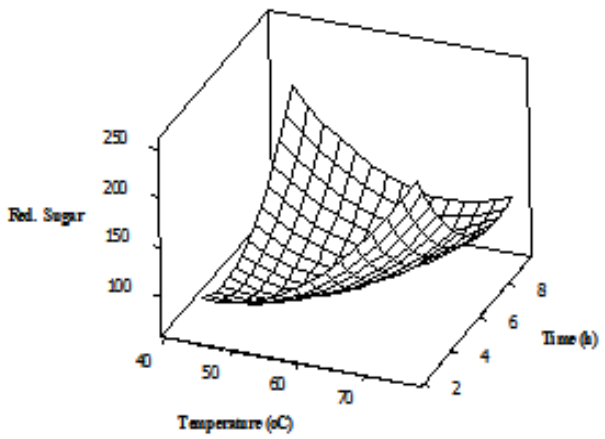
Run Order	Temperature (X_1), ^oC	Time (X_2), h	H_2O_2 (X_3)%(v/v)	Experimental (mg/g)	Predicted (mg/g)
1	43.7	6.0	2.0	89.85	92.07
2	60.0	6.0	2.0	67.35	71.98
3	60.0	6.0	3.6	187.78	178.60
4	60.0	9.3	2.0	95.89	115.26
5	*60.0*	*6.0*	*0.4*	*223.78*	*227.29*
6	76.3	6.0	2.0	145.10	137.21
7	60.0	6.0	2.0	75.15	71.98
8	60.0	2.7	2.0	150.98	125.94
9	60.0	6.0	2.0	69.75	71.98
10	70.0	8.0	1.0	190.95	177.49
11	60.0	6.0	2.0	73.95	71.98
12	50.0	4.0	3.0	109.34	126.58
13	50.0	4.0	1.0	118.95	119.50
14	70.0	8.0	3.0	107.55	110.78

15	50.0	8.0	3.0	132.50	120.09
16	60.0	6.0	2.0	71.30	71.98
17	70.0	4.0	1.0	167.89	184.08
18	60.0	6.0	2.0	72.50	71.98
19	70.0	4.0	3.0	194.34	204.20
20	50.0	8.0	1.0	205.92	199.84

Table 2: Estimated regression coefficients and their probability values

Term	Coefficient	T	P
Constant	482.780	2.455	0.034
X_1	-11.946	-2.245	0.049
X_2	30.577	1.461	0.175
X_3	-165.788	-4.207	0.002
X_1^2	0.160	3.878	0.003
X_2^2	4.558	4.420	0.001
X_3^2	49.111	11.907	0.000
X_1X_2	-1.087	-4.101	0.002
X_1X_3	0.326	0.615	0.552
X_2X_3	-10.854	-4.096	0.002

A



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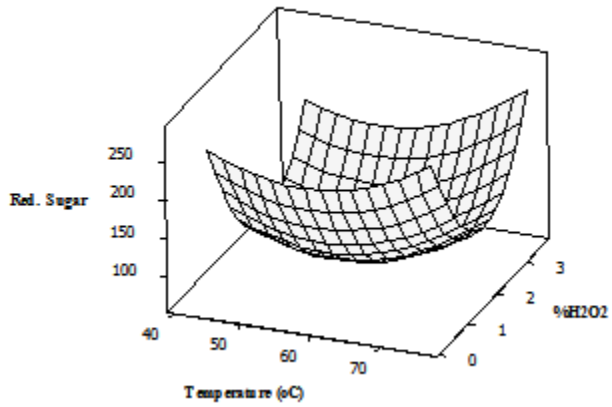

C

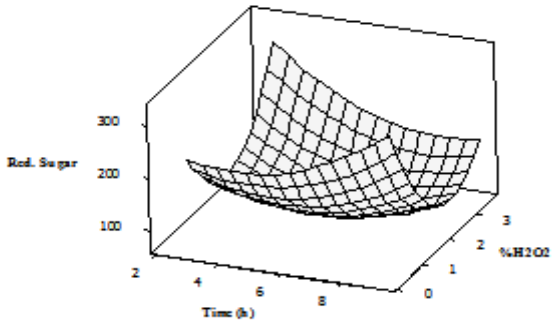

Fig. 2: Response surface plots of effects of operating variables on reducing sugar yields (mg/g dry biomass)A: Temperature and Time, B: Temperature and %H_2O_2, C: Time and H_2O_2.

The statistical significance of the model equation using confidence interval of 95% was validated by the *F*-value for analysis of variance (ANOVA), which showed that the regressions were statistically significant for the treated samples ($F = 24.62$, $P \leq 0.000$) (data not shown). The ANOVA of the models also showed the linear, square, and the interactive effects of factors on treatments to be statistically significant ($P \leq 0.004$). Analysis of variance (ANOVA) fitted for the model was required to test the significance and adequacy of the model. Temperature was reported to have significant effect on conversion for most lignocellulosic materials [9,28,29]. The coefficient of determination (R^2) of the model was 0.9568, indicating again that the model was suitable in establishing relationships among the reaction variables. The R^2 value explains that about 96% variability is attributed to the factors for the response Y (reducing sugar yield). This also means only 4% of the total variation is not explained by the model. The model equation for the response (equation 1) and the response surface plots (Fig. 2) were utilized in determining the optimum process conditions.

The influences of individual factors on on reducing sugar yield are shown in Fig. 2(A to C). These plots were obtained by holding the third variable at mid point value. Fig. 2 (A) shows the surface plot of Time and Temperature on sugar yields, indicating that the optimum reducing sugar yields should occur between the 40–50 ^oC with increasing time between 6–9 h. The surface plots also show that optimum hydrogen peroxide concentration should occur very closely to 1% and 2% (Fig. 2(B) and Fig. 1(C)). The response optimizer was set by maximizing with a target of 300. The upper limit was selected to be 300. Considering the minimum time, temperature, and %H_2O_2 set to 4 h, 50 ^oC, and 1% respectively, the optimum cumulative response was obtained at 43.7 ^oC, 9.3 h, and 0.4% H_2O_2. The optimized predicted response of the reducing sugar was 415.2 mg/g with a desirability of 1. The individual desirability evaluates how the settings optimize a single response. Desirability value of 1 represents an ideal case; zero indicates that one or more responses are outside their acceptable limit. A value close to 1 indicates that the settings are more effective at maximizing the response. Additional sets of experiments at these specific conditions were performed to validate the optimized conditions. The validated reducing sugar yields at optimized pretreatment conditions was obtained to be 391.3 mg/g dry biomass. The experimental and predicted responses were found to be in close agreement, thus confirming the optimization process.

Effects of variations of hydrolysis temperature at optimized conditions: A single optimum condition for enzymatic digestibility may be impossible because the optimum may shift due to factors such as dry solid content, pH, temperature, the desired residence time, and enzyme activity. Enzymes are inhibited by the end products, the build-up of any of these products negatively affects cellulose hydrolysis. The maximum cellulase activity for most fungal derived cellulases and β-glucosidase occurs at 50 ± 5 °C and a pH of 4.0–5.0 [30**]**. Treated to untreated biomass reducing sugar yield at 50 ^oC with same hydrolysis conditions was about 6-fold increase (Fig. 3). The untreated solid material was used as the control for comparing the enzymatic digestibility of the treated siam weed. This showed the efficiency of pretreatment process to cause disruption to the lignocellulosic complex. The digestibility of treated sample at 45 ^oC hydrolysis temperature (at optimized conditions; 43.7 ^oC, 9.3 h, and 0.4% H_2O_2) was also evaluated. Under the same digestibility conditions, (25 FPU/mL cellulase enzyme loading, pH of 4.8, time of 72 h, and 2% treated biomass loading), results showed a decrease of about 2-folds in the reducing sugar yield at 45 ^oC to 50 ^oC hydrolysis temperature (Fig. 3). This may not be unconnected to the mild pretreatment conditions on biomass and enzymatic hydrolysis conditions. Future studies will be directed at optimizing between the hydrolysis period, time, pH, and biomass loadings.

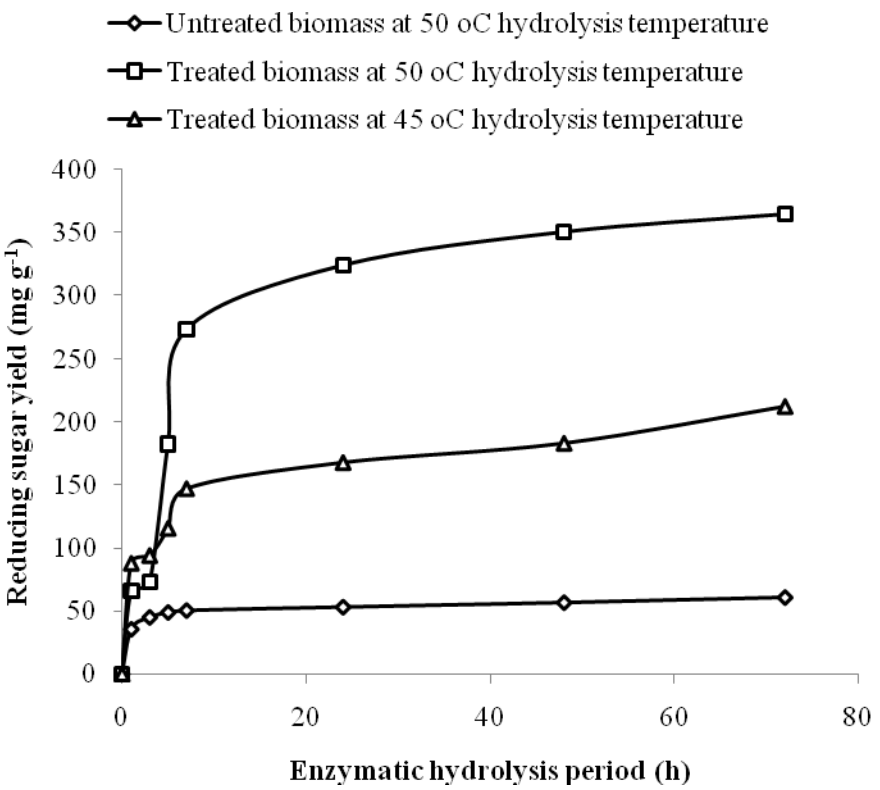

Fig. 3: 3-d Effect of temperature on treated and untreated biomass on sugar yields. Pretreatment conditions: 44 ^{o}C, 0.4%H_2O_2, and 9.3 h. Enzyme hydrolysis conditions: 25 FPU cellulase per g dry biomass, 45 ^{o}C and 50 ^{o}C hydrolysis temperatures, pH 4.8, 20 g kg^{-1} substrate concentration.

IV. CONCLUSIONS

The study explored the feasibility of using a suitable method (alkaline peroxide oxidation) pretreatment for the bioconversion of a lignocellulosic biomass (siam weed) to reducing sugar which may eventually be acted upon by microbes through fermentation techniques with the aim of producing ethanol. A 2^3 central composite design was used to determine the validated optimized pretreatment condition for the biomass as 43.7^{o}C, 9.3 h, 0.4% H_2O_2 so as to obtain 391.3 mg/g dry biomass reducing sugar yield. Enzymatic hydrolysis evaluated at the optimized conditions for the untreated biomass showed the efficiency of pretreatment on raw biomass. The reducing sugar yield of the treated to the untreated biomass was about a 6-fold increase.

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American Journal of Engineering Research (AJER)
e-ISSN : 2320-0847 p-ISSN : 2320-0936
Volume-3, Issue-9, pp-127-134
www.ajer.org
Research Paper Open Access

EXPLORING CERAMIC RAW MATERIALS IN NIGERIA AND THEIR CONTRIBUTION TO NATION'S DEVELOPMENT

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ABSTRACT
Nigeria no doubt is an oil-rich nation and has solely relied on this resource as her economic main-stay to the utter neglect of all otter huge naturally endowed, mineral resources that abound almost everywhere in the country. This paper therefore attempts to explore the major ceramic raw materials particularly clay minerals in Nigeria, their locations and applications. Aggressive exploitation of these solid minerals will not only boost the nation's economy, but will enhance her technological development, changes the country's status from consumer to producer and create employment for the teeming unemployed youths. On a final analysis, embarking on this techno-economic journey will bring to focus the role and importance of ceramic education, hence adequate attention towards its development will be guaranteed.

KEYWORDS: *Oil-rich, clay minerals, ceramic raw materials, exploitation, ceramic education.*

I. INTRODUCTION

The term, "Ceramic" is derived from the Greek word "Keramos", meaning potter's earth or clay[1]. It has been applied traditionally to earthenware objects produced by the moulding and subsequentfiring of moist clay at low temperature to form hard, dense solids. Today, ceramics may be defined as inorganic and non metallic crystalline materials manufactured by heat treatment[2].In a broad sense, ceramics are defined as solid compounds that are formed by the application of heat and sometimes heat and pressure, comprising at least one metal and a non metallic elemental solid (NMES) or a non metal, a combination of at least TWO NMESs and a non metal[3]. For example, magnesia (MgO) is a ceramic since it is a solid compound composed of a metal, Mg bonded to a non metal, oxygen. Silica (SiO_2) is also a ceramic since it combines non metallic elemental solid, Si and a non metal, oxygen. It follows that oxides, nitrides, bonds, carbides and silisides of all metals and NMESs are ceramics. Ceramics are classified into two, viz; traditional ceramics and modern (advanced) ceramics. The traditional ceramics, called traditional because they have long been in use, have similar molecular structure to fired earthenware. Members of traditional ceramics include rocks, minerals, clay, concrete, refractories and porcelain. The modern ceramics which are becoming increasingly important in engineering and technology include pureoxide products (e.g. Al_2O_3, SiO_2, ZrO_2, ZnO, MgO, $MgAl_2O_4$), nuclear fuels, e.g. UO_2, Nitrides of Al, Si and B used as refractories and carbides of Si, B, W, Ti, etc used as abrasives and cutting tool materials.

II. GENERAL PROPERTIES AND APPLICATIONS OF CERAMICS

- Ceramic materials are hard and strong but brittle.
- They have good strength in compression due to the presence of ionic bonding and high melting temperatures but weak in shearing and tension.
- Ceramics are good electrical and thermal insulators due to the presence of porosity; often resistant to damage by high temperatures and chemical degradation or corrosive environments. Generally, they can withstand chemical erosion that occurs in other materials subjected to acidic/caustic environments and very high temperatures such as temperatures that range from 1000^0C – 1600^0C.
- They have low thermal shock resistance because of low thermal expansion coefficient and low thermal conductivity due to presence of porosity and defects.

The applications of ceramics to mankind cannot be overemphasized. Apart from serving the immediate needs of man, such as household utensils and decorative, it is being applied in technology in diverse ways which include:

- Grinding wheel/disc that puts the fine finish on ground steel shafting.
- Drilling bits (abrasives) used for drilling operations.
- Piezo electrical crystal that reads the pressure in an engine cylinder.
- Mico spacer in a vacuum radio tube.
- Titanium oxides in paints.
- Talc in baby powder
- Clay in refractories, porcelain and paper.
- Calcium carbonate in toothpaste.
- Ferrites in the memory of a large digital computer.
- Vehicle ceramic brake discs which are resistant to abrasion at high temperatures.

III. CERAMIC RAW MATERIALS IN NIGERIA

Clay is the longest known and most common of the ceramics. It has its origin in the mechanical and chemical disintegration of rocks. Clays are complex alumino-silicate compounds containing attached water.
Clay mineral is the most common and abundant mineral on earth; and it is located all over Nigeria. The industrial products obtainable from clays include pottery, refractories, chemical stoneware, electrical porcelain(insulators), bricks, tiles, Portland cement, filters, sanitary wares, drilling mud, sculptural ceramics and catalysts for the cracking of petroleum[1,5].The exploitation, processing and utilization of these clay minerals will positively influence the technological development and economic growth of Nigeria[6]. Tables 1 – 8 show the basic clay minerals (kaolin, feldspar, quatz, limestone, talc, silica sand, ball clay and bentonite) and their locations in Nigeria. In order to shun over-dependence in oil and imported goods, and diversify the economy, there is need for proper harnessing of these vast clay minerals. Hence, the suitability of the contribution of ceramics in the production of the aforementioned wares and tools will be guaranteed, thereby playing a key role in the economic and technological development of Nigeria.

Table 1: Locations of kaolin deposit in Nigeria

States	Locations
Abia	Umuahia South, Ikwuano, Isukwato, Nnochi
Akwa-Ibom	Ibiaku, Ntok Opko, Mbiafum, Ikot Ekwere
Anambra	Ozubulu, Ukpor, Ayamelum, Ekwusigo, Nnewi South, Ihiala, Njikoka, Aguata
Bauchi	Ackaleri, Genjuwa, Darazo, Misan, Kirfi, Dambam
Benue	Apa Ogbadibo, Okpokwu, Vandikya
Borno	Maiduguri, Biu, Dembua
Cross River	Alige, Betukwe, Mba, Behuabon
Delta	Aniocha South, Ndokwa East
Edo	All parts of the State
Ekiti	Isan-Ekiti, Ikere-Ekiti
Enugu	Uzo Uwani, Nsukka South, Udi, River-Oji, Enugu North
Imo	Ehime Mbano, Ahiazu Mbaise, Orlu, Ngor Okpalla, Okigwe, Oru
Kaduna	Kachia
Kano	Kano, Bichi, Tsanyawa, Dawakin-Tofa, Gwarzo Kankara, Dutsema, Safana, Batsari, Ingawa, Musawa, Malumfashi
Kebii	Danko, Zuru, Giro, Dakin-Gari
Kogi	Agbaja
Nasarawa	Awe, Keffi
Niger	Lavum Gbako, Bida, Kpaki, Patigi
Ogun	Ibeshe, Onibode
Ondo	Abusoro, Ewi, Odo-Aye, Omifun
Osun	Irewole, Ile-Ife, Ede, Odo-Otin, Ilesha
Oyo	Iwo, Alakia
Plateau	Barkin-Ladi, Mangu, Kanam
Yobe	Fika (Turmi)

Table 2:Locations of Feldspar Deposit in Nigeria

States	Locations
Adamawa	Maiba, Guyuk
Borno	Gwaza, Shani, Kwajaffa, Bakin Kasuwa
Edo	Etsako (East and Central)
Ekiti	Ijero-Ekiti
Katsina	Faskari, Batsari, Kurfi
Kebbi	Zuru, Yawuri, Kaoye
Kogi	Osara, Lokoja, Egbe, Okene
Nasarawa	Akwanga, Kokona, Nasarawa
Niger	Shiroro, Kontagora, Borgu
Ogun	Abeokuta
Osun	Oshogbo, Ilesha, Ede, Ipole, Iwo
Plateau	Bassa, Mangu, Panshin, Langtan North, Jos North & South
Taraba	Jalingo, Yorro, Baissa, Ussa.

Table 3:Locations of Limestone Deposit in Nigeria

States	Locations
Abia	Arochukwu, Ohafia, Bende
Anambra	Njikoka
Akwa-Ibom	Obotime
Adamwa	Guyuk, Shelleng, Ngurore, Numan
Benue	Ado, Apa, Gboko, Guma, Gwer West, Katsina-Ala, Konshisha, Makurdi, Oju, Okpokwu, Ushongo
Borno	Yadi-GIlan
Ebonyi	Abakaliki, Ikwo, Ishielu, Afikpo North, Ohaozara, Ohaukwu
Edo	Akoko-Edo, Owan East and West, Etsako East, Central and West
Enugu	Nkanu East, Agwu, Aninri
Gombe	Gombe, Yamaitu-Deba, Funa-Kaye, Numan
Imo	Okigwe
Kebbi	Jega
Kogi	Ajaokuta, Osara, Ekinrin-Adde, Itobe, Jakura
Nasarawa	Awe
Ogun	Ewekoro, Shagamu
Yobe	Garin Ari, Deda, Turmi (Fika), Kwayaya

Table 4:Locations of Quartz Deposit in Nigeria

States	Locations
Ebonyi	Ohaozara, Abakaliki
Ekiti	Idao, Iroko, Aiyegunle, Efon-Alaaye, Okemesi
Katsina	Faskari, Bakori, Kurfi, Funtna
Kebbi	Danko, Washgu
Plateau	Mansu, Panshin, Kanam, Langtang North

Table 5:Locations of Talc Deposit in Nigeria

States	Locations
Cross River	Obudu
Ekiti	Ijero-Ekiti
Kaduna	Zonkwa
Kogi	Isawu
Niger	Rafi, Shiroro
Osun	Ile-Ife, Illa, Ilesha
Oyo	Iseyin

Table 6:Locations of Silica Sand Deposit in Nigeria

States	Locations
Abia	Ukwa East, Aba North, Isiala-Ngwa North and South, Ukwa West.
Bayelsa	Sagbama, Southern Ijaw, Yenagoa
Benue	Buruku, Gboko, GUma, Katsina Ala, Vandeikya, Agato, Logo.
Borno	Dikwa, Gwoza, Maiduguri, Jere, Monguno, Kaga, Nganzai, Mobbar, Magumberi, Mafa, Kaga, Kukawa, Kalal Balge, Guzamala, Gubio.
Cross River	Ikom, Ibine Oban, Mfamosing, Okorotong Hills, Akamkpa, Obudu, Iwuo Ukem, Ibeno Beach, Mbo.
Delta	Ughelli North & South, ANiocha North & South, Bomadi, Burutu, Ethiope East & West, Ika South, Isoko North & South, Ndokwa East
Enugu	Enugu-Ikulu, Igbo Eze North & South, Isi-Uzo, Nkanu East, Uzo-Uwani
Gombe	Yamaitu-Deba, Akko, Dukku
Imo	Ihiagwa, Obinze, Isu, Njaba, Obowo
Kaduna	Kaduna
Kano	Dambatta, Makoda
Katsina	Zango, Baure
Lagos	Apapa, Badagry, Epe, Eti-Osa, Ibeju-Lekki, Ikeja, Ikorodu, Lagos Island, Ojo
Nasarawa	Lafia, Doma, Nasarawa
Niger	Gbako, Gurara, Lavun, Mokwa, Katcha, Muya, Wushishi, Bida
Ondo	Igbokoda, Atijere, Akata-Agbala, Zion Pepe, Aboto, Agerige, Ese-Odo, Ikare, Ilaje
Yobe	Ngeji (Fika), Damaturu, Jakusko, Karaguwa, Nguru, Tarmuwa, Geidam

Table 7:Locations of Ball Clay Deposit in Nigeria

States	Locations
Abia	Isukwuato, Ikwuano, Umuahia, Bende, Arochukwu
Akwa-Ibom	Nkari, Nlung, Ukim, Ikot-Etim, Eket-Uyo, Ekpere-Obom, Ikot-Okoro, Ikwa
Benue	Katsina Ala, Otukpo, Buruku, Gwer West, Markudi
Cross-River	Appiapumet, Ofumbongbaone, Ogurude, Ovonum
Delta	Ethiope East, Isoko South, Ndokwa East, South & West, Okpe, Sapele, Ughelli South, Warri North & South
Ebonyi	Ohaukwu, Ezza North, Abakaliki, Izzi, Afikpo South, Ohaozara
Enugu	Enugu, Isi-Uzo, Uzo-Uwani, Oji River, Udi
Ekiti	Ara-Ijero, Igbara, Ado, Orin
Kaduna	Kachia, Maraba-Rido, Farin-Kassa
Kano	All over the State
Kogi	All over the State
Niger	Lavun, Gbako, Suleja, Minna, Agaie, Paikoro, Bida, Murya, Mashegu
Ogun	Bamajo, Onibodo
Ondo	Erugu, Akoko, Ikale, Ode-Aye, Ute Arimogija, Ifon.
Plateau	Bassa, Barinkin-Ladi, Mangu, Kariam, Langtang North
Rivers	Etche, Ikwere

Table 8:Locations of Bentonite Clay Deposit in Nigeria

States	Locations
Abia	Arochukwu, Umuahia, Bende, Isukwuoto, Ikwuano
Adamawa	Mayo-Belwa, Guyuk, Mbi, Gombi
Akwa-Ibom	Itu
Anambra	Awka-South
Borno	Ngala, Marte, Mongunu, Gmboru, Dikwa
Cross River	Ogurude
Ebonyi	Ohaozara
Edo	Akoko-Edo, Owan East & West, Etsako East, Central and West
Gombe	Akko, Gombe, Yamatta, Debba
Yobe	Gujba

CLAY MINERALS IN NIGERIA: AN OVERVIEW

Kaolin

Kaolin is an industrial clay mineral with the chemical composition, $Al_2O_3.2SiO_2.2H_2O$. Due to its whiteness, fine particle size and plate-like structure, it holds importance as a major raw material in refractory applications and ceramic production[7]. Kaolin is also suitable as a coating, functional filler, extender, pigment, catalyst, concrete and fiber glass. Current applications of Kaolin include[7]:

- **Refractory Bricks:** Refractory bricks (fire bricks) are used to line high temperature furnaces and kilns, hence must be able to resist high temperature. User industries are all heat using industries such as iron and steel, ceramics, glass, cement, galvanizing and petroleum.

  Despite having huge deposits of kaolinite clay mineral in Nigeria, Nigeria continues to depend on external sources of refractory clays for its industries[8]. In 1987 alone, Nigeria imported about 27 million metric tons of refractory materials[9].

- **Ceramic Wares:** Kaolin stands out as the major raw material in almost all ceramic products. These include structural ceramics (drain pipes, sewage pipes, tiles, etc), white wares (household utensils, sanitary wares, etc), and porcelain, e.g. high and low tension electrical insulators and dental ceramics.

- **Paper Making:** The largest use of kaolin is in the production of paper where it serves both as a coating pigment and as a filler to replace fibre. Kaolin is suited in this aspect because it possesses desirable optical properties, chemically inert and relatively inexpensive when compared to other minerals.
- **Concrete:** Kaolin when added to concrete helps to improve strength and durability of concrete and motars. It reacts with free line during hydration to produce additional cementitious material, resulting in an improved high performance concrete.
- **Plastics and Rubber:** Kaolin is widely used as a functional filler in the plastic and rubber industry because of its inert chemical nature, unique size, shape and structure. Its presence results to improved overall performance of the plastics and rubber.
- **Paint:** In the production of paint, kaolin is used as an extender pigment. Primarily, kaolin in paint reduces the amount of expensive pigments e.g. titanium dioxide, assists the desired rheological properties that help maintain proper dispersion, and provides bulk to the product.
- **Pharmaceuticals and Cosmetics:** Kaolin is used in pharmaceuticals for treating different stomach irritations such as diarrhea. In cosmetics, it is used in various skin care products in removing black needs and dirt from the skin/skin pores[10].

  Kaolin is also eaten for health reasons and to suppress hunger, a practice known as geophagy. Its consumption is greater among women especially during pregnancy.

Feldspar

Feldspar is a rock forming mineral that is industrially important in glass and ceramic industries, and as a bonding agent in the manufacture of bonded abrasives e.g. wheels and discs of garnet, corundum, emery, etc. To some extent, feldspar is used as a filler and extender in paint, cements and concretes, fertilizer, insulating compositions, tarred roofing materials, used in medications like anticonstipation drugs and as a welding rod coating[11].

- **Feldspar in Glass Production:** About 70% of feldspar is used in the manufacture of glass products and 30% in ceramics and other products[12]. The raw materials for glass sand batch consists of silica sand, soda ash (Na_2CO_3) and limestone ($CaCO_3$) with feldspar making upto 10 – 15% of the batch.

  Alumina (Al_2O_3) from feldspar provides hardness, workability, strength, resistance to chemical corrosion and thermal shock resistance to the product. Alkali oxides (Na_2O and K_2O) from feldspar are fluxes. As fluxing agents, they reduce the melting temperature of the Silica sand in the batch, hence less energy is used, enabling the control of the glass viscosity and decreases the amount of soda ash needed[13,14].
- **Feldspar in Ceramic Production:** 30% of feldspar is used for manufacturing ceramics. Here, feldspar serves as a vitrifying (fluxing) agent forming a glassy phase at low temperatures, and also a source of alkalies and alumina in glazes[15].
- **Feldspar in Earth Sciences:** In earth sciences and archaeology, feldspars are used for dating, such as K-Ar dating, Ar-Ar dating, thermoluminuescence dating and optical dating.

Limestone

Limestone ($CaCO_3$) has numerous uses or applications, and these include:[16]

- Major raw material in the production of Portland cement.

- As an aggregate or base for roads and formulations, concrete and construction stone in buildings.
- It is used as a while pigment/filter or additive in products such as toothpaste, paints, papers and as a chemical feedstock.
- Limestone is used in the manufacturing and purification of molten glass.
- It is used in the manufacture and removal of impurities from molten iron.
- Limestone is used in the production of brake pads.

Talc

Talc is a silicate mineral, typically phyllosilicate composed of hydrated magnesium silicate with the chemical formular: $Mg_3Si_4O_{10}(OH)_2$. The most commonly known applications of talc include the following:[17]

- In cosmetics and dusting (antiperspirants), body and baby powders. The oleophilic (oil loving) nature of talc mineral helps to absorb natural oils, hence serving as a lubricant; while the slippery nature presents a pleasant feel.
- Paper Industry: Paper industry is the highest consumer of talc, and it is used as a filler to enhance opacity, brightness and whiteness of the paper. Talc also improves the paper's ability to absorb ink.
- Ceramic Industry: In this industry, talc mineral is used to prevent glaze crazing, lowers firing temperatures and reduces firing shrinkage of the ceramic products.
- **Paints and Coatings:** Here, talc is used as extender and filler. The platy shape of talc particles improves the suspension of solids in the container and helps the liquid paint adhere to the wall without sagging. It also improves exterior durability, controls viscosity, brushing and gloss properties.
- **Plastic Industry:** When used in plastics, the plates of talc make the plastic product more rigid and stronger, increases stiffness (and heat resistance), and reduction in shrinkage. For example, polypropylene parts reinforced with about 40% talc have replaced metal in many automotive applications such as bumpers.
- Talc minerals are also used as chewing gum dusting, insecticide carriers, rubber dusting, textile filling materials and as additive in asphalt roofing compounds.

Silica Sand

Silica minerals make up approximately 12% of the earth's crust and are second only to the feldspars in mineral abundance[18]. Free silica occurs in many crystalline forms viz; quartz, tridymite and cristobalite with quartz as the most commonly occurring form. Quartz, a crystalline form of silica is the only natural silica mineral used in significant quantities with millions of tones consumed annually by many industries. The basic applicators are:[18,19]

- **Construction Industry:** It is used as aggregate in concrete and mortar, building and road construction.
- **Glass:** Quartz silica is the major raw material in virtually all types of glass manufacture.
- **Ceramics:** Quartz sand has been ground to fine size as an ingredient of most clay bodies and as a major constituent of ceramic glazes. These typical ceramic products in high demand of silica include refractories, porcelain, tableware, sanitary ware, ornaments and tiles.
- **Foundry Casting:** It is used for the preparation of the form blends from cast iron, steels and non-ferrous foundries, and abrasive cleaning of casting surfaces.
- **Abrasives and Adhesives:** Quartz silica is used as sand paper, emery paper and in sand blasting for polishing and cutting glass, stone and metal. It is also used in manufacturing adhesives for tiles, natural rock pavement, marble, etc.
- Quartz is used as a hydrophobic (water-repelling) coatings, organic silicates and silicones, silicon carbides, silicon metal, smelting flux and alloying in metallurgy.

Ball Clay

Ball clay is a fine grained, high plastic sedimentary (secondary) clay which fires to a light or near white colour[20]. It exhibits highly variable compositions and consists of a mixture, primarily of kaolinite, mica and quartz with each contributing different properties to the clay. The inherent properties of ball clay is valued in its high plasticity, strength, light fired colour and bonding nature (binding agent). The high plasticity facilitates shaping and finishing of ceramic bodies, while the high strength allows green clay articles to keep their shape and withstand all types of moulding, shaping and conveying during manufacture[21]. Hence, ball clay adds plasticity to ceramic bodies inconjunction with kaolin (non-plastic clay) to produce a workable and malleable raw material.

Ball clay is highly recommended in the following applications:[22]

- **Sanitary Ware:** A ceramic body for sanitary ware typically consists of 30% ball clay to provide plasticity and workability, 70% kaoline, 30% feldspar and 20% quartz/silica.

- **Tableware:** Ceramic tableware utilizes ball clay to provide high plasticity and a good white fired colour, combined with kaolin, feldspar and quartz.
- **Wall and floor tiles:** Combined with talc, feldspar, quartz/silica and kaolin, ball clays are utilized to their plasticity and bonding properties.
- **Refractory clays:** An ability to resist the effects of extremely high temperatures makes ball clays ideal for use in refractory products such as dense and insulation bricks, and furniture bat.
- **Construction Ceramics:** Building materials such as bricks, clay pipes and roof tiles all contain ball clay.
- **Electrical Porcelain insulators:** Ball clays are found in the electrical porcelain components that provide insulation from high voltage currents.
- **Non-Ceramic Applications:** These include the construction industry, horticulture, agriculture and amenity industries used as fillers and extenders in polymers, adhesives, plastics, sealants, fertilizers and insecticides.

Bentonite

Bentonite is a plastic, colloidal, and absorbent aluminium phyllosilicate impure clay consisting mostly of montmorillonite. Industrially, two major types of bentonite exist, viz: sodium bentonite and calcium bentonite. The basic uses of bentonite are:[23,24,25]

- **Drilling muds:** It is used as a drilling fluid in the oil industry to lubricate and cool the cutting tools, remove cuttings and helps to prevent blow outs.
- **Binder:** Bentonite is widely used as a foundry-sand bond in iron and steel foundries, castings, and as a binding agent in the manufacture of iron ore pellets.
- **Clay bodies and ceramic glazes:** It is an important ingredient used to design clay bodies and ceramic glazes.
- **Bentonite clay is used in pyrotechnics to make end plugs and rock**-engine nozzle.
- **Purification:** It is used for decolorizing various minerals, vegetable and animal oils, clarifying of wines, liquors, ciders, beer, vinegar and the like.
- **Absorbent:** Bentonite is applied in pet care items, e.g. cat litter to absorb odour and surrounding faeces, absorption of oils and grease.
- **Ground water Barner:** It is used as sealant by providing self-seeding and low permeability barner; to line the base of land-fills; making slurry walls and for quarantining metal pollutants of ground water.
- **Medicinal:** Bentonite has been described as a bulk laxative, used as a base for many dermatologic formulas, and as a desiccant due to its high adsorption properties.

IV. RECOMMENDATIONS

The position of ceramic technology in Nigeria as a veritable tool in the development of any nation is that of neglect with attendant lack of manpower, moribund (in the case of previously established ceramic industries), in adequate funding and poor research patronage or grant occasioned with epileptic power supply and non-existence of statutory regulatory support[26]. This assertion is in agreement with the position of Dr. Chike Obidigbo who posits that:

"The prime sector of our economy, which is agriculture, exploitation of abundant mineral resources and local manufacturing is not been assisted by government and the preference of foreign products to that of made in Nigeria by the Nigerian populace is not helping matters either. Instead of government to support, she is rather frustrating the effort of the manufacturers and researchers with multiple taxation policy. Cost of production is too high coupled with the outrageous bank interest on loans. Power supply is massively construed in the hands of the politicians"[27].

For Nigeria to diversify her economic sources and improve her econo-technological growth, there is urgent need to maximally exploit the abundant clay minerals in the country. The exploitation and utilization process will yield the needed result through:

- Establishment and finding of ceramic technology and engineering department in our tertiary institutions.
- Establishment of effective ceramic industries and resuscitation of moribund ones.
- Improved power supply.
- Adequate funding of research and development (R&D), and manpower training in ceramic technology and engineering, and solid mineral exploitation and processing.
- Statutory policy to support local ceramic products.
- Imposition of high tariff on foreign ceramic products.

V. CONCLUSION

The abundant ceramic resources in Nigeria when exploited and utilized, will on the long term, result to economic empowerment, job creation and technological advancement.Transforming the challenges to opportunities will strengthen the nation and bring her close to the economically and technologically developed nations of the world.

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American Journal of Engineering Research (AJER)
e-ISSN : 2320-0847 p-ISSN : 2320-0936
Volume-3, Issue-9, pp-135-139
www.ajer.org
Research Paper Open Access

The Use of Local Ceramic Materials for the Production of Dental Porcelain

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ABSTRACT: *The use of local ceramic raw materials (Edda clay as source of Kaolin, Feldspar and Quartz) sourced in Nigeria was studied in this research. The Edda clay sample was chemically analyzed using the atomic absorption spectroscopy AAS (Model AA 320N) to determine its chemical (oxides) composition.The dental porcelain was produced by pressing method using POP mould. The specimens produced were tested for linear shrinkage and apparent porosity properties in order to ascertain their compatibility and acceptability. The chemical analysis showed that the local clay is kaolinite in nature with silica (SiO_2), alumina (Al_2O_3) and iron oxide (Fe_2O_3) contents of 56..00%, 21.64% and 0.12% respectively. The physical test results reveal a firing linear shrinkage value of 2.40%, and apparent porosity value of 4.21%. These test results fall within the range of acceptable values for the production of standard dental porcelain.*

KEYWORDS: *Atomic absorption spectroscopy, dental porcelain, POP mould, linear shrinkage, apparent porosity.*

I. INTRODUCTION

Porcelain is an inorganic compound made by heating a blend of three silicate clay minerals: Kaolin, Quartz and Feldspar, each of which reacts upon one another when subjected to appropriate high temperature (Eke, 2006). Kaolin serves as the plastic material while quartz (silica) and feldspar are the non-plastic materials. Porcelain generally can be classified into dental, electrical, translucent and hard porcelain. Porcelain as a clay body when fired becomes very hard, strong and translucent. It is normally very white with smooth surface when glazed. Porcelain also is unreactive and must contain little or no iron impurities.Dental porcelain, also known as dental ceramic is a material designed with the purpose of producing dental prostheses which is used to replace missing or damaged dental structures, e.g. teeth (Rosenblum & Schulman, 1997). The procedure consists of rebuilding the missing tooth with a porcelain covering (Jacket).

The raw material of dental porcelain contains crystalline ingredients; feldspar ($K_2Al_2O_3.6SiO_2$), Silica (SiO_2) and Kaolin $(Al_2O_3.2Si)_2\ 2H_2O$ held together in a clear liquid like glass structure (Craig, *et al.*, 1979). The feldspar is an alkali flux which lowers the firing temperature and controls density and porosity of the clay body. Silica controls shrinkage and gives rigidity and support to the porcelain body. Kaolin gives soft plastic base, shape and opacity to the fired porcelain (Eke, 2006).

Jones (1985) classified dental porcelain according to its fusing temperature into:

- High fusing (1200 – 1450^{0}C) which is used for denture teeth.
- Medium fusing (1050 – 1200^{0}C) used for inlays, jacket crown and bridge pontic construction.
- Low fusing (850 – 1050^{0}C) used mainly in the fabrication of porcelain bonded to metal crowns.

II. FUNCTIONALITY OF DENTAL PORCELAIN IN DENTISTRY

Dental ceramics are used to replace the natural dentitions or portions of it, to preserve existing dentitions, or to strengthen or enhance the existing aesthetic appearance. The science of dental, ceramics for any given application particularly in dentistry involves a study of the materials' compositions, properties and interactions with the applied environment. Therefore, the selection of the materials must be undertaken with confidence and sound judgment (McCabe & Walls, 1998).

Many dental ceramics are fixed permanently into the patient's month and removed only intermittently for cleaning. Such materials must have the capacity to withstand the effect of most hazardous environment, variations in temperature, acidity/alkalinity and high stresses. The dental ceramics fabricated for use as replacement for natural tissues place a very high demand upon the chemical, physical and biological properties. For effective functionality as a dental aid, the dental porcelain must be:

- Compatible with biological tissues and without eliciting any adverse reactions.
- Capable of responding successfully to the stresses and strains.
- Able to withstand the corrosive or chemical environment.
- Capable of stimulating in most cases, the appearance of natural tissues in terms of both colour and translucency.
- Capable of being reasonably easy to fabricate by traditional methods. (McCabe & Walls, 1998).

III. THE ROLE OF GLAZING IN DENTAL PORCELAIN

Glazing is the process of covering the porcelain body with a thin layer of glass. A suspension (slip) of the finely ground constituent glaze material is applied to the body which is then dried and fired. The glassy state is developed during firing. Thus, dental glazes are composed of colourless glass powder which is applied to the fired crown surfaces so as to produce a glossy surface (McLean, 1974). According to McLean (1979), the main purpose of glazing includes:

- To make the porcelain more pleasing to touch and to eye.
- To provide an impervious coating which makes the ceramic more hygienic, resistant to chemical attack and mechanically stronger.
- To seal the opening pores in the surface of a fired dental porcelain.

IV. RESEARCH OBJECTIVES

Teeth damage or loss of teeth is one of the major health challenges facing the human race globally. More often than not, the victims sought for artificial teeth as an alternative.In Nigeria for instance, these artificial dental restoratives are imported and costly too, hence unaffordable by the rural poor teaming population. Ironically, Nigeria is richly endowed with these raw materials (kaolin, feldspar and silica) and other clay minerals that can be exploited for the production of dental porcelain and other ceramic products (RMRDC, 2009). Regrettably, these natural resources are left untapped and unutilized.

Based on the background of the problems identified, the objectives of this research are:

- To produce dental porcelain that will be used as a replacement for a damaged or lost dental structure (tooth) using local ceramic raw materials.
- To produce affordable and compatible dental ceramics of acceptable standard using the local raw materials.
- To re-awaken the technological consciousness of Nigeria with a view to exploiting her abandoned rich natural mineral resources especially clay minerals.
- To maintain and improve the quality of life of dental patients.

V. MATERIALS AND METHODS

RAW MATERIAL SOURCING

The ceramic raw materials used in the production of the dental porcelain were:

- Edda clay (source of kaolin) obtained from Edda in Afikpo South L.G.A of Ebonyi State, Nigeria.
- Feldspar obtained from Ijero-Ekkti in Ekiti State, Nigeria.
- Quartz obtained from Abakaliki, Ebonyi State, Nigeria.
  These raw materials were consequently washed, air dried, crushed, ground and sieved using jaw crusher, pan mill and mesh 100 respectively.

CHEMICAL ANALYSIS : The chemical composition of the raw Edda clay sample was carried out at the Research Centre, Caritas University, Enugu, Nigeria using Atomic Absorption Spectrophometer, AAS (Model No. AA 320N).

MODEL PREPARATION : The design of the proposed dental porcelain (8cm x 1cm) was drawn on a plain sheet of paper, and spread on a smooth table surface. A blend of 100g Plaster of Paris (POP) and 100ml water was stirred vigorously and poured into the design on the table. The mixture poured was allowed to set, forming leather hard clay. It was later shaped and trimmed accordingly using saw blade and scrapper. The carved model was allowed to dry in air for 24 hours.

MOULD PRODUCTION : 150ml of water and 250g of POP were measured using measuring cylinder and digital electronic weighing balance respectively. The water measured was poured into a plastic 150ml of water and 250g of POP were measured using measuring cylinder and digital electronic weighing balance respectively. The water measured was poured into a plastic bucket while the POP was gently sprinkled into it. The blend was stirred thoroughly till flocculation. The suspension was gradually poured into the retaining wall of the model and allowed for 15 – 20 minutes to set. Therefore, the retaining wall was dismantled, hence the produced mould was trimmed using scrapper and saw blade.Lock was created on the two sites of the mould produced to enable it lock effectively when in use. The same procedure was repeated to produce the other side of the mould. The mould was finally dried in the oven for 24 hours at 110^0C.

PRODUCTION OF DENTAL PORCELAIN : The production sequence adopted in producing the dental ceramics was; communition, sieving, batching and mixing, forming/shaping, drying, firing and glazing. The air dried raw materials were crushed and ground to fine aggregates to liberate the mineral constituents. The powdered samples were also sieved using 100 mesh sieve. Thereafter, the raw samples were batched (with a total weight of 500g) and mixed thoroughly with water forming a plastic paste. This paste was allowed to age for 24 hours in order to obtain a workable mix.The aged plastic paste was pressed into the mould and tapped adequately. After one hour, the formed sample was removed from the mould and air dried for 48 hours in the ceramic workshop. Thereafter, the dental porcelain was dried in a drying cabinet for 3 days at a temperature of 110^0C. Consequently the product was high bisque fired with an electric kiln to a temperature of 1200^0C.
Finally, the dental porcelain was glazed, after which it was subjected to gloss firing at 1230^0C for 8 hours in the kiln.

PHYSICAL TESTING OF DENTAL PORCELAIN : The following properties associated with dental ceramics were determined:

Linear Shrinkage : Linear shrinkage was determined by measuring the dimensional changes that occurred in the green (wet), dry and fired test samples of the porcelain with the same body composition.

In the green state, the test sample was marked with a shrinkage line of 8.5cm and noted as the original (green) length. After drying, the linear length of the test sample at this state was measured using vernier calipers. The linear drying shrinkage was calculated using the relationship:

$$S_d = \frac{L_g - L_d}{L_g} \times 100 \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where, S_d = Linear drying shrinkage
L_g = Green/original length of sample
L_d = Dry length of sample

Consequently, the dried test sample was fired in the kiln at a temperature of 1230^0C. Upon cooling, it was removed and its fired length, L_f measured. The linear firing shrinkage, S_f was calculated using the formula:

$$S_f = \frac{L_d - L_f}{L_d} \times 100 \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

The combined effect of the drying and firing known as the total linear shrinkage, S_t was determined and calculated thus:

$$S_t = \frac{L_g - L_f}{L_g} \times 100 \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

Apparent Porosity : The test sample was dried in a dry cabinet at 110^0C for 24 hours and fired to 1230^0C in an electric kiln. The fired test sample was weighed in airW_1 and later transferred into a beaker of water, boiled for 5 hours and allowed to cool. The sample was removed from the water, cleaned and weighed to determine the boiled weight, W_2 Apparent porosity, AP was determined using the relationship:

$$AP = \frac{W_2 - W_1}{W_1} \times 100 \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

VI. EXPERIEMENTAL RESULTS

Tables 1 and 2 show the chemical analysis of the local clay (Edda clay) used and body composition of the dental porcelain. The results of the linear shrinkage and apparent porosity tests are shown in tables 3 and 4.

Table 1: Chemical analysis of Edda clay

Composition	Weight %
SiO_2	56.00
Al_2O_3	21.64
MgO	1.23
Fe_2O_3	0.12
Na_2O	2.10
K_2O	1.90
LOl	15.34

Table 2: Body Composition of the Dental Porcelain

Materials	Composition	
	g	%
Edda Clay	150	30
Feldspar	300	60
Quartz	50	10

Table 3: Linear Shrinkage Test Result

Green Length (cm)	Dry length (cm)	Fired length (cm)	Linear Shrinkage, %		
			Drying	Firing	Total
8.50	8.41	8.30	1.10	2.40	2.35

Table 4: Apparent Porosity Test Result

Fired Weight W_1 (g)	Boiled Weight W_2 (g)	Apparent Porosity %
61.80	64.40	4.21

VII. DISCUSSION OF RESULTS

Convincing evidence suggests that dental porcelain or dental ceramics must be biocompatible, esthetic, insoluble (less porous) low firing shrinkage and have hardness of 7 on the Mohr's scale (Della & Kelly, 2008).

VIII. BIOCOMPATIBILITY

According to UIPAC recommendation (2012), biocompatibility is the ability of a material to be in contact with a living system without producing an adverse effect.Ceramic materials have been used in dentistry for over 200 years. Hence, they are the most biocompatible of dental restorative materials because they are chemically very stable (Derek Jones, 1998).

Aesthetics : Aesthetics also known as the judgements of sentiment and taste is scientifically defined as the study of sensory or sensori-emotional values. A desirable feature of ceramics is that their appearance can be customized to stimulate the colour, translucency and fluorescence of natural teeth.

Chemical Analysis : The chemical composition of the Edda clay (source of kaolin) is presented in table 1. The silica (SiO_2) and alumina (Al_2O_3) contents are 56% and 21.64% respectively. The iron oxide content is 0.12%.

These results indicate that the Edda clay is actually kaolinite clay, hence a source of kaolin. Furthermore, the iron content is very low and is of required acceptable standard for a dental porcelain.

Linear Shrinkage : The results of the linear shrinkage (drying, firing and total) are shown in table 3. It revealed low shrinkage values of 1.10%, 2.40% and 2.35% for the drying linear shrinkage, linear firing shrinkage and total linear shrinkage respectively. Thus, these values fall within the acceptable shrinkage values of dental porcelain.

Apparent Porosity : Table 4 shows the apparent porosity test result of the dental porcelain. An apparent porosity of 4.2% was obtained. This low value (4.21%) indicated that the dental ceramic depicts increase in durability and strength, less porous, and confirmed with the suggested evidence (acceptable standard) of Della and Kelly, 2008.

IX. CONCLUSION

From the production and physio-chemical tests, the following can be concluded.

- The local clay (Edda clay) is kaolinite in nature, hence a source of kaolin.
- The chemical analysis revealed a very low iron impurity (0.12%) required of an acceptable standard dental porcelain.
- Though the investigated properties gave results that are acceptable for a standard dental porcelain, the dental ceramic produced using local raw materials is a prototype, hence requires a clinical/medical compatibility test.

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American Journal of Engineering Research (AJER)
e-ISSN : 2320-0847 p-ISSN : 2320-0936
Volume-3, Issue-9, pp-140-146
www.ajer.org
Research Paper Open Access

Studying of affiliation's citizens concept in urban spaces (Case study: Mashhad Metropolitan)

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ABSTRACT :*Today one of the main issues in urban space is identity. Identity concept is sensation of a particular space. It is perhaps within the realm of recognizing the significance of the concept space which we can recognize and realize ourselves as human beings. The affiliations allows and assists an average location to not only become individually unique, but also importantly reflects the cultural aesthetics of it's social surrounding as well. Affiliation is perhaps one of the most crucial phenomena's in understating the organic and humanistic relationship between human and location. This way of revealing has always been particularly important to urban designers and planners, because analyzing the sense of belonging to one neighborhood can directly assist us in the process of forming a grandeur society.The purpose of paper is, demonstrate how we can increase the level of affiliation to a particular environment (neighborhood) that surrounds us, and furthermore, analyze how we can also increase the collective sense of human responsibility towards the conditions of the common neighborhood as well. This research is applied. Also, method of research is "descriptive – analytical", and data collection method is "document –field". In order to be used questionnaire tools for collecting data. On the other hand we used from Cochran formulate for detecting relation between variables. Also, was measured affiliation of mentioned area. Finding show, there is positive relation between resident affiliation and their space , so the Affiliation of residence of kooh – sangi is high.*

KEYWORDS: *Affiliation, identity, neighborhood, Mashhad city*

I. INTRODUCTION

The concept of spatial environment and it's exterior form in relation to our average everydayness, has been one of the most important issues in the field of urban research (Bentley , 1974). The concept of identity crisis in our current age is mostly the result of dislocating the meaning and sense of being a human from the actual world we live in, and eventually enslaving ourselves to the materialistic structure of the current age. Our current technological age has produced various ways for mass communication, but the actual act and art of physical of communication has not only drastically decreased, but it's humanistic potency has declined as well; massive urban landscapes have constantly raised human beings with extremely limited perceptual experiences and memories. Our environment is the totality of a social and cultural collectiveness; it is human beings who physically and conceptually construct particular locations, because without the presence of rational agents space has no intrinsic meaning on its own. Therefore, the common and universal sense which the individual arrives at after the comprehension of a particular landscape, can be defined as the sense of belonging- This very concept is integral in the formation of the relationship of human beings and their environment. And it is perhaps in the midst of this relation whom the individual is able to gain a deep and continuous sense of belonging towards the desired landscape. In regard to this very analysis, our goal is to demonstrate why the affiliation has gradually vanished among various urban residents.

The sense of a place is the direct outcome of internal communication within one's own mental occurrences and the landscape which surrounds him, and this creates a profound sense of belonging in individual's mind when the environment he is affiliated with is able to correctly correspond to his way of being. So therefore, the sense of a place is not a presupposed outcome, but rather it is the result of the communication between human beings and their environment (our everydayness is also the result of this as well), (Felahat 2008, 63). In the realm of a common landscape, various people impose various beliefs upon the world they live in based on presupposed ideas they have towards their area of residency (Partovi, 2010: 7).John Jackson argues that, the sense of a place is not only a particular humanistic sense, but one which occurs internally in one's own individual state of being, and constantly gets redefined through the continuity of perceptual experience (Jackson, 1994). On the other hand, Towan replaces the term: sense of a place, with the term: care for a place, which is basically the caring and affectionate relationship human beings can build with their environment- For Town, this connection has aesthetics and physiological value in it as well(Felahat, 2006, 3).

The affiliation is a much more profound occurrence than just experiencing the sense of a place. This particular event is not only the result of continuous residency in a landscape, but more importantly depends on the notion of place awareness. The sense of belonging has it's foundation in the sense of a place, but at the same time transcends itself beyond that particular location, and eventually develops a sense of care and attention for that place as well. The affiliation is one of the most essential attributes in the process of evaluating the quality of human communication in relation to their environment. Basically, individuals are looking to find a response to their various needs in the environment they reside in, and in the case of failure to supply this need, eventually a positive sense of emotional connection between the person and the place will not be created (Forouzande 2012, 4).

The affiliation o a particular place first and foremost means to be un-universal, steady and sustainable (Gol Mohammadi, 2003: 230) - From the perceptive of Geographical Phenomenologist the sense of belonging creates a solid and effective link between the people and the place, and this link not only has to be humanistic ally affirmative, but it has to also expand the depth of communication and interaction with the environment with the passing of time (habibi, 2004).Various Academic Research have indicated that when the amount of time spent in a particular location increases, not only the level of awareness towards the area of residency increases, but more importantly the sense of belonging elevates itself as well. In general, we can analytically divide the various semantic dimensions of human beings physiological relationship with their environment in a few steps.

Cognitive : Based on this approach, the value of environment for individuals with more knowledge and awareness of that particular place has more much connotation than a similar environment in the absence of the individual's care and recognition of it. It can also be argued that this approach refers to the necessity of creating the idea of sense of belonging in human beings approach towards their environment.

Social : Based on this approach, the sense of belonging to a social environment is the result of interpersonal communication among all members of society. Furthermore, the environment in itself contains various social and collective cues which can not only enhance the process of human understanding, but can also decode our enigmatic interaction with the environment so we can eventually have a healthy relationship with it.

Sentimental : Based this approach, the emotional connection human beings have with a particular place allows them to engage themselves in the formation of meaning in virtue of human emotion and sentiment.
Based on the semantic model of analyzing the concept of sense belonging there exists 3 main components (individual; Collective; Environment) in this very process.
1- The individual's proper recognition and his humanistic relationship with his surrounding environment are key in the formation of sense belonging.
2- It is essential that urban planners connect their thoughts and methods of operations to actual environmental users, because again the concept of belonging heavily relies on the activity of social communication in a collective landscape.
3- Various elements existing in the realm of common place and environment serve as instruments in the pathway of cognition and identity realization.

Identity : The concept of Place Identity directly depends upon the productivity of environmental structures. Furthermore, each place does not only has it's own unique identity structure, but at the same time each singular place provokes it's own unique sense of belonging based on it's own set of beliefs and values.Urban Structures (neighborhood, pathway and etc) are deeply influenced by the historical background, and the social and political events occurring at the core of each local state. At the same time, various public or private institutes can both

have a senseless or positively effective impact on the structure of urban landscape. We have to also indicate that, the diversity of conceptual meaning present at the core of urban structures influences it's resident way of self-identification.Identity manifests itself in the sum of all diverse thoughts and desires present in one's mental state, but at the same time we cannot analyze the concept of identity without the recognition of the cultural and collective platform one's thoughts are based upon. In other words, place is the horizon for abstract thoughts to achieve actuality.Human beings are the primary presence which gives rise to meaning in a particular place, and at the same time what influences human beings way of living are the intellectual cues which they pick up from their collective landscape. So therefore, each place has its own unique mental state-The same human metal state which constructs the identity of particular place at the same time influences human beings way of living and way of being.

The Phenomenon of Neighborhood identity is the result of affiliation to a particular and local area of residency. In our current technological age where digital objects have dominated the way relationships function, Neighborhood identity has drastically lost it's humanistic significance. In our current age, the identity of neighborhood has not only been deformed, but it has also lost it's role in the development of culture and society. In the not so distant past, neighborhood was the centre of local discussions and gatherings, but the hegemony of current technology has created an overall un-local atmosphere where the localness of neighborhood has not only been diminished, but the unique affiliation to a neighborhood has also been impaired(Heidinger , 2007: 8-9)

Urban Space : Public urban space, in a sense is the manifestation of societies collective way of living- It is perhaps the primary platform for our interpersonal stories to unfold. So therefore, the only way a particular urban space can actually become publicly open and available, is for it to be transformed to a place where social communication and cultural competition constantly occurs (Pakzad, 2007:81).Urban space is an essential component of the social space; urban space allows the state of affairs to become available for public's perceptual experiences (Rogers, 2003:118). Urban space, both as a physical and symbolic entity, blends together what is culturally considered as known and unknown, in a specific social and geographical point (Zookin, 2002: 31)

Neighborhood : Rapport (1997) was one of the first figures in the area of Urban Planning which considered neighborhoods as an instrument for it's residents to realize their own sense of identity. The unique sense of belonging to particular neighborhoods indirectly constructs the abstract meaning of those neighborhoods, and this can adequately respond to our individual need of finding an intimate and personal sense of home and hominess beyond what it is traditionally known as the Home. Furthermore, Neighborhood has to adequately respond to the everyday desires and needs of it's residents. For Mumford, in the context of society, neighborhoods also carries in itself a parental role in the development of it's residents collective and individual psyche (Mumford, 1954). The structure of Neighborhood has the potential to be vast and local at the same time; this unique characteristic makes neighborhoods physically and conceptually visible for the majority of outside observers. In other words, one will encounter a unique phenomenological experience (mental state) in the midst of entering the objective context of neighborhoods (Chapman, 1384: 190).
In order to achieve the unique sense of belonging to a particular urban place, like for example neighborhood, we have keep in mind these general descriptions:

- New neighborhoods are in direct relation to the historic past and the current present of the city.
- Neighborhoods are symbolic entities which carry in themselves a visible identity(Kevin Lynch)
- Understanding people's activities through the constructed ambiance of a particular landscape.
- The harmony and compatibility of Urban Design with the concept of temporality(This method of revealing is aesthetically valuable)

Research Objective : The main objective of this research is : at first demonstrate how we can increase the level of affiliation to a particular environment (neighborhood) that surrounds us, and furthermore, analyze how we can also increase the collective sense of human responsibility towards the conditions of the common neighborhood as well.

Hypothesis

- ✓ It seems the urban quality in Kooh-Sangi neighborhood (famous neighborhood in Mashhad city) has been decreased.
- ✓ It seems the f affiliation of urban residents has been decreased (to mentioned place) .

II. RESEARCH METHOD

This research is applied. Also, method of research is "descriptive – analytical", and data collection method is "document –field". The data are generally gathered from academic centre libraries like universities, organizations, institutes and research centers such as management and planning organization and internet, official statistics and censuses, urban development plans by consulting engineers, and so on. Statistic society is citizens of koh-sangi neighborhood. In order to be used questionnaire tools for collecting data. On the other hand we used from Cochran formulate for detecting relation between variables. Also, was measured affiliation of mentioned area.

Studied area : Studied area is a particular neighborhood in the eighth district of Holly Mashhad/Iran: This location is at the core of Kooh- Sangi [1]region, and is also nearby the Kooh-Sangi Park.The Kooh-Snagi neighborhood is located in the eighth district of Holly Mashhad/Iran, and is also considered to be one of the oldest and greenest parts of Mashhad city. The presence of Kooh-Sangi Parkland, and more importantly it's historic trees which have poetically casted a stream of shadow on the neighborhood's main pathway, are one of the few natural assets of this particular neighborhood.

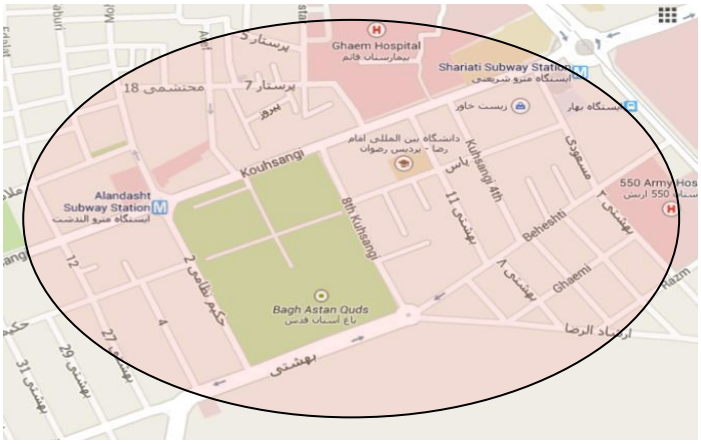
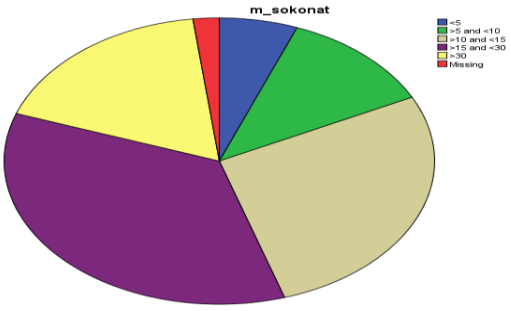


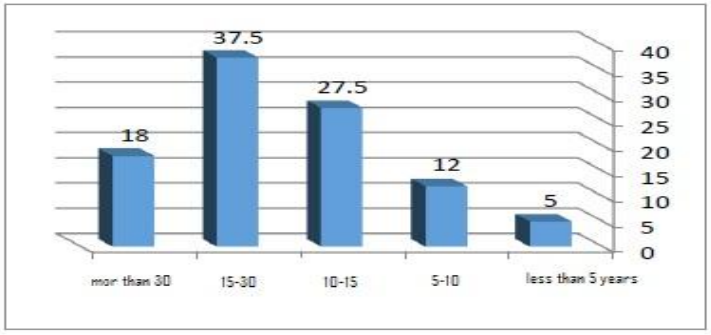
Figure 1: studied area

III. FINDING

3.1. Analyzing of collected data : The process of paper is to be used questionnaire tools for collecting data. In continue, we used from Cochran formulate for detecting relation between variables. Also, it was measured affiliation of mentioned area.

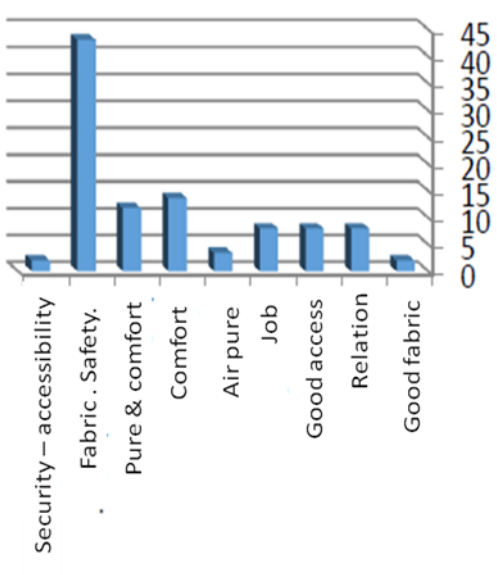
Long time of residency : Based on the data collected, the majority of the residents of Kooh-Sangi neighborhood have been living in the area for more than 10 years (81% of it's population). The fact that many families have been residing in this particular location for this many years(some even more than 20) indicates the level of neighborhood maturity, and perhaps it's rich historic age (This is also a significant factor in why the relationship between the residents and their neighborhood has been noticeably steady over a long period time).



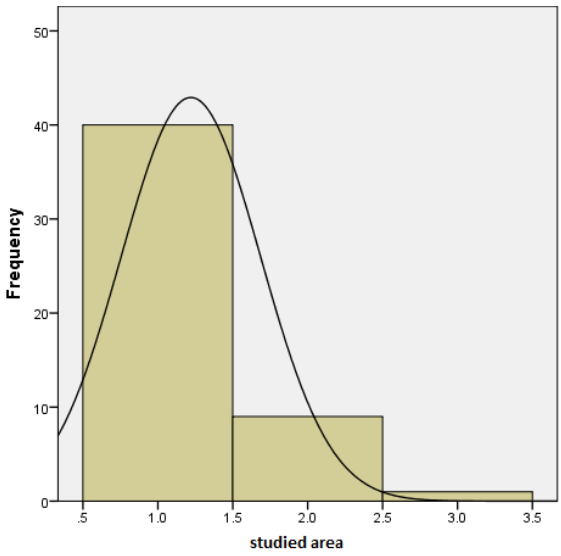


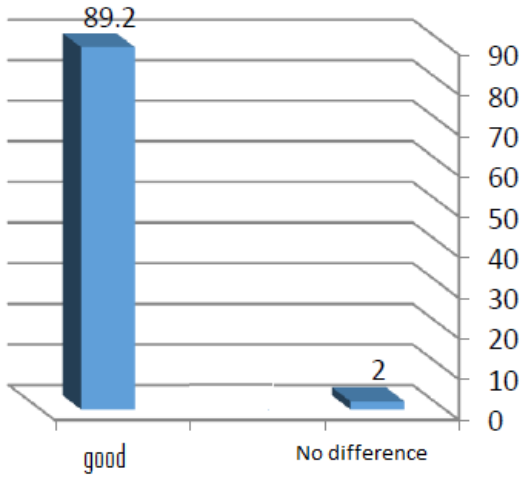
[1] - Kooh- Sangi is famous location that has been located in Mashhad metropolitan.

Based on our data, many of the Kooh-Sangi residents have chosen this particular area for residency due to it's clean atmosphere and it's evident level of neighborhood security.

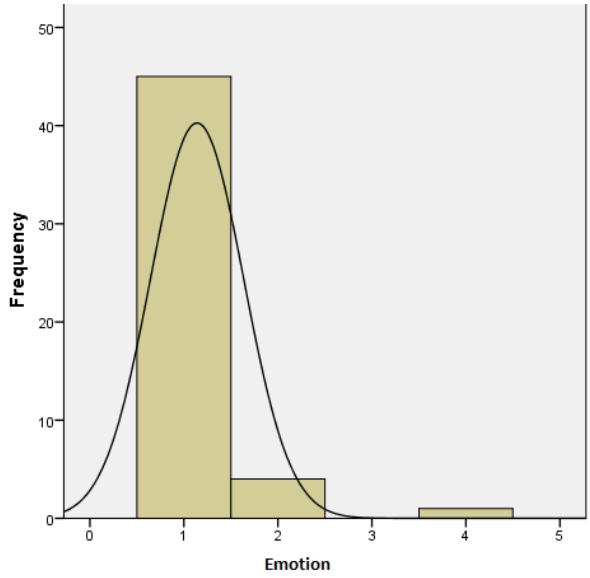


Neighborhood condition : Based on the data collected, the majority of the residents have indicated that the overall condition of the neighborhoods is important to them, and only less than 2% were neutral towards the status of their common landscape. This perhaps indicates that the sense of belonging is not only noticeably high among Kooh-Sangi residents, but they feel to be influenced by the area as well.



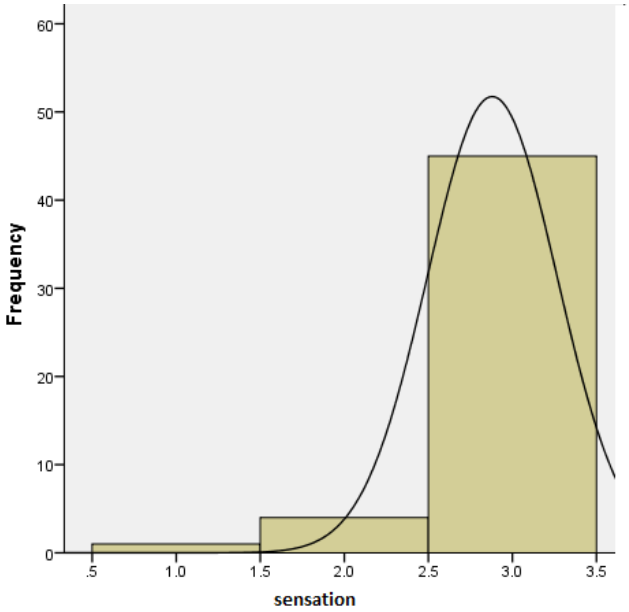


Sensation of resident toward studied area : Based on the data collected, it shows that the natural aspect of Kooh-Sangi neighborhoods have made possible the connection between the abstract concept of human emotions and the concrete objectivity of Place. This particular element has been regarded as the most significant factor in their physiological attachment to their area of residency- Many have also indicated that the natural aspect of the neighborhoods is nothing but the very identity of Kooh-Sangi (residents have considered this particular feature as highly valuable).



Resident affiliation : Based on the data collected, the level of affiliation of neighborhoods among Kooh-Sangi residents have been divided into 3 distinct categories; but it is also appropriate to point out that more than 85% of the residents have indicated that they have experienced and expressed their affiliation towards their area of residency.

Resident affiliation	Percentage
High	88.2
Medium	9
Low	2.8



Correlation Test : According to result of questioner correlation test between resident affiliations and studied area is positive. The amount is 0.8. So the hypothesis is false. Therefore affiliation toward environment is high .

III. CONCLUSION

Based on the data collected, the residents of Kooh-Sangi neighborhood not only consider themselves to carry a affiliation towards their area of residency, but more importantly the majority of them identify themselves based on the fact that they are living in such neighborhood.

At the end, based on our research on the Kooh-Sangi neighborhood in Mashhad/Iran, we can conclude that:

[1] Residents carry a noticeably high level of sense belonging to their neighborhood.

[2] Residents consider the overall structure and condition of the location as significant.

[3] Residents consider the natural aspect of the neighborhood (Park, Trees, and etc) as not only aesthetically significant, but a major factor in the construction of concepts like Place-identity and communication.

[4] The amount of time(more than 10 years) the majority of residents have spent in this particular area of residency has allowed them to not only comprehend the overall situation more precisely, but to also develop a deep sense of belonging as well.

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American Journal of Engineering Research (AJER)
e-ISSN : 2320-0847 p-ISSN : 2320-0936
Volume-3, Issue-9, pp-147-158
www.ajer.org
Research Paper Open Access

GIS-Based Analysis of the Location of Filling Stations in Metropolitan Kano against the Physical Planning Standards

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ABSTRACT: *This paper analysed the location of filling stations in Kano Metropolis against the physical planning standards set by Department of Petroleum Resource, DPR (2007) and Kano Urban Planning and Development Agency, KNUPDA (2013). Names and street addresses of the filling stations were obtained from the Department Petroleum Resource (DPR) Kano Office. Global positioning System Garmin 76X GPS was used to capture the location of the filling station. The quickbird imagery, street map, and boundary map were obtained from the Kano State Ministry of Land and Physical planning. The data were imported to Arcmap environment of ArcGIS 10, integrated and georefrenced to the same coordinate system. All the analyses were performed in the Arcmap environment using spatial statistics, spatial analyst and proximity tools available in the software. The findings revealed that there 214 filling station located along the 43 roads in the study area, of which 69% are owned by independent marketers, 26% owned by Major Marketers and 5% owned by the NNPC. Most of the station satisfied the minimum requirement of 15 metre distance from the road (96%). Equally 98% of the filling stations met the minimum distance of 100 meter from the health care facilities. However many station had not meet the criteria of 400 meter minimum distance to other stations where located on same road side and when not separated by any road or street. The research finally concludes that regulatory agencies need to look into the issue and take appropriate measures.*

KEYWORDS: *Filling stations, GIS, Location and Physical Planning Standards*

I. INTRODUCTION

The term location is used to identify a point or an area on the earth or elsewhere and this may be through the use absolute or relative terms. Location is said to be relative when it is described in relation to other point or area. An absolute location uses a specific pairing of latitude and longitude in a Cartesian coordinate grid.

The increase of urban population and the growth of the number of cars and other vehicle generate various kinds of demands, one of which is fuel. A considerable amount of cars fuel is wasted due to the long urban paths and unnecessary trips (Harrison, 1999). Increase in vehicles triggered increasing demands for fuel and by extension fuel station, since engines are made to use petroleum products and filling station are the places were fuel are sold.

Filling Station, Petrol station, gas station or petroleum outlet is defined as any land, building or equipment used for the sale or dispensing of petrol or oil for motor vehicles or incidental thereto and includes the whole of the land, building or equipment whether or not the use as a petrol station is the predominant use or is only a part thereof. Most filling stations sell petrol or diesel, some carry specialty fuels such as liquefied petroleum gas (LPG), natural gas, hydrogen, biodiesel, kerosene, or butane while the rest add shops to their primary business (Ayodele, 2011)

Petroleum is no doubt a predominant source of Nigeria's revenue and foreign exchange. It has occupied strategic importance in the Nigerian economy, accounting for as high as 78 percent of gross domestic product and up to 90 percent of the country's total annual revenue and foreign exchange earnings (National Bureau of

Statistics, 2008).The petroleum industry in Nigeria is divided into two main segments, the upstream and the downstream sectors. The upstream refers to activities such as exploration, production and delivery to an export terminal of crude oil or gas. The downstream on the other hand encompasses activities like loading of crude oil at the terminal and its user especially transportation, supply trading, refining distribution and marketing of petroleum (Asada, nd). Activities of filling stations or petroleum outlets are part of the downstream sector.

According to Ehinomen and Adeleke (2012) the petroleum industry can be classified by type of actors or by sector. The actors in the Nigerian industry consist of both private and public organizations. The public actors are the government agents and functionaries such as the Nigerian National Petroleum Corporation (NNPC) and its subsidiaries, the Department of Petroleum Resources (DPR), the Petroleum Products Pricing Regulatory Authority (PPPRA), among others. The private segment consists of both indigenous and foreign actors. The indigenous actor consist of independent marketers which numbered about 1000 in 1979, a year after formulating the act which established them but increased to 7948 in 2010 (Ehinomen and Adeleke, 2012) and they are competing with the foreign or multinational marketers (referred to as major marketers) like Mobil Oil Nigeria Plc., MRS Nigeria Plc., Total Nigeria Plc., Conoil Plc., Oando Nigeria Plc. and African Petroleum Plc.
According to the DPR procedure guide for grant of approvals to construct and operate of a petrol products retail outlet (2007), before one begin petroleum retail outlet or filling station business one has to submit:

1) Three (3) copies of approved plan showing the building existing or proposed on the site and the relation to the roadways and adjoining properties.
2) A certificate signed by signed by the Chief Federal/ State Fire Officer, or by an officer authorized in that behalf, that the arrangements proposed for the prevention of fire at the site are satisfactory.
3) A certification by the Area/Town Planning Authority for the construction of a Petrol Filling Station on the proposed site.
4) A certificate signed by the divisional police Officer or a superior police officer in-charge of the police motor traffic that he is satisfied that the site and layout of the proposed filling station do not constitute an unnecessary traffic hazard.
5) Evidence that company applying is duly registered as a limited liability company by the appropriate Federal Ministry/Corporate Affairs Commission to deal in petroleum products.
6) Tax receipt and/or tax clearance certificate for the preceding 3years.
7) According to the DPR manual before operating filling station one has to certify some physical planning standards. These standards are**:**
8) Land should be zoned for commercial/industrial use or be designated specifically for the purpose in a subdivision.
9) The parcel of land should not be less than 33 x 33 square meters or equivalent of two plots of land allow for the free flow of traffic
10) A petrol filling station should be sited 400 meters away from the next petrol station.
11) A petrol station should be sited 50 meters away in all angles of the build-up areas to create a buffer zone for the residential house-the buffer zone can be devoted to any non-residential land use.
12) That the distance from the edge of the road to the nearest pump should not be less than 15meters.
13) The total number of stations within 2 km radius of the site should not be more than four (4) including the one under construction
14) Filling station should not be located less than 100 meters from school, hospital, theaters, clinics and other public and semi-public buildings.
15) The site (for filling station) should not lie within NNPC/PPMC pipeline right of way or PHCN transmission or railroad lines (Procedure guide for grant of approvals to construct and operate of a petrol products retail outlet by DPR, 2007).

Selecting a better site for business enterprise is at mind of every government and entrepreneurs who invests their capital to earn profit. Some of the variables considered when selecting location for utility are proximity to population centers, distance from neighboring stations, the easements of using existing utility, and the magnitudes of environmental pollution parameters **(**Alesheikh and Golestani, 2011)**.** Other factors to take into account when making a decision about the location of business, including customers, transport, the neighborhood, finances and the longer term future (Oetomo and Sesulihatien, 2012).

Bolen (1988) stated that every location in the earth has its analyzable advantages and disadvantages. According to him the factors can be classified into two physical conditions. These are the real physical and analysis physical. Real physical is a visible condition in relation to area such as land condition, the width, and the distance from the highway. Analysis physical, on the other hand, is physical condition obtained from physical analysis such as population analysis, neighborhood factor, and competitor analysis. Both factors are

important while locating business, this because while the physical condition can affect the nature and type of business to be conduct, analysis physical can affect the business performance. For example, if the distance between one station and the other is too close, then it will lead to decreased turnover on each station (Oetomo and Sesulihatien, 2012).

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This work focus on the location analysis of filling station in Kano Metropolis, the second largest city in Nigeria and the commercial hub of northern part of the country. The study is triggered by the fact that human and vehicle population is high in the city and from the observation it seems there may be some problems as regard location and distributions of filling stations in the city. In the word of Christeller (1933) in Abler, Adams and Gold (1973), there is some ordering principles unrecognized that governs the distribution of things and phenomena. Only when proper investigation is made that one can explain what is where and why, a question that geography holds since the epoch of Eratosthenes, since the beginning of geography.

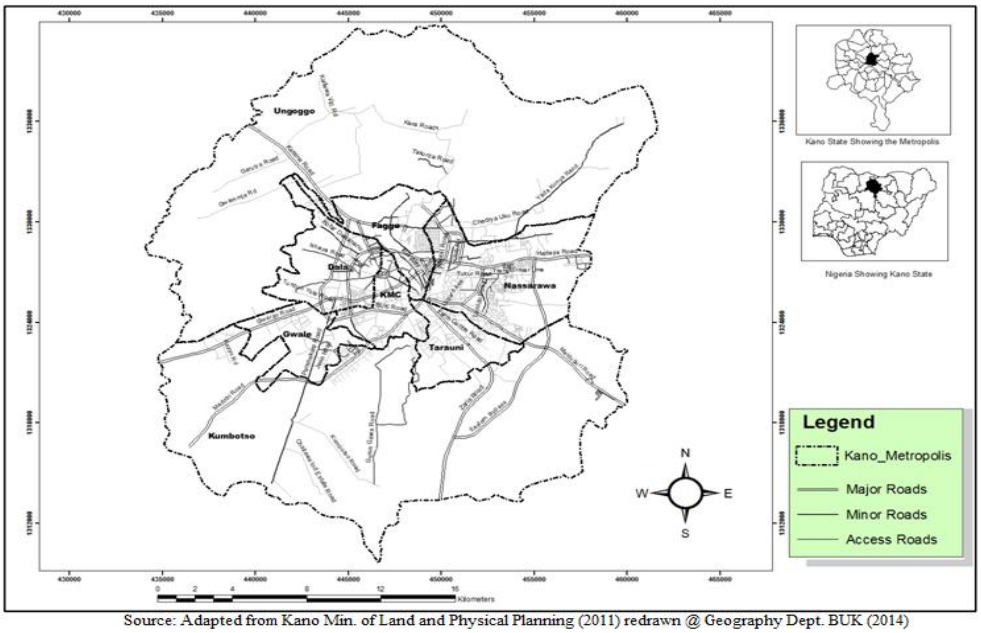
2. Study Area

The study area, Kano metropolis lies between latitude $11^0$50' to $12^0$07' N and longitude $8^0$22' to $8^0$47' E and altitude 472 meters above sea level. The climate of the area is Tropical wet and dry climate, coded Aw by the Koppen's Climatic Classification System (Olofin, 1987). Kano Metropolis bordered by Minjibir LGA to the Northeast and Gezawa LGA to the East, Dawakin Kudu LGA to the South East and Madobi and Tofa LGAs to the South West.

According historical sources Kano city was founded around Dala Hill in the 9th century A.D. (Olofin 1987, Dankani 2013). Dankani is of the view that the spatial planning and development of the area started with the building of the first city wall between 1095 and 1134, which started east of the Kurmi market near the Jakara stream. After independence, Kano witnessed an unprecedented urbanisation and rapid population growth due to socio-economic transformation in the state. According to Marafa (1999) as cited in Na'aba (2002), by the time colonial masters came in early 20th century, what constitute Kano and virtually encompassed by the wall was contained within 17.5 km^2. Today metropolitan Kano (made up of the declared urban area in accordance with the Land Use and Allocation Committee) is contained within 60 km^2, while the built-up metropolitan Kano is contained within 40 km^2 (Dankani, 2013).

The Kano Metropolis is regarded as urban Kano, as the sprawling and the expansion of the city is swallowing the peripheral area vis-à-vis the surrounding lands is gradually taking over by urban structure and site acquire an urban character. Urban Kano is located at the central part of Kano closed settled zone, and therefore having the highest density, as a result of industrialization and other economic development, it has also through time become a cosmopolitan city with all the ethnic groups.

The study area includes the eight metropolitan local government of Kano State namely Dala, Fagge, Gwale, Kano Municipal, Kumbotso, Nassarawa, Ungogo, and Tarauni. The population of the Kano Metropolis based on 2006 is 2,826,307 (National Population Commission, 2006).



Source: Adapted from Kano Min. of Land and Physical Planning (2011) redrawn @ Geography Dept. BUK (2014)

Figure 1: Kano Metropolis

II. MATERIAL AND METHODS

A preliminary survey was carried out to identify and document filling station in the area. This acquainted the researcher with the knowledge of the area and provide guide on how to source the data, types of data needed and preparation for the field work. Street maps of Kano State at a scale 1:2000 were sourced from Kano State Ministry of Land and Physical Planning. Quickbird imagery of 2013 of 2.5 meter resolution was also sourced from Kano State ministry of Land and physical planning and integrated with street map in order to produce the update street map of the study area. List of filling stations were obtained from the Department of Petroleum Resources (DPR), a department under the Ministry of Petroleum Resources responsible for registering and regulating the filling station. From the data filling station name, type and area (street) of location were identified. This served as a guide for verification and collection of the coordinate data using Global Positioning System (GPS).

Street map sourced was scanned, imported into ArcMap environment of ArcGIS 10.1 and then geo-referenced using map to image georeferencing method. Quickbird 2013 image of the area was used as a slave image for the georeferencing. Major land marks in the area like Silver Jubilee Round About, Katsina Road/Airport Round-about, Dawanau Junction and Aminu Kano Airport were used as reference points for the georeferencing.. The georeferenced maps were auto rectified and then given the same coordinate with image, Universal Transverse Mercator (UTM) Global Coordinate System (GCS) projection and Minna Zone 32N datum. UTM system was choosing because it is metric and has the capacity to enable the researcher calculate the length, distance and other measurement that may not be possible with geographic coordinate system. Two shape files were created in ArcCatalog environment and given same coordinate system with the maps and image. The shape files were later imported into the ArcMap environment and used to digitize the street map and land use map separately. Fields were created for name and the type of the road, and to calculate the length of the road in metre.

A simple checklist were drafted and used to source the detailed information on the filling station. Field visit were made to all the filling stations, and coordinate of the filling stations were obtain using GPS (Garmen 76X Model).

Data obtained from the DPR were first entered in Excel Microsoft (2007) applications to create a simple database. Columns were used as field to store information on filling station. The data were saved in the project folder (created in C drive) and exported to ArcMap environment of ArcGIS 10. The data was converted to shape file and used to perform all the analysis. Different symbolization was used to map out the filling stations. The numbers of filling station in each road were determined. In addition tables and charts created in Microsoft Excel were used to present the inventoried data. These help in achieving the first objective of the work i.e.to take an inventory and map out the filling stations. to compare location of the filling stations with standards buffer and proximity analysis were done in Arcmap. Buffer of 15 meter were created on the roads to know stations that meet the criteria of fifteen (15) metre distance from the to the road, Query by location was performed using selection menu in ArcMap environment. In addition the data were query to give all location that are withing 15m buffer. The selected stations were highlighted, right clicked was done on the shape file (containing the station) and the software was commanded to create layer from the selected features. The stations selected were identified as those not meet the distance criterion of 15m from road. Chart was created to see the proportions of the stations not meet this criterion.

Another query operation was done using selection menu, the query is to give stations that are within distance of 400 metre from other station. The selected stations are identified as those not meet the criterion of 400 meter between stations. Shape file for these stations was also created, saved and used to compute the proportion not meet 400m criterion.

A hospital (being a public building) database was also imported into the ArcMap environment and a query by location was performed. The software was asked to find and highlight all stations that are within 100 meter from the hospitals. The selected stations were identified as those not meet the criterion of 100 meter from public place (hospitals). A similar operation was done using schools shape file to identify those not meet the distance of 100 meter from school.

Worshiping places (even though public and semi public) were not included in this work because their of lack of spatial data for them, also the fact that anyone familiar with the study area (Kano Metropolis) mosque are built everywhere in the city and that comparison with them will prove difficult and nearly impossible

III. RESULTS AND DISCUSSION

The result of the analysis was presented under the sub-headings below:

5.1 Inventory of Filling Stations by Road

There exist two hundred and fourteen (214) filling stations at the time of study. These filling stations are located along the forty four (43) roads in the area in the area (table 1). However the filling stations are not equally distributed between the roads as can be observed from the table, Zaria road has the highest number of station (28) followed by Maiduguri and Katsina road with (27) and (25) each respectively, these three roads account for more than one-third of the filling stations in the area (representing 36%). This result is not surprising because the three roads are the major roads in the metropolis; they are the longest and linked Kano with major cities of Nigeria. Equally Gwarzo road, Eastern bye-pass and Hadejia Road have significant number of filling stations as can be observed from the table. On the other hand short and access roads have least number of filling stations. This can be seen in roads like IBB Way, Jakara Road, Kofar Wambai and many others with one filling station each. Indeed this finding has corroborate with that of Baichie and Wallimsi (2000) which ascertains that filling stations are not built in town centres but rather on exit roads.

Table 1: Distribution of Filling Stations by Road

S/N	Road	Type	No. of Stations	
			F	%
1	Abdullahi Bayero Way	Major	1	0.5
2	Bompai Road	Minor	1	0.5
3	Enugu Road	Access	1	0.5
4	Ibb Way	Minor	1	0.5
5	Jakara Qtrs	Minor	1	0.5
6	Kofar Mazugal Road	Major	1	0.5
7	Kofar Wambai	Access	1	0.5
8	Kumbotso Secreteriate Road	Access	1	0.5
9	Lagos Street	Access	1	0.5
10	Lawan Danbazu Link/Off Buk Road	Access	1	0.5
11	Middle/Court Road	Access	1	0.5
12	New Road	Access	1	0.5
13	Old Katsina Road	Minor	1	0.5
14	Sabo Bakin Zuwo Road	Access	1	0.5
15	Tafawa Balewa Road	Minor	1	0.5
16	Tudun Yola Road	Access	1	0.5
17	Waika-Dawanau Road	Minor	1	0.5
18	Zango Road (Dakata)	Minor	1	0.5
19	Court/Middle Road	Access	2	0.9
20	Link Road	Access	2	0.9
21	Yahaya Gusau Road	Minor	2	0.9
22	Zungero Road	Minor	2	0.9
23	Bello Road	Major	3	1.4
24	Club Road	Major	3	1.4
25	Dala Hospital Road	Major	3	1.4
26	Dambatta/Daura Road	Major	3	1.4
27	Independence Road	Minor	3	1.4
28	Zoo Road	Minor	3	1.4
29	Aminu Kano Way	Major	4	1.8
30	Murtala Moh'd Way	Major	4	1.8
31	Sharada Ind. Estate	Major	4	1.8
32	Buk Road	Major	5	2.3
33	Ibrahim Taiwo Road	Minor	5	2.3
34	Kofar Ruwa Road	Access	6	2.8
35	Madobi Road	Major	7	3.2
36	Panshekara Road	Minor	7	3.2
37	Sani Abacha Way (Airpport Road)	Major	8	3.7
38	Hadejia Road	Major	9	4.1

39	Eastern Byepass	Major	14	6.5
40	Gwarzo Road	Major	17	7.8
41	Katsina Road	Major	25	11.5
42	Maidaguri Road	Major	27	12.4
43	Zaria Road	Major	28	12.9
	Total		214	98.6

Source: Field Survey (2014)

5.2 Distance from Road

According the physical planning Standards set by DPR (2007) Procedure guide for grant of approvals to construct and operate of a petrol products retail outlet, the distance from the road to filling station pump should not be less than 15meter. Since filling station were represented as point facilities and road as line feature, a buffer of 15m was created on the road and data query by location was made in ArcMap environment. The query assisted with "selecting all locations that are completely within 15meter road buffer.' The result is presented in Figure 2 and 3.

The result revealed that only eight stations (4%) did not meet the criteria of 15m minimum distance from road (figure 3). These stations include those along the access road (e.g. Jakara and New road) and a few along the major roads (one station along Zaria, Katina, Daura/Dambatta road each.
This result confirmed that majority of the filling stations meet the standard criteria of locating 15m distance from road. Among the filling stations that did not meet this criterion 62% are independent marketers, 38% are major markers and none is NNPC.

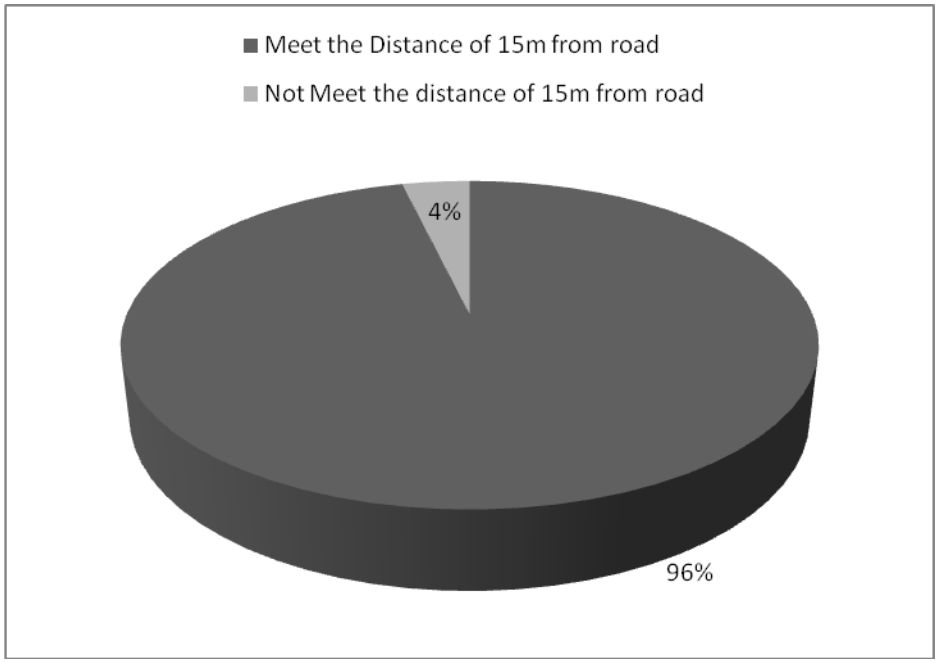


Figure 2: Station and 15 metre Standard Distance from Road

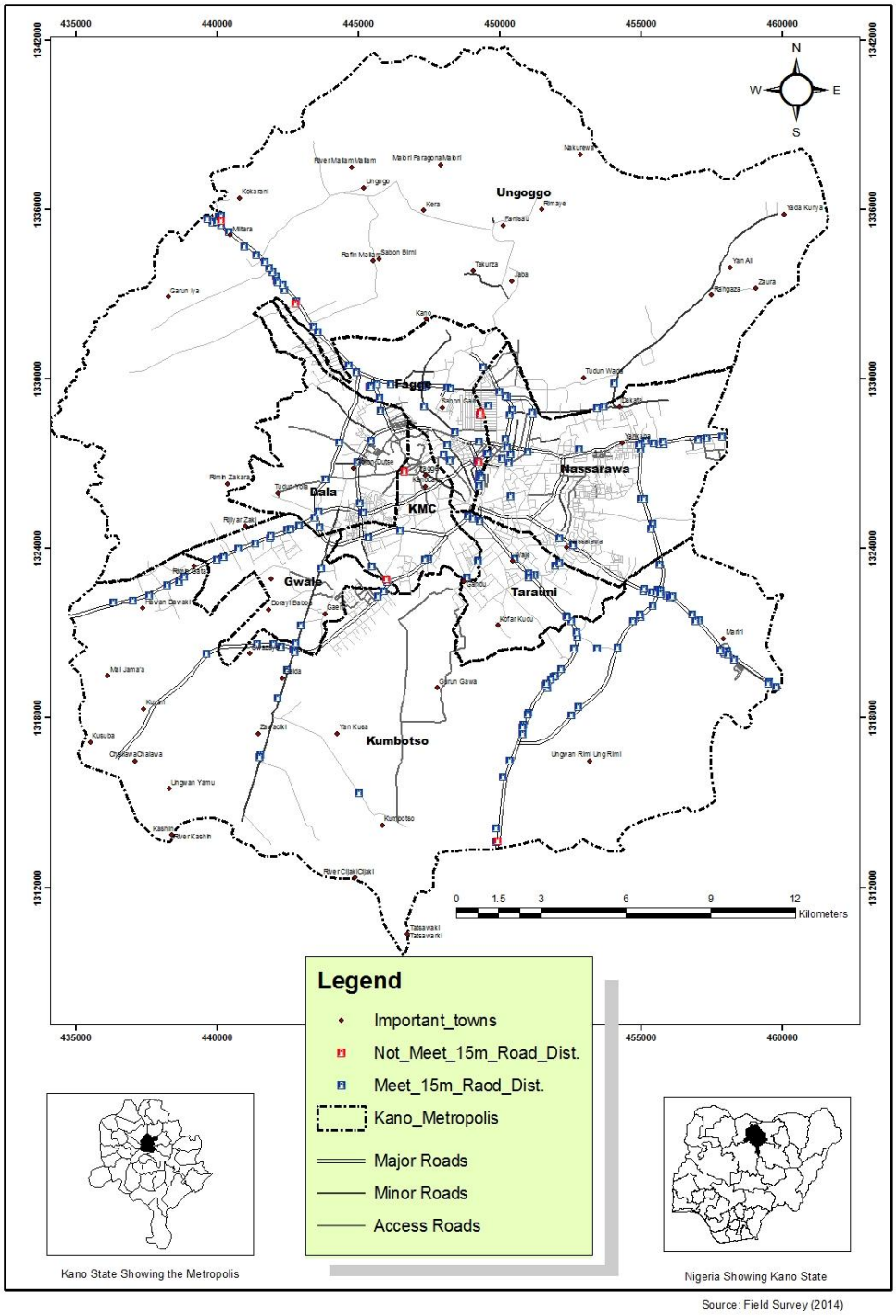


Figure 3: Filling Station and 15 meters Distance from Road

4.3 Distance between the Location of Filling Stations

Distances between stations in the area were determined in ArcMap environment using proximity operation of the analysis tool. The finding revealed that longest distance between neighbouring filling stations was about 3,700 metre. This was found between Gasau Petroleum along Kumbotso Secretariat and Misbahu Garba Nigeria ltd along Panshekara road. Apart from the two mentioned, the mean distance between neighboring filling stations was about 300 metre. The shortest distance of less than a metre and was observed were neighboring station lied back to back. The result also shows that more than half of the filling stations were less than 400 metre to their neighbours. However about only 24% of the station could not meet the minimum distance of 400 metre from their neighbours (with no road separation).

In a nut shell more one-quarter of the filling station did not to satisfy the standard of 400 metre distance from the nearest neighbour (figure 4). The filling stations that had not satisfied these standards are found in most roads. The highest number of those not meet the minimum standard of 400m distance between the location of filling station was observed in Katsina and Gwarzo road, which are major road linking Kano to other major Nigeria's cities (figure 5). The likely reason for these play out may be due to the market along these areas and the fact that regulator bend to this rule and give waver to the filling stations (as regard the standards) in heavy traffic roads.

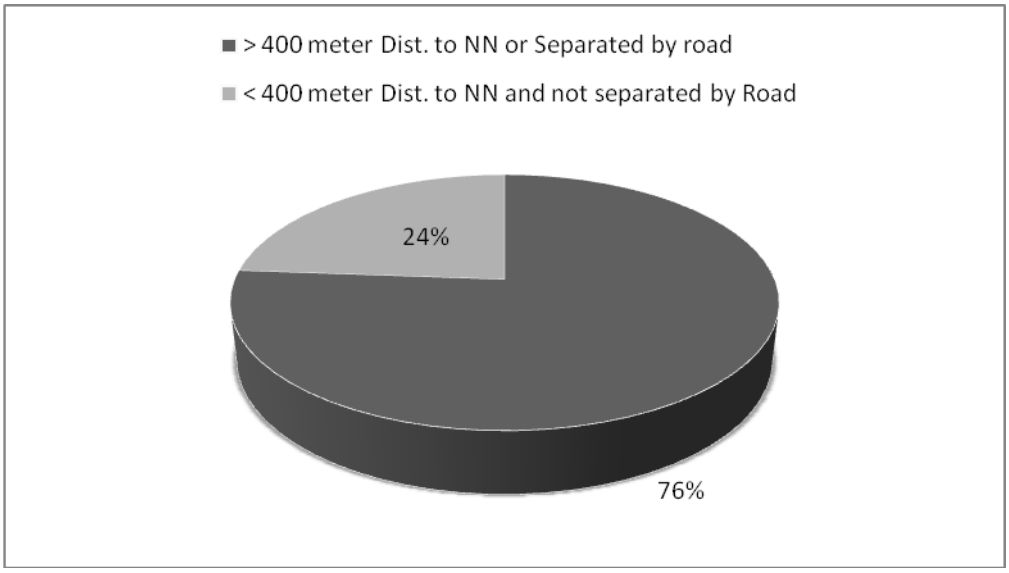


Figure 4: Filling Stations in Relation to 400m Distance to Other Filling Station

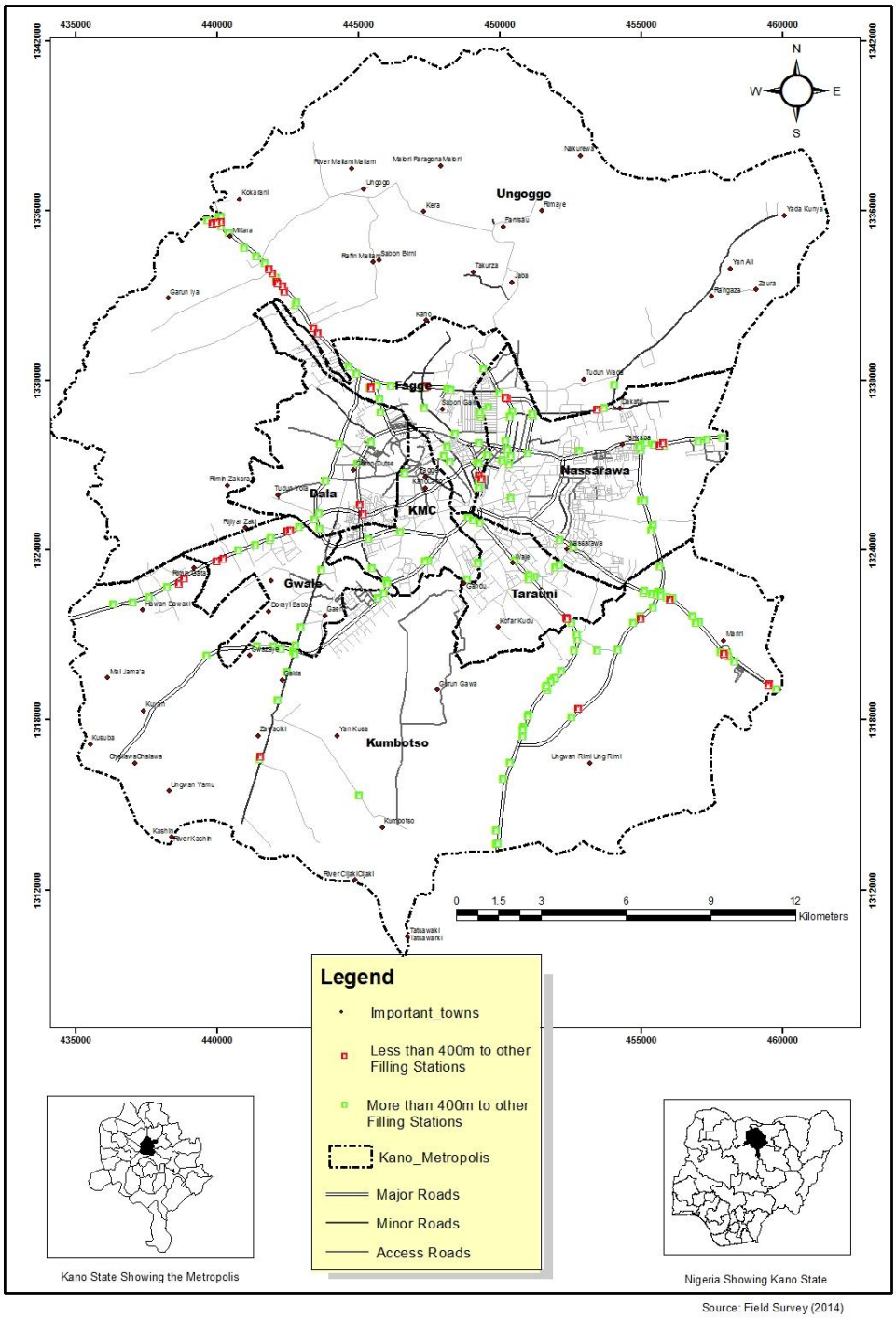


Figure 5: Location of Filling Stations in Relation 400m Distance Other Stations

5.4 Distance to Health Facilities

According the criteria set by the DPR filling station are not allow to operate adjacent to public institution like hospitals. In case they are to operate, the minimum distance of 100meter has to be maintained. Thus a comparison was made between the location of filling station and their distance to the hospital. The findings revealed that majority of the stations meet this standard (figure 4.4.3). Only few of the station (2%) could not meet the criteria. These stations are mainly major and independent marketers and none among them is NNPC outlet. In essence distance of filling station to the hospital is one major criterion the regulators not play with because only few station.

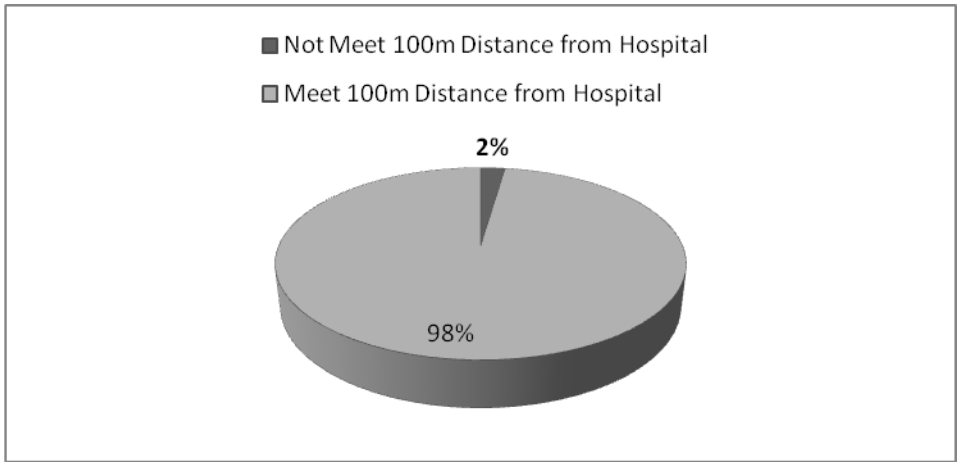


Figure 6: Filling Station Distribution in Relation to 100m Distance to Hospital

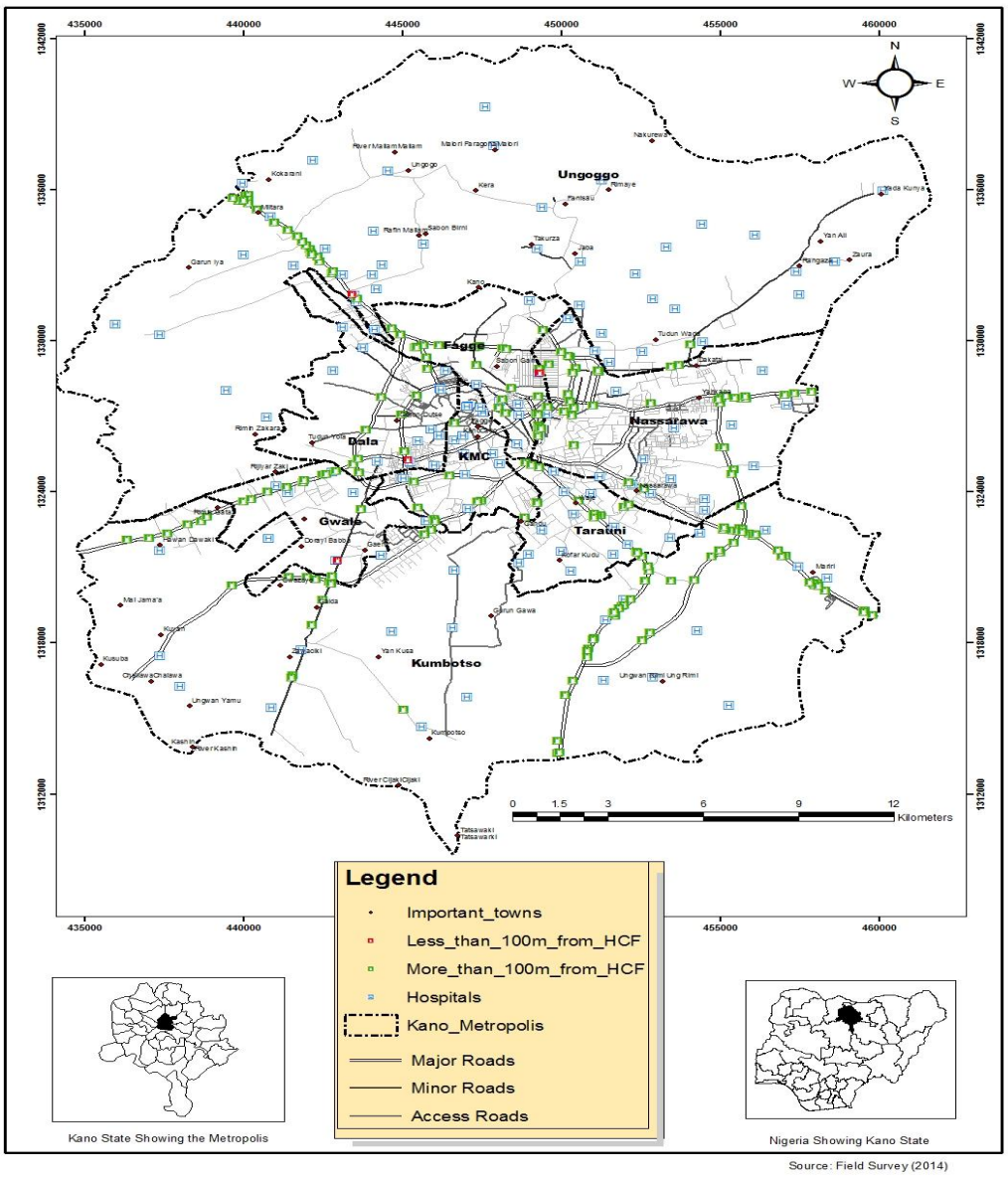


Figure 7: Location of Filling Stations in Relation to Health Care Facilities

5. Conclusion and Recommendations

Filling stations in Kano metropolis are more concentrated along the major roads (high ways) especially Zaria road, Katsina road and Maiduguri road. These three roads account for more than one-third of the filling station in the area. Even though filling station complies most to the standard regarding distance from the road and from public buildings specifically hospital, many stations did not meet the minimum distance of 400 metre from other station. Indeed it is common in the area to see two stations lie back to back. This has been observed in almost all the major road. Finally the paper conclude with the following recommendations

1) That there is need for more studies on filling station especially issues related to site selection and optimization. Also issue like people's perception on the location of the filling station can be investigated.
2) The distance of filling station to other public institution like school and mosque has not been considered by this study simply because the school and mosque are too many in Kano metropolis; this can be area for future research.
3) Discrepancies were observed as regard the compliance with standards, as such regulatory agencies need to look into the issue and take appropriate measures.

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American Journal of Engineering Research (AJER)
e-ISSN : 2320-0847 p-ISSN : 2320-0936
Volume-3, Issue-9, pp-159-166
www.ajer.org
Research Paper Open Access

Variation of Carbon Monoxide (CO) Levels in Enugu-a Comparison of High Traffic and Industrial Sites Measurements

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ABSTRACT: *This study assessed the day-time variation of carbon monoxide, CO in two sites in Enugu (a high traffic, site 1 and a low traffic/industrial area, site 2) using VRAE programmable multi-gas monitor. The results showed variation of CO concentration with the period of the day (morning, afternoon and evening), weekday and weekend and between the two sites. The CO levels measured in the evening period (4.30-6.00 pm) were relatively higher than that of the other periods; similarly site 1 values were higher than that of site 2. Student t-test statistics comparison of pair-wise difference in mean in CO levels in the different periods of the day between sites 1 and 2revealed that they were significant($p<0.05$).Also analysis of variance(ANOVA) for difference in mean of CO levels at the different day periods within each site showed a significant difference ($p<0.05$).Homogeneity test of the CO means for the different day periods in each site using Duncan multiple mean comparison test showed that the mean for the evening is statistically significant from that of the other periods($p<0.05$) .The CO levels were generally within the WHO 8hours guideline limit of 9ppm at the time of the study but was found to approach this value in 33% of the evening periods in site 1.*

KEYWORDS*: carbon monoxide, high traffic site, industrial site, comparison, RAE gas monitor.*

I. INTRODUCTION

Carbon monoxide, CO is a colourless, odourless, tasteless gas with low reactivity and solubility in water. In terms of absolute concentration, CO is the most prevalent of the toxic air pollutants hence it is measured in the unit of milligram per cubic meter (mg/m^3) in contrast to lesser units such as microgram per cubic meter ($\mu g/m^3$) used for other pollutants. The global background level of CO ranges between 0.05 and 0.15 ppmv (0.06 and 0.17mg/m^3) [1]

Ambient air levels of CO in urban cities in Nigeria and elsewhere has been reported in literature [2-5]. Reported levels of CO in a Nigerian urban city (Akure) indicated that WHO 8-hours mean was exceeded in some sites throughout the week during the day time except on Sundays and levels about four times higher than that of rural sites were recorded[6] . In another Nigerian site (Kaduna) Arko *et al* [7] reported that the CO 8-hours means value was exceeded on daily basis in the evening period in contrast to the control site. Several studies on CO levels in Nigerian urban sites showed that CO concentrations in the cities exhibited distinct diurnal and day of week variation with respect to traffic rush hours [6, 4, 8]. The sources of CO in the ambient air comes from both natural activities such as volcanic eruptions biogenic processes and human activities such as combustion of fossil fuel in motor engines and in power generation facilities, combustion of solid waste in dumpsites, agriculture activities, bush burning, industrial activities.

Mechanisms that emit CO into the air have been categorized into two namely direct emissions of CO from different sources and chemical formation from other pollutants such as oxidation of methane and other hydrocarbon [1].
Also draft 5.2 version CO position paper to European commission[9] reported that about 44 million tons of CO was emitted into the air by EU countries in 1994 noting transport to be the largest sources and to have accounted for two-third of the CO emissions.

The effect of CO on human blood haemoglobin is well known [10] as it has higher affinity for the haemoglobin relative to oxygen forming carboxyhaemoglobin. Hence in the presence of CO especially at high

concentration, the oxygen carrying capacity of the blood is reduced. Acute exposure to CO could lead to heart attack as the highly oxygen demanding organs and tissues of the body such as the heart and brain are deprived of enough oxygen they needed to function. World Health Organization (WHO) has recommended that carboxyhaemoglobin level of 2.5% should not be exceeded and has adopted four guideline for the maximum CO concentration exposure as follows: 100 mg/m^3 for 15 minutes, 60mg/m^3 for 30 minutes, 30mg/m3 for 1 hour and 10 mg/m3 (9pmm)for 8 hours[9]

The indirect effect of CO on the environment has also be noted to include increase in CO_2 and ozone levels due to its reactions in the atmosphere thereby indirectly aiding global warming (CO_2) and damage (from ozone) to materials in the environment[9].

The objective of this study therefore is to assess the level of the CO in the two sites (high traffic site and industrial sites and also compare the level (in the day-time) of the two sites among themselves and with the WHO 8-hours average.

II. MATERIALS AND METHODS

The study area: Enugu, the study area is located in the South Eastern Nigeria. Enugu is capital of the defunct East Central State of Nigeria and is known for coal deposit and production before the advent of crude oil.

It is located between latitude $6^0 22'$ N and $6^0 38'$ N and longitude $7^0 28'$ E and $7^0 37'$ E [11].
Enugu has tropical climatic conditions with two distinct seasons namely dry season and wet season. Dry season usually starts from December and last till March while wet season starts from April to November. Enugu urban has a population of 722, 664 and population density of 6,400/km^2 [12].

Site selection and description

The two stations or sites were selected to suit the objective of the study.
Site I is located in a 3-way round about, adjacent to Ogbete main market, three motor parks, Enugu North Local Government secretariat and Banks and located in a built-up area. The GPS coordinates of site 1 is N$06^0$26.326' E$007^0$29.241' while that of site 2 is N$06^0$28.106' E$007^0$36.122'. Site 2 is located in out-skirt of the city, close to a high way and is within an industrial layout. Industries in the layout include Emenite Nig Ltd, Innoson tech industries Ltd, Juhel Nig Ltd, Adris-hydrometers, Tarry well Nig Ltd, Obika Industries Ltd, ANAMCO Nig Ltd, Sologi Company Ltd, St. John Aluminum Company, Intercolour Nig Ltd, Intencil Company, El-Shadai Aluminum, ALO-Aluminum, Niger steel company. Other facilities close to site 2 that can impact on the air quality in the site include NNPC depot and the Akanu Ibiam International Airport.

Sampling of the CO

The CO level in each of the two sites was measured simultaneously using portable VRAE programmable multi gas monitor model PGM7840 REV.E by standing the monitor at a height of about two meters above the ground level. The monitoring involves obtaining morning, afternoon and evening daily average levels of CO in the two sites from 2nd January to 31st January 2009 (30 days monitoring). The morning, afternoon and evening average measurements for each day was obtained from the monitor's thirty minutes logged intervals recording between 7.30-9.00am, 1.00-2.30pm and 4.30 – 6.00pm for morning, afternoon and evening measurements respectively as downloaded into computer from the monitor's data logged computer communication port..

III. DATA ANALYSIS

The data fed into computer was analyzed using social science statistical software (SPSS) version 10 for morning, afternoon and evening mean for each day. The daily mean, morning, afternoon and evening average for the month (January) was also computed. Student t-test for difference in mean between the two sites was also computed and analysis of Variance (ANOVA) was computed for the morning, afternoon and evening mean of each site.

IV RESULTS AND DISCUSSION

Table 2A: The Results of the student's t-test variation between sites 1 and sites 2 among periods of the day

		N	Mean	Std. Deviation	Std. Error	Minimum	Maximum
VALUE1	MORNING	30	4.5200	1.02769	.18763	3.00	7.00
	NOON	30	4.1267	1.02417	.18699	2.00	6.00
	EVENING	30	6.3733	1.69073	.30868	3.50	10.00
	Total	90	5.0067	1.60867	.16957	2.00	10.00
VALUE2	MORNING	30	.3400	.14527	.02652	.10	.60
	NOON	30	.2667	.09589	.01751	.10	.40
	EVENING	29	.6172	.25644	.04762	.30	1.20
	Total	89	.4056	.23177	.02457	.10	1.20

N/B: value1 and 2 = Sites 1 and 2 respectively.
B: Analysis of variance of mean within sites among the periods of the day

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
VALUE1	Between Groups	86.371	2	43.185	26.101	.000
	Within Groups	143.945	87	1.655		
	Total	230.316	89			
VALUE2	Between Groups	2.007	2	1.004	31.730	.000
	Within Groups	2.720	86	.032		
	Total	4.727	88			

C: The Duncan tests for homogeneity of mean within sites

VALUE1

Duncan

SOURCE	N	Subset for alpha = 0.05	
		1	2
NOON	30	4.1267	
MORNING	30	4.5200	
EVENING	30		6.3733
Sig.		.240	1.000

VALUE2

Duncan

SOURCE	N	Subset for alpha = 0.05	
		1	2
NOON	30	.2667	
MORNING	30	.3400	
EVENING	29		.6172
Sig.		.116	1.000

Table 1: Day time variation of CO levels (ppm) in sites 1 and 2 in Enugu

CHRIST/OGBETE ROUNDABOUT ENUGU (SITE 1)						ITF JUNCTION EMENE ENUGU (SITE 2)				
DAY	MORNING MEAN	AFTERNOON MEAN	EVENING MEAN	DAILY MEAN	STANDARD DEVIATION	MORNING MEAN	AFTERNOON MEAN	EVENING MEAN	DAILY MEAN	STANDARD DEVIATION
FRI-2-09	6	4.5	7	5.833333	1.258306	0.4	0.3	0.6	0.433333	0.152753
SAT-3	5	5	9	6.333333	2.309401	0.3	0.3	0.7	0.433333	0.23094
SUN-4	3	2	4	3	1	0.2	0.1	0.4	0.233333	0.152753
MON-5	7	5	10	7.333333	2.516611	0.6	0.4	1	0.666667	0.305505
TUE-6	5	4	6	5	1	0.3	0.2	0.5	0.333333	0.152753
WED-7	6	3.5	5.5	5	1.322876	0.4	0.3	0.6	0.433333	0.152753
THUR-8	4.6	5.8	7	5.8	1.2	0.3	0.2	0.6	0.366667	0.208167
FRI-9	5.5	6	8	6.5	1.322876	0.4	0.3	0.8	0.5	0.264575
SAT-10	5	5.5	7.6	6.033333	1.379613	0.5	0.3	1.2	0.666667	0.472582
SUN-11	3.4	2.9	3.7	3.333333	0.404145	0.2	0.1	0.3	0.2	0.1
MON-12	4.8	5.6	8.5	6.3	1.946792	0.6	0.4	0.9	0.633333	0.251661
TUE-13	4.2	4.7	6	4.966667	0.929157	0.3	0.3	0.5	0.366667	0.11547
WED-14	4.5	3.8	5.6	4.633333	0.907377	0.2	0.2	0.4	0.266667	0.11547
THUR-15	4	3.5	5.8	4.433333	1.209683	0.3	0.2	0.6	0.366667	0.208167
FRI-16	3.5	3.3	6.2	4.333333	1.619671	0.4	0.4	0.8	0.533333	0.23094
SAT-17	4.8	4.1	7.2	5.366667	1.625833	0.2	0.3	1	0.5	0.43589
SUN-18	3.1	2.9	3.5	3.166667	0.305505	0.4	0.1	0.5	0.333333	0.208167
MON-19	5.7	5.3	6.9	5.966667	0.832666	0.3	0.3	0.7	0.433333	0.23094
TUE-20	3.8	3.4	5.9	4.366667	1.342882	0.2	0.2	0.4	0.266667	0.11547
WED-21	4.8	4.2	6	5	0.916515	0.3	0.2	0.3	0.266667	0.057735
THUR-22	4.1	3.9	5.8	4.6	1.044031	0.2	0.2	0.4	0.266667	0.11547
FRI-23	4.9	4.5	6.7	5.366667	1.171893	0.3	0.4	1.1	0.6	0.43589
SAT-24	5.1	4.8	8.9	6.266667	2.285461	0.6	0.4	0.9	0.633333	0.251661
SUN-25	3	2.8	4.1	3.3	0.7	0.5	0.1	0.3	0.3	0.2
MON-26	5.2	4.6	7.8	5.866667	1.70098	0.1	0.3	0.7	0.366667	0.305505
TUE-27	3.5	3.2	5.6	4.1	1.30767	0.4	0.3	0.4	0.366667	0.057735
WED-28	3.2	3	4.2	3.466667	0.64291	0.2	0.3	0.3	0.266667	0.057735
THUR-29	3	2.9	4.5	3.466667	0.896289	0.1	0.2	0.4	0.233333	0.152753
FRI-30	4.5	4.1	5.5	4.7	0.72111	0.4	0.3	0.6	0.433333	0.152753
SAT-31	5.4	5	8.7	6.366667	2.030599	0.6	0.4	1.2	0.733333	0.416333

Table 1 shows the mean morning, afternoon and evening levels of CO in sites1 and 2 for the 30 days sampling, and also the computed daily means and standard deviation for the mornings, afternoon and evenings of the month January (30 days). The range of mean CO levels within the thirty days of the measurement in site 1 was 3.17 – 7.33 ppm while that of site 2 was 0.2 – 0.73ppm (Table 1). Site 1 recorded the highest daily mean CO level on Monday, 5th January (7.33 ppm) while, the least was on Sunday, 18th January (0.31ppm) (Table 1). In site 2, the highest CO level (0.73 ppm) within study period was on Saturday, 31st January while the least level (0.2 ppm) was on Sunday, 11th January (Table 1). The highest mean CO level occurring on Monday, 5th January in site 1 may be attributed to increase in traffic volume following resuming of work, business and schools after the new year festivities as site 1 is a traffic station and very close to the major market in Enugu

(Ogbete) and motor parks.. The minimum CO level in the two sites was record on Sunday corresponding to a day of low traffic and industrial activities in the two sites respectively

30 days average: The mean and standard error for concentration in the morning of January gave 4.52 ± 0.19; afternoons gave 4.13 ±0.18 while evening gave 6.37 ± 0.31ppm for site 1. The corresponding values for site 2 were 0.34 ± 0.03, 0.27 ± 0.02 and 0.62 ± 0.05 ppm respectively (Table 2A). Weekday-weekend variation in the daily mean CO level existed in the two sites but the variation is more pronounced in site 1.Within the week day, the CO level generally peaks on Monday decreases afterward and peak up again on weekend (Friday and Saturday) and lowers to minimum on Sunday (Figs. 1a-d and 2a-d). This observation is in line with similar studies in traffic prone sites in urban areas of Nigeria [6, 7].

Variation between the periods of the day: The analysis of variance between the mean of CO concentrations in the morning, afternoon and evening showed that there exist significant difference in the level of CO between the different day periods in the two sites (P <0.5) (Table 2B). The mean levels were generally higher in the evening compared to the morning and afternoon values. This may be attributed to peak in traffic and traffic hold up associated with close of work and business in the evening.

Variation between sites 1 and 2: The student t-test for difference in mean (pair wise comparison) between the different day periods in sites 1 and 2 showed that the level of CO in site 1 and 2 was statistically significant p < 0.5 (Table 2A) and this is collaborated by the CO mean level of 4.5200, 4.1267 and 6.3733 ppm for morning, afternoon and evening for site 1 respectively as against 0.3400, 0.2667 and 0.6172 ppm for site 2. This is consistent with the observed nature of the site which is characterized by high traffic volume and build-up areas and hence less ventilated and could imply that traffic may have a higher impact (contribution) to CO concentration in Enugu compared to that from industries within the period of the study.

The present CO concentration obtained in the study does not exceed on the average in the two sites the 8 hours WHO guideline limit of 9 ppm except in the evening of Monday, 5 January in site I with a value of 10ppm (Table1). The CO levels in evening in site 1 had levels that ranged between 7 to 9 ppm in 10 days out of the 30 days measurement (Table 1)

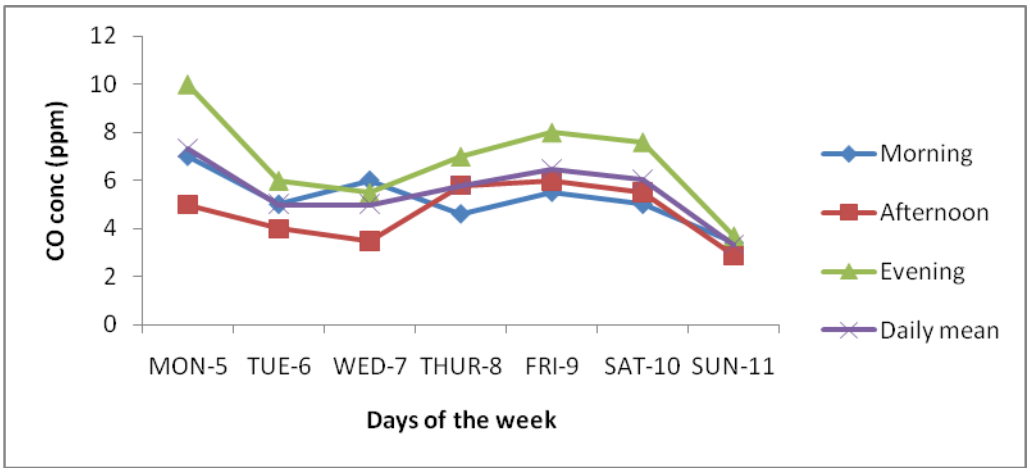
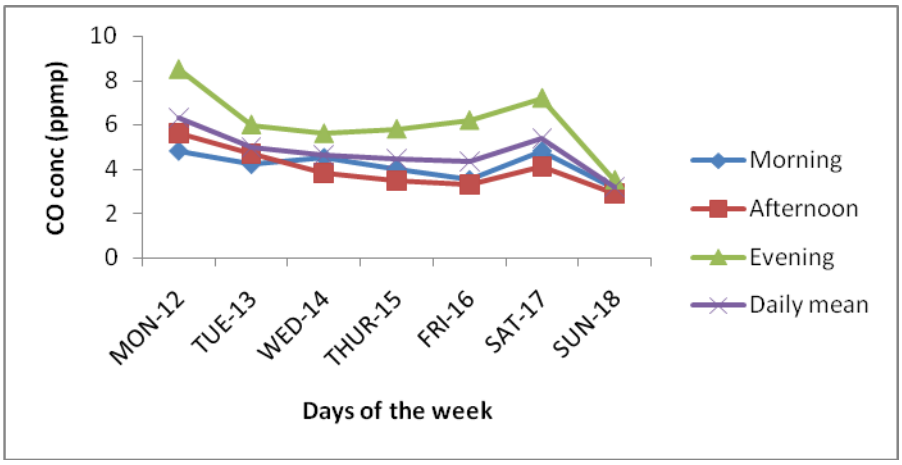
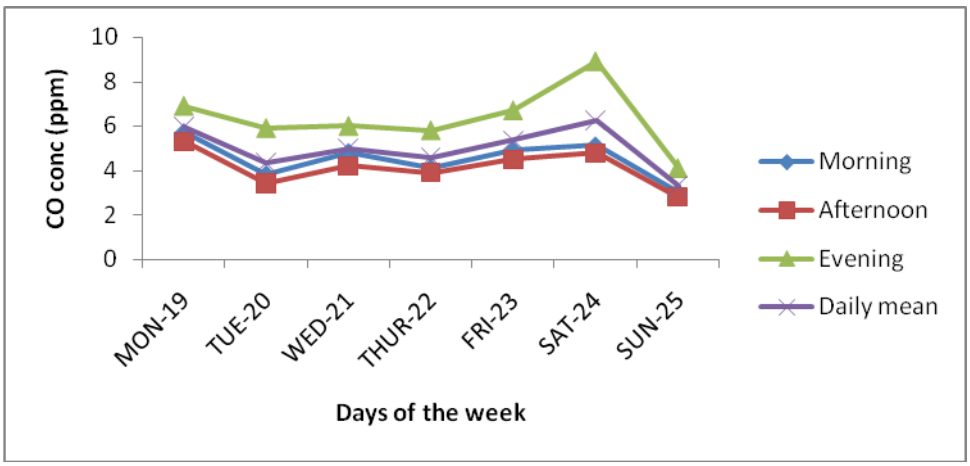


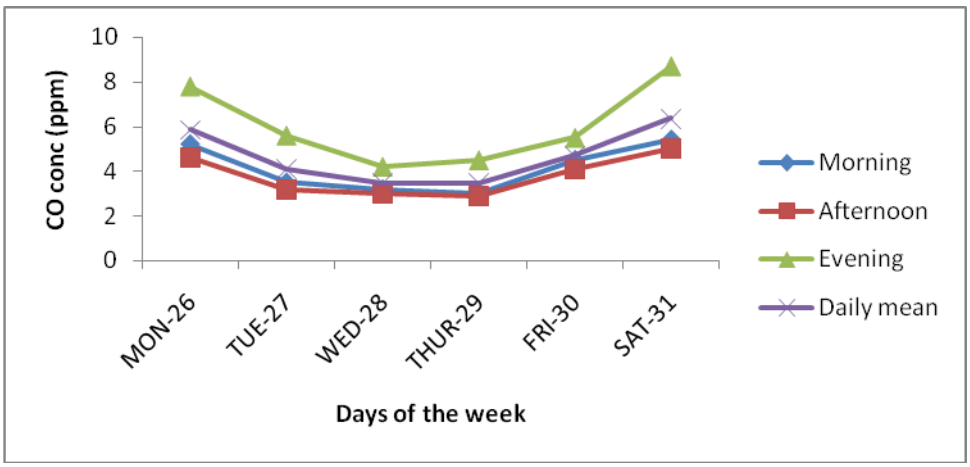
Fig. 1a: CO daily variation in site 1 for the week 1.



1b: CO daily variation in site 1 for the week 2



1c: CO daily variation in site 1 for the week 3



1d: CO daily variation in site 1 for the week 4

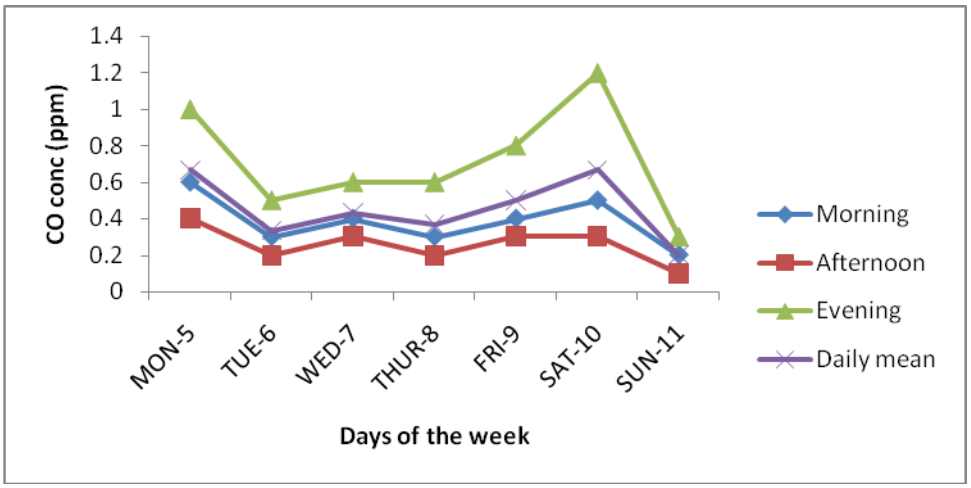
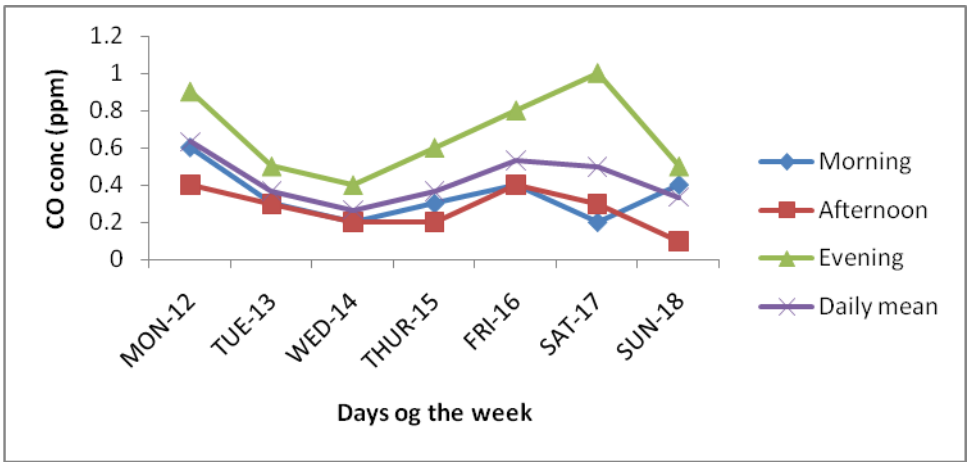
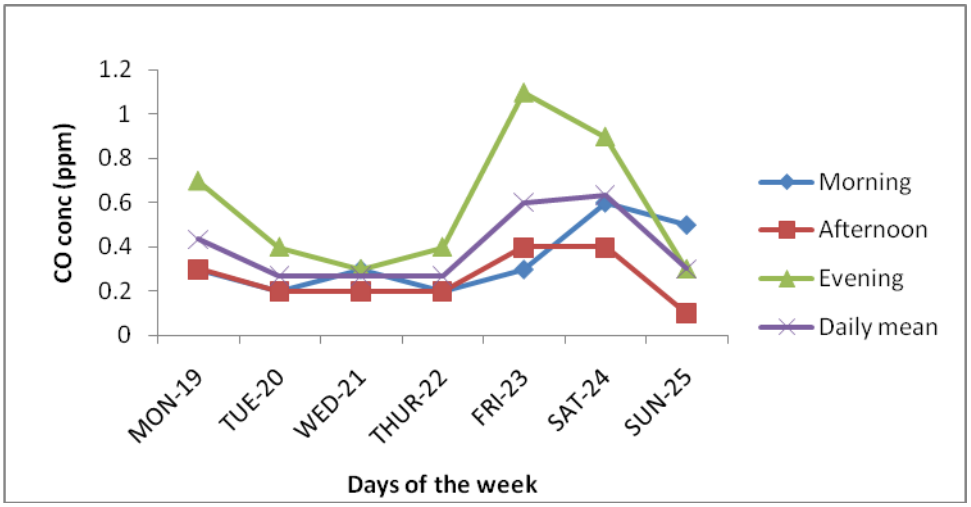


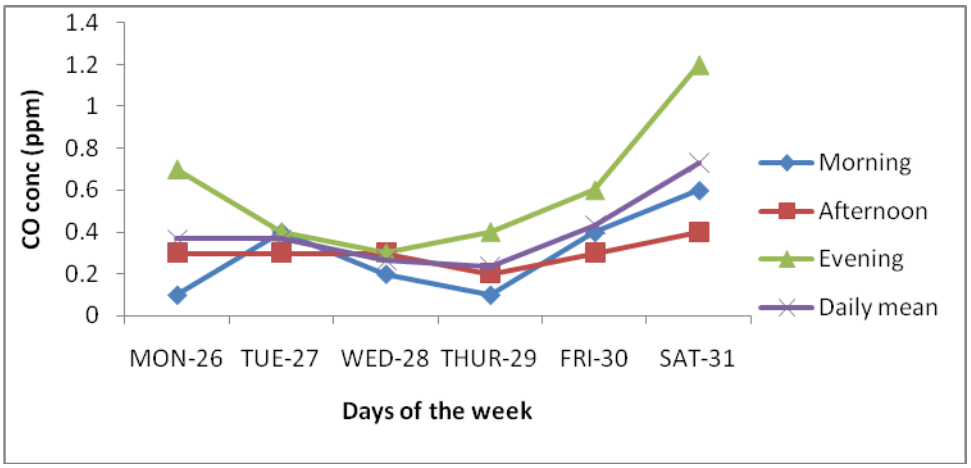
Fig. 2a: CO daily variation in site 2 for the week 1



2b: CO daily variation in site 2 for the week 2



1c: CO daily variation in site 2 for the week 3



1d: CO daily variation in site 2 for the week 4

V CONCLUSION

This study has provided data on CO levels in the sites in Enugu urban and revealed that there is variation in CO levels within the sites, within the period of the day, between weekend and other week days on one hand and between an industrial site (low traffic site) and traffic site in the other hand. CO levels as measured the two sites within the period of the research suggest that traffic emissions impact highly on the CO levels in Enugu Urban.

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American Journal of Engineering Research (AJER)
e-ISSN : 2320-0847 p-ISSN : 2320-0936
Volume-3, Issue-9, pp-167-170
www.ajer.org
Research Paper Open Access

Common Fixed Point Theorems for Hybrid Pairs of Occasionally Weakly Compatible Mappings in b-Metric Space.

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ABSTRACT: *The objective of this paper is to obtain some common fixed point theorems for hybrid pairs of single and multi-valued occasionally weakly compatible mappings in b-metric space.*

KEYWORDS: *Occasionally weakly compatible mappings, single and multi—valued maps, common fixed point theorem, b- metric space.*
2000 Mathematics Subject Classification: 47H10; 54H25.

I. INTRODUCTION

The study of fixed point theorems, involving four single-valued maps, began with the assumption that all of the maps are commuted. Sessa [8] weakened the condition of commutativity to that of pairwise weakly commuting. Jungck generalized the notion of weak commutativity to that of pairwise compatible [5] and then pairwise weakly compatible maps [6]. Jungck and Rhoades [7] introduced the concept of occasionally weakly compatible maps.

Abbas and Rhoades [1] generalized the concept of weak compatibility in the setting of single and multi-valued maps by introducing the notion of occasionally weakly compatible (owc).
The concept of $b-metric\ space$ was introduced by Czerwik[3]. Several papers deal with fixed point theory for single and multi- valued maps in $b-metric\ space$.
In this paper we extend the result of Hakima Bouhadjera [2] from $metric\ space$ to $b-metric\ space$.

II. PRELIMINARY NOTES

Let (X,d) denotes a metric space and $CB(X)$ the family of all nonempty closed and bounded subsets of X. Let H be the Hausdorff metric on $CB(X)$ induced by the metric d; i.e.,
$H(A,B) = \max\{\sup_{x\in A} d(x,B), \sup_{y\in B} d(A,y)\}$
for A, B in $CB(X)$, where

$$d(x,A) = \inf\{d(x,y): y \in A\}.$$

Definition2.1.[3] Let X be a nonempty set and $s \geq 1$ a given real number. A function $d: X \times X \longrightarrow R_+$ (nonnegative real numbers) is called a $b-metric$ provided that, for all $x,y,z \in X$,
$(bi)\ \ d(x,y) = 0\ \ iff\ \ x = y,$
$(bii)\ \ d(x,y) = d(y,x),$
$(biii)\ \ d(x,z) \leq s[d(x,y) + d(y,z)].$
The pair (X,d) is called $b-metric\ space$ with parameter s.
It is clear that the definition of $b-metric\ space$ is an extension of usual metric space. Also, if we consider $s = 1$ in above definition, then we obtain definition of usual metric space.

Definition2.2.[1] Maps $f: X \longrightarrow X$ and $T: X \longrightarrow CB(X)$ are said to be occasionally weakly compatible (owc) if and only if there exist some point x in X such that $fx \in Tx$ and $fTx \subseteq Tfx$.
For our main results we need the following lemma. We cite the following lemma from Czerwik [3,4].

Lemma2.3. Let (X,d) be any $b-metric\ space$ and let $A,B \in CB(X)$, then for any $a \in A$ we have

$$d(a,B) \leq H(A,B).$$

III. MAIN RESULTS

Theorem3.1 Let (X,d) be a b-metric space with parameter $s \geq 1$. Let $f,g:X \longrightarrow X$ and $F,G:X \longrightarrow CB(X)$ be single and multi-valued maps, respectively such that the pairs $\{f,F\}$ and $\{g,G\}$ are owc and satisfy inequality

$$H(Fx,Gy) \leq \lambda[max\left\{d(fx,gy),d(fx,Fx),d(gy,Gy),\tfrac{1}{2}[d(fx,Gy)+d(gy,Fx)]\right\}] \quad (3.1)$$

for all $x,y \in X$, where $s\lambda \in [0,\frac{1}{2})$. Then f,g,F & G have a unique common fixed point in X.

Proof: Since the pairs $\{f,F\}$ and $\{g,G\}$ are owc, then there exist two elements $u,v \in X$ such that $fu \in Fu, fFu \subseteq Ffu$ and $gv \in Gv, gGv \subseteq Ggv$.

First we prove that $fu = gv$. By Lemma [2.3] and by $(biii)$ we have $d(fu,gv) \leq s\,H(Fu,Gv)$. Suppose that $H(Fu,Gv) > 0$. Then by (3.1) we get

$$H(Fu,Gv) \leq \lambda[max\left\{d(fu,gv),d(fu,Fu),d(gv,Gv),\tfrac{1}{2}[d(fu,Gv)+d(gv,Fu)]\right\}]$$

Since $d(fu,Gv) \leq H(Fu,Gv)$ and $d(gv,Fu) \leq H(Fu,Gv)$ by Lemma [2.3], and then

$$H(Fu,Gv) \leq \lambda \max\{sH(Fu,Gv),H(Fu,Gv)\} = s\lambda\, H(Fu,Gv)$$

This inequality is false as $s\lambda \in \left[0,\frac{1}{2}\right)$, unless $H(Fu,Gv) = 0$ which implies that $fu = gv$.

Again by Lemma [2.3] and $(biii)$ we have

$d(f^2u,fu) = d\big(f(fu),g(v)\big) \leq s\,H(Ffu,Gv)$. We claim that $f^2u = fu$. Suppose not. Then $H(Ffu,Gv) > 0$ and using inequality (3.1) we get

$$H(Ffu,Gv) \leq \lambda[max\left\{d(ffu,gv),d(ffu,Ffu),d(gv,Gv),\tfrac{1}{2}[d(ffu,Gv)+d(gv,Ffu)]\right\}].$$

But $d(f^2u,Gv) \leq H(Ffu,Gv)$ and $d(gv,Ffv) \leq H(Ffu,Gv)$ by Lemma [2.3] and so

$$H(Ffu,Gv) \leq s\lambda\, H(Ffu,Gv),$$

which is false as $s\lambda \in \left[0,\frac{1}{2}\right)$, unless $H(Ffu,Gv) = 0$, thus $f^2u = fu = gv$.

Similarly, we can prove that $g^2v = gv$.

Putting $fu = gv = z$, then $fz = z = gz$, $z \in Fz$ and $z \in Gz$. Therefore z is the common fixed point of maps f,g,F & G.

Now suppose that f,g,F & G have another common fixed point $z \neq z'$. Then by lemma [2.3] and $(biii)$ we have $d(z,z') = d(fz,gz') \leq s\,H(Fz,Gz')$.

Assume that $H(Fz,Gz') > 0$. Then the use of (3.1) gives

$$H(Fz,Gz') \leq \lambda[max\left\{d(fz,gz'),d(fz,Fz),d(gz',Gz'),\tfrac{1}{2}[d(fz,Gz')+d(gz',Fz)]\right\}].$$

Since $d(fz,Gz') \leq H(Fz,Gz')$ and $d(gz',Fz) \leq H(Fz,Gz')$,

we have $H(Fz,Gz') \leq s\lambda\, H(Fz,Gz')$.

which is false as $s\lambda \in \left[0,\frac{1}{2}\right)$. Then $H(Fz,Gz') = 0$ and hence $z = z'$.

Corollary3.2 Let (X,d) be a b-metric space with parameter $s \geq 1$. Let $f,g:X \longrightarrow X$ and $F,G:X \longrightarrow CB(X)$ be single and multi-valued maps, respectively such that the pairs $\{f,F\}$ and $\{g,G\}$ are owc and satisfy inequality

$$H(Fx,Gy) \leq \lambda[max\{d(fx,gy),d(fx,Fx),d(fx,Gy),d(gy,Gy),d(gy,Fx)\}] \quad (3.2)$$

for all $x,y \in X$, where $s\lambda \in [0,\frac{1}{2})$. Then f,g,F & G have a unique common fixed point in X.

Proof: Clearly the result immediately follows from Theorem 3.1.

Theorem3.3 Let (X,d) be a b-metric space with parameter $s \geq 1$. Let $f,g:X \longrightarrow X$ and $F,G:X \longrightarrow CB(X)$ be single and multi-valued maps, respectively such that the pairs $\{f,F\}$ and $\{g,G\}$ are owc and satisfy inequality

$$H(Fx,Gy) \leq \lambda[\alpha d(fx,gy) + \beta \max\{d(fx,Fx),d(gy,Gy)\} + \gamma \max\{d(fx,gy),d(fx,Gy),d(gy,Fx)\}] \quad (3.3)$$

for all $x,y \in X$, with $\alpha,\beta,\gamma > 0$ & $(\alpha+\beta+\gamma) = 1$, also $s\lambda \in \left[0,\frac{1}{2}\right)$. Then f,g,F & G have a unique common fixed point in X.

Proof: Since the pairs $\{f, F\}$ and $\{g, G\}$ are owc, then there exist two elements $u, v \in X$ such that $fu \in Fu, fFu \subseteq Ffu$ and $gv \in Gv, gGv \subseteq Ggv$.

First we prove that $fu = gv$. By Lemma [2.3] and by $(biii)$ we have $d(fu, gv) \leq s\,H(Fu, Gv)$. Suppose that $H(Fu, Gv) > 0$. Then by (3.3) we get

$$H(Fu, Gv) \leq \lambda[\alpha d(fu, gv) + \beta \max\{d(fu, Fu), d(gv, Gv)\} + \gamma \max\{d(fu, gv), d(fu, Gv), d(gv, Fu)\}]$$
$$= \lambda[\alpha d(fu, gv) + \gamma \max\{d(fu, gv), d(fu, Gv), d(gv, Fu)\}]$$

Since $d(fu, Gv) \leq H(Fu, Gv)$ and $d(gv, Fu) \leq H(Fu, Gv)$ by Lemma [2.3], and then

$$H(Fu, Gv) \leq \lambda[\alpha s H(Fu, Gv) + \gamma \max\{sH(Fu, Gv), H(Fu, Gv), H(Fu, Gv)\}]$$
$$= \lambda[\alpha s\, H(Fu, Gv) + \gamma s\, H(Fu, Gv)]$$
$$= \lambda[(\alpha + \gamma) sH(Fu, Gv)]$$
$$< s\lambda\, H(Fu, Gv), \quad \text{as } (\alpha + \beta + \gamma) = 1.$$

This inequality is false as $s\lambda \in \left[0, \frac{1}{2}\right)$, unless $H(Fu, Gv) = 0$ which implies that $fu = gv$.

Again by Lemma [2.3] and $(biii)$ we have

$d(f^2u, fu) = d\big(f(fu), g(v)\big) \leq s\,H(Ffu, Gv)$. We claim that $f^2u = fu$. Suppose not. Then $H(Ffu, Gv) > 0$ and using inequality (3.3) we get

$$H(Ffu, Gv) \leq \lambda[\alpha d(ffu, gv) + \beta \max\{d(ffu, Ffu), d(gv, Gv)\}$$
$$+ \gamma \max\{d(ffu, gv), d(ffu, Gv), d(gv, Ffu)\}]$$
$$= \lambda[\alpha d(ffu, gv) + \gamma \max\{d(ffu, gv), d(ffu, Gv), d(gv, Ffu)\}]$$

But $d(f^2u, Gv) \leq H(Ffu, Gv)$ and $d(gv, Ffv) \leq H(Ffu, Gv)$ by Lemma [2.3] and so

$$H(Ffu, Gv) \leq \lambda[\alpha s H(Ffu, Gv) + \gamma \max\{sH(Ffu, Gv), H(Ffu, Gv), H(Ffu, Gv)\}]$$
$$= \lambda[\alpha s\, H(Ffu, Gv) + \gamma s\, H(Ffu, Gv)]$$
$$= \lambda[(\alpha + \gamma) s\, H(Ffu, Gv)]$$
$$< s\lambda\, H(Ffu, Gv), \quad \text{as } (\alpha + \beta + \gamma) = 1.$$

$$H(Ffu, Gv) \leq s\lambda\, H(Ffu, Gv),$$

which is false as $s\lambda \in \left[0, \frac{1}{2}\right)$, unless $H(Ffu, Gv) = 0$, thus $f^2u = fu = gv$.

Similarly, we can prove that $g^2v = gv$.

Putting $fu = gv = z$, then $fz = z = gz$, $z \in Fz$ and $z \in Gz$. Therefore z is the common fixed point of maps $f, g\ F$ & G.

Now suppose that f, g, F & G have another common fixed point $z \neq z'$. Then by lemma and $(biii)$ we have

$d(z, z') = d(fz, gz') \leq s\,H(Fz, Gz')$.

Assume that $H(Fz, Gz') > 0$. Then the use of (3.3) gives

$H(Fz, Gv) \leq \lambda[\alpha d(fz, gz') + \beta \max\{d(fz, Fz), d(gz', Gz')\} + \gamma \max\{d(fz, gz'), d(fz, Gz'), d(gz', Fz)\}]$.

Since $d(fz, Gz') \leq H(Fz, Gz')$ and $d(gz', Fz) \leq H(Fz, Gz')$,

we have $H(Fz, Gz') < s\lambda\, H(Fz, Gz')$.

which is false as $s\lambda \in \left[0, \frac{1}{2}\right)$. Then $H(Fz, Gz') = 0$ and hence $z = z'$.

Theorem3.4 Let (X, d) be a b-metric space with parameter $s \geq 1$. Let $f, g: X \longrightarrow X$ and $F, G: X \longrightarrow CB(X)$ be single and multi-valued maps, respectively such that the pairs $\{f, F\}$ and $\{g, G\}$ are owc and satisfy inequality

$$H^p(Fx, Gy) \leq \lambda\left[\alpha d^p(fx, gy) + (1 - \alpha)\max\{d^p(fx, gy), d^p(fx, Fx), d^p(gy, Gy), d^{\frac{p}{2}}(gy, Fx).\, d^{\frac{p}{2}}(fx, Gy)\}\right]$$

(3.4)

for all $x, y \in X$, with $\alpha \in [0,1]$ also $s\lambda \in \left[0, \frac{1}{2}\right)$ and $p \geq 1$. Then f, g, F & G have a unique common fixed point in X.

Proof: Since the pairs $\{f, F\}$ and $\{g, G\}$ are owc, then there exist two elements $u, v \in X$ such that $fu \in Fu, fFu \subseteq Ffu$ and $gv \in Gv, gGv \subseteq Ggv$.

First we prove that $fu = gv$. By Lemma [2.3] and by $(biii)$ we have $d(fu, gv) \leq s\,H(Fu, Gv)$. Suppose that $H(Fu, Gv) > 0$. Then by (3.4) we get

$$H^p(Fu, Gv) \leq \lambda\left[\alpha d^p(fu, gv) + (1-\alpha)\max\{d^p(fu, gv), d^p(fu, Fu), d^p(gv, Gv), d^{\frac{p}{2}}(gv, Fu).d^{\frac{p}{2}}(fu, Gv)\}\right]$$

Since $d(fu, Gv) \leq H(Fu, Gv)$ and $d(gv, Fu) \leq H(Fu, Gv)$ by Lemma [2.3], and then

$H^p(Fu, Gv) \leq s\lambda\, H^p(Fu, Gv)$

This inequality is false as $s\lambda \in \left[0, \frac{1}{2}\right)$, unless $H(Fu, Gv) = 0$ which implies that $fu = gv$.

Again by Lemma [2.3] and $(biii)$ we have

$d(f^2u, fu) = d\big(f(fu), g(v)\big) \leq s\,H(Ffu, Gv)$. We claim that $f^2u = fu$. Suppose not. Then $H(Ffu, Gv) > 0$ and using inequality (3.4) we get

$H^p(Ffu, Gv) \leq$

$$\lambda\left[\alpha d^p(ffu, gv) + (1-\alpha)\max\{d^p(ffu, gv), d^p(ffu, Ffu), d^p(gv, Gv), d^{\frac{p}{2}}(gv, Ffu).d^{\frac{p}{2}}(ffu, Gv)\}\right]$$

.

But $d(f^2u, Gv) \leq H(Ffu, Gv)$ and $d(gv, Ffv) \leq H(Ffu, Gv)$ by Lemma [2.3] and so

$H^p(Ffu, Gv) \leq s\lambda\, H^p(Ffu, Gv)$,

which is false as $s\lambda \in \left[0, \frac{1}{2}\right)$, unless $H(Ffu, Gv) = 0$, thus $f^2u = fu = gv$.

Similarly, we can prove that $g^2v = gv$.

Putting $fu = gv = z$, then $fz = z = gz$, $z \in Fz$ and $z \in Gz$. Therefore z is the common fixed point of maps f, g, F & G.

Now suppose that f, g, F & G have another common fixed point $z \neq z'$. Then by lemma [2.3] and $(biii)$ we have $d(z, z') = d(fz, gz') \leq s\,H(Fz, Gz')$.

Assume that $H(Fz, Gz') > 0$. Then the use of (3.4) gives

$H^p(Fz, Gz') \leq$

$$\lambda\left[\alpha d^p(fz, gz') + (1-\alpha)\max\{d^p(fz, gz'), d^p(fz, Fz), d^p(gz', Gz'), d^{\frac{p}{2}}(gz', Fz).d^{\frac{p}{2}}(fz, Gz')\}\right]$$

.

Since $d(fz, Gz') \leq H(Fz, Gz')$ and $d(gz', Fz) \leq H(Fz, Gz')$,

we have $H^p(Fz, Gz') \leq s\lambda\, H^p(Fz, Gz')$.

which is false as $s\lambda \in \left[0, \frac{1}{2}\right)$. Then $H(Fz, Gz') = 0$ and hence $z = z'$.

If we put in above Theorem $f = g$ and $F = G$, we obtain the following result.

Corollary3.5 Let (X, d) be a b-metric space with parameter $s \geq 1$. Let $f: X \longrightarrow X$ and $F: X \longrightarrow CB(X)$ be single and multi-valued maps, respectively such that the pairs $\{f, F\}$ are owc and satisfy inequality

$$H^p(Fx, Fy) \leq \lambda\left[\alpha d^p(fx, fy) + (1-\alpha)\max\{d^p(fx, fy), d^p(fx, Fx), d^p(fy, Fy), d^{\frac{p}{2}}(fy, Fx).d^{\frac{p}{2}}(fx, Fy)\}\right]$$

(3.5)

for all $x, y \in X$, with $\alpha \in [0,1]$ also $s\lambda \in \left[0, \frac{1}{2}\right)$ and $p \geq 1$. Then f & F have a unique common fixed point in X.

Now, letting $f = g$ we get the next corollary.

Corollary3.6 Let (X, d) be a b-metric space with parameter $s \geq 1$. Let $f: X \longrightarrow X$ and $F, G: X \longrightarrow CB(X)$ be single and multi-valued maps, respectively such that the pairs $\{f, F\}$ and $\{f, G\}$ are owc and satisfy inequality

$$H^p(Fx, Gy) \leq \lambda\left[\alpha d^p(fx, fy) + (1-\alpha)\max\{d^p(fx, fy), d^p(fx, Fx), d^p(fy, Gy), d^{\frac{p}{2}}(fy, Fx).d^{\frac{p}{2}}(fx, Gy)\}\right]$$

(3.6)

for all $x, y \in X$, with $\alpha \in [0,1]$ also $s\lambda \in \left[0, \frac{1}{2}\right)$ and $p \geq 1$. Then f, g, F & G have a unique common fixed point in X.

Corollary3.7 Let (X, d) be a b-metric space with parameter $s \geq 1$. Let $f, g: X \longrightarrow X$ and $F, G: X \longrightarrow CB(X)$ be single and multi-valued maps, respectively such that the pairs $\{f, F\}$ and $\{g, G\}$ are owc and satisfy inequality

$$H(Fx, Gy) \leq d(fx, gy) + (\lambda - 1)\max\{d(fx, gy), d(fx, Fx), d(gy, Gy), d(gy, Fx), d(fx, Gy)\}$$

(3.7)

for all $x, y \in X$, where $s\lambda \in [0, \frac{1}{2})$. Then f, g, F & G have a unique common fixed point in X.

Proof: Clearly the result immediately follows from Theorem 3.1.

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American Journal of Engineering Research (AJER)
e-ISSN : 2320-0847 p-ISSN : 2320-0936
Volume-3, Issue-9, pp-171-176
www.ajer.org
Research Paper Open Access

Development of a cocoa beans batch dryer

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ABSTRACT: *A cocoa beans batch dryer of 25kg wet capacity was designed, constructed and evaluated using wood as fuel material. It consists of four major parts namely; drying platform, drying chamber, heating duct (flue) and air holes. The heated air cocoa batch dryer used in the evaluation was successful in drying 5cm deep thin layer of cocoa beans from initial moisture content of 80.01% (db) to 7.49% (db) in 7 hours of continuous drying at drying temperature between 61.3^{0}C and 66.7 ^{0}C. The even drying efficiencies ranges between 72.3% to 92.9%. Drying efficiency were observed to increase with increase in batch mass . Hence, adopting the dryer will help in boosting cocoa production for agricultural advancement of the country.*

KEYWORDS: *Batch-dryer, Cocoa Beans, Moisture Content, Drying efficiency*

I. INTRODUCTION

Cocoa (Theobroma Cacao) is one of the most important cash crop in Nigeria and other countries such as Cote d'voire, Ghana, Indonesia, Cameroon, Brazil, Ecuador, Malaysia, Sierra-Leone and Republic of Benin. In Nigeria, the crop has recently gained government re-birth process after long dependence on petroleum. The Nigerian average annual production according to CRS [1] is about 170,000 tonnes. About 90-95 percent of cocoa production in Nigeria are from the Western part of the country and concentrated in Oyo and Ondo States Laryca, [2].

The end products from cocoa bean especially chocolate and beverages are considered among the basic food in many countries of the World and the quality of these end products is a function of how they are processed [3]. Also, economic importance of cocoa beans is indicated by its use in the manufacturing of wines, floor tiles, ceiling board and shoes polish among others. One of the most important post harvest processing of cocoa bean is drying before storage. Cocoa beans are dried traditionally or artificially. Traditionally, cocoa beans are dried by spreading the beans on concrete, raised platform, tarpaulin etc. in the sun for some days. Though, this method is the oldest and most widely used, it has disadvantages, such as beans damage by rodents, contamination by wind blown dust and dirt , inconsistency in the weather condition and frequent turning. All these therefore called for the use of artificial method. Artificially, solar and other conventional (heated air) driers are used. In conventional drying, the hot air in contact with the wet beans is used to supply heat and carry away the vapourised moisture. Musa-Makama [4] reported that hot-air drying of crops has been receiving much attention as an immediate alternative to sun-drying in developing countries. Biomass (including plant and animals) is a renewable energy resource which is relatively abundant on the farm in rural areas. ECN [5] presents that Nigeria need to work seriously toward incorporating renewable energy in the national energy mix and estimated a total biomass resources in the country to be about 9 x 10^{12} MJ. This offers a viable energy resource alternative to biofuels and petroleum in artificial dryers for drying crop.

Upon harvesting of ripe cocoa pods, fresh cocoa beans were fermented in wooden boxes for 5-7 days and dried until it reaches the safe moisture level of 7.5% [6]. According to Are and Gwynee-Jonnes [7] a loss of 55 to 64% in weight of cocoa beans occur during fermentation and drying of the beans.
In the humid tropics, slow drying with ambient air is not sufficiently attractive because the prevailing environmental condition of about 29-32^{0}C and relative humidity result in low drying potential Fagunwa et al [8].

Incidentally, harvest season of cocoa beans fall within the raining season, thus, the need of a weather independent drying system.

In recent years, investigations have been undertaken and reported on drying of cocoa beans using solar and artificial drying methods in comparison with traditional/ open sun drying, Ndukwu et al [3], Hii et al[6], Fagunwa et al [8], Nicholas [9], Leopold et al [10], Akmel et al [11], Yeboah [12]. However, limited studies have been reported on the use of firewood for cocoa drying. Since the usage of solar and artificial dryers is invisible in the rural areas where boiling, cooking, frying and heating are done by firewood or charcoal. In Nigeria, it was observed that most people in cocoa business are peasant farmers and illiterates thus operating a costly and complex dryer will be difficult. Therefore, this paper present a report on the development of a natural heated air cocoa beans batch dryer which is cheap, simple to construct and operate, independent of weather, and capable of reducing problems associated with traditional/open sun-drying method.

II. MATERIALS AND METHODS

A developed conventional (heated air) natural heat transfer cocoa beans batch dryer was adopted for this study. The Cocoa beans used for the study were obtained from Cocoa Research Institute of Nigeria (CRIN), Ibadan and fermented for seven days Ndukwu [13] prior to the dryer evaluation. Locally available firewood were collected from the Farm of the Federal College of Agriculture, Ibadan on Lat. 7^0 22 ½ ^{1} N and Long 3^0 50 ½ ^{1} E where the study was carried out. Rainfall pattern is usually bimodal with a long and short rainy season separated by a short period of dryness.

The construction materials were obtained locally at Araromi , Agodi gate and Ogunpa markets both at Ibadan, Nigeria. These construction materials are galvanized metal sheet (2mm thick) for the heating duct and chimney, stainless steel (3mm thick) for the drying platform, Plywood (12.5mm thick) for the buffler and fired bricks. The flow of air into the drying chamber and heating duct is natural by the provision of air inlet holes and bufflers. The bufflers directs the natural air towards flue opening and air inlet holes respectively for proper combustion and convective heat transfer irrespective of the wind direction and speed.
The drying air temperature was measured at intervals with K-type thermocouple. At temperature above 60^0C (recommended drying temperature for cocoa) Hii et al [6] and Donald et al [14], a paddle made of metal head and wooden handle was used to draw out the firewood from the heating duct to prevent overheating.

2.1 Description of the batch dryer

The developed cocoa beans batch dryer and its general features are respectively shown on Plate 1 and Fig. 1. Below. It consists mainly of four major parts namely; drying platform, drying chamber, heating duct and air inlet holes. The drying platform (2) holds the beans during drying. It is made of stainless steel measuring 1900mm x 1000mm x 30mm . It has about 45% of its area perforated . The drying chamber (3) measuring 2340mm (length), 1340mm (width) and 920mm (depth) is made of mud brick walls which also help to reduce heat loss . The heating duct (flue) (4) enveloped by the drying chamber is where the fuel (wood) is burnt to heat the incoming air. One of its ends is opened for fuel loading, while the other end is connected to a chimney (1) through which the fumes is expelled. Also ashes from the burnt wood drops on the collection tray through perforated holes on the floor of the heating duct. Provision were made for adequate conventional heat transfer by the incorporation of two air inlet holes (6) of 150mm diameter each at the lower parts of the side. Bufflers and their slots (5) were also provided to properly direct the natural air towards the air inlet holes and the flue irrespective of the wind speed and direction. The thermometer/thermocouple holes (7) allow easy measurement of temperature in the drying chamber.

Plate 1: The Cocoa Beans Batch Dryer

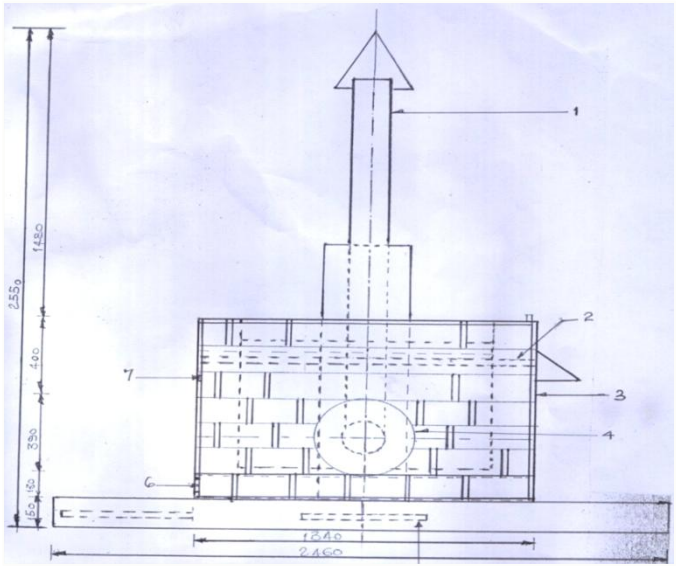

Fig. 1: Front view of the Cocoa Bean Batch Dryer

2.2 Design Equations

The design calculations for the construction of the dryer were based on the assumptions and criteria stated below.

The total energy required for drying of cocoa was calculated using equation presented by Seveda [15]

$$Q = M_d \times C_C \text{ X } (T_1 - T_2) + M \text{ x } Cp \text{ x } (T_1 - T_2) + Mw \text{ x } L \quad (1)$$

Where Q is the total energy required for drying of the beans(kJ), M_d is mass of bone dry beans in kg , c_c is the specific heat of beans in $kJkg^{-1}\ ^0C^{-1}$, T_2 is temperature inside the drying chamber in ^0C, T_1 is ambient air temperature in ^0C, M is the mass of initial water content in kg, C_p is specific heat water in $kJ\ kg^{-1}\ ^0C^{-1}$, M_w is mass of water to be removed in kg and L is the latent heat of vapourization of water $kJkg^{-1}$.

Neglecting the effect of weather since the drying operation is expected to take place under a shed, the total amount of heat available for drying is that supplied by burnt wood and this was calculated from equation (2)

$$Q_T = M_{wt}\ S_p C_W \quad (2)$$

Where Q_T is total amount of heat in (J), M_{wt} is total mass of wood in kg and $S_p\ C_w$ is the Specific Calorific value of wood in MJ/kg (18.5- 19MJ/kg, Valter and Eliseo [16]).

Heat required to evaluate the moisture and also keep the beans at the dryer temperature was calculated based principles of heat transfer using equation by Karlekar and Desmond[17]

$$E = m_c\ c_c d_T\ + M_W L \quad (3)$$

Where E is the heat required to evaporate the moisture, m_c is the mass of cocoa beans; c_c is specific heat of beans $kJ\ kg^{-1}\ ^0C^{-1}$, M_w is mass of water to be removed in kg and L is the latent heat of vapourization of water $kJkg^{-1}$(2256kJ/kg, Liley[18]) and dT is change in temperature in ^0C.

While the total rate of heat transfer to the drying cocoa beans is a combination of conductive, convective and radiative which is similar to that of Okonkwo and Okoye [19].

$$q = q_c + q_r + q_k \quad (4)$$

Where q is the total rate of heat transfer in W, q_c is convective heat transfer in W, q_r is radiative heat transfer in W and q_k is conductive heat transfer, W

but

$$q_c = h_c\ (T - T_{ch}\ )\ A \quad (5)$$
$$q_r = h_r\ (T - T_{ch})\ A \quad (6)$$
$$q_k = U_k\ (T - T_{ch})\ A \quad (7)$$

where is h_c convective heat transfer coefficient w/m^{2}K, T is temperature of hot air coming from the heating duct ^{0}C, is T_{ch} temperature of chamber ^{0}C , h_r is radiative heat transfer coefficient, w/m.^{2}K and U_k is thermal conductivity of material in w/m^{2}K.

2.3 Evaluation

The performance evaluation of the cocoa batch dryer was carried out firstly by loading 20kg of fermented cocoa beans on the drying tray with a known mass of wood in fixed volume inside the flue. The drying samples were agitated for uniform drying at interval of 10 minutes and the moisture content of the samples on dry basis(db) were determined according to ASAE standard [20] at every one hour . Drying continued until the mass of the beans remain unchanged and also in accordance with Opeke [21] that drying should stop when the colour of the beans turned brown and a pressed handful of beans together gives crack shells (testa) and a bean cut with knife gives separated cotyledons.

Secondly, the dryer was evaluated for even drying efficiencies by drying varied masses (5kg, 10kg, 15kg and 20kg) and the dried products were separated manually into well dried, less dried and burnt beans and their weights were taken.

The even drying efficiencies were obtained from the relation as :

$$Z_e = \frac{M_{wd}}{M_{wd} + M_{ld} + M_b} \quad (8)$$

Where Z_e is even drying efficiency in % , M_{wd} is mass of well dried beans in kg, M_{ld} is mass of less dried beans in kg and M_b is Mass of burnt beans in kg.

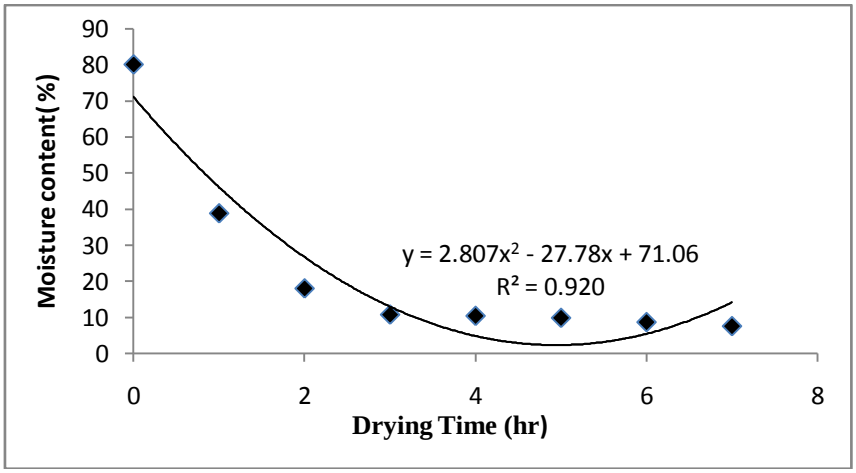

Fig.2 Drying rate of Cocoa beans batch dryer

TABLE 1: DRYING RATE OF COCOA BEANS DRYER

INITIAL MASS = 20.0kg

INITIAL MOISTURE CONTENT = 80.01% (db)

	REPLICATE 1			REPLICATE 2			REPLICATE 3			AVERAGE		
Drying Time (hr)	Mass (kg)	Temp. ^{0}C	Moisture Content (%)	Mass (kg)	Temp. ^{0}C	Moisture Content (%)	Mass (kg)	Temp. ^{0}C	Moisture Content (%)	Mass (kg)	Temp. ^{0}C	Moisture Content (%)
1	14.32	62.0	39.66	14.41	62.0	38.93	14.53	60.0	37.65	14.42	61.33	38.75
2	12.15	60.0	17.86	12.32	62.0	16.96	12.41	60.0	19.00	12.29	60.67	17.94
3	11.09	61.0	9.56	11.11	62.0	10.89	11.12	61.0	11.60	11.11	61.30	10.68
4	10.10	60.0	9.80	10.06	61.0	10.44	10.04	62.0	10.76	10.06	61.00	10.33
5	9.26	62.0	9.07	9.12	61.0	10.31	9.13	63.0	9.97	9.17	62.00	9.78
6	8.50	61.0	8.94	8.41	65.0	8.44	8.42	60.0	8.43	8.37	62.00	8.60
7	7.00	62.0	7.52	6.95	61.0	7.46	6.98	62.0	7.5	6.98	61.67	7.49

TABLE 2: COCOA BEAN BATCH DRYER PERFORMANCE ON MASS BASIS

S/N	Replicate	Initial Mass of Wet Beans (kg)	Time of drying (hr)	Mass of Wood used (kg)	Final Mass of Dried Beans (kg)	Mass of well dried beans (kg)	Mass of less dried (kg)	Mass of burnt beans (kg)	Even drying efficiency (%)
1	1	5.0	3.15	6.80	2.13	1.59	0.35	0.19	72.3
2	2		3.10	7.00	2.20	1.60	0.37	0.23	72.7
3	3		3.00	6.60	2.10	1.56	0.39	0.15	72.3
4	1	10.0	5.20	13.00	4.50	3.90	0.40	0.20	86.7
5	2		5.00	12.80	4.47	3.82	0.39	0.26	85.5
6	3		4.55	13.20	4.45	3.80	0.42	0.23	85.4
7	1	15.0	6.05	14.80	6.70	6.00	0.52	0.18	89.6
8	2		6.00	14.50	6.67	5.95	0.49	0.23	89.2
9	3		5.50	14.20	6.50	5.80	0.50	0.20	89.2
10	1	20.0	7.05	20.50	8.50	7.90	0.40	0.20	92.9
11	2		7.00	19.50	8.41	7.79	0.39	0.24	92.6
12.	3		6.50	20.00	8.40	7.80	0.42	0.18	92.9

III. RESULTS AND DISCUSSION

The result of the performance of cocoa batch dryer were as presented in Tables 1,2 and Figure 2. The result in Table 1 showed that the dryer dried 20kg of cocoa beans from initial moisture content of 80.01%(db) to 7.49%(db) in 7 hours in comparison with an open sun-drying of about 7days depending on weather condition. The average drying chamber temperature(61.4ºC) was found to be higher than that of open air (46^0C) obtained by Adejumo and Bamgboye [22] in the same environment . Fig. 2 showed falling rate drying similar to that obtained by Adejumo and Bamgboye [22] and Okonkwo and Okoye [19]. The dryer was found to have a high even drying efficiency of 72.3 to about 92.9% and increases as mass of cocoa beans increases. This suggests that the beans dried in bulk is evenly and thoroughly dried. The equation describing the relationship between moisture content and drying time is polynomial and it is given as $mc= 2.807dt^2 - 27.78dt + 71.06$, ($R^2$=0.920), where mc = moisture content (%) and dt = drying time (hr). The cocoa batch dryer can be expanded for community and commercial utilization. Biomass fuel such as wood, grass, animal residue e.t.c are easily obtained on the farm. Being operated under a shed, reduced the effect of rainfall and other environmental factors . The total cost of construction of about N5,200 is considered cheap and can be adopted by local communities in Cocoa producing areas for timely and effective drying of cocoa beans as an alternative to open sun- drying method.

IV. CONCLUSION

Development and performance evaluation of a Cocoa beans batch dryer were carried out. The results of the performance using locally available wood as heat source showed that the dryer dried 20kg of fermented cocoa beans from initial moisture content of 80.01% to 7.49% in 7hours. The average drying chamber temperature was 61.4^0C and over 90% even drying efficiency was obtained. The efficiency increases as the mass of cocoa beans increases per batch. The short period of drying cocoa beans suggests that this dryer is a good substitute for open sun-drying method especially when the insolation from sun is low because it does not depend on weather. No doubt, the dryer will help to boost cocoa production for agricultural advancement of the country.

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American Journal of Engineering Research (AJER)
e-ISSN : 2320-0847 p-ISSN : 2320-0936
Volume-3, Issue-9, pp-177-184
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A fuzzy-logic based MPPT method for stand-alone wind turbine system

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ABSTRACT : *In this paper, a fuzzy-logic based maximum power point tracking (MPPT) method for a stand-alone wind turbine system is proposed. Hill climb searching (HCS) method is usedto achieve the MPPT of thepermanent magnet synchronous generator (PMSG) driven wind turbine system. Simulation results will show the effectiveness of the proposed method in various operating conditions.*

KEYWORDS: *wind energy conversion system; permanent magnet synchronous generator; stand-alone; maximum power point tracking; hill climb searching; fuzzy logic control;*

I. INTRODUCTION

In recent years, the use of renewable energy resources is more and more increased due to the increasing need for energy and the shortage of traditional energy sources in the near future [1]. The literature review shows that, renewable energy systems are not cost competitive against conventional fossil fuel power systems, but the need for cleaner power and improvements in alternative energy technologies make a wide-spread use and application of such systems [2].

Many research and development in wind energy conversion system (WECS) have shown their excellent potential for remote areas located far from power stations and distribution networks which are uneconomical to install [3]. Among those, PMSGs are oftenchosenfor stand-alone WECS because of its advantages: higher reliability, less maintenance and more effectiveness. Besides, it is suitable for variable speed operation, which provides 10-15% higher energy output, lower mechanical stress and less power fluctuation compared withconstantspeedoperation. A system of variable speed PMSG wind turbine has more flexibility because it can adapt wind variations [4].

In this paper, a direct searching MPPT controller is designed for variable speed PMSG driven wind turbine. With this proposed method, wind generator gives maximum power without any knowledge about generator's characteristic or ambient condition. Control algorithm is independent, achieving the fast dynamic responses for the complex nonlinear system.

II. SYSTEM DESCRIPTION

The WECS consists of a wind turbine coupled to a PMSG to power a stand-alone system. A three-phase diode bridge rectifier is used for the AC/DC conversion. A boost converter (DC/DC 1) is used to vary the rotor speed. A FLC is designed to track the MPP of the WECS by adjusting the duty ratio of this converter. The proposed control algorithm is independent on turbine characteristics, achieving the fast dynamic responses. Another DC/DC converter (DC/DC 2) is used to boost the system’s voltage to a sufficient value for a voltage source inverter which provides a sufficient voltage to load. A battery bank is also used to store surplus power and recompense when wind power is not enough for load demand (Figure 1).

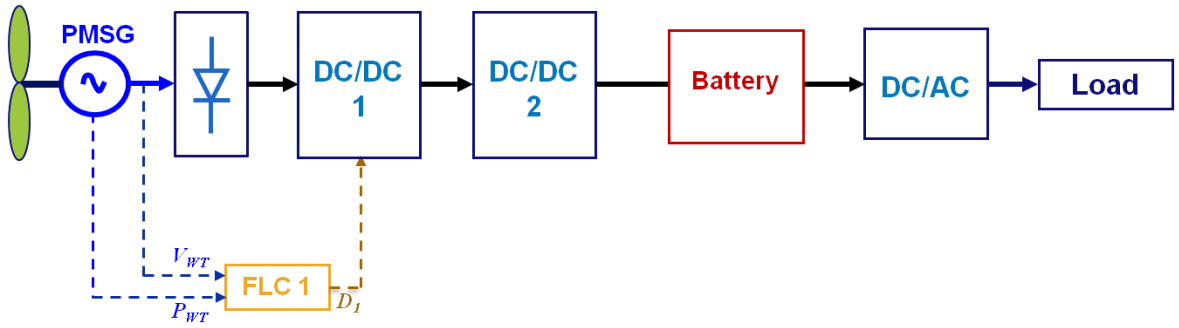

Figure 1. Stand-alone WECS.

III. WIND ENERGY CONVERSION SYSTEM

1.Wind aerodynamic

Mechanic power of a wind turbine can be expressed in terms of the air densityρ, the blade radius R_{blade}, and is the wind speed v_{wind}[9]:

$$P_m=0.5C_p\rho\pi R_{blade}^2 v_{wind}^3 \quad (1)$$

where C_p is the power coefficient. This coefficient is also known as Betz limit. It can be expressed in terms of reduced velocity λ and blade angleθ. If Ω is the rotor speed, the reduced speed λ is defined:

$$\lambda = \Omega R_{blade}/v_{wind} \quad (2)$$

A generic equation is used to model the power coefficient $C_p = C_p(\lambda,\theta)$, based on the modeling turbine characteristics described in [10]:

$$C_p(\lambda,\theta)=0.5(98/\lambda_i - 0.4\beta - 5)e^{-(16.5/\lambda_i)} \quad (3)$$

where:

$$\lambda_i = \frac{1}{\frac{1}{\lambda+0.089}-\frac{0.035}{\beta^3+1}} \quad (4)$$

ThecharacteristicfunctionCpvs. λ,forvariousvaluesofthepitchangle β,isillustratedinfigure 2.The maximum value of $C_p$is achieved for$\beta=0^0$. This particular valueλ_{opt} results in the point of optimal efficiency where the wind turbine captures the maximum power [10]. In this work, a typical small-sized three-bladed horizontal-axis wind turbine generator with no blade pitch angle control is considered, so that $\beta=0^0$ at all times.

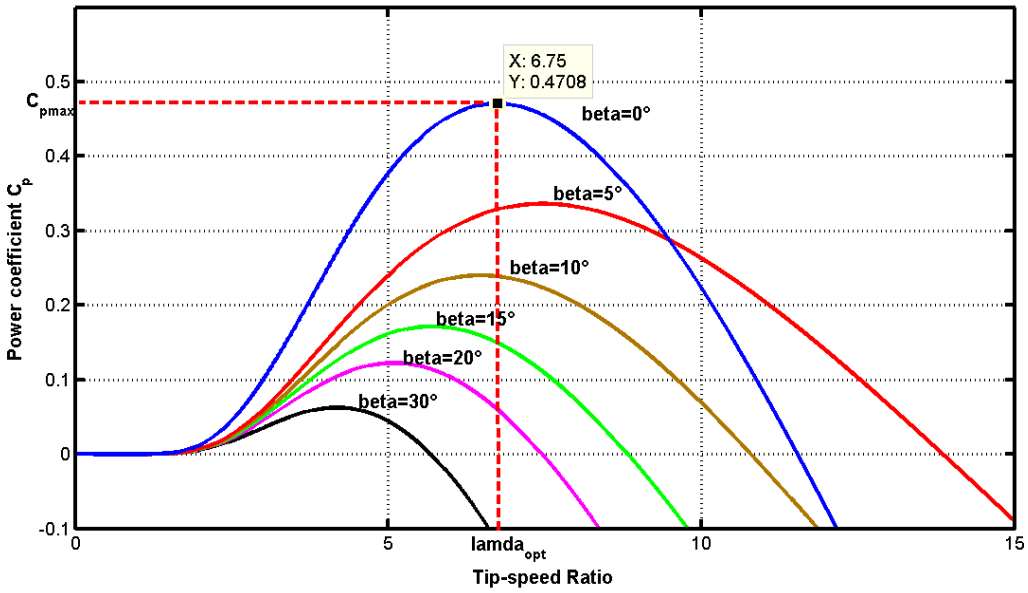

Figure 2.C_p vs λ, for various pitch angles β

For each wind speed v_{wind}, there is a maximum rotor speed Ω_{opt}(or ω_{opt})which made a maximum power recovered from the wind turbine (Figure 3).

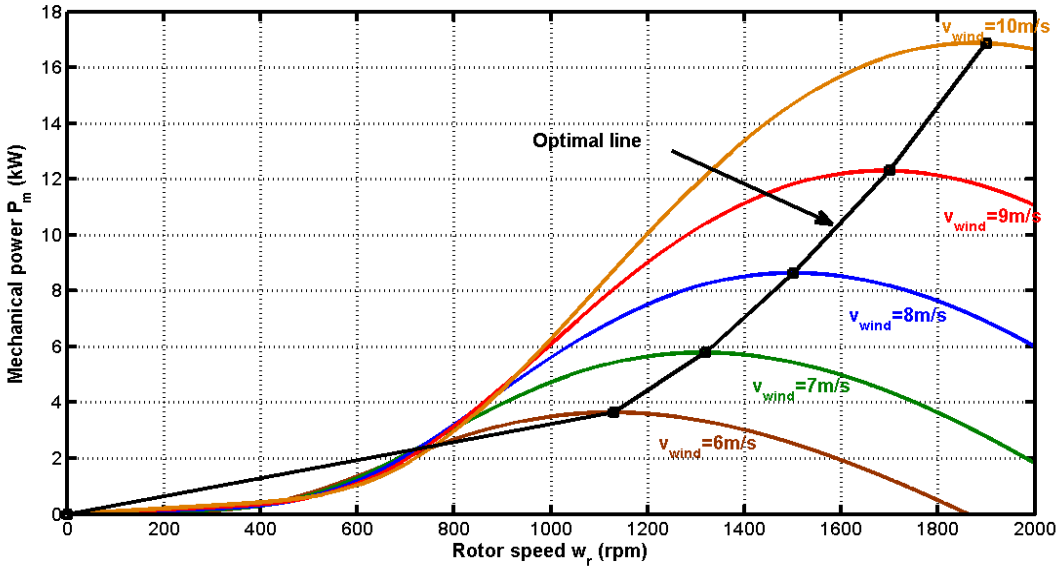

Figure 3.Power versus rotor speed at various wind speeds

2. Electrical system modeling

In PMSG wind generation systems, the output current and voltage are proportional to the electromagnetic torque and rotor speed, respectively [9]:

$$T_e=k_T I_a \quad (5)$$

$$E=k_e\omega \quad (6)$$

where I_a is the stator current, ω is the rotor speed, k_T and k_e is the torque and voltage coefficient, respectively.

Output voltage of the wholesystem[9]:

$$V_{DC} = \frac{1}{1-D_2}\frac{3\sqrt{6}}{\pi}\omega\sqrt{k_e^2 - (\frac{T_g L_s}{k_T})^2} \quad (7)$$

So with a specific wind speed, if we vary the system's output voltage by adjusting the duty cycle D_2, rotor speed will be controlled. By applying this strategy,the maximum power of wind energy is achieved when rotor speed achieve its optimum value[11].

3. Proposed fuzzy MPPT controller

AnWECS involves the air masses complex dynamics, the wind regimes tochastic nature and the turbine and generator non-linear behavior. In such kind of applications, the fuzzy-logic based controllershaveshownbetterperformanceandsomeothersadvantages.The mathematical model is not necessary to controller synthesis; it tolerates parameter imprecisions or parameter variations [12].

Koutroulis et al. [13] has proposed a MPPT algorithm which is based on the fact that dP/dD=0 in the MPP, and from that calculate the new duty cycle to track the MPP when wind speed change. Trinh et al. [14] has based on the same equation, but using a FLC to follow the MPP. Both show that neither wind generator'scurves nor actual wind speed is required. However, it just can apply for a constant load demand. If load demand varies while wind speed remains constant, current and voltage of the system will change but dP/dD still remains at the same value so the controller cannot recognize that change, thus the system will not work in the true MPP. So these methods can not apply for a stand-alone system where load demand varies in time.

Here we propose a modified HCS method which base on the relationship between wind power and rotor speed at the MPP:

$$dP/d\omega=0 \quad (8)$$

Applying the chain rule, we have:

$$dP/d\omega=(dP/dV).(dV/d\omega) \quad (9)$$

In a PMSG, rotor speed is proportional to the generator phase voltage, so:

$$dV/d\omega>0 \quad (10)$$

Then:

$$dP\backslash d\omega=0 \Rightarrow dP/dV=0 \quad (11)$$

Applying this principle in the HCS algorithm: On the MMP, we have dP/dV=0. If we are in the up-hill region (dP/dV>0), we should increase the voltage to reach the MPP. If we are in the down-hill region (dP/dV<0), we should decrease the voltage to reach the MPP (Figure 4). Thus, whenever wind speed or load demand change, wind turbine power or wind turbine output voltage will vary, so the controller can recognize these change and react to reach the new MPP.

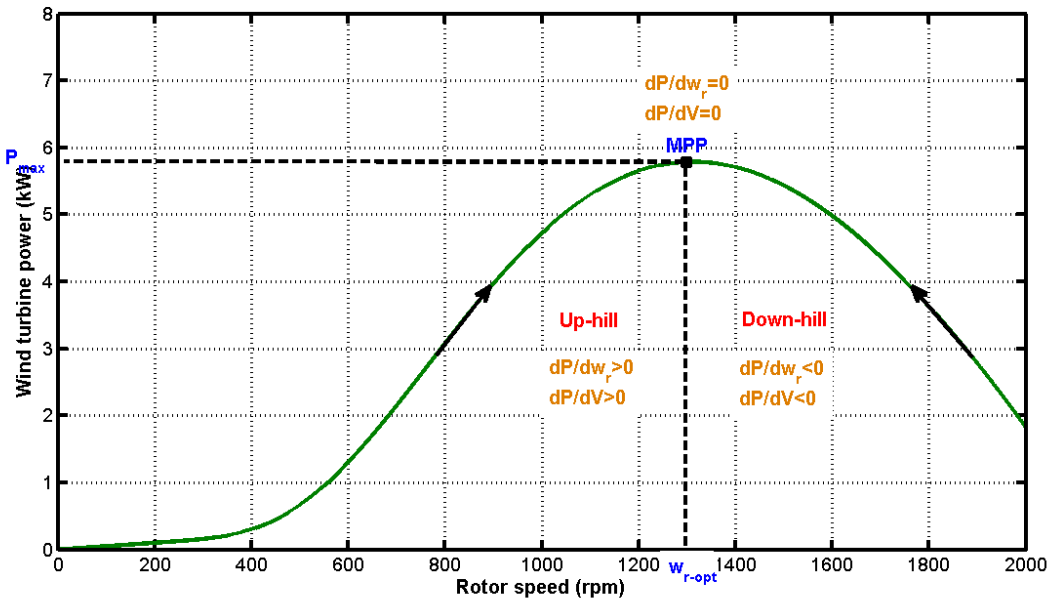

Figure 4. MPP in function of rotor speed

To implement this algorithm in a FLC, we need two inputs: change in wind turbine power (dP/dV) and its derivative, output is duty cycle D_1 of the converter DC/DC 1.

Fuzzy rules are summarized in table 1.

ΔD_1		(dP/dV)'		
		Negative	Zero	Positive
dP/dV	Very Negative	+3%	+3%	+3%
	Negative	+3%	+1%	+1%
	Zero	0%	0%	0%
	Positive	-1%	-1%	-3%
	Very Positive	-3%	-3%	-3%

Table 1. Rules of ΔD_1

IV. SIMULATION AND RESULTS

1. Initial conditions

The system described in section 2 is implemented in Matlab Simulink (Figure 5).

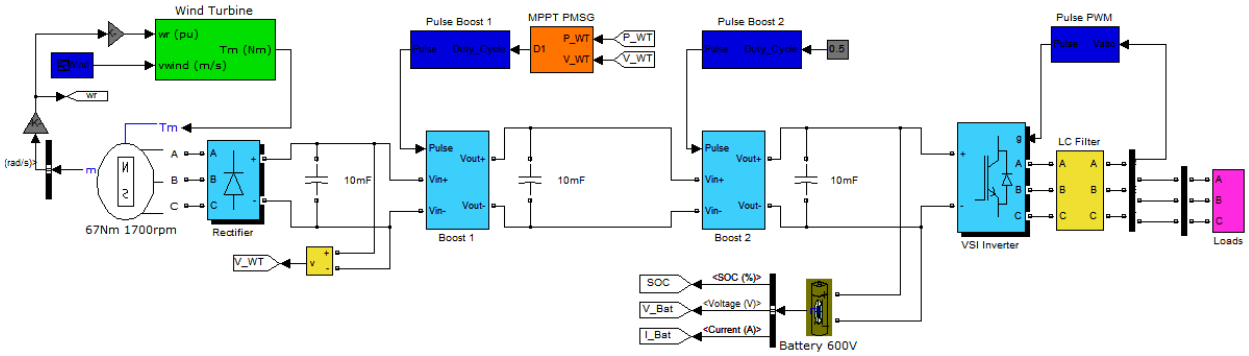

Figure5. Simulation in Simulink Matlab

Wind speed and load demand are varied within 100 seconds to test our controllers in various climatic and operating conditions (Figures 6, 7).

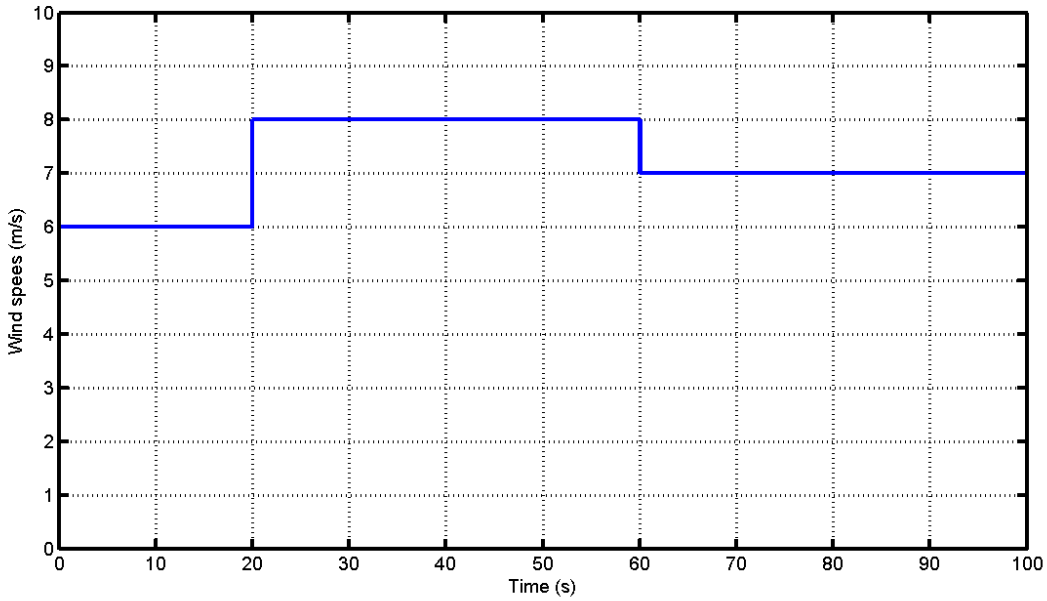

Figure 6.Wind speed

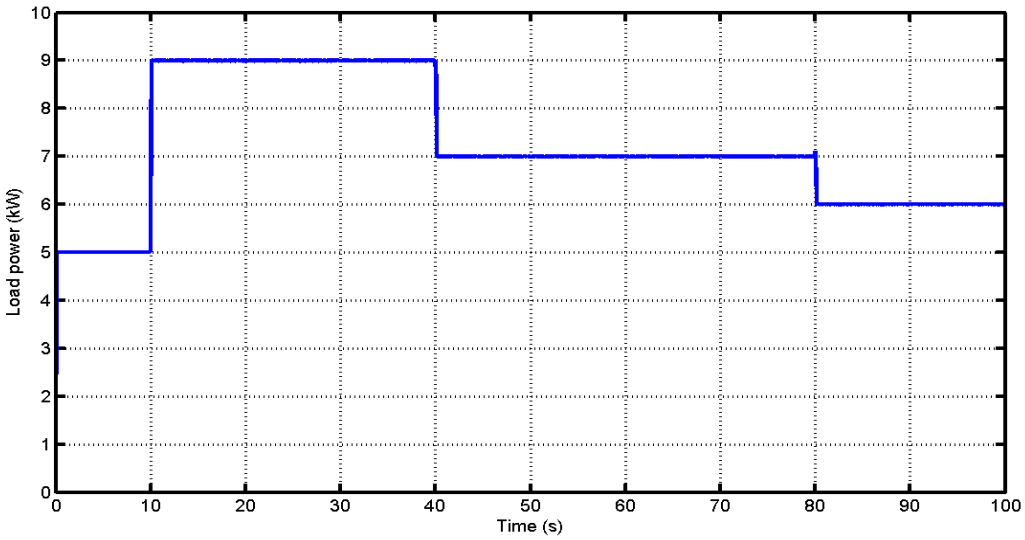

Figure7. Load demand

V. RESULT AND DISCUSSION

In the first ten seconds, load demand is 6 kW and wind speed is 6 m/s. In these conditions, our FLC has chosen the value for D_1 around 0.55 to keep the DC output voltage at 130 V (rotor speed at around 1150 rpm), which make power extracted around 3.1 kW. According to the generator curve in figure 3, we have the optimal rotor speed and the maximum power output is 1130 rpm and 3.645 kW respectively. The 0.545 kW difference between these two values is the power loss. After, when load change from 6 kW to 9 kW, the FLC still keep rotor speed around 1200 rpm to extract the maximum power from wind.

When wind speed change from 6m/s to 8m/s, our FLC decrease the duty cycle to increase wind turbine voltage to 160 V (rotor speed is 1500 rpm), the value of FLC output is kept near 0.35 to achieve the maximum power of 7.33 kW (optimal rotor speed is 1500 rpm and maximum power is 8.64 kW for wind speed 8 m/s).

In the last forty seconds, wind speed drops down to 7 m/s (for a optimal rotor speed of 1320 rpm and maximum power of 5.78 kW). Rotor speed is kept at 1300 rpm now, which make a 5 kW power extracted (Figures 8, 9, 10, 11).

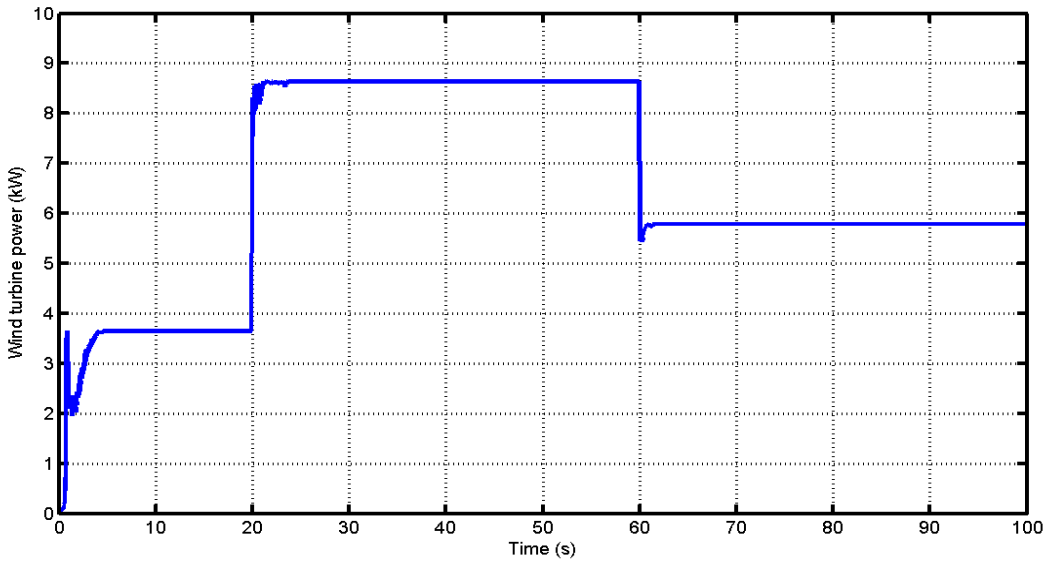

Figure8. Wind turbine power

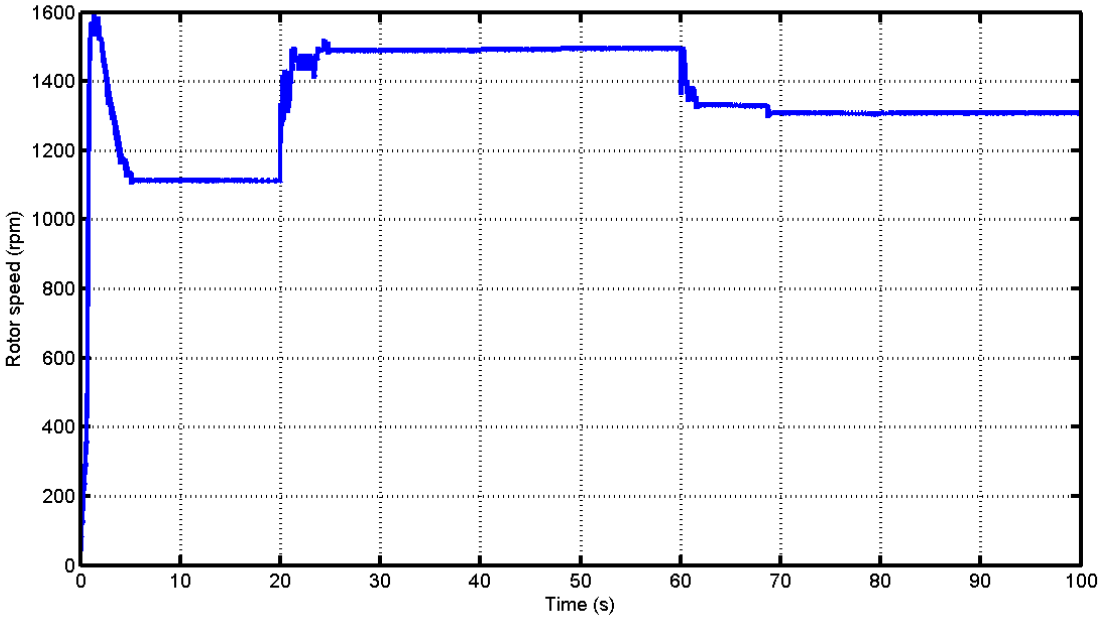

Figure9. Rotor speed

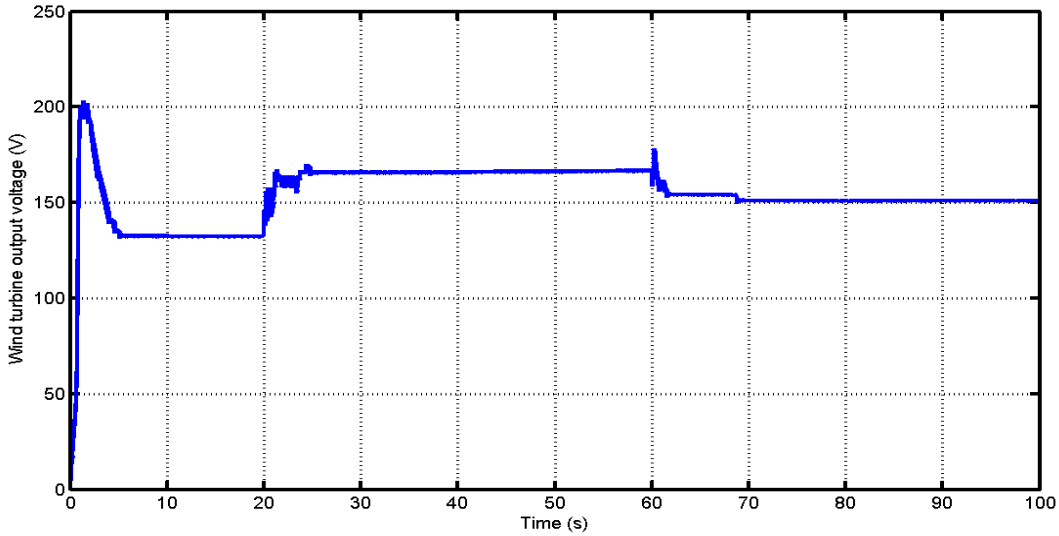

Figure 10. Wind turbine output voltage

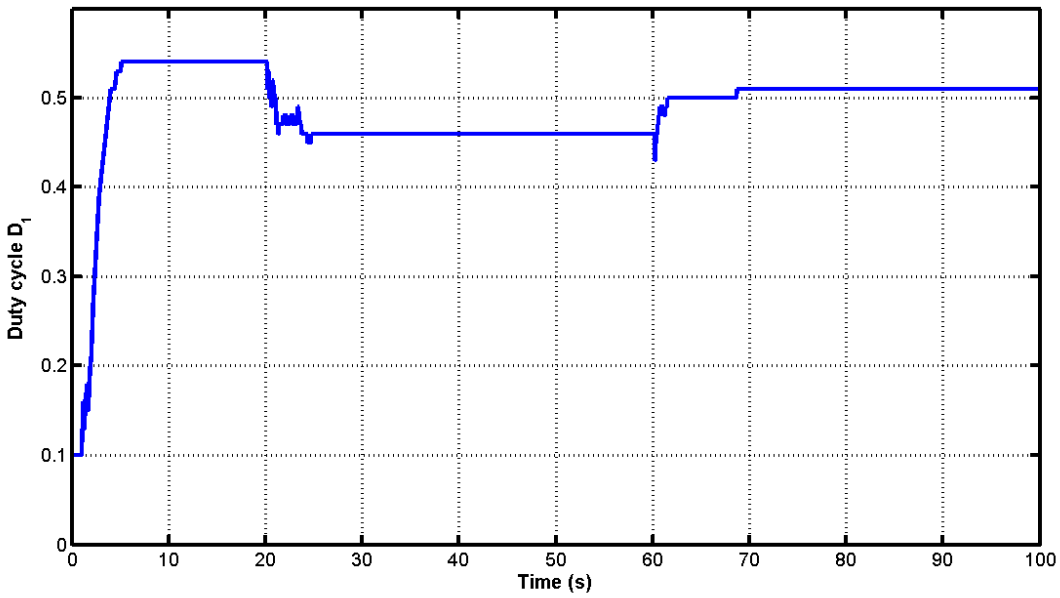

Figure 11.Duty cycle D_1

We can see that our FLC works well to track the maximum power point when wind speed or load demand change. These results still have some oscillation, it is evident because of the complex and nonlinear nature of the WECS, but it does not affect the final objective of our controller.

VI. CONCLUSION

In this paper, a new MPPT method for stand-alone WECS is proposed. Without information of wind speed or generator's power characteristic, control signals were generated to recover maximum power from the wind in any climatic or operating conditions. Simulation result shows good behavior of our controllers to achieve the MPPT. As perspective, experimental result will be carried out to verify the efficiency and feasible of our proposed method.

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American Journal of Engineering Research (AJER)
e-ISSN : 2320-0847 p-ISSN : 2320-0936
Volume-3, Issue-9, pp-185-193
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Assessment effective factors on satisfaction of personals occupation in Rural Municipalities (Dehyari) in Iran (Case study: Kuhsorkh of Kashmar County)

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ABSTRACT : *Local or rural municipality's Iran is named "Dehyari". Rural Municipalities (Dehyari) is In Iranian rural areas, there are organizations that provide services and facilities to the local people and they are responsible for doing it. Dehyari or rural municipality is an organization that has been expanded rapidly in recent years in rural areas. Dehyari has an important role in the rural management and development, which performance assessment can increase the success of this institution. Today organization need to assessment performance in order to achieving more efficiency of their activities. So this research was studied one of local municipality's Iran. The Kuhsorkh county of Kashmar area was selected as one of the rural municipality's Iran. The main object of research is assessment impact factors on personals satisfaction's rural municipalities. The research method is "descriptive – analytical" and questionnaire is used to collect data. Also we used the statistical methods to analyze the data. The statistical populations are 28 "Dehar"[1] in mentioned area.*
Findings show personals satisfaction has positive effect on their performance. In order to achieving purposes, are proposed some activities such as: Expansion financial resources, supervision on personals performance in order to improving local administers.
KEY WORD : *Performance, personals satisfaction, rural municipality, Dehyari, Kashmar, Iran*

I. INTRODUCTION

In recent years, the Islamic Councils and Dehyars are defined as the new management in the villages; After Islamic revelation were created rural council due to promoting local people condition .then in 1999 was created " Deyari " as official institutions in order to solving of people problems . Dehyari and the Islamic Councils as public local organizations manage the villages and they can use the policies, management and the performance of the various educational programs, the necessary infrastructures for the development, and attracting more financial resources and such stuff, to develop entrepreneurship in villages, they can also provide the necessary field for rural entrepreneurship. In the new management system in the country, management of the villages is given to the councils and dehyries. (Falsoleyman, 2013: 75).

One of the main factors in order to achieving rural sustainability is democracy in local levels. So people participant in various fields (such as : supervision , making decision financial and etc) is important factors (Bai , 2013 : 85) . Therefore, one of the effective strategies in multidimensional and sustainable rural areas is participation and empowerment of the people, especially the villagers in all aspects of construction and development of the rural area. On the other hand, rural management has a significant role in integrated, and sustainable rural development process. As a matter of fact, rural management means organizing and leading the rural society through forming the organizations and institutions (Motiee, 2012: 36). If we consider the fields of sustainable development in the areas of the environment, economic and cultural activities, there can be an extensive cooperation and interaction between dehyari, the council and the people; since these activities with public participation, education and normalizing this type of participation is easy to achieve. Rural management

[1] Deyar is the chief of rural administer

can train people and form various local groups, NGOs, pave the way to form various commissions for the embodiment of sustainable development. Moreover, by making the right culture, creating the spirit of cooperation, tolerance of group participation, and giving confidence to them, this type of activity can be effective and influential for the rural people. In other words, using wide participation of the people in a cooperative management system, utilizing the governmental and public resources and facilities, make it easier for rural managers to manage the situations (Moradi, 2013: 177).

The most important tool for achieving this purpose is establishing non-governmental organizations (NGOs), which are based on the needs and capabilities of various groups living on rural areas, in different topics essential to the native and local environment, thus perform the development plans of village (Anabestani , 2013 : 149) . Also, these organizations and institutions are the tools and instruments for providing the objectives of the rural society; the objectives which people draw and accept. Rural development management is a multilateral process that consists of three components: people, government, and public organizations. In this process, through the collaboration of the people and with the help of the organizations and rural firms, the programs and plans of the rural development were provided and administered under close supervision and assessment (Darban, 2011: 7).

The role of villages in various aspects such as: economic, social and political development in different scales on the one hand, and the results of under development of the rural areas including intense inequality, rapid population growth, unemployment, immigration, suburb life and etc. on the other hand make us concentrate more and more on rural development planning. With regard to the importance of rural management to fulfill the objectives of rural development and by considering the fact that sustainable development in the present condition of the world is based on knowledge, the rural development management in Iran should rely on knowledge and it should provide the necessary forces to fulfill this end. Therefore, the village as the smallest social unit in a country division needs an appropriate position in the development cycle of the country, it also needs a better and more accurate recognition of the general social, and economic objectives of the country, especially “the regional development and building” and “organizing the rural space and accommodation.” (Rezvani, 1383: 211).

To gain the rural development objectives, we need a local management who examines the rural problems and suggests the best solutions. If we consider the history of development of rural management in Iran, we get the fact that there has always been a need for a manger who could recognize the needs and various conditions of a rural society, this manager should be a member of the rural society and he should lead the village and the villagers to reach development and progress. Such managers existed in ancient times, too. But land reform in 1964 eliminated the chief of village from rural management; this act put rural management in total chaos and confusion. By the victory of Islamic revolution, rural management was changed from a single unit of management to a council, “Islamic councils” took over the responsibility for rural affairs which was accepted in 1361 in the parliament, but the executive problems of rural management in 1999 made another law; the law of establishing self-sufficient Dehyari in the villages of the country. As rural management is one of the most significant events in villages of the country, we need to deal with rural management which needs the villagers’ cooperation in the village’s affairs. A correct rural management leads to employment and income for different groups of rural society which results in regional development (Pasha Sharifi, 2002: 33).

1.1. Research Objective

It is necessary, are determined the main objectives for scientific research (Araste kho, 2001: 16). So the main research objectives are:

- Identifying geographical characterizes of studied area (KUSORKH County).
- Assessment effective factors on Dehyari performance in studied area.
- Proposing appropriate solution in order to promoting their condition.
- Preventing from rural migration to importance area.

1.2. Research Hypothesis

Each scientific research is trying that propose some hypothesis in order to achieving purpose (Sarukhani, 1994:25). So the hypothesis of this paper is:

It seems personals satisfaction effect on "DEHYARAN" performance.

II. RESEARCH MYTHOLOGY

The paper is applied and the research method is "descriptive – analytical". Also, questionnaire is used to collect data. The statistical population is "DEHYARAN"[2] of studied area. Thus sample size is 28 persons.

[2] The chief of studied area administers

Also we used the statistical methods to analyze the data for example SPSS Software. Also, was used ONE-SAMPLE T-TEST.

III. STUDIED AREA

One of the parts of Kashmar County is Kuhsorkh. The center of Kuhsorkh is Rivash. It is located between latitudes 35 ° and 15 ° north and longitude 58 °and 36 ° (Agricultural Organization of Khorasan Razavi, 2012). According to political division have three sections. So total villages is 28 numbers.

Figure 1: plan of studied area

IV. FINDING

a. *Descriptive findings*

i. Sex

According table 1 all of participants is male.

Table 1: sex of population society

Congested frequency	Percent	Frequency	Sex
100	100	28	**Male**
100	0	0	**Female**
	100	**28**	**Total**

ii. Age

According table 2 the most frequency is 25-34 range. Also, 12 people include in next range (35-44). So most of population is between 25 – 44 years old (89.3%).

Table2: Age of population society

Congested frequency	Percent	Frequency	Result
3.6	3.6	1	20-24
50	46.4	13	25-34
92.9	42.9	12	35-44
96.4	3.6	1	45-54
100	3.6	1	55-64
	100	**28**	**Total**

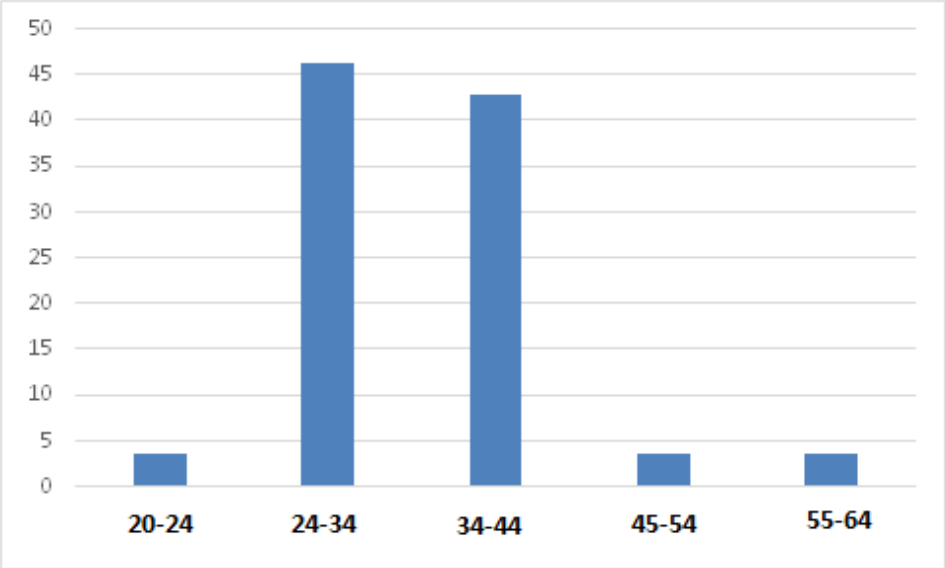

Figure 2: Age of studied sample

iii. Education

Based on collected data, most of "DEHYARAN" have diploma degree (64.3%). Also, 21.4% of them have bachelor degree. Therefore educational condition is not bad but isn't high (table 3).

Table3: Education of population society

Congested frequency	Percent	Frequency	Result
67.9	64.3	18	Diploma
89.3	21.4	6	Bachelor
100	10.7	3	Master of science
	100	**28**	**Total**

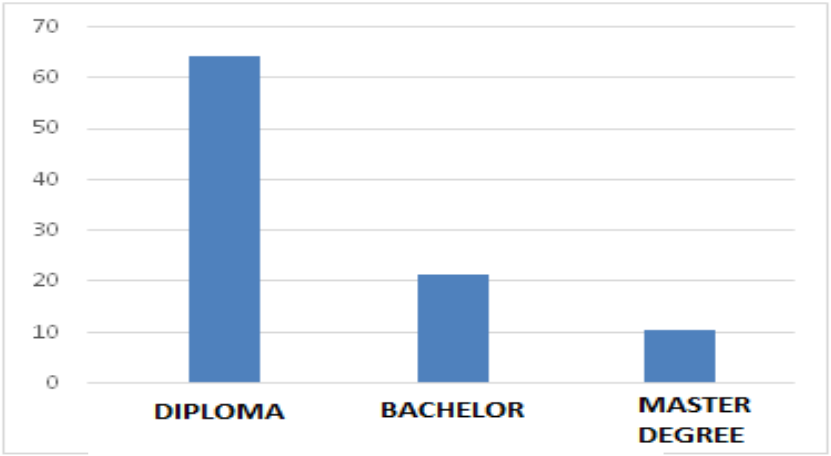

Figure 3: Education of studied sample

b. Inferential DATA (STATISTICS)

i. timely payment effect on performance

According to table 4 numerous of people believed timely payment have positive effect on "DEHYARAN" performance (82.2%).

Table 4: Timely payment influence result

Congested frequency	Percent	Frequency	Test result
0	0	0	Lowest
3.6	3.6	1	low
17.9	14.3	4	Average
32.1	14.3	4	High
100	67.9	19	Highest
4.464			Weigh average
0.881			Weighted standard deviation

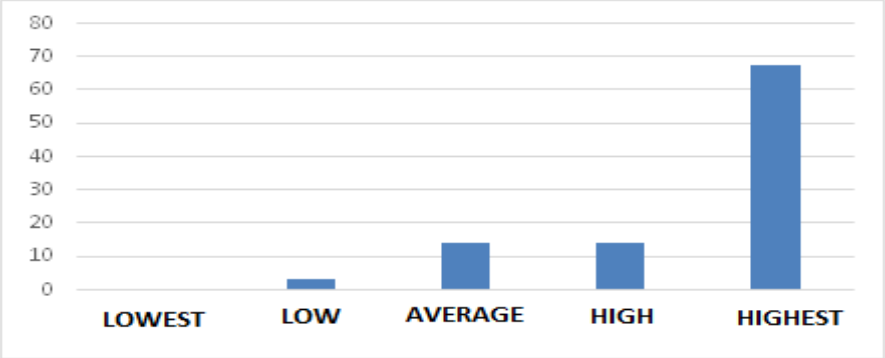

Figure 4: Timely payment influence

ii. Rights and benefit

There is oriented relation between rights & benefit and "DEHYARAN" performance. Based on data collected. 67.9 % believed that salary have highest influence on their performance (table5).

Table 5: Rights and benefit influence result

Congested frequency	Percent	Frequency	Test result
0	0	0	Lowest
7.1	7.1	2	low
32.1	25	7	Average
46.4	14.3	4	High
100	53.6	15	Highest
4.142			Weigh average
1.04			**Weighted standard deviation**

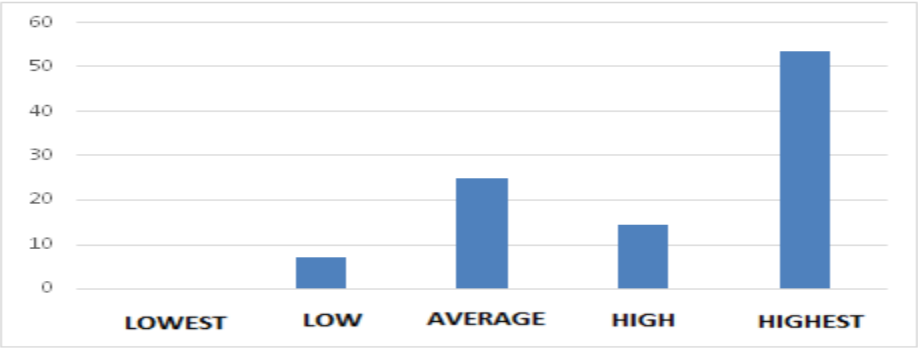

Figure 5: Rights and benefit influence result

iii. Satisfaction of salary

According to table 6 data, 42.9% of participant satisfies. So, most of research society don't satisfy from salary. Also, believed that amount of salary affect on their performance. Thus, this factor has negative impact on their performance at this time.

Table 6: Satisfaction of salary influence result

Congested frequency	Percent	Frequency	Test result
0	0	0	Lowest
25	25	7	low
57.1	32.1	9	Average
82.1	25	7	High
100	17.9	5	Highest
4.357			Weigh average
1.06			**Weighted standard deviation**

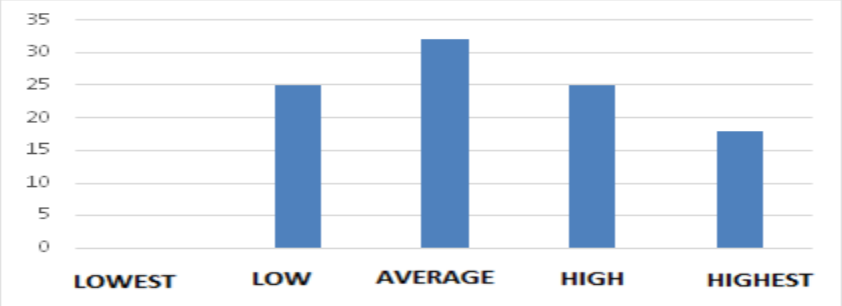

Figure 6: Satisfaction of salary influence result

iv. Interesting to occupation

Based on collected data, there is oriented relation between interesting to occupation and their performance. 92.9% believed interesting to job have high influence to their performance.

Table 7: Interesting to occupation influence result

Congested frequency	Percent	Frequency	Test result
0	0	0	Lowest
0	0	0	low
7.1	7.1	2	Average
57.1	50	14	High
100	42.9	12	Highest
4.357			Weigh average
0.621			**Weighted standard deviation**

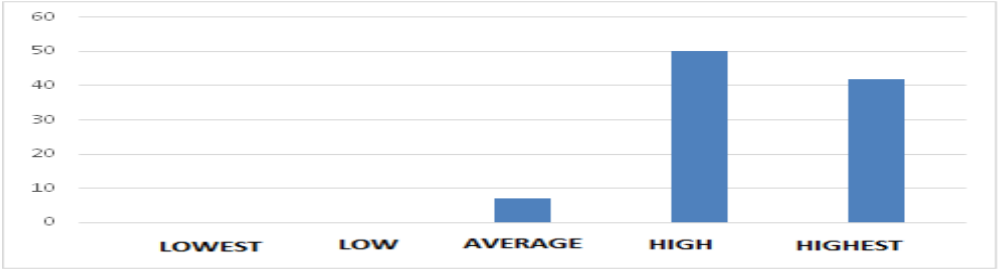

Figure 7: Interesting to occupation influence result

v. Income Influence On Performance

According findings, income have clean effect to performance. 96.4% believed adequate income have sharp effect o their performance.

Table 8: Income influence result

Congested frequency	Percent	Frequency	Test result
0	0	0	Lowest
0	0	0	low
3.6	3.6	1	Average
42.9	39.3	11	High
100	57.1	16	Highest
4.607			Weigh average
0.628			**Weighted standard deviation**

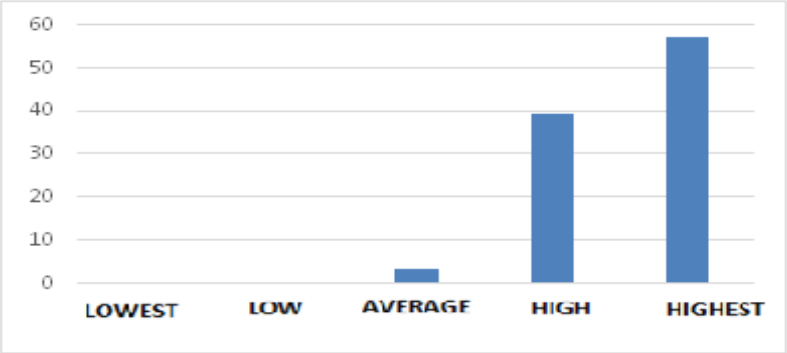

Figure 8: Income influence result

vi. Satisfaction of occupation

92.9% believed satisfaction of occupation affect on their performance sharply.

Table 9: satisfaction of occupation

Congested frequency	Percent	Frequency	Test result
0	0	0	Lowest
3.6	3.6	1	low
7.1	3.6	1	Average
57.1	50	14	High
100	42.9	12	Highest
4.321			Weigh average
0.722			**Weighted standard deviation**

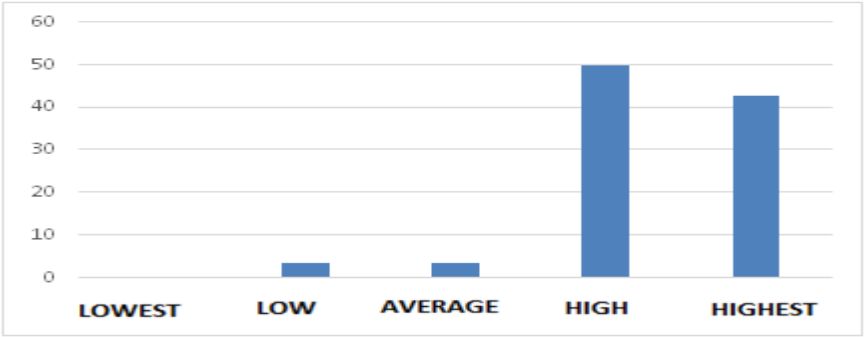

Figure 9: Satisfaction of occupation

c. Hypothesis Test

The hypothesis research is: **It seems personals satisfaction effect on "DEHYARAN" performance.** According table 10, are concluded relation between two variables. So, 83.7% believed the relation between variables is sharply.

Table10: Relation between variables

Percent	Frequency	Result
0	0	Lowest
3.57	9	low
12.69	32	Average
30.55	77	High
53.7	134	Highest
100	**252**	**Total**

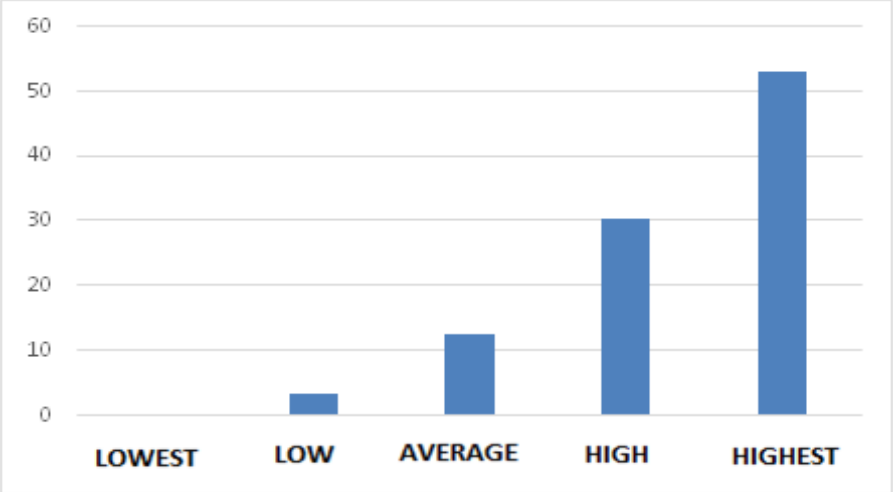

Figure10: Relation between variables

In order to analyzing hypothesis, has been used from SPSS software. The average of viewpoint "DEHYARAN" about relation variables (satisfaction of personals occupation and appropriate performance) is 29.821. Also, in order to meaningful test was used one- sample T-TEST. The t-test is probably the most commonly used Statistical Data Analysis procedure for hypothesis testing. The statistics t-test allows us to answer this question by using the t-test statistic to determine a p-value that indicates how likely we could have gotten these results by chance, if in fact the null hypothesis were true (i.e. no difference in the population). By convention, if there is less than 5% chance of getting the observed differences by chance, we reject the null hypothesis and say we found a statistically significant difference between the two groups. So, the hypothesis, are:

2 $\leq \mu 1$ $H0=\mu$

2 $\mu 1$ $>H1=\mu$

According above analytical data, calculated average (29.821) is more than default hypothesis of questionnaire hypothesis (18). Also, calculated P from one-sample t-test is less than meaningful level of alpha (0.05) .thus, H0 is false. Therefore, there is oriented relation between satisfaction of personals occupation and appropriate their performance. On the other word, there is oriented mean difference.

Table 10: result of one-sample T-TEST

Confidence span		Mean difference	Mean	sig	df	T	
The most	The least						
13.164	10.478	11.821	29.821	0.000	27	18.055	**Satisfaction of personals occupation**

V. CONCLUSION

According to results, there is a different on performance of Rural Municipalities in every village from point of view of people. In other words, in some village there is a partly desirable opinion about performance of Rural Municipalities. In addition, there is a positive relationship between people and rural council members' opinion on performance of Rural Municipalities. Since most of rural managers don't have the sufficient education, therefore existence of rural managers with high education can be useful for improving performance in Rural Municipalities. In fact, lack of sufficient recognition on place and legal obligations of Rural Municipalities is very important to improve of the performance. Therefore this matter can be affected to decline participation and collaboration to Rural Municipalities. Furthermore, the active participation between people and rural managers, and use of people opinion and views is very important to rural planning and management.
According to statistical tests of SPSS is concluded that 96.6 % of people believed there is oriented relation between satisfaction of personals occupation and appropriate performance.

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American Journal of Engineering Research (AJER)
e-ISSN : 2320-0847 p-ISSN : 2320-0936
Volume-3, Issue-9, pp-194-202
www.ajer.org
Research Paper Open Access

Analysis of a Prey-Predator System with Modified Transmission Function

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ABSTRACT *- In this paper, a predator–prey model with a non-homogeneous transmission functional response is studied. It is interesting to note that the system is persistent. The purpose of this work is to offer some mathematical analysis of the dynamics of a two prey one predator system. Criteria for local stability and global stability of the non- negative equilibria are obtained. Using differential inequality, we obtain sufficient conditions that ensure the persistence of the system.*

KEYWORDS *– Transmission function, Prey-Predator interaction, Local stability and Global Stability*

I. INTRODUCTION

Mathematical modelling is frequently an evolving process. Systematic mathematical analysis can often lead to better understanding of bio-economic models. System of differential equations has, to a certain extent, successfully described the interactions between species. There exists a huge literature documenting ecological and mathematical result from the model. Heathcoat et al. [6] proposed some epidemiological model with nonlinear incidence. Kesh et al. [3] proposed and analyzed a mathematical model of two competing prey and one predator species where the prey species follow Lotka - Volterra dynamics and predator uptake functions are ratio dependent. Some works in context of source-sink dynamics are due to Newman et al. [10]. His results show that the presence of refuge can greatly stabilize a population that otherwise would exhibit chaotic dynamics. Dubey et al. [2] analyzed a dynamic model for a single species fishery which depends partially on a logistically growing resource in a two patch environment. Ruan et al. [9] studied the global dynamics of an epidemic model with vital dynamics and nonlinear incidence rate of saturated mass action. Kar [11] considered a prey- predator fishery model and discussed the selective harvesting of fishes age or size by incorporating a time delay in the harvesting terms. Feng [14] considered a differential equation system with diffusion and time delay which models the dynamics of predator prey interactions within three biological species. Kar et al. [13] describe a prey predator model with Holling type II functional response where harvesting of each species is taken into consideration. Braza [8] considered a two predator; one prey model in which one predator interferes significantly with the other predator is analyzed. Kar and Chakraborty [12] considered a prey predator fishery model with prey dispersal in a two patch environment, one of which is a free fishing zone and other is protected zone. Sisodia et al. [1] proposed a generalized mathematical model to study the depletion of resources by two kinds of populations, one is weaker and others stronger. The dynamics of resources is governed by generalized logistic equation whereas the population of interacting species follows the logistic law. We have formulated and analyzed two species prey-predator model in which the prey dispersal in a two patch environment. Mehta et al. [4] considered prey predator model with reserved and unreserved area having modified transmission function. A model of predator-prey in homogeneous environment with Holling type-II functionl response is introduced to Alebraheen et al. [7]. Recently Mehta et al. [5] describe the epidemic model with an asymptotically homogeneous transmission function.

In this paper biological equilibria of the system are obtained and criteria for local stability and global stability of the system derived. We have investigate the model persistence with an asymptotically transmission function.

II. MATHEMATICAL MODEL

Mathematical Model considered is based on the predator –prey system WITH MODIFIED change transmission rate:

$$\frac{dx_1}{dt} = rx_1(1-\frac{x_1}{K_1}) - px_1x_2 - \omega_1 x_1 y,$$

$$\frac{dx_2}{dt} = sx_2(1-\frac{x_2}{K_2}) - qx_1 y - \frac{\omega_2 x_2 y}{A + Bx_2 + Cy}, \quad (1)$$

$$\frac{dy}{dt} = b_1\omega_1 x_1 y + b_2\omega_2 \frac{x_2 y}{A + Bx_2 + Cy} - ky,$$

Where x_1, x_2 denote population densities of prey and y denote population density of the predator. In model (1) r and s are the intrinsic growth rate of two prey species, K_1 and K_2 are their carrying capacities, k is the mortality rate coefficient of the predator, p, q are inter species interference coefficient of two prey species. b_1 and b_2 are the conversion factors denoting the number of newly born predators for each captured of first and second prey respectively, ω_1 is the first prey specie's searching efficiency and ω_2 is the second type prey specie's searching efficiency of the predator.

III. EQUILIBRIUM ANALYSIS

The system (2) has seven equilibrium points, $E_0(0,0,0), E_1(K_1,0,0), E_2(0,K_2,0), E_3(x_1^*, x_2^*, 0),$ $E_4(0,\bar{x}_2,\bar{y}), E_5(\tilde{x}_1,0,\tilde{y}), E_6(\hat{x}_1,\hat{x}_2,\hat{y})$ where three of them, namely $E_0(0,0,0), E_1(K_1,0,0), E_2(0,K_2,0)$ always exist. We show the existence of other equilibria as follows:

Existence of $E_3(x_1^*, x_2^*, 0)$

Here x_1^*, x_2^* are the positive solutions of the following algebraic equations.

$$r(1-\frac{x_1}{K_1}) - px_2 = 0 \quad (3)$$

$$s(1-\frac{x_2}{K_2}) - qx_1 = 0 \quad (4)$$

Solving (3) and (4) we get

$$x_1^* = \frac{sK_1(r-pK_2)}{rs-pqK_1K_2}, x_2^* = \frac{rK_2(s-qK_1)}{rs-pqK_1K_2} \quad (5)$$

Thus the equilibrium $E_3(x_1^*, x_2^*, 0)$ exists

if $(r-pK_2)$ and $(s-qK_1)$ are of same sign, that is either

$r > pK_2$ and $s > qK_1$ (6)

$r < pK_2$ and $s < qK_1$ (7)

Existence of $E_4(0,\bar{x}_2,\bar{y})$

Here $E_4(0,\bar{x}_2,\bar{y})$ is the positive solution of the following algebraic equations.

$$s(1-\frac{x_2}{K_2}) - \frac{\omega_2 x_2 y}{(A+Bx_2+Cy)} = 0 \quad (8)$$

$$b_2\omega_2 \frac{x_2^2}{A+Bx_2+Cy} - k = 0 \quad (9)$$

Solving (8) and (9) we get

$$\bar{x}_2 = \frac{kA+Cky}{b_2\omega_2 - kB} \text{ and } \bar{y} = \frac{s(A+Bx_2)(K_2-Bx_2)}{\omega_2 K_2^2 - Cs(K_2-sx_2)} \quad (10)$$

It can be seen that $E_4(0,\bar{x}_2,\bar{y})$ exists if

$(b_2\omega_2 - kB) > k(A+Cx_2)$.

Existence of $E_5(\tilde{x}_1, 0, \tilde{y})$

Here $\tilde{x}_1, \tilde{y}$ are the positive solutions of

$$r(1-\frac{x_1}{K_1}) - \omega_1 y = 0 \qquad 0$$

(11)

$$b_1\omega_1 x_1 - k = 0 \qquad (12)$$

Solving (11) and (12) we get

$$\tilde{x}_1 = \frac{k}{b_1\omega_1}, \tilde{y} = \frac{r}{\omega_1}(1-\frac{k}{K_1 b_1 \omega_1}) \qquad (13)$$

It can be seen that $E_5(\tilde{x}_1, 0, \tilde{y})$ exists if

$$Kb_1\omega_1 > k \qquad (14)$$

Existence of $E_6(\hat{x}_1, \hat{x}_2, \hat{y})$

Here $E_6(\hat{x}_1, \hat{x}_2, \hat{y})$ is the positive solution of the system of algebraic equations given below:

$$rx_1(1-\frac{x_1}{K_1}) - px_1x_2 - \omega_1 x_1 y = 0 \qquad (15)$$

$$sx_2(1-\frac{x_2}{K_2}) - qx_1 y - \frac{\omega_2 x_2 y}{A + Bx_2 + Cy} = 0 \qquad (16)$$

$$b_1\omega_1 x_1 y + b_2\omega_2 \frac{x_2 y}{A + Bx_2 + Cy} - ky = 0 \qquad (17)$$

Solving (15) and (16) and eliminate x_1 we get

$$(qr - pqx_2 - \omega_1 yq)K_1K_2(A + Bx_2 + Cy) - sr(K_2 - x_2)(A + Bx_2 + Cy) + r\omega_2 K_2 y = 0 \qquad (18)$$

when $y \to 0$, then $x_2 \to x_{2a}$

where

$$x_{2a} = \frac{rK_2(s - qK_1)}{rs - pqK_1K_2}$$

We note that $x_{2a} > 0$, if the inequalities

$r > pK_2$ and $s > qK_1$ hold.

Also from the equation (18), we have

$$\frac{dx_2}{dy} = \frac{F_1}{F_2},$$

$$F_1 = qKL(r - px_2) - \omega_1 qK_1K_2(A + Bx_2 + 2Cz) + \omega_2 rL \text{ and}$$

$$F_2 = qBK_1K_2(r - \omega_1 y) + (sr - pqK_1K_2)(A + 2Bx_2 + Cy) - srBK_2$$

It is clear that $\frac{dy}{dz} > 0$, if either

$F_1 > 0$ and $F_2 > 0$, or

$F_1 < 0$ and $F_2 < 0$, hold.

Again solving (14) and (15) and eliminate again x_1 then we get

$$(rb_1\omega_1 K_1 - a_1 b_1 \omega_1 y K_1 - \omega_1^2 b_1 y K_1 - kr)(A + Bx_2 + Cy) + rb_1\omega_1 x_2 = 0 \qquad (19)$$

when $y \to 0$, then $x_2 \to x_{2b}$

where

$$x_{2b} = \frac{-G_2 + \sqrt{G_2^{\,2} - 4G_1G_2}}{2G_1}$$

In which

$G_1 = -pb_1\omega_1K_1B$

$G_2 = b_1\omega_1(rK_1B - pK_1A - r)$

$G_3 = rA(b_1\omega_1K_1 - k)$

Clearly $G_1 < 0$ and $G_3 > 0$ if the inequalities (14) is satisfied.

We also get from the equation $\frac{dx_2}{dy} < -\frac{D_1}{D_2}$,

Where

$$D_1 = -pb_1\omega_1K_1 + rb_1\omega_1\frac{(A+Cy)}{(A+Bx_2+Cy)^2}$$

$$D_2 = -\omega_1^{\,2}b_1K_1 + rb_1\omega_1\frac{(A+Bx_2)}{(A+Bx_2+Cy)^2}$$

It is clear that $\frac{dy}{dz} < 0$, if either

$D_1 > 0$ and $D_2 > 0$, or

$D_1 < 0$ and $D_2 < 0$, hold.

From above conditions we note that $x_{2a} < x_{2b}$ holds. Knowing the value of $\hat{x}_2, \hat{y}$, the value of $\hat{x}_1$ can be calculated from

$$\hat{x}_1 = \frac{k(A+C\hat{y}) - \hat{x}_2(b_2\omega_2 - kB)}{(A+B\hat{x}_2+C\hat{y})b_1\omega_1}$$

We can see that $E_6(\hat{x},\hat{y},\hat{z})$ exists if x^* to be positive,

if $k(A+C\hat{y}) > \hat{x}_2(b_2\omega_2 - kB)$ condition is hold.

III. STABILITY ANALYSIS

Now we check the stability of model (2). For that matrix is

$$J = \begin{pmatrix} r - \frac{2x_1r}{K_1} - px_2 - \omega_1y & -px_1 & -\omega_1x_1 \\ -qx_2 & s - \frac{2sx_2}{K_2} - qx - \frac{\omega_2y(A+Cy)}{(A+Bx_2+Cy)^2} & -\frac{\omega_2x_2(A+Bx_2)}{(A+Bx_2+Cy)^2} \\ b_1\omega_1y & -\frac{b_2\omega_2y(A+Cy)}{(A+Bx_2+Cy)^2} & b_1\omega_1x_1 - \frac{b_2\omega_2x_2(A+Bx_2)}{(A+Bx_2+Cy)^2} - k \end{pmatrix}$$

(a) The viariational matrix at equilibrium point $E_0(0,0,0)$

$$J_0 = \begin{pmatrix} r-\lambda & 0 & 0 \\ 0 & s-\lambda & 0 \\ 0 & 0 & -c-\lambda \end{pmatrix}$$

Thus E_0 is a saddle point which is stable in y direction and unstable manifold in the x_1-x_2 plane.

(b) The viariational matrix at equilibrium point $E_1(K_1, 0, 0)$

$$J_1 = \begin{pmatrix} -r-\lambda & -pK_1 & -\omega_1 K_1 \\ 0 & s-qK_1-\lambda & 0 \\ 0 & 0 & b_1\omega_1 K_1 - k - \lambda \end{pmatrix}$$

E_1 is a saddle point with locally stable manifold in x_1 direction and with locally unstable manifold in x_2-y plane, if $s - qK_1 > 0$ and $b_1\omega_1 K_1 - k > 0$ hold, but if $s - qK_1 < 0$ and $b_1\omega_1 K_1 - k < 0$, then E_1 is locally asymptotically stable in $x_1 - x_2$ - y plane.

(c) The viariational matrix at equilibrium point $E_2(0, K_2, 0)$

$$E_2 = \begin{pmatrix} r - pK_2 - \lambda & 0 & 0 \\ -qK_2 & -s-\lambda & -\dfrac{\omega_2 K_2 (A + BK2)}{(A + BK_2)^2} \\ 0 & 0 & -\dfrac{b_2\omega_2 K_2 (A + BK_2)}{(A + BK_2)^2} - k - \lambda \end{pmatrix}$$

E_2 is a saddle point with locally stable manifold in x_2 direction and with locally unstable manifold in x_1-y plane if $r - pK_2 > 0$ holds, but if $r - pK_2 < 0$, then E_2 is locally asymptotically stable in $x_1 - x_2$-y plane.

(d) The viariational matrix at equilibrium point $E_3(x_1^*, x_2^*, 0)$

$$J_3 = \begin{pmatrix} r - \dfrac{2x_1^* r}{K_1} - px_2^* - \lambda & px_1^* & \omega_1 x_1^* \\ -qx_2^* & s - \dfrac{2sx_2^*}{K_2} - qx_1^* - \lambda & 0 \\ 0 & 0 & b_1\omega_1 x_1^* - \dfrac{b_2\omega_2 x_2^* (A + Bx_2^*)}{(A + Bx_2^*)^2} - k - \lambda \end{pmatrix}$$

Put $x_1^* = \dfrac{sK_1(r - pK_2)}{rs - pqK_1K_2}, x_2^* = \dfrac{rK_2(s - qK_1)}{rs - pqK_1K_2}$, then j_3

$$J_3 = \begin{pmatrix} \dfrac{sr(pK_2 - r)}{rs - pqK_1K_2} - \lambda & -\dfrac{psK_1(r - pK_1)}{rs - pqK_1K_2} & -\dfrac{\omega_1 sK_1(r - pK_1)}{rs - pqK_1K_2} \\ -\dfrac{qrK_2(s - qK_1)}{rs - pqK_1K_2} & \dfrac{rs(qK_1 - s)}{rs - pqK_1K_2} - \lambda & 0 \\ 0 & 0 & \dfrac{b_1\omega_1 sK(r - a_1L)}{rs - pqK_1K_2} - \dfrac{b_2\omega_2 qrK_2(s - qK_1)}{A(rs - pqK_1K_2) + BrK_2(s - qK_1)} - k - \lambda \end{pmatrix}$$

Here sum of two eigen values are

$$\frac{sr(pK_2-r)}{rs-pqK_1K_2}+\frac{rs(qK_1-s)}{rs-pqK_1K_2}$$

and product of two eigen values are

$$\frac{sr(pK_2-r)(qK_1-s)}{rs-pqK_1K_2}$$

If $r>pK_2$ and $s>qK_1$ holds, then the sum of two eigen values is negative and product is positive. So that we can say that $E_3(x_1^*,x_2^*,0)$ exists and is asymptotically stable in x_1-x_2 plane, but if $Kr<pK_2$ and $s<qK_1$ holds, then the product of two eigenvalues is negative. Then $E_3(x_1^*,x_2^*,0)$ exists and in that case it will be unstable in x_1-x_2 plane. Moreover, it will be stable in x_1- x_2-y plane if for the other eigen value of the system is

$$\frac{b_1\omega_1 sK(r-a_1L)}{rs-pqK_1K_2}<\frac{b_2\omega_2 qrK_2(s-qK_1)}{A(rs-pqK_1K_2)+BrK_2(s-qK_1)}+k\,.$$

(e) The viariational matrix at equilibrium point $E_4(0,\bar{x}_2,\bar{y})$

$$J_4=\begin{pmatrix} r-p\bar{x}_2-\omega_1\bar{y}-\lambda & 0 & 0 \\ -q\bar{x}_2 & s-\frac{2s\bar{x}_2}{K_2}-\frac{\omega_2\bar{y}(A+C\bar{y})}{(A+B\bar{x}_2+C\bar{y})^2}-\lambda & -\frac{\omega_2\bar{x}_2(A+B\bar{x}_2)}{(A+B\bar{x}_2+C\bar{y})^2} \\ b_1\omega_1\bar{y} & -\frac{b_2\omega_2\bar{y}(A+C\bar{y})}{(A+B\bar{x}_2+C\bar{y})^2} & -\frac{b_2\omega_2\bar{x}_2(A+B\bar{x}_2)}{(A+B\bar{x}_2+C\bar{y})^2}-k-\lambda \end{pmatrix}$$

Where $\bar{x}_2=\frac{kA+Ck\bar{y}}{b_2\omega_2-kB}$ and $\bar{y}=\frac{s(A+B\bar{x}_2)(K_2-B\bar{x}_2)}{\omega_2K_2^{\,2}-Cs(K_2-s\bar{x}_2)}$

$E_4(0,\bar{x}_2,\bar{y})$ exists and is asymptotically stable in x_2-y plane if the inequality $r-p\bar{x}_2-\omega_1\bar{y}<0$, and $\frac{2s\bar{x}_2}{K_2}+\frac{\omega_2\bar{y}(A+C\bar{y})}{(A+B\bar{x}_2+C\bar{y})^2}<s$ holds , then it will be asymptotically stable in x-y-z plane.

(f) The viariational matrix at equilibrium point $E_5(\tilde{x}_1,0,\tilde{y})$

$$J_5=\begin{pmatrix} -\frac{rk}{K_1b_1\omega_1}-\lambda & -\frac{pk}{b_1\omega_1} & -\frac{k}{b_1} \\ 0 & s-\frac{qk}{b_1\omega_1}-\frac{r\omega_2}{\omega_1}/(\frac{AK_1b_1\omega_1}{K_1b_1\omega_1-k}+\frac{Cr}{\omega_1})-\lambda & 0 \\ rb_1(1-\frac{k}{K_1b_1\omega_1}) & \frac{b_2\omega_2 r}{\omega_1}/(\frac{AK_1b_1\omega_1}{K_1b_1\omega_1-k}+\frac{Cr}{\omega_1}) & -\lambda \end{pmatrix}$$

$E_5(\tilde{x},0,\tilde{z})$ exists and is asymptotically stable in x_1-x_2-y plane, if the inequality

$$\frac{qk}{b_1\omega_1}-\frac{r\omega_2}{\omega_1}/(\frac{AK_1b_1\omega_1}{K_1b_1\omega_1-k}+\frac{Cr}{\omega_1})>s \text{ holds .}$$

(g) The viariational matrix at equilibrium point $E_6(\hat{x}_1, \hat{x}_2, \hat{y})$

$$J_6 = \begin{pmatrix} r - \frac{2\hat{x}_1 r}{K_1} - p\hat{x}_2 - \omega_1\hat{y} - \lambda & -p\hat{x}_1 & -\omega_1\hat{x}_1 \\ -q\hat{x}_2 & s - \frac{2s\hat{x}_2}{K_2} - q\hat{x}_1 - \frac{\omega_2\hat{y}(A+C\hat{y})}{(A+B\hat{x}_2+C\hat{y})^2} - \lambda & -\frac{\omega_2 x_2(A+B\hat{x}_2)}{(A+B\hat{x}_2+C\hat{y})^2} \\ b_1\omega_1\hat{y} & -\frac{b_2\omega_2\hat{y}(A+C\hat{y})}{(A+B\hat{x}_2+C\hat{y})^2} & b_1\omega_1\hat{x}_1 - \frac{b_2\omega_2\hat{x}_2(A+B\hat{x}_2)}{(A+B\hat{x}_2+C\hat{y})^2} - k - \lambda \end{pmatrix}$$

The stability of the point $E_6(\hat{x}_1, \hat{x}_2, \hat{y})$ depends on the determinant and trace of the above Jacobean J_6. The point is stable if the det $J_6 > 0$ and Trace $J_6 < 0$.

In the following theorem, we show that all equilibrium point is globally asymptotically stable.

Theorem 1- The interior equilibrium E_3 is globally asymptotically stable in the interior of the quadrant of the x_1-x_2 plane.

Proof -Let $\Delta(x_1, x_2) = \frac{1}{x_1 x_2}$ .Clearly $\Delta(x_1, x_2)$ is positive in the interior of the positive quadrant of the x_1,x_2-plane.

$$h_1(x_1, x_2) = rx_1(1 - \frac{x_1}{K_1}) - px_1x_2$$

$$h_2(x_1, x_2) = sx_2(1 - \frac{x_2}{K_2}) - qx_1x_2.$$

Then

$$\Delta(x_1, x_2) = \frac{\delta}{\delta x_1}(h_1 H) + \frac{\delta}{\delta x_2}(h_2 H)$$

$$\Delta(x_1, x_2) = -\frac{r}{x_2 K_1} - \frac{s}{x_1 K_2} < 0.$$

From the above equation, we note that $\Delta(x_1, x_2)$ does not change sign and is not identically zero in the interior of the positive quadrant of the x_1, x_2 plane. In the following theorem, we show that E_3 is globally asymptotically stable.

Theorem 2- The interior equilibrium E_4 is globally asymptotically stable in the interior of the quadrant of the x_2, y plane.

Proof -Let $H'(x_2, y) = \frac{1}{x_2 y}$ .Clearly $H'(x_2, y)$ is positive in the interior of the positive quadrant of the x_2, y plane.

$$h_1'(x_2, y) = sx_2(1 - \frac{x_2}{K_2}) - \frac{\omega_2 x_2 y}{A + Bx_2 + Cy},$$

$$h_2'(x_2, y) = \frac{b_2\omega_2 x_2 y}{A + Bx_2 + Cy} - ky.$$

Then

$$\Delta(x_2, y) = \frac{\delta}{\delta x_2}(h_1' H') + \frac{\delta}{\delta y}(h_2' H')$$

$$\Delta(x_2, y) = \frac{\omega_2 B}{(A + Bx_2 + Cy)^2} - \frac{s}{yK_2} - \frac{b_2\omega_2 C}{(A + Bx_2 + Cy)^2} < 0.$$

when $(A + Bx_2 + Cy)^2 - \frac{\omega_2 ByK_2}{s} + \frac{b_2\omega_2 yK_2 C}{s} > 0$

From the above equation, we note that $\Delta(x_2, y)$ does not change sign and is not identically zero in the interior of the positive quadrant of the x_2y - plane. In the following theorem, we show that E_4 is globally asymptotically stable.

Theorem 3- The interior equilibrium E_5 is globally asymptotically stable in the interior of the quadrant of the x_1y plane.

Proof - Let $H''(x_1y) = \frac{1}{x_1y}$ .Clearly $H(x_1y)$ is positive in the interior of the positive quadrant of the x_1y plane.

$$h^*_1(x_1y) = rx_1(1-\frac{x_1}{K_1}) - \omega_1 x_1 y,$$

$$h^*_2(x_1, y) = b_1\omega_1 x_1 y - ky.$$

Then

$$\Delta(x_1, y) = \frac{\delta}{\delta x_1}(h^*_1 H^*) + \frac{\delta}{\delta y}(h^*_2 H^*)$$

$$\Delta(x_1, y) = -\frac{r}{yK_1} < 0.$$

From the above equation, we note that $\Delta(x_1, y)$ does not change sign and is not identically zero in the interior of the positive quadrant of the x_1, y plane. In the following theorem, we show that E_5 is globally asymptotically stable.

Theorem 4-The interior equilibrium E_6 is globally asymptotically stable with respect to (x_1, x_2, y) plane.

Proof-Consider the following positive definite function about E_6,

$$W(t) = \left(x_1 - x_1^* - x_1^* \ln\frac{x_1}{x_1^*}\right) + d_1\left(x_2 - x_2^* - x_2^* \ln\frac{x_2}{x_2^*}\right) + d_2\left(y - y^* - y^* \ln\frac{y}{y^*}\right)$$

Differentiating W with respect to time t along the solutions of model (1), we get

$$\frac{dW}{dt} = -\frac{r}{K_1}(x_1 - x_1^*)^2 - \frac{d_1 s}{K_2}(x_2 - x_2^*)^2 - \omega_1(y - y^*)$$

$$-\omega_2 d_1[\frac{A(y-y^*) + B(x_2^* y - x_2 y^*)}{(A + Bx_2 + Cy)(A + Bx^*_2 + C^* y)}] + \omega_2 d_2 b_2[\frac{A(x_2 - x_2^*) - C(x_2^* y - x_2 y^*)}{(A + Bx_2 + Cy)(A + Bx^*_2 + C^* y)}]$$

We choose $d_2 = \frac{d_1(y - y^*)}{b_2(x_2 - x^*_2)}$

So that,

$$\frac{dW}{dt} = -\frac{r}{K_1}(x_1 - x_1^*)^2 - \frac{d_1 s}{K_2}(x_2 - x_2^*)^2 - \omega_1(y - y^*)$$

$$-[\frac{\omega_2(x_2^* y - x_2 y^*)(B(x_2 - x_2^*) + C(y - y^*)}{(A + Bx_2 + Cy)(A + Bx^*_2 + C^* y)(y - y^*)}]$$

Hence W is a Lipunov function with respect to $E_6(x_1, x_2, y)$.

IV. CONCLUSION

In this paper, a mathematical model has been discussed with the transmission function, we have analyzed a prey-predator fishery model change the transmission function in a two patch environment, one is assumed to a free fishing zone and the other is a reserved zone where fishing and other extractive activities are prohibited. The population and the resource both the growing logistically. The existence of equilibrium point has been discussed and local stability and global stability analysis has been carried out by Variational Matrix and Liapunov function method. It has been observed that, whether in the absence or in the presence of predators, the fishing populations may be sustained at an appropriate equilibrium level.

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American Journal of Engineering Research (AJER)
e-ISSN : 2320-0847 p-ISSN : 2320-0936
Volume-3, Issue-9, pp-203-208
www.ajer.org
Research Paper Open Access

Some Common Fixed Point Results for a Rational inequality in Complex Valued Metric Spaces

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ABSTRACT : *We prove some common fixed point theorems for two pairs of weakly compatible mappings satisfying a rational type contractive condition using (E.A.) and (CLR)-property in Complex Valued metric spaces. Our results generalize and extend some of the existing results in the literature.*

KEYWORDS: *Complex valued metric space, weakly compatible mappings, (E.A.) - property, (CLR)-property.*
Mathematics subject classification*: 47H10, 54H25.*

I. INTRODUCTION

Azam et al. [2] introduced the concept of complex valued metric spaces and obtained sufficient conditions for the existence of common fixed points of a pair of contractive type mappings involving rational expressions. Subsequently many authors have studied the existence and uniqueness of the fixed points and common fixed points of self mapping in view of contrasting contractive conditions. Aamri and Moutawakil [1] introduced the notion of (E.A.) - property. Sintunavrat and P. Kumam [8] introduced the notion of (CLR) - property. Then many authors proved several fixed point theorems using the concept of weakly compatible maps with (E.A.) and (CLR)-property. The main purpose of this paper is to present fixed point results for two pair of weakly compatible mappings satisfying a generalize contractive condition by using the concept of (E.A.) and (CLR)-property in complex valued metric space. The proved results generalize and extend some of the existing results in the literature.

II. PRELIMINARIES

Let C be the set of complex numbers and let z_1 , $z_2 \in C$. Define a partial order $\lesssim$ on C as follows:
$z_1 \lesssim z_2$ if and only if $Re(z_1) \leq Re(z_2)$, $Im(z_1) \leq Im(z_2)$. It follows that $z_1 \lesssim z_2$ if one of the following conditions is satisfied:

[1] $Re(z_1) = Re(z_2)$, $Im(z_1) < Im(z_2)$,
[2] $Re(z_1) < Re(z_2)$, $Im(z_1) = Im(z_2)$,
[3] $Re(z_1) < Re(z_2)$, $Im(z_1) < Im(z_2)$,
[4] $Re(z_1) = Re(z_2)$, $Im(z_1) = Im(z_2)$.

In particular, we will write $z_1 \lesssim z_2$ if one of (i), (ii) and (iii) is satisfied and we will write $z_1 \prec z_2$ if only (iii) is satisfied.

Definition2.1. Let X be a non-empty set. Suppose that the mapping $d: X \times X \to C$ satisfies:

[1] $0 \lesssim d(x,y)$ for all $x, y \in X$ and $d(x,y) = 0$ if and only if $x = y$;
[2] $d(x,y) = d(y,x)$ for all $x, y \in X$;
[3] $d(x,y) \lesssim d(x,z) + d(z,y)$ for all $x, y, z \in X$.

Then d is called a complex valued metric on X and (X, d) is called a complex valued metric space.

A point $x \in X$ is called an interior point of a set $A \subseteq X$ whenever there exists $0 \prec r \in C$ such that $B(x,r) = \{y \in X : d(x,y) \prec r\} \subseteq A$. A subset A in X is called open whenever each point of A is an interior

point of A. The family $F = \{B(x,r): x \in X, 0 < r\}$ is a sub-basis for a Hausdorff topology τ on X. A point $x \in X$ is called a limit point of A whenever for every $0 < r \in C$, $B(x,r) \cap (A \backslash X) \neq \phi$.
A subset $B \subseteq X$ is called closed whenever each limit point of B belongs to B.
Let $\{x_n\}$ be a sequence in X and $x \in X$. If for every $c \in C$, with $0 < c$ there is $n_0 \in N$ such that for all $n > n_0$, $d(x_n, x) < c$, then x is called the limit point of $\{x_n\}$ and we write $\lim_{n\to\infty} x_n = x$ or $x_n \to x$ as $n \to \infty$.
If for every $c \in C$, with $0 < c$ there is $n_0 \in N$ such that for all $n > n_0$, $d(x_n, x_{n+m}) < c$, then $\{x_n\}$ is called a Cauchy sequence in (X,d) is called a complete complex valued metric space.
Lemma2.2. Let (X,d) be a complex valued metric space and $\{x_n\}$ is a sequence in X. Then $\{x_n\}$ converges to x if and only if $|d(x_n, x)| \to 0$ as $n \to \infty$.

Lemma2.3. Let (X,d) be a complex valued metric space and $\{x_n\}$ is a sequence in X. Then $\{x_n\}$ is a Cauchy sequence if and only if $|d(x_n, x_{n+m})| \to 0$ as $n \to \infty$.

Definition2.4. Let f and g be self-maps on a set X, if $w = fx = gx$ for some x in X, then x is called coincidence point of f and g, w is called a point of coincidence of f and g, w is called a point of coincidence of f and g.

Definition2.5. Let f and g be two self-maps defined on a set X, then f and g are said to be weakly compatible if they commute at coincidence points.

Definition 2.6. Let f and g be two self-mappings of a complex valued metric space (X,d). We say that f and g satisfy the (E.A.)-property if there exist a sequence $\{x_n\}$ in X such that $\lim_{n\to\infty} fx_n = \lim_{n\to\infty} gx_n = t$, for some $t \in X$.

Definition 2.7. Let f and g be two self-mappings of a complex valued metric space (X,d). We say that f and g satisfy the (CLR_f) property if there exist a sequence $\{x_n\}$ in X such that $\lim_{n\to\infty} fx_n = \lim_{n\to\infty} gx_n = fx$.

III. MAIN RESULTS

Theorem: 3.1 Let (X,d) be a Complex valued metric space and $A, B, S, T: X \to X$ four self-mappings satisfying the following conditions:

(i) $A(X) \subseteq T(X)$, $B(X) \subseteq S(X)$;

(ii) for all $x, y \in X$,

$$d(Ax, By) \leq a_1 \frac{d(Ty,By)[d(Ax,Ty)+d(Sx,Ax)]}{[1+d(Sx,Ty)+d(Ax,Ty]} + a_2 \frac{d(Ax,Ty)d(Sx,By)[d(Sx,Ax)+d(Ty,By)]}{[1+d(Sx,Ty)+d(Ax,Ty)]}$$

$$+a_3[d(Ax,Ty) + d(Sx,By)] + a_4[d(Sx,Ax) + d(Ty,By)] + a_5 d(Sx,Ty) \quad (3.1)$$

where $2a_3 + a_4 + a_5 < 1$ and $a_1, a_2, a_3, a_4, a_5 > 0$;

(iii) the pairs (A,S) and (B,T) are weakly compatible;

(iv) One of the pairs (A,S) or (B,T) satisfy (E.A.)-property.
If the range of one of the mapping $S(X)$ or $h(X)$ is closed subspace of X, then the mappings A, B, S and T have a unique common fixed point in X.

Proof: First suppose that the pair (B,T) satisfies (E.A.) property then there exists a sequence $\{x_n\}$ in X, such that
$\lim_{n\to\infty} Bx_n = \lim_{n\to\infty} Tx_n = t$, for some $t \in X$.
Further, since $B(X) \subseteq S(X)$, there exists a sequence $\{y_n\}$ in X, such that $Bx_n = Sy_n$. Hence $\lim_{n\to\infty} Sy_n = t$.

Now, we claim that $\lim_{n\to\infty} Ay_n = t$. Let $\lim_{n\to\infty} Ay_n = t_1 \neq t$ then putting $x = y_n, y = x_n$ in (3.1), and we have

$$d(Ay_n, Bx_n) \leq a_1 \frac{d(Tx_n,Bx_n)[d(Ay_n,Tx_n)+d(Sy_n,Ay_n)]}{[1+d(Sy_n,Tx_n)+d(Ay_n,Tx_n)]}$$

$$+a_2 \frac{d(Ay_n,Tx_n)d(Sy_n,Bx_n)[d(Sy_n,Ay_n)+d(Tx_n,Bx_n)]}{[1+d(Sy_n,Tx_n)+d(Ay_n,Tx_n)]}$$

$$+a_3[d(Ay_n,Tx_n)+d(Sy_n,Bx_n)]+a_4[d(Sy_n,Ay_n)+d(Tx_n,Bx_n)]$$
$$+a_5 d(Sy_n,Tx_n)$$

Letting $n \to \infty$, we have

$$d(t_1,t) \leq a_1 \frac{d(t,t)[d(t_1,t)+d(t,t_1)]}{[1+d(t,t)+d(t_1,t)]} + a_2 \frac{d(t_1,t)d(t,t)[d(t,t_1)+d(t,t)]}{[1+d(t,t)+d(t_1,t)]}$$

$$+a_3[d(t_1,t)+d(t,t)]+a_4[d(t,t_1)+d(t,t)]+a_5 d(t,t)$$
$$\Rightarrow [1-(a_3+a_4)]\, d(t,t_1) \leq 0$$

as $a_3 + a_4 < 1$

$\Rightarrow |d(t,t_1)| \leq 0$. Hence $t_1 = t$ and that is, $\lim_{n\to\infty} Ay_n = \lim_{n\to\infty} Bx_n = t$.

Now suppose that $S(X)$ is a closed subspace of X, then $t = Su$ for some $u \in X$, subsequently we have

$\lim_{n\to\infty} Ay_n = \lim_{n\to\infty} Bx_n = \lim_{n\to\infty} Tx_n = \lim_{n\to\infty} Sy_n = t = Su$.

We claim that $Au = Su$. For this put $x = u$, $y = x_n$ in (3.1), and we have

$$d(Au, Bx_n) \leq a_1 \frac{d(Tx_n,Bx_n)[d(Au,Tx_n)+d(Su,Au)]}{[1+d(Su,Tx_n)+d(Au,Tx_n)]} + a_2 \frac{d(Au,Tx_n)d(Su,Bx_n)[d(Su,Au)+d(Tx_n,Bx_n)]}{[1+d(Su,Tx_n)+d(Au,Tx_n)]}$$

$$+a_3[d(Au,Tx_n)+d(Su,Bx_n)]+a_4[d(Su,Au)+d(Tx_n,Bx_n)]+a_5 d(Su,Tx_n)$$

Letting $n \to \infty$, we have

$$d(Au,t) \leq a_1 \frac{d(t,t)[d(Au,t)+d(t,Au)]}{[1+d(t,t)+d(Au,t)]} + a_2 \frac{d(Au,t)d(t,t)[d(t,Au)+d(t,t)]}{[1+d(t,t)+d(Au,t)]}$$

$$+a_3[d(Au,t)+d(t,t)]+a_4[d(t,Au)+d(t,t)]+a_5 d(t,t)$$
$$\Rightarrow [1-(a_3+a_4)]\, d(Au,t) \leq 0$$

as $a_3 + a_4 < 1$

$\Rightarrow |d(Au,t)| \leq 0$, which is a contradiction. Hence u is a coincidence point of (A,S).

Now the weak compatibility of pair (A,S) implies that $ASu = SAu$ or $At = St$.

On the other hand, Since $A(X) \subseteq T(X)$, there exists v in X such that $Au = Tv$.

Thus, $Au = Su = Tv = t$. Now, we show that v is a coincidence point of (B,T); that is $Bv = Tv = t$.

Put $x = u$, $y = v$ in (3.1), and we have

$$d(Au,Bv) \leq a_1 \frac{d(Tv,Bv)[d(Au,Tv)+d(Su,Au)]}{[1+d(Su,Tv)+d(Au,Tv)]} + a_2 \frac{d(Au,Tv)d(Su,Bv)[d(Su,Au)+d(Tv,Bv)]}{[1+d(Su,Tv)+d(Au,Tv)]}$$

$$+a_3[d(Au,Tv)+d(Su,Bv)]+a_4[d(Su,Au)+d(Tv,Bv)]+a_5 d(Su,Tv)$$

or

$$d(t,Bv) \leq a_1 \frac{d(t,Bv)[d(t,t)+d(t,t)]}{[1+d(t,t)+d(t,t)]} + a_2 \frac{d(t,t)d(t,Bv)[d(t,t)+d(t,Bv)]}{[1+d(t,t)+d(t,t)]}$$

$$+a_3[d(t,t)+d(t,Bv)]+a_4[d(t,t)+d(t,Bv)]+a_5 d(t,t)$$

$$\Rightarrow [1-(a_3+a_4)]\, d(t,Bv) \leq 0,$$

as $a_3 + a_4 < 1$

$\Rightarrow |d(t,Bv)| \leq 0$, which is a contradiction. Thus $Bv = t$.

Hence, $Bv = Tv = t$, and v is the coincidence point of B and T. Further, the weak compatibility of pair (B,T) implies that $BTv = TBv$, or $Bt = Tt$. Therefore, t is a common coincidence point of A, B, S and T.

Now, we show that t is a common fixed point. Put $x = u$, $y = t$ in (3.1), and we have

$$d(t, Bt) = d(Au, Bt) \leq a_1 \frac{d(Tt,Bt)[d(Au,Tt)+d(Su,Au)]}{[1+d(Su,Tt)+d(Au,Tt]} + a_2 \frac{d(Au,Tt)d(Su,Bt)[d(Su,Au)+d(Tt,Bt)]}{[1+d(Su,Tt)+d(Au,Tt)]}$$
$$+a_3[d(Au, Tt) + d(Su, Bt)] + a_4[d(Su, Au) + d(Tt, Bt)] + a_5 d(Su, Tt)$$

$$\Rightarrow (1 - 2a_3 + a_5)\, d(t, Bt) \leq 0,$$

as $2a_3 + a_5 < 1$

$\Rightarrow |d(t, Bt)| \leq 0$, which is a contradiction. Thus $Bt = t$.

Hence, $At = Bt = St = Tt = t$.

Similar arguments arises if we assume that $T(X)$ is closed subspace of X. Similarly, the (E.A.)- property of the pair (A, S) will give a similar result.

For uniqueness of the common fixed point, let us assume that w is another common fixed point of A, B, S and T. Therefore $Aw = Bw = Sw = Tw = w$. Then, Put $x = w$ and $y = t$ in (3.1), and we have

$$d(w, t) = d(Aw, Bt) \leq a_1 \frac{d(Tt,Bt)[d(Aw,Tt)+d(Sw,Aw)]}{[1+d(Sw,Tt)+d(Aw,Tt]} + a_2 \frac{d(Aw,Tt)d(Sw,Bt)[d(Sw,Aw)+d(Tt,Bt)]}{[1+d(Sw,Tt)+d(Aw,Tt)]}$$
$$+a_3[d(Aw, Tt) + d(Sw, Bt)] + a_4[d(Sw, Aw) + d(Tt, Bt)] + a_5 d(Sw, Tt)$$

or
$$d(w, t) \leq a_1 \frac{d(t,t)[d(w,t)+d(w,w)]}{[1+d(w,t)+d(w,t]} + a_2 \frac{d(w,t)d(w,t)[d(w,w)+d(t,t)]}{[1+d(w,t)+d(w,t)]}$$
$$+a_3[d(w, t) + d(w, t)] + a_4[d(w, w) + d(t, t)] + a_5 d(w, t)$$

$$\Rightarrow (1 - 2a_3 + a_5)\, d(w, t) \leq 0$$

as $2a_3 + a_5 < 1$

$\Rightarrow |d(w, t)| \leq 0$, which is a contradiction. Thus, $w = t$. Hence $At = Bt = St = Tt = t$,

and t is the unique common fixed point of A, B, S and T.

Corollary: 3.2 Let (X, d) be a Complex valued metric space and $A, T: X \to X$ self-mappings satisfying the following conditions:

(i) $A(X) \subseteq T(X)$;

(ii) for all $x, y \in X$,

$$d(Ax, Ay) \leq a_1 \frac{d(Ty,Ay)[d(Ax,Ty)+d(Tx,Ax)]}{[1+d(Tx,Ty)+d(Ax,Ty]} + a_2 \frac{d(Ax,Ty)d(Tx,Ay)[d(Tx,Ax)+d(Ty,Ay)]}{[1+d(Tx,Ty)+d(Ax,Ty)]}$$
$$+a_3[d(Ax, Ty) + d(Sx, By)] + a_4[d(Sx, Ax) + d(Ty, By)] + a_5 d(Sx, Ty)\,, \quad (3.2)$$

where $2a_3 + a_4 + a_5 < 1$ and $a_1, a_2, a_3, a_4, a_5 > 0$;

(iii) the pairs (A, T) is weakly compatible;

(iv) the pair (A, T) satisfies (E.A.)-property.

If the range of the mapping $T(X)$ is a closed subspace of X.Then the mappings A and T have a unique common fixed point in X.

Theorem: 3.3 Let (X, d) be a Complex valued metric space and $A, B, S, T: X \to X$ four self-mappings satisfying the following conditions:

(i) $A(X) \subseteq T(X)$, $B(X) \subseteq S(X)$;

(ii) for all $x, y \in X$,

$$d(Ax, By) \leq a_1 \frac{d(Ty,By)[d(Ax,Ty)+d(Sx,Ax)]}{[1+d(Sx,Ty)+d(Ax,Ty]} + a_2 \frac{d(Ax,Ty)d(Sx,By)[d(Sx,Ax)+d(Ty,By)]}{[1+d(Sx,Ty)+d(Ax,Ty)]}$$

$$+a_3[d(Ax,Ty)+d(Sx,By)]+a_4[d(Sx,Ax)+d(Ty,By)]+a_5 d(Sx,Ty) \qquad (3.3)$$

where $2a_3+a_4+a_5<1$ and $a_1,a_2,a_3,a_4,a_5>0$;

(iii) the pairs (A,S) and (B,T) are weakly compatible.

If the pair (A,S) satisfies (CLR_A) property or (B,T) satisfies (CLR_B) property, then the mappings A,B,S and T have a unique common fixed point in X.

Proof: First, we suppose that the pair (B,T) satisfies (CLR_B) property then there exists a sequence $\{x_n\}$ in X such that

$\lim_{n\to\infty} Bx_n = \lim_{n\to\infty} Tx_n = Bx$, for some $x \in X$.

Further, since $B(X) \subseteq S(X)$, we have $Bx = Su$, for some $u \in X$.

we claim that $Au = Su = t$ (say). put $x = u, y = x_n$ in (3.3), and we have

$$d(Au,Bx_n) \le a_1 \frac{d(Tx_n,Bx_n)[d(Au,Tx_n)+d(Su,Au)]}{[1+d(Su,Tx_n)+d(Au,Tx_n)]} + a_2 \frac{d(Au,Tx_n)d(Su,Bx_n)[d(Su,Au)+d(Tx_n,Bx_n)]}{[1+d(Su,Tx_n)+d(Au,Tx_n)]}$$

$$+a_3[d(Au,Tx_n)+d(Su,Bx_n)]+a_4[d(Su,Au)+d(Tx_n,Bx_n)]+a_5 d(Su,Tx_n)$$

Letting $n \to \infty$ we have,

$$d(Au,Bx) \le a_1 \frac{d(Bx,Bx)[d(Au,Bx)+d(Su,Au)]}{[1+d(Su,Bx)+d(Au,Bx)]} + a_2 \frac{d(Au,Bx)d(Bx,Bx)[d(Su,Au)+d(Bx,Bx)]}{[1+d(Su,Bx)+d(Au,Bx)]}$$

$$+a_3[d(Au,Bx)+d(Su,Bx)]+a_4[d(Su,Au)+d(Bx,Bx)]+a_5 d(Su,Bx)$$

$\Rightarrow [1-(a_3+a_4)]\, d(Au,Su) \le 0$,

as $a_3+a_4<1$

$\Rightarrow |d(Au,Bx)| \le 0$, which is a contradiction. Thus, $Au = Su$.

Hence, $Au = Su = Bx = t$.

Now the weak compatibility of pair (A,S) implies that $ASu = SAu$ or $At = St$.

Further, since $A(X) \subseteq T(X)$, there exist v in X such that $Au = Tv$. Thus, $Au = Su = Tv = t$. Now, we show that v is a coincidence point of (B,T) that is, $Bv = Tv = t$. Put $x = u, y = v$ in (3.3) and we have

$$d(Au,Bv) \le a_1 \frac{d(Tv,Bv)[d(Au,Tv)+d(Su,Au)]}{[1+d(Su,Tv)+d(Au,Tv)]} + a_2 \frac{d(Au,Tv)d(Su,Bv)[d(Su,Au)+d(Tv,Bv)]}{[1+d(Su,Tv)+d(Au,Tv)]}$$

$$+a_3[d(Au,Tv)+d(Su,Bv)]+a_4[d(Su,Au)+d(Tv,Bv)]+a_5 d(Su,Tv)$$

or $$d(t,Bv) \le a_1 \frac{d(t,Bv)[d(t,t)+d(t,t)]}{[1+d(t,t)+d(t,t)]} + a_2 \frac{d(t,t)d(t,Bv)[d(t,t)+d(t,Bv)]}{[1+d(t,t)+d(t,t)]}$$

$$+a_3[d(t,t)+d(t,Bv)]+a_4[d(t,t)+d(t,Bv)]+a_5 d(t,t)$$

$\Rightarrow [1-(a_3+a_4)]\, d(t,Bv) \le 0$,

as $a_3+a_4<1$

$\Rightarrow |d(t,Bv)| \le 0$, which is a contradiction. Thus $Bv = t$.

Hence, $Bv = Tv = t$ and v is coincidence point of B and T. Further, the weak compatibility of pair (B,T) implies that $BTv = TBv$, or $Bt = Tt$. Therefore, t is a common coincidence point of A,B,S and T.

Now, we show that t is a common fixed point. Put $x = u$ and $y = t$ in (3.3), and we have

$$d(t,Bt) = d(Au,Bt) \le a_1 \frac{d(Tt,Bt)[d(Au,Tt)+d(Su,Au)]}{[1+d(Su,Tt)+d(Au,Tt]} + a_2 \frac{d(Au,Tt)d(Su,Bt)[d(Su,Au)+d(Tt,Bt)]}{[1+d(Su,Tt)+d(Au,Tt)]}$$

$$+a_3[d(Au,Tt)+d(Su,Bt)]+a_4[d(Su,Au)+d(Tt,Bt)]+a_5 d(Su,Tt)$$

$\Rightarrow (1-2a_3+a_5)\, d(t,Bt) \le 0$,

as $2a_3+a_5<1$

$\Rightarrow |d(t,Bt)| \le 0$, which is a contradiction. Thus $Bt = t$.

Therefore $At = Bt = St = Tt = t$. The uniqueness of the common fixed point follows easily.

In a similar way, the argument that the pair (A,S) satisfies property (CLR_A) will also give the unique common fixed point of A,B,S and T. Hence the result follows.

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American Journal of Engineering Research (AJER)
e-ISSN : 2320-0847 p-ISSN : 2320-0936
Volume-3, Issue-9, pp-209-214
www.ajer.org
Research Paper Open Access

A Novel Aeration Method for the Preparation of Algae (Dunaliella Salina) Biomass for Biofuel Production.

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ABSTRACT: *Preparation of algae (Dunaliela Salina) biomass in ammonia (NH_4^+) and nitrate (NO_3^-) growth media for biofuel production was investigated, with special attention on the elimination of inhibitory oxygen that adversely affects algae growth. A novel aeration method based on high and efficient transfer of carbon dioxide (CO_2) required to stabilize the CO_2 of the algae growth medium in a short time was adopted for the elimination of the inhibitory oxygen. The novel aeration method was found to increase the algae growth rate in the growth media investigated as suggested by increases in pH and decreases in dissolved oxygen concentration. However, algae grown in ammonia medium showed 17% higher growth rate than algae grown in nitrate medium. The high mass transfer of CO_2 and high energy efficiency make the novel aeration method of algae growth in ammonia medium better suited for high yield of algae biomass for biofuel production.*

KEYWORDS: Aeration, algae, biofuel, biomass, growth medium.

I. INTRODUCTION

Over the years, fossil fuels have dominated the energy supply needs of the world market. However, numerous energy issues have led to the search for alternative energy sources. Among them is the dramatic rise in the price of crude oil [1-3] raising global energy fears especially among non crude oil producing nations that depend solely on imported crude as the major source of energy supply. This is in addition to fossil fuel reserves which decrease by the day as they are not renewable energy sources, and would one day, run out. Again, the adverse effects of global warming and climatic change due to high volumes of greenhouse gas emissions from combustion of fossil fuels [3-6] have been on the increase in the past years, raising serious global concern on the environment. These daring energy issues have led to a search for alternative energy sources that are cheap and environmental friendly to reduce over-dependence on fossil fuels. Of all the alternative energy sources investigated, algae biomass proves to be the best potential replacement option. This is largely due to the rapid growth rate and high lipid content of algae, and production of biodegradable fuels unlike other plant biomass. In recent years, algae has attracted global attention as a result of its potential as biofuel feedstock, effluent remediation and lots of valuable natural products they produce [2]. Algae are mostly aquatic and can grow in brackish, fresh and marine water.

They can also grow in different habitats such as snow, banks, deserts, soils, hot springs, rocks, tree trunks ([7,8]. *Dunaliella Salina* is an algae specie and is one of the most important industrial microalgae because of its biofuel feedstock and large β-carotene accumulations. *Dunaliella Salina* is among the most studied green microalgae specie because they can thrive in environments of extreme salinity [1] and can grow in wide range of salt concentrations between 50mM to above 5M NaCL[9] and have large production of β-carotene (about 10%*D.Salina* dry weight in lipid globules located in the chloroplast). *D.Salina* is used in evolution of salt adaptation and attractive β-carotene "cell factory" because of these traits [10]. Biofuels that can be produced with algae biomass feedstock are biodiesel, methane [5,11,12], and biohydrogen [5,12,13]. The major setbacks of algae biofuel production are high cost of harvesting due to low biomass concentration in microalgae culture, drying due to large amount of water in the harvested algae, high intense care and cost when compared to conventional crop production; but all these problems can be overcome by technological developments [12]. Since mass culture of algae for biofuel production requires exploitation of high photo conversion of algae in the presence of carbon dioxide (CO_2) and other growth requirements for the production of biomass that would be used for biofuel production, the most suitable medium and culture conditions for high yield are required to

achieve this purpose, and also to achieve a reduced carbon footprint. For high algae yield and low carbon footprint, this study investigates the use of a novel fluidic oscillator generating micro-bubbles [14] for transfer of CO_2 that is highly required for algae growth into algae culture using NO_3^- and NH_4^+ as different sources of nitrogen in order to determine the most suitable growth medium for high algae growth. Measurement of PH change and dissolved oxygen concentration in the medium before, during and after bubbling CO_2 into the medium was used to evaluate the mass transfer rate of the novel fluidic oscillator micro-bubbles.

II. EXPERIMENTAL

2.1.Materials

Bioreactors, ceramic diffusers, pipes, valves, clips, flow meter, high speed camera, conical flasks, timer, rule, centrifuge, cuvette, 5% CO_2 cylinders, trolley, lights, thermometer, pH meter, clamps, stands, test tubes, Duran bottles, measuring cylinders, distilled water, screws, aluminium foil, masking tape, markers, oxygen probe, measuring tape, magnetic stirrers, weighing balance, sample bottles, oscillator, pipettes, bunsen burner. All the materials were kindly provided by the department of Chemical and Biological Engineering, The University of Sheffield, Sheffield, UK.

2.2. Growth Of Algae

Dunaliella Salina algae strain was used in this study and was obtained from the Biology department of The University of Sheffield, Sheffield, UK and pre-cultured.Two nitrogen sources namely ammonium (NH_4^+) and nitrate (NO_3^-) were used in different growth medium. A modified Dunaliella Salina growth medium recipe was used to supply the elements required for algae growth by dissolving calculated amounts of salts in water (Tables 1 and Table 2). The CO_2required for photosynthesis was supplied from a 5% carbon dioxide bottle.
The microbubbles which transferred CO_2 into the algae growth medium were generated from the patentednovel fluidic oscillator [14].

Table 1.Modified *D. Salina* recipe showing actual chemical composition of NO_3^-growthmedium.

Composition of growth medium (Modified)	Original chemicals	Weight of salt required for 250 litres
*0.5 M/L NaCl	NaCl	14.6kg
10 mM/L KCl	KCl	186g
20 mM/L $MgCl_2$	$MgCl_2.6H_2O$	509g
10 mM/L $CaCl_2$	$CaCl_2.6H_2O$	274g
24 mM/L $MgSO_4$	$MgSO_4.7H_2O$	740g
5 mM/L $NaNO_3$	$NaNO_3$	106g
24 mM/L Na_2SO_4	$Na_2SO_4.10H_2O$	484g
0.1 mM/L NaH_2PO_4	Na_2HPO_4	3.549g
0.0015 mM/L FeEDTA	FeEDTA	0.14g
1 mM/L Trace elements	Trace elements (stock solution)	250ml
20 mM/L HEPES	-	-
1 g/L $NaHCO_3$	$NaHCO_3$	250g

Table 2. Modified *D. Salina* recipe showing actual chemical composition of NH_4^+ growth medium.

Composition of growth medium (Modified)	Original chemicals	Weight of salt required for 250 litres
*0.5 M/L NaCl	NaCl	14.6kg
10 mM/L KCl	KCl	186g
20 mM/L $MgCl_2$	$MgCl_2.6H_2O$	509g
10 mM/L $CaCl_2$	$CaCl_2.6H_2O$	274g
24 mM/L $MgSO_4$	$MgSO_4.7H_2O$	740g
5 mM/L NH_4Cl	NH_4Cl	67g
24 mM/L Na_2SO_4	$Na_2SO_4.10H_2O$	484g
0.1 mM/L NaH_2PO_4	Na_2HPO_4	3.549g
0.0015 mM/L FeEDTA	FeEDTA	0.14g
1 mM/L Trace elements	Trace elements (stock solution)	250ml
20 mM/L HEPES	-	-
1 g/L $NaHCO_3$	$NaHCO_3$	250g

Microbubble Generation : The patented fluidic oscillator [14]was used on a compressed ceramic diffuser to generate microbubbles used in the bioreactor for dissolving CO_2 into algae growth medium.

Algae Pre-Culture : Algae strain of *Dunaliella Salina* was pre-cultured under modified *Dunaliella Salina* recipe in conical flask and kept in a shelve under light and allowed to grow.

Algae Culture : Algae were cultured in a 250L bioreactorcapacity with 5% of CO_2 dissolved daily into the medium for about 30mins at a flow rate of 2L/min. The cultured algae were then used for the determination of algae growth.

Algae Growth Determination : The measurement of chlorophyll content was used to determine the growth rate of the cultured algae. 10ml of culture sample collected over the algae culture period were transferred into a 15ml Falcon tube and centrifuged in a bench centrifuge for 10mins. The supernatant was immediately poured off and the pellets were re-suspended in 1ml of distilled water. Thereafter, 4ml of acetone were added to each of the pellets and allowed to stand for a few minutes in direct sunlight to break open the cells and release the chlorophyll contained therein, and then centrifuged for 5mins until the pellet content was completely white. The optical density of each two supernatants was measured with a spectrophotometer. The chlorophyll content was calculated using the chlorophyll content equation. (Equation 1)

$$Chlorophyll\ (\mu g\ /\ ml) = \frac{OD_{645} \times 202 + OD_{663} \times 80.5}{2 \times 5} \quad (1)$$

Where OD_{645} and $OD_{663}$are absorption wave lengths

Dissolved Oxygen and pH Measurement : Dissolved oxygen probe was used to measure the amount of dissolved oxygen in the growth medium before and during the dissolving of CO_2 in the growth medium while a pH meter was used to measure the PH before and during CO_2 dissolution.

III. RESULTS AND DISCUSSION

Chlorophyll Content Measurement

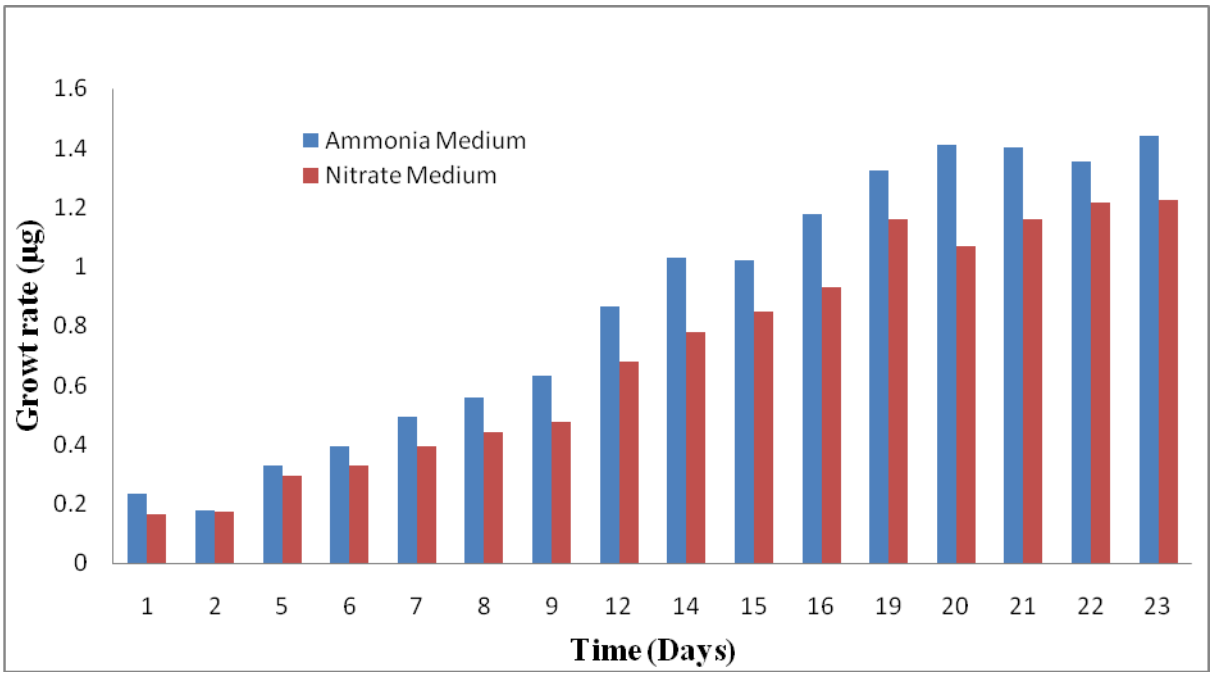

Figure1. Plot of chlorophyl content of Ammonia (NH_4^+) and Nitrate (NO_3^-)growth media versus time.

Figure 1 shows the results of algae growth rate obtained by measuring the chlorophyll content of the algae. The result shows that *D. Salina* specie grows faster in NH_4^+ than in NO_3^- medium. The higher algae growth rate of *D. Salina* in NH_4^+ growth mediumthan in NO_3^- growth medium is in agreement with the result of studies carried out by Giordano, [17],

where algae grown in NH_4^+ medium had higher growth rate than algae cultured in NO_3^- medium. This can be attributed to the fact that algae cells can readily use nitrogen from NH_4^+ directly without any further conversion unlike NO_3^- that requires further conversion to NH_4^+ before nitrogen can be available to algae cells for metabolism [8], Again, algae conserves energy when grown in NH_4^+ medium as a result of readily available nitrogen that does not require energy for conversion. Furthermore, algae grown in NH_4^+ medium saves time that would have been used in the conversion of NO_3^- to NH_4^+ in growth metabolism.

This time saving benefit due to readily available nitrogen in NH_4^+ can also be why fast growing algae like *D. Salina* prefers NH_4^+ growth medium. This is in agreement with the findings of Kumar *et al* [15] who revealed that algae that have high growth rate prefer NH_4^+ growth medium to NO_3^- growth medium as nitrogen source. However, the initial decrease in growth observed in algae grown in NH_4^+ a day after algae inoculation can be related to some undesirable side effects. Richmond [18], pointed out that these undesirable side effects are likely to take place in NH_4^+ growth medium due to sharp drop in pH as shown in the algae grown in NH_4^+ growth medium where the ph dropped from initial inoculation pH of 7.13 to 6.95, even as algae density reduced to about 25% of its initial inoculation density.

This trend was not observed for algae grown in NO_3^- growth medium. This initial side effect due to sharp drop in pH affected the overall algae growth rate because about 25% of algae that were lost to side effects occurred in the algae grown in NH_4^+ growth medium. Without this initial loss, perhaps the overall algae growth observed in NH_4^+ growth medium would have been higher. For this reason, algae cultivation in NH_4^+ growth medium would require higher algae inoculation density to compensate for loses due to side effects to achieve required growth rate when cultivating algae for production of the required algae biomass for production of biofuels and other useful products. Although the algae grown in NO_3^- growth medium did not produce a reduction in algae density after inoculation, they did not start growing very fast and showed 13% loss in growth rate throughout the culture period. At the initial stage, this can be due to adaptation to the new culture environment and the lag phase of growth. However, even without reduction in initial algae growth density in algae grown in NO_3^- growth medium, NH_4^+ growth medium still remains a better and preferred growth medium because of higher overall algae growth. Therefore, to achieve low carbon footprint in algae biofuel production, the use of NH_4^+ growth medium is favoured.

Dissolved Oxygen and pH Measurement : Figure 2 shows the pH change of the algae growth medium on addition of CO_2micro-bubbles. The uptake of CO_2 by algae for growth leads to increased change in pH of the culture medium and can inhibit algae growth at high pH. Because of this, CO_2 has to be added to the growth medium to keep pH at optimum [15]. The rise and fall of pH observed in figure 2 is used to represents the common daily trend of different CO_2 concentrations in the medium. The rise in pH observed from beginning of each day to the end of the previous day, represents algae growth. This is because algae makes use of CO_2 in the medium to grow which leads to increase in pH of the medium. It can be seen from figure 2 that the starting pH of the NH_4^+ growth medium is higher than the starting pH of the NO_3^- growth medium which represents higher photosynthetic rate which is an indication of higher uptake of CO_2 and more algae growth in the NH_4^+ growth medium than in the NO_3^- growth medium. Another reason for higher acidity for NH_4^+ growth medium can be due to the utilization of nitrogen from NH_4^+ source as stated by Goldman and Brewer[16] who revealed that nitrogen uptake from NH_4^+ turns the medium acidic.The rise in pH of both growth medium was controlled by the use of the novel aeration method of Zimmerman et al [14].

This novel aeration system has the capacity to transfer sufficient amount of CO_2 required to stabilize the CO_2 of the medium at optimum level in less than 40mins due to the very high and efficient mass transfer of the microbbubles produced with the novel method. This technique transfers enough CO_2 that can maintain the CO_2 concentration of the medium for a whole day in a short time. The high mass transfer of this novel aeration system has the potential of making microalagae biofuel production a promising option to fossil fuels as well as, a potential climatic change mitigation option.

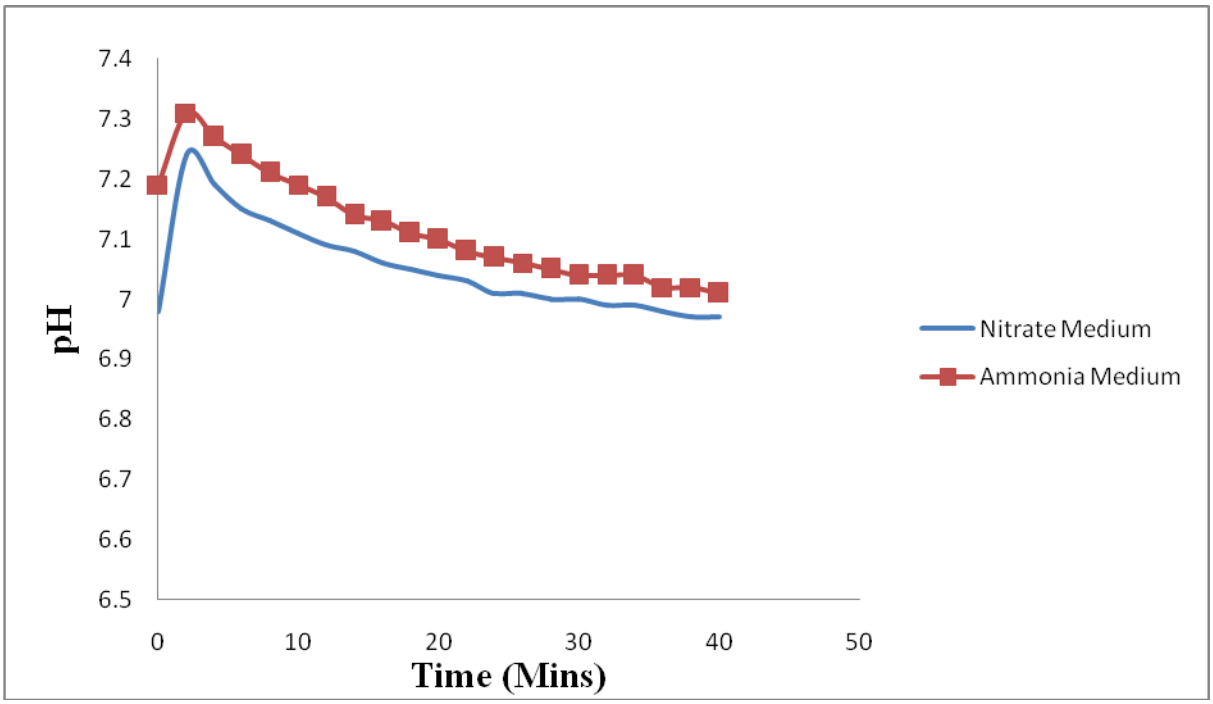

Figure2. Plot ofdaily pH change on addition of CO_2 microbubbles

As Shown in Fig3, the ammonia medium has higher dissolved oxygen which indicates higher growth rate when compared to the nitrate medium. However, the introduction of CO_2 microbubbles into the bioreactor by the novel microbubble aeration method [14] rapidly decreased the concentration of dissolved oxygen. This indicates that the use of the novel aeration method in algae mass culture for biofuel production is more efficient than the conventional methods in eliminating inhibitory oxygen that adversely affects algae growth. This method provides algae mass culture with good growing environment maintaining low oxygen concentrations in algae mass culture. The efficient oxygen striping ability of this novel aeration method is achieved by the oscillatory effect and high momentum of the microbubbles, as well as the low rising velocity of the microbubbles.

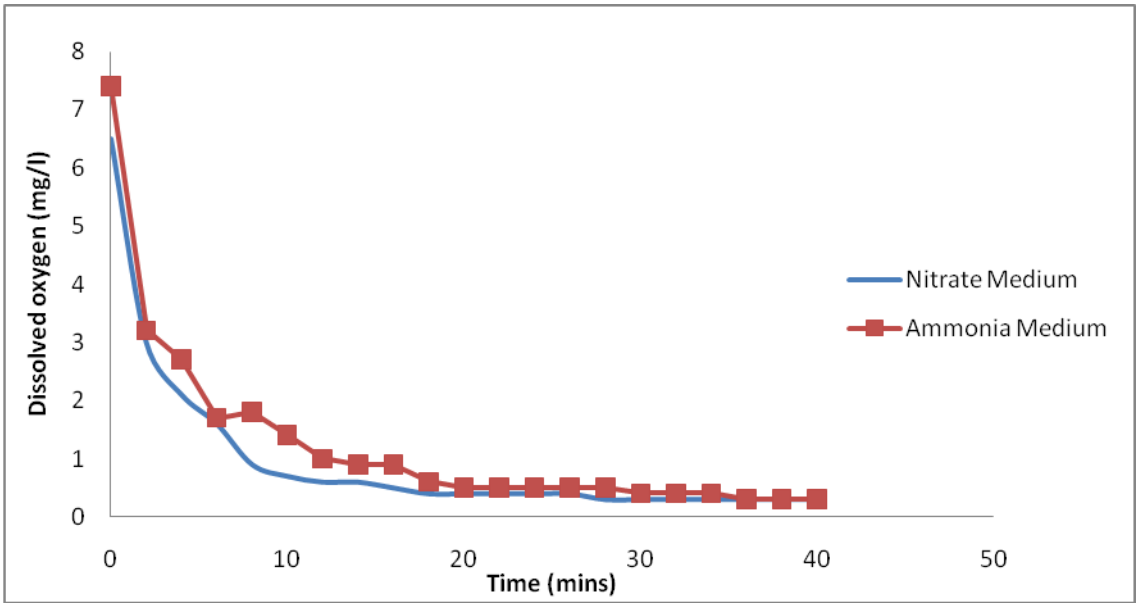

Figure3. Plot of daily dissolved Oxygen in Nitrate and Ammonia growth media versus time

IV. CONCLUSION

The following conclusion can be drawn from this work;

- Algae grown in NH_4^+growth medium had 17% higher growth rate than algae grown in NO_3^- growth medium. This makes NH_4^+ growth medium a better growth medium for commercial cultivation of algae for maximum yield, which would in turn, make algae biofuels viable by supplying enough algae feedstock required for biofuel production.However, Control measures should be taken when using NH_4^+ as nitrogen source due to rapid drop in pH as nitrogen is taken up. On the other hand, if a strain that can withstand the sudden pH change with desired qualities is used, high yields of algae biomass can be achieved because nitrogen in NH_4^+ is readily available to algae for metabolism unlike nitrate that would require further conversion.
- Also, high algae yield withNH_4^+ growth medium would reduce the high cost of harvestingalgae with low biomass concentration. This would in turn increase the potentials of algae biomass as a potential replacement option for fossil fuels.
- The incorporation of the novel fluidic oscillator to large scale algae biofuel production would hasten the replacement of fossil fuels with algae biofuels because of the high mass transfer of the novel method. Again, the energy efficiency associated with the novel method would not only reduce the cost of algae biofuel production, but would also, reduce the carbon footprint of algae biofuel which is of great importance to the environment as it would lead to algae taking up more CO_2.
- The use of algae in biofuel production would provide energy security and global economic benefits like provision of jobs in every part of the globe as algae biofuels can be produced in any part of the globe due to the fact that algae can be grown in all environments even in areas of extreme weather conditions such as in desserts and brackish water unlike economic benefits from oil exploration presently enjoyed by only regions and countries with fossil fuel deposits. The biofuels produced from them would also contribute immensely to the environment as they are biodegradable, can be combined with waste treatment. Even when they release CO_2 back into the atmosphere, it would balance for the CO_2 used during growth.

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American Journal of Engineering Research (AJER)
e-ISSN : 2320-0847 p-ISSN : 2320-0936
Volume-3, Issue-9, pp-215-223
www.ajer.org
Research Paper Open Access

Analyze the Properties of Woven Fabric Manufactured by Hand Loom and Power Loom

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ABSTRACT: *The handloom weaving industry is one of the ancient cottage industries in Bangladesh. Next to agriculture, it is the second largest sources of rural employment and income. The present study is an effort to investigate the present scenario of handloom weaving industries in Bangladesh. Also the analysis the properties and present trends of local woven fabric manufactured by Hand loom and Power loom. The study is based on secondary data.*

KEYWORDS : *Fabric Properties, GSM, Count, Dimensional Stability, Color Fastness, Wash Fastness*

I. INTRODUCTION

The The handloom weaving industry is one of the ancient cottage industries in Bangladesh. Next to agriculture, it is the second largest sources of rural employment and income. The present study is an effort to investigate the present scenario of handloom weaving industries in Bangladesh. The study is based on secondary data. The data used in this study were collected from different sources such as books, reports, journal articles, newspaper and online sources. Collected data have been analyzed through tabular, graphical and statistical method. The study found that in Bangladesh there are about 183512 handlooms weaving units with about 505556 looms. The total operational looms are 311851, which are 61.7 percent of total looms, and the rest 193705 looms are non-operational. The study also found that handloom weaving industry is a promising sector to provide rural employment in the perspective of Bangladesh. Handloom sector is contributing to generation rural employment and income increase, alleviating rural poverty, substituting imports, and increasing potentials for exports. Another important finding is that this sector provides employment for the women labor force at family environment. At present, a significant portion of local demand for fabric is met-up by handloom industries. Therefore, government should take proper care for the development of the handloom industries.[i]

II. HISTORY OF HANDLOOM

In the annals of Indian handloom saree, Shantipur and Fulia are a name to reckon with. Their fascinating story is also in a nutshell the story of Bengal handloom sarees. The geographical twins could not be more different. The first, a handloom weaving centre over 500 years old. The second came to flourish only after Partition. Yet, their destinies are linked together – the Shantipur and Fulia saree swim or sink with the success or otherwise of Bengal handloom.There are records of handloom saree weaving activity in Shantipur, a centre of Vaishnavite culture and Bhakti movement, as early as the 15th century. Weaving flourished throughout the medieval era, and the famed indigo-dyed Neelambari made the Shantipur saree a household name.There was a strong sense of identity among Shantipur weavers. They united to agitate against the stranglehold of the Dadni system of the British East India Company and even took their grievances to colonial courts during the19th century.In the decades leading up to independence, Shantipur saw gradual inflow of techniques like the Barrel Dobby facilitating the conversion from Throw Shuttle to Fly Shuttle (1920s), the Jacquard Machine (1930s), and sectional warping and sizing that allowed production of warp yarns 350 yards long (1930s).

Important Products with Places of Production

Sl.	Name of the Products	Place of Production
1	Jamdani	Rupgonj and Sonargaon of Narayangonj district.
2	Benarasi	Mirpur of Dhaka, Iswardi of Pabna district and Gangachara of Rangpur district.
3	Tangail Sharee (Cotton sharee, Half Silk, Soft Silk, Cotton Jamdani, Gas-mercerised twisted cotton sharee, Dangoo sharee, Balucherri)	Tangail Sadar, Delduar and Kalihati, Nagorpur, Basail of Tangail District.
4	Handloom Cotton share	Shahjadpur, Belkuchi and Sadar of Sirajgonj district, Narsingdi and Pabna districts.
5	Lungi	Ruhitpur of Keranigonj and Dohar of Dhaka district,Shahjadpur,Ullapara, Belkuchi, Sadar of Sirajgonj district,Kumarkhali of Kushtia district, Sathia,
6	Silk share	Sadar and Shibgonj of Chapai Nawabgonj and Rajshahi district.
7	Gamcha	Ullapara,Kamarkhand of Serajgonj, Gouranadi of Barisal, Fultola,Doulatpur of Khulna,Jhalokathi, Jessore and Bogra districts.
8	Check Fabrics	Belkuchi of Sirajgonj district.
9	Bed Sheet & Bed Cover	Kumarkhali of Kustia district, Danga of Narsingdi district.
10	Sofa Cover	Danga of Narsingdi district.
11	Rakhine Special Wear(Wooling Shirting, Woolen Bed Sheet, ladies chadar, Bag,Lungi and Thami for tribal ladies)	Taltoli of Borguna district, Kalapara, Rangabali of Patuakhali district and Cox's Bazar district.
12	Tribal Fashion Wear (Thami for tribal ladies, Khati(Orna), Ladies Chadar & Lungi.	Rangamati, Khagrachari & Bandarban Hill districts.
13	Miniouri Fashion Garments (Monipuri Sharee, Punek for ladies like lungi, Lungi, Un-stitched cloth (three pieces), Innachi(Orna) & Vanity Bag	Sylhet and Moulivibazar districts.[ii]

[Source: Bangladesh Handloom Board, http://www.bhb.gov.bd/productionPlaces.php]

III. PRESENT SCENARIO OF HANDLOOM

Handloom sector in Bangladesh consists of more than 0.505 million Handlooms and 1.0 million Handloom weavers. But only 0.3 million looms are active (59% of existed looms) and that provides around 620 million meters of fabric (about 40% total demand of the population) annually. About more than 1.5 million people are directly and indirectly involved for their livelihood. (http://www.bhb.gov.bd/; visited on 17th July'10). Handloom industry is the biggest handicraft industry in our country; it is the second largest source of rural employment after agriculture (Ahmed, M.U 1999). The knowledge and skills needed for this sector transformed from their forefathers. Thus, the cottage-based industry has been build up by inheritance. Handloom fabric is more producer-driven than buyer-driven. An international experts study reveals that the technical skill of the weavers of Bangladesh is second to none in the world (i.e. Dhaka muslin products, the finest cotton fabric). Handloom products are best known for their eco-friendly nature. The world is solely concentrating on 'green technology', therefore 'green products' and 'social business concept' to save the struggling world, where 'Handloom technology' could be best 'green technology' to fulfill basic needs of human i.e., clothing. The Handloom sector has a great deal of potential for further value addition in the RMG sector for further meeting local needs of fabrics and expanding sales of its products directly in foreign countries. This sector is an important channel for balanced sustainable economic growth. (The Financial Express, dated on 5th Dec'07 'Giving Support to Handloom Sector'). Handloom weavers and workers are generally poor. Vitality of

Handloom Industry can lead to improvement in the earning of those people on a large scale who are at the fringes of social existence by alleviating their poverty. This sector can be a source of employment of hard-passed rural people, particularly.Since long the Handloom and its weaving Industry have been struggling; though the government and Non-government sectors have been providing supporting initiatives to the cottage-based industry. The objective of paper is to apply 'Adoption and Diffusion of Innovation Theory' to active idle looms and bring back weavers and stakeholders of the industry.

IV. RAW MATERIAL USED

Bangladesh has remained a net importer of yarn at least since 1947. Almost all yarns are imported; warp silk from China, cotton from China and India. Some local silk and cotton can be used for weft. Jute, which is locally grown and an important agricultural crop, has a lot of potential, especially the softer material developed in the Norad project as well as blends. The Jute Research Institute has made an interesting 40 %jute/60 % cotton yarn. Jute/silk experiments – silk warp and jute weft - have also been conducted, showing that a softer jute yarn is needed. One textile designer claims that "Interesting yearns are made only for exports." Thin yarns for the handloom industry are machine spun. Hand spun cotton is used in the fabric called "khaki", a thicker cotton quality. Linen also has to be imported and is too expensive to be used in any quantity. Synthetic dyes are imported. Natural dyes, except madder, which has to be imported, are grown locally. Some international designers using the Pantone color system face problems, because they do not take the availability of dyes and the working process of the dyers into consideration.

V. PRESENT PRODUCT OF HANDLOOM

The handloom is simply a weaving device made of wood and iron mainly operated by hand ,relying solely on human metabolic energy. It requires a space barely 8 sq. metres. Handloom weaving is a cottage based industry spread through out the country. The sounds of the handloom is the music of the rural home inviting fortune to them. In the process of weaving the handloom weaver create a harmony of motion and rhythm. The vast majority of Bangladeshi handlooms are engaged in weaving cotton and blended fabrics although handloom cloth of silk earned a good reputation. Famous areas for silk weaving are Rajshahi, Tangail and Nobabgonj . Rajshahi produces mainly silk sarees, a special type of cloth weared by the women folk . Tangail produces also silk saree namely Tangail Muslin and Narayangonj produces the famous Jamdani saree, silk sarees Tangail Muslins and famous jamdani. Zari work called brocade is also famous in Mirpur, Dhaka .In Bangladesh there are different schools of weaving on jacquard, dobby, frame and pit looms .Product assortments made of other are saree , lungie, gamsa, grameen check fabrics, printed bed covers, pillow covers, table mats, kitchen and hand towels, apron, curtain and upholstery, furnishing fabrics, bags bandage etc.

VI. POWER LOOMS DEVELOPMENT

Edmund Cartwright built and patented a power loom in 1785, and it was this that was adopted by the nascent cotton industry in England. The silk loom made by Jacques Vaucanson in 1745 operated on the same principles but wasn't developed further. The invention of the flying shuttle by John Kay was critical to the development of a commercially successful power loom.[8] Cartwright's loom was impractical but the ideas were developed by numerous inventors in the Manchester area in England, where by 1818 there were 32 factories containing 5732 looms. Horrocks loom was viable but it was the Roberts Loom in 1830[10] that marked the turning point. Before this time hand looms had outnumbered power looms. Incremental changes to the three motions continued to be made. The problems of sizing, stop-motions, consistent take-up and a temple to maintain the width remained. In 1841, Kenworthy and Bullough produced the Lancashire Loom[11] which was self-acting or semi-automatic. This enables a 15-year-old spinner to run six looms at the same time. Incrementally, the Dickinson Loom, and then the Keighley born inventor Northrop working for the Draper Corporation in Hopedale produced the fully automatic Northrop Loom which recharged the shuttle when the pirn was empty. The Draper E and X model became the leading products from 1909 until they were challenged by the different characteristics of synthetic fibres such as rayon. From 1942 the faster and more efficient shuttleless Sulzer looms and the rapier looms were introduced. Modern industrial looms can weave at 2000 weft insertions per minute. Today, advances in technology have produced a variety of looms designed to maximize production for specific types of material. The most common of these are air-jet looms (e.g. "JAT710") and water-jet looms

VII. METHODOLOGY AND ANALYSIS OF RESULT

To judge fabric performance we have to work with the following parameter:

[1] Color fastness to washing
[2] Color fastness to rubbing
[3] Tensile strength
[4] Dimensional stability
[5] Abrasion resistance
[6] Count
[7] GSM

Color Fastness to Washing: Color fatness to washing means, A specimen of the textile, in contact with one or two specified adjacent fabrics, is mechanically agitated under described conditions of time and temperature in a soap solution, then rinsed and dried. The change in color of the specimen and the staining of the adjacent fabric are assessed with the grey scales

A composite specimen is agitated in a wash- wheel using one of the sets of conditions shown in Table. The sample is then dried and assessed for color loss and the adjacent fabric is assessed for staining.

Test	Liquor	Temperature	Time in minute	Reproduces action of
C01	0.5% soap	40	30	Hand Washing
C02	0.5% soap	50	45	Repeated hand washing
C03	0.5% soap 0.2% soda ash	60	30	Medium cellulosic wash, Several wool wash.
C04	0.5% soap 0.2% soda ash	95	30	Several cellulosic wash.
C05	0.5% soap 0.2% soda ash	95	240	Very several cellulosic wash.
C06	4g/l reference detergent + perborate	Various	Various	Domestic laundering.

Recipe:

Sodium Perborate……..1 gm/litre
ECE Phosphate……..4 gm/litre

Sample Preparation:

Sample Fabric……..10 cm X 4 cm
Multi fiber fabric……10 cm X 4 cm

Working Procedure:

Collecting the sample from bulk and then conditioning for 04.30 to 06 hours
↓
Making a specimen of 04 cm*10 cm in size.
↓
Sewing the specimen with multi-fibre fabric of same size at one corner.
↓
Making the solution of 4gm/litre ECE detergent & 1 gm/litre sodium perborate, (If required SKFL use 0.15 gm/litre TAED).
↓

Putting the specimen with multi-fibre fabric into the solution in Rotawash m/c
Prog.: C2S Temp.: 60OC/ 40OC Time: 30 min Still ball: 25 pcs
↓
Rinsing with hot water respectively.
↓
squeezing with cold water of the sample is done (Hand Wash).
↓
then drying is done at a temperature in the air not exceeding 60OC
↓
the stitching is then broken out except on one of the shorter end.
↓
Measuring the staining and color change by grey scale & make a test report.

Result of Color Fastness to Washing:

Sample Fabric	Change Value		Staining Value	
	Numerical Value	Remarks	Numerical Value	Remarks
1.Lungi (Power Loom)	4	Good	4	Good
2.Lungi (Hand Loom)	2	Fair	2	Fair
3.Gamsa (Power Loom)	4	Good	4	Good
4.Red Gamsa (Hand Loom)	2	Fair	2	Fair
5.Green Gamsa(Hand Loom)	4	Good	4	Good

Note: *Here we can't find the sample of same count and same structure of power loom as well as hand loom, so the expected result can't be shown.*

Color Fastness to Rubbing: This test is designed to determine the degree of color which may be transferred from the surface of a colored fabric to a specify test cloth for rubbing (which could be dry and Wet).

Sample Preparation:

Sample Fabric -------- 14 cm X 5 cm pieces

Test Procedure of Color Fastness to Rubbing:

Lock the test specimen (textile sample) onto the base of the crock meter.
↓
Using the spinal clip, set 5 Cm * 5Cm of the white cotton fabric to the finger of the crock meter.
↓
Lower the covered finger on the test sample.
↓
Turn hand crank at the rate of the one turn per second.
↓
Remove the white rubbing test cloth and e valuate with grey scale.

Result of Color Fastness to Rubbing: In this stage compare the contrast between the treated and untreated white rubbing cloth with grey scale and rated 1 to 5.

Sample Fabric	Staining Scale	
	Dry	Wet
1.Lungi (Power Loom)	5	4/5
2.Lungi (Hand Loom)	3	2
3.Gamsa (Power Loom)	5	4
4.Red Gamsa (Hand Loom)	4/5	3
5.Green Gamsa(Hand Loom)	3/4	2/3

Note: *Here we can't find the sample of same count and same structure of power loom as well as hand loom, so the expected result can't be shown.*

Tensile Strength: Tensile strength means the material under tensile stress in the largest deformation of homogeneous material stress.Tensile strength of textile testing methods are: 1 inch grasp like law, like law in Article 2 inches, 1 inch sample method, elongation at break,Material tensile strength is the maximum uniform plastic deformation of the stress.

a. In the tensile test, the specimen until fracture suffered the biggest so far is the tensile strength of tensile stress and the results expressed in MPa. Some call it the wrong tensile strength, tensile strength and so on.

b. Instruments like the tensile strength tests can be obtained tensile fracture stress, the tensile yield stress, elongation at break data.

c. The calculation of tensile strength:
σt for tensile strength (MPa); p for the peak load (N); b for the specimen width (mm); d is the sample thickness (mm).

Sample Preparation: Sample Fabric --- 6''x4''

Result of Tensile Strength:

Sample Fabric	Tensile Strength
1.Lungi (Power Loom)	11.00 Kg
2.Lungi (Hand Loom)	14.10 Kg
3.Gamsa (Power Loom)	12.90 Kg
4.Red Gamsa (Hand Loom)	08.80 Kg
5.Green Gamsa(Hand Loom)	07.60 Kg

Note: *Here we can't find the sample of same count and same structure of power loom as well as hand loom, so the expected result can't be shown.*

Dimensional Stability: A measure of the dimensional change of a material that is caused by factors such as tem Dimensional stability refers to a material's ability to maintain its size and shape when subjected to environmental variables such as thermo cycles of hot and cold or humidity changes and the result of polymerization or setting premature changes, humidity changes, chemical treatment, and stress exposure.

Procedure of Dimensional Stability Test: Dimensional stability test is an off line quality assurance system. By this test, we can be confirming about the shrinkage and spirility properties of a fabric. After dyeing and finishing operation; dimensional stability test is carried out. Dimensional properties can be changed by stentering, compacting or by treating the fabric with finishing chemicals.
Sample: Two piece of 11 cm x 11 cm fabric is taken for test.

Procedure:

- Conditioning: Put the sample in the table for 4 hours for conditioning before starting test.
- Cut the sample 11 x 11 cm & benchmark should be 10 x 10 cm. Stitch the sample (3 sides) by over lock

sewing machine.

- Put sample in washing machine and run according to buyer's choice.
- Drying: All Buyers' requirement is tumble Dry except ECHO SCOURING is flat dry.

Calculation: Shrinkage (%) = (Before wash – After Wash) / Before Wash x 100
Expansion (%) = (After wash – Before wash) / Before wash x 100

Results of Dimensional Stability:

Sample Fabric	Shrinkage (%)		Expansion (%)	
	Warp way	Weft way	Warp way	Weft way
1.Lungi (Power Loom)	10 %	3 %	--	--
2.Lungi (Hand Loom)	5 %	1 %	--	--
3.Gamsa (Power Loom)	13 %	15 %	--	--
4.Red Gamsa (Hand Loom)	0 %	0 %	--	--
5.Green Gamsa(Hand Loom)	5 %	0 %	--	--

Note: Here we can't find the sample of same count and same structure of power loom as well as hand loom, so the expected result can't be shown.

Pilling Test: Pilling is a fabric surface characterized by little pills of entangled fiber clinging to the cloth surface and giving the garment unsightly appearance. The pills are formed during wear and washing by the entanglement of loose fibers which protrude from the fabric surface. Under the influence of the rubbing action these loose fibers develop into small spherical bundles anchored to the fabric by a few unbroken fibers.

Procedure of Pilling Test: Martindale abrasion tester may be used for pilling test of any fabric. The normal samples holders are replaced with light weight square holders, which are keyed so that they may have vertical movement but cannot turn on their axes. The samples are given a multi directional movement and rubbed against a standard fabric. After certain number of rubs, the samples are examined and the number of pills counted. This may be repeated say in stages of 500 cycles up to 3000 or 5000 and the rate of development of pills noted. The abrading materials may be 15 oz. cotton canvas or the test materials itself. The test specimens are mounted on the rectangular blocks. One and half inch * two and half inch and after a given number of rubs, the number of pills is counted.

Scale and Counting:

No of Pill	Standard Ratio	Remarks
0 – 4	5	Very Good
5 – 10	4	Good
11 – 20	3	Fair
21 – 40	2	Moderate
41 – 60	1	Bad
>60	0	Very Bad

Note: *Here we can't find the sample of same count and same structure of power loom as well as hand loom, so the expected result can't be shown.*

Sample Preparation:

Sample Fabric Size------ 140 mm X 140 mm

RESULTS OF PILLING TEST:

Sample Fabric	No of Pill	Numerical Value	Remarks
1.Lungi (Power loom)	4	5	Very Good
2.Lungi (Hand Loom)	35	2	Moderate
3.Gamsa (Power Loom)	5	4	Good
4.Gamsa (Hand Loom)	16	3	Fair

Note: *Here we can't find the sample of same count and same structure of power loom as well as hand loom, so the expected result can't be shown.*

Count: Count is a numerical expression which indicates the fineness or coarseness of yarn. A definition is given by textile institute, "count, a number indicating the mass per unit length or length per unit mass of yarn".

Sample Fabric	Count (Ne)	
	Warp	Weft
1.Lungi (Power Loom)	54	74
2.Lungi (Hand Loom)	23	21
3.Gamsa (Power Loom)	9	8
4.Red Gamsa (Hand Loom)	25	20
5.Green Gamsa(Hand Loom)	35	23

Note: *The term count variation is generally used to express variation in the weight of a lea and this is expressed as C.V. %. The number of samples and the length being considered for count checking affects this. While assessing count variation, it is very important to test adequate number of leas. After reeling the appropriate length of yarn, the yarn is conditioned in the standard atmosphere for testing before its weight is determined.*

GSM: The GSM of fabric is one kind of specification of fabric which is very important for a textile engineer for understanding and production of fabric. 'GSM' means 'Gram per square meter' that is the weight of fabric in gram per one square meter. By this we can compare the fabrics in unit area which is heavier and which is lighter.

Procedure: The weight of a fabric can be expressed in two ways, either as the 'weight per unit area' or the 'weight per unit length'; the former is self explanatory but the latter requires a little explanation because the weight of a unit length of fabric will obviously be affected by its width. In woven fabric, the weight per unit length is usually referred to as the 'weight per running yard'. It is necessary therefore to know the agreed standard width upon which the weight per running yard is based. Usually this width depends upon the width of loom. Before coming the term 'GSM' there was another term called 'lb/100 yards'. This expression is used by British Standard. For measuring this there are a template and a quadrant balance. The template area is 1/100 square yards of which each arm is 1/10 yards in length. For measuring GSM, a GSM cutter is used to cut the fabric and weight is taken in balance. Both of these measurement and method is equally used for both woven and knitted fabrics.

Sample Fabric	**GSM**
1.Lungi (Power Loom)	92
2.Lungi (Hand Loom)	105
3.Gamsa (Power Loom)	170
4.Red Gamsa (Hand Loom)	75
5.Green Gamsa(Hand Loom)	93

VIII. COMPARISON

Test	Hand loom						Power loom			
	Lungi		Red Gamsa		Green Gamsa		Lungi		Gamsa	
1. Color fastness to washing	2		2		4		4		4	
2. Color fastness to rubbing	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet
	3	2	4/5	3	3/4	2/3	5	4/5	5	4
3. Tensile strength	14.10 Kg		08.80 Kg		07.60 Kg		11.00 Kg		12.90 Kg	
4. Dimensional stability	Warp way	Weft Way	Warp way	Weft Way	Warp way	Weft Way	Warp way	Weft Way	Warp way	Weft Way
	5 %	1 %	0 %	0 %	5 %	0 %	10 %	3 %	13 %	15 %
5. Abrasion resistance	Moderate		Fair		Fair		Very Good		Good	
6. Count	Warp	Weft	Warp	Weft	Warp	Weft	Warp	Weft	Warp	Weft
	23	21	25	20	35	23	54	74	9	8

By considering above data we can say that the power loom product has much more acceptable quality than the hand loom product .For this reason we are going towards the power loom production today. Now a day's most of the hand looms are replaced by the power loom.

IX. CONCLUSION

The importance of the textile industry in the economy of Bangladesh is very high. Furthermore, the industry is expected to be the catalyst in the industrialization of Bangladesh, and has been declared as a thrust sector by the government. However, over the course of my Senior Project investigations, I have realized that Bangladesh's low labor cost, skill development potential, a presently expanding market, and favorable conversion cost can be used to turn the challenges of the quota-free market into a window of opportunity. In addition, most developed countries are turning away from industries like the textile industry and investing in other sectors, thus creating a vacuum in the market. There is currently a serious lack of coordination among the various government agencies that are connected in some way with the textile industry.

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American Journal of Engineering Research (AJER)
e-ISSN : 2320-0847 p-ISSN : 2320-0936
Volume-3, Issue-9, pp-224-232
www.ajer.org
Research Paper Open Access

On analytical solutions for the nonlinear diffusion equation

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ABSTRACT. *The nonlinear diffusion equation arises in many important areas of nonlinear problems of heat and mass transfer, biological systems and processes involving fluid flow and most of the known exact solutions turn out to be approximate solutions in the form of a series which is the exact solution in the closed form. The approximate results obtained by using Homotopy perturbation transform method (HPTM) and have been compared with the exact solutions by using software "mathematica" to show the stability of the solutions of nonlinear equation. The comparisons indicate that there is a very good agreement between the HPTM solutions and exact solutions in terms of accuracy.*

KEYWORDS: *Laplace transform method, He's polynomial, Homotopy perturbation method, Nonlinear diffusion equation*

1. INTRODUCTION

The nonlinear diffusion equation (1) is a prominent example of porous medium equation [1]

$$\frac{\partial u}{\partial t} = \frac{\partial}{\partial x}\left(D(u)\frac{\partial u}{\partial x} \right) \text{ with } D(u) = u^m \quad (1)$$

where m is a rational number, x and t denote derivatives with respect to space and time, when they are used as subscripts. This equation is one of the simplest examples of nonlinear evolution equation of parabolic type. It appears in the description of different natural phenomena [2-5] such as heat transfer or diffusion, processes involving fluid flow, may be the best known of them is the best known of them is the description of the flow of an isentropic gas through a porous medium, modelled independently by Leibenzon and Muskat around 1930. An earlier application is found in the study of groundwater infiltration by Boussisneq in 1903 and the particular cases $m = 2$, it leads to Boussinesq equation is used in the field of buoyancy-driven flow (also known as natural convection), $m = 3$, the equation (1) can be obtained from the Navier-Stokes equations. Equation (1) has also applications to many physical systems including the fluid dynamics of thin films [6].

Most phenomena described by nonlinear equations are still difficult to obtain accurate results and often more difficult to get an analytic approximation than a numerical one. The results are obtained by some techniques as Adomian's decomposition method, the variational iteration method, the weighted finite difference method, the Laplace decomposition method and the variational iteration decomposition method are divergent in most cases and which results in causing a lot of chaos. These methods have their own limitation like the calculation of Adomain's polynomials and the Lagrange's multipliers.

In this work, to overcome these difficulties and drawbacks such new technique, which is called Homotopy perturbation transform method (HPTM) and using the "software mathematica" are introduced for finding the approximate results with different powers of m .

2. Homotopy Perturbation Transform Method (HPTM)

To illustrate the basic idea of this method [7, 8], we consider a general nonlinear non-homogeneous partial differential equation with initial conditions of the formula:

$$Du(x,t)+Ru(x,t)+Nu(x,t)=g(x,t) \quad (2) \qquad u(x,0)=h(x),\ u_t(x,0)=f(x) \quad (3)$$

Where D is the second order linear differential operator $D=\dfrac{\partial^2}{\partial t^2}$, R is the linear differential operator of less order than D, N represent the general non-linear differential operator and $g(x,t)$ is the source term. Taking the Laplace transform (denoted by L) on both side of Eqs. (2) and (3):

$$L\left[Du(x,t)\right]+L\left[Ru(x,t)\right]+L\left[Nu(x,t)\right]=L\left[g(x,t)\right] \quad (4)$$

Using the differentiation property of the Laplace transform, [9] we have

$$L\left[u(x,t)\right]=\frac{h(x)}{s}+\frac{f(x)}{s^2}-\frac{1}{s^2}L\left[Ru(x,t)\right]-\frac{1}{s^2}L\left[Nu(x,t)\right]+\frac{1}{s^2}L\left[g(x,t)\right] \quad (5)$$

Operating with the Laplaceinverse on both side of Eq. (5) gives

$$u(x,t)=G(x,t)-L^{-1}\left[\frac{1}{s^2}L\left[Ru(x,t)+Nu(x,t)\right]\right] \quad (6)$$

Where $G(x,t)$ represent the term arising from the source term and the prescribed initial conditions. Now, we apply the homotopy perturbation method [10, 11]

$$u(x,t)=\sum_{n=0}^{\infty}p^n u_n(x,t) \qquad (7)$$

And the nonlinear term can be decomposed as

$$Nu(x,t)=\sum_{n=0}^{\infty}p^n H_n(u) \qquad (8)$$

For some He's polynomial H_n that are given by

$$H_n(u_0\ldots u_n)=\frac{1}{n!}\frac{\partial^n}{\partial p^n}\left[N\left(\sum_{i=0}^{\infty}\left(p^i u_i\right)\right)\right]_{p=0}, \quad n=0,1,2,3,\ldots$$

Substituting Eqs. (7) and (8) in Eq. (6) we get

$$\sum_{n=0}^{\infty}p^n u_n(x,t)=G(x,t)-p\left(L^{-1}\left[\frac{1}{s^2}L\left[R\sum_{n=0}^{\infty}p^n u_n(x,t)+\sum_{n=0}^{\infty}p^n H_n(u)\right]\right]\right) \quad (9)$$

This is the coupling of the Laplace transform and the homotopy perturbation method using He's polynomial.

Comparing the coefficient of like powers of p, the following approximations are obtained [12]

$$p^0 : u_0(x,t) = -\frac{1}{s^2} L\left[R u_0(x,t) + H_0(u) \right]$$
$$p^1 : u_1(x,t) = -\frac{1}{s^2} L\left[R u_1(x,t) + H_0(u) \right]$$
$$p^2 : u_2(x,t) = -\frac{1}{s^2} L\left[R u_1(x,t) + H_1(u) \right] \quad (10)$$
$$p^3 : u_3(x,t) = -\frac{1}{s^2} L\left[R u_2(x,t) + H_2(u) \right]$$

The best approximations for the solutions are

$$u = \lim_{p \to 1} u_n = u_0 + u_1 + u_2 + \ldots \quad (11)$$

3. Resolution and results

In order to assess the accuracy of solution HPTM for equation (1), we will consider the three following examples.

3.1. Example 1. Let us take $m = 1$, Eq. (1) becomes

$$\frac{\partial u}{\partial t} = \frac{\partial}{\partial x}\left(u \frac{\partial u}{\partial x} \right) \quad (12)$$

with initial condition $u(x,0) = x$

3.1.1. Homotopy perturbation transform method

Apply Laplace transform on both the sides of Eq. (12) subject to the initial condition

$$L\left[\frac{\partial u}{\partial t} \right] = L\left[\left(\frac{\partial u}{\partial x} \right)^2 \right] + L\left[u \frac{\partial^2 u}{\partial x^2} \right] \quad (13)$$

This can be written on applying the above specified initial condition as

$$u(x,t) = \frac{1}{s}(x) + \frac{1}{s} L\left[\left(\frac{\partial u}{\partial x} \right)^2 \right] + \frac{1}{s} L\left[\left(u \frac{\partial^2 u}{\partial x^2} \right) \right] \quad (14)$$

Taking inverse Laplace Transform on both sides, we get

$$L^{-1}\left[u(x,s) \right] = x L^{-1}\left[\frac{1}{s} \right] + L^{-1}\left[\frac{1}{s} L\left[\left(\frac{\partial u}{\partial x} \right)^2 + \left(u \frac{\partial^2 u}{\partial x^2} \right) \right] \right] \quad (15)$$

$$u(x,t) = x + L^{-1}\left[\frac{1}{s} L\left[\left(\frac{\partial u}{\partial x} \right)^2 + \left(u \frac{\partial^2 u}{\partial x^2} \right) \right] \right]$$ Now on applying the homotopy perturbation method in the form

$$u(x,t) = \sum_{n=0}^{\infty} p^n \left(u_n(x,t) \right) \quad (16)$$

Equation (15) can be reduces to

$$\sum_{n=0}^{\infty} p^n \left(u_n(x,t) \right) = x + L^{-1}\left[\frac{1}{s} L\left[\left(\left(\sum_{n=0}^{\infty} p^n \left(u(x,t) \right) \right)_x \right)^2 + \left(\left(\sum_{n=0}^{\infty} p^n \left(u_n(x,t) \right) \right) \left(\sum_{n=0}^{\infty} p^n \left(u_n(x,t) \right) \right)_{xx} \right) \right] \right] \quad (17)$$

On expansion of equation (17) and comparing the coefficient of various powers of p, we get

$$p^0 : u_0(x,t) = x$$

$$p^1 : u_1(x,t) = L^{-1}\left[\frac{1}{s}L\left[\left(\frac{\partial u_0}{\partial x}\right)^2\right]\right] + L^{-1}\left[\frac{1}{s}L\left[\left(u_0\frac{\partial^2 u_0}{\partial x^2}\right)\right]\right] \quad (18)$$

$$p^2 : u_2(x,t) = L^{-1}\left[\frac{1}{s}L\left[2\left(\frac{\partial u_0}{\partial x}\right)\left(\frac{\partial u_1}{\partial x}\right)\right]\right] + L^{-1}\left[\frac{1}{s}L\left[\left(u_1\frac{\partial^2 u_0}{\partial x^2} + u_0\frac{\partial^2 u_1}{\partial x^2}\right)\right]\right]$$

In this case the values obtained as $u_0 = x$, $u_1 = t$ and $u_2 = 0$ which follows $u_n(x,t) = 0$ for $n \geq 2$. Putting these values in (11) we get the solution as

$$u(x,t) = x + t \quad (19)$$

This is same as the exact solution given in [13].

3.2. Example 2. Let us take $m = -1$ in equation (1), we get

$$\frac{\partial u}{\partial t} = \frac{\partial}{\partial x}\left((u)^{-1}\frac{\partial u}{\partial x}\right) \quad (20)$$

With initial condition as $u(x,0) = \frac{1}{x}$

Exact solution of this equation is

$$u(x,t) = \frac{1}{x-t} \quad (21)$$

3.2.1. Homotopy perturbation transform method

Using HPTM we can find solution by applying Laplace transform on both side of equation (20) subject to the initial condition

$$L\left[\frac{\partial u}{\partial t}\right] = L\left[\left(u^{-1}\right)\left(\frac{\partial^2 u}{\partial x^2}\right)\right] - L\left[\left(u^{-2}\right)\left(\frac{\partial u}{\partial x}\right)^2\right] \quad (22)$$

This can be written as

$$\left[su(x,s) - u(x,0)\right] = L\left[\left(u^{-1}\right)\left(\frac{\partial^2 u}{\partial x^2}\right)\right] - L\left[\left(u^{-2}\right)\left(\frac{\partial u}{\partial x}\right)^2\right] \quad (23)$$

On applying the above specified initial condition we get

$$su(x,s) - \left(\frac{1}{x}\right) = L\left[\left(u^{-1}\right)\left(\frac{\partial^2 u}{\partial x^2}\right)\right] - L\left[\left(u^{-2}\right)\left(\frac{\partial u}{\partial x}\right)^2\right] \quad (24)$$

$$u(x,s) = \frac{1}{s}\left(\frac{1}{x}\right) + \frac{1}{s}L\left[\left(u^{-1}\right)\left(\frac{\partial^2 u}{\partial x^2}\right)\right] - \frac{1}{s}L\left[\left(u^{-2}\right)\left(\frac{\partial u}{\partial x}\right)^2\right] \quad (25)$$

Taking Inverse Laplace Transform on both sides we get

$$L^{-1}\left[u(x,s)\right] = L^{-1}\left[\frac{1}{s}L\left[\left(u^{-1}\right)\left(\frac{\partial^2 u}{\partial x^2}\right)\right]\right] - L^{-1}\left[\frac{1}{s}L\left[\left(u^{-2}\right)\left(\frac{\partial u}{\partial x}\right)^2\right]\right] \quad (26)$$

$$u(x,t) = L^{-1}\left[\frac{1}{s}L\left[\left(u^{-1}\right)\left(\frac{\partial^2 u}{\partial x^2}\right)\right]\right] - L^{-1}\left[\frac{1}{s}L\left[\left(u^{-2}\right)\left(\frac{\partial u}{\partial x}\right)^2\right]\right] \quad (27)$$

Now we apply the homotopy perturbation method in the form

$$u(x,t)=\sum_{n=0}^{\infty}p^{n}\left(u_{n}(x,t)\right) \quad (28)$$

Using Binomial expansion and He's Approximation, equation (26) reduces to

$$\sum_{n=0}^{\infty}p^{n}\left(u_{n}(x,t)\right)=L^{-1}\left[\frac{1}{s}L\left[\left(\left(\sum_{n=0}^{\infty}p^{n}\left(u_{n}(x,t)\right)\right)^{-1}\right)\left(\left(\sum_{n=0}^{\infty}p^{n}\left(u_{n}(x,t)\right)\right)_{xx}\right)\right]\right]$$

$$-L^{-1}\left[\frac{1}{s}L\left[\left(\left(\sum_{n=0}^{\infty}p^{n}\left(u_{n}(x,t)\right)\right)^{-2}\right)\left(\left(\sum_{n=0}^{\infty}p^{n}\left(u_{n}(x,t)\right)\right)_{x}\right)^{2}\right]\right] \quad (29)$$

This can be written in expanded form as

$$u_{0}+pu_{1}+p^{2}u_{2}+\ldots=\left(\frac{1}{x}\right)+pL^{-1}\left[\frac{1}{s}L\left[\left(\left(u_{0}+pu_{1}+p^{2}u_{2}+\ldots\right)\right)^{-1}\left(\frac{\partial^{2}u_{0}}{\partial x^{2}}+p\frac{\partial^{2}u_{1}}{\partial x^{2}}+p^{2}\frac{\partial^{2}u_{2}}{\partial x^{2}}+\ldots\right)\right]\right]$$

$$-pL^{-1}\left[\frac{1}{s}L\left[\left(\left(u_{0}+pu_{1}+p^{2}u_{2}+\ldots\right)\right)^{-2}\left(\left(\frac{\partial u_{0}}{\partial x}+p\frac{\partial u_{1}}{\partial x}+p^{2}\frac{\partial u_{2}}{\partial x}+\ldots\right)^{2}\right)\right]\right] \quad (30)$$

Comparing the coefficient of various power of p, we get

$$p^{0}:u_{0}(x,t)=\frac{1}{x}$$

$$p^{1}:u_{1}(x,t)=L^{-1}\left[\frac{1}{s}L\left[(u_{0})^{-1}\left(\frac{\partial^{2}u_{0}}{\partial x^{2}}\right)\right]\right]-L^{-1}\left[\frac{1}{s}L\left[\left((u_{0})^{-2}\left(\frac{\partial u_{0}}{\partial x}\right)^{2}\right)\right]\right] \quad (31)$$

$$p^{2}:u_{2}(x,t)=L^{-1}\left[\frac{1}{s}L\left[(u_{0})^{-1}\left(\frac{\partial^{2}u_{1}}{\partial x^{2}}-\frac{\partial^{2}u_{0}}{\partial x^{2}}\left(\frac{u_{1}}{u_{0}}\right)\right)\right]\right]-L^{-1}\left[\frac{1}{s}L(u_{0})^{-2}\left(2\left(\frac{\partial u_{0}}{\partial x}\right)\left(\frac{\partial u_{1}}{\partial x}\right)-2\left(\frac{\partial u_{0}}{\partial x}\right)^{2}\left(\frac{u_{1}}{u_{0}}\right)\right)\right]$$

Proceeding in similar manner we can obtain further values, substituting above values in equation (11) we get solution in the form of a series

$$u(x,t)=\frac{1}{x}+\frac{t}{x^{2}}+\frac{t^{2}}{x^{3}}+\frac{t^{3}}{x^{4}}+\ldots \quad (32)$$

Which is the exact solution obtained in (21) in the closed form.

3.3. Example. Let us take $m=-4/3$, equation (1) becomes

$$\frac{\partial u}{\partial t}=\frac{\partial}{\partial x}\left(u^{-4/3}\frac{\partial u}{\partial x}\right) \quad (33)$$

The exact solution to Eq. (33) is given by [14]

$$u(x,t)=(2x-3t)^{-3/4} \quad (34)$$

3.3.1. Homotopyperturbation transform method

Applying the same procedure again on (33) subject to the initial condition

$$u(x,0) = (2x)^{-3/4} \quad (35)$$

We get,

$$p^0 : u_0(x,t) = (2x)^{-3/4}$$

$$p^1 : u_1(x,t) = L^{-1}\left[\frac{1}{s}L\left[(u_0)^{-4/3}\left(\frac{\partial^2 u_0}{\partial x^2}\right)\right]\right] - L^{-1}\left[\frac{1}{s}L\left[\left(\frac{4}{3}\right)\left((u_0)^{-7/3}\left(\frac{\partial u_0}{\partial x}\right)^2\right)\right]\right] \quad (36)$$

$$p^2 : u_2(x,t) = L^{-1}\left[\frac{1}{s}L\left[(u_0)^{-4/3}\left(\frac{\partial^2 u_1}{\partial x^2} - \left(\frac{4}{3}\right)\frac{\partial^2 u_0}{\partial x^2}\left(\frac{u_1}{u_0}\right)\right)\right]\right]$$

$$-L^{-1}\left[\frac{1}{s}L\left[\left(\frac{4}{3}\right)(u_0)^{-7/3}\left(2\left(\frac{\partial u_0}{\partial x}\right)\left(\frac{\partial u_1}{\partial x}\right) - \frac{7}{3}\left(\frac{\partial u_0}{\partial x}\right)^2\left(\frac{u_1}{u_0}\right)\right)\right]\right]$$

On solving above we get values as $u_0 = (2x)^{-3/4}$, $u_1 = 9\times 2^{-15/4}\times x^{-7/4}\times t$, $u_2 = 189\times 2^{-31/4}\times x^{-11/4}\times t^2$ and so on. Substituting these terms in Eq. (11), one obtains

$$u(x,t) = u_0(x,t) + u_1(x,t) + u_2(x,t) + \ldots$$

$$u(x,t) = (2x)^{-3/4} + 9\times 2^{-15/4}x^{-7/4}t + 189\times 2^{-31/4}x^{-11/4}t^2 + \ldots \quad (37)$$

This gives the exact solution obtained in Eq. (34) in the closed form.

4. Comparing the HPTM results with the exact solution

The approximate and plotted results of the example 1 are required to obtain accurate solution. Both the exact solutions and the approximate solutions are plotted in Figs.4.2-4.5 and only few terms are required to obtain accurate solution.

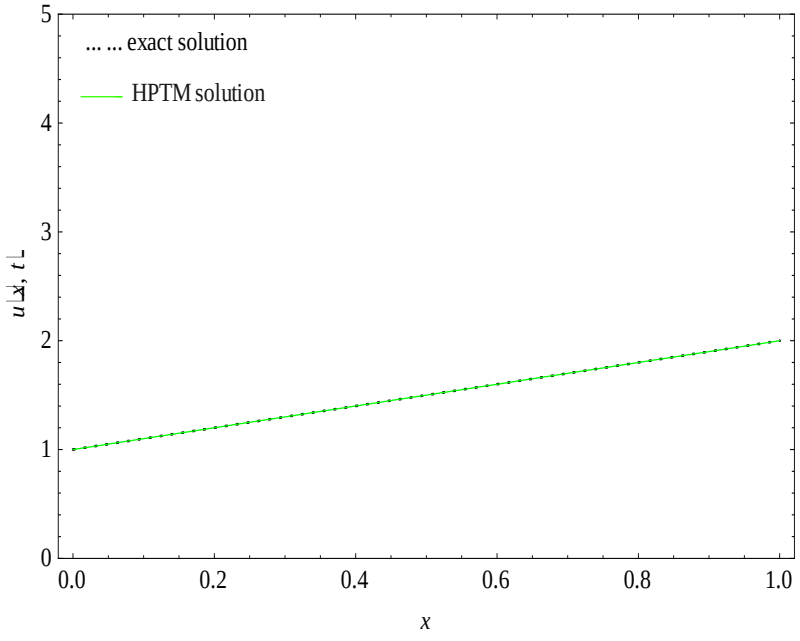


Fig.4.1.The comparison of the exact solution and HPTM solution for example1 at $t = 1$

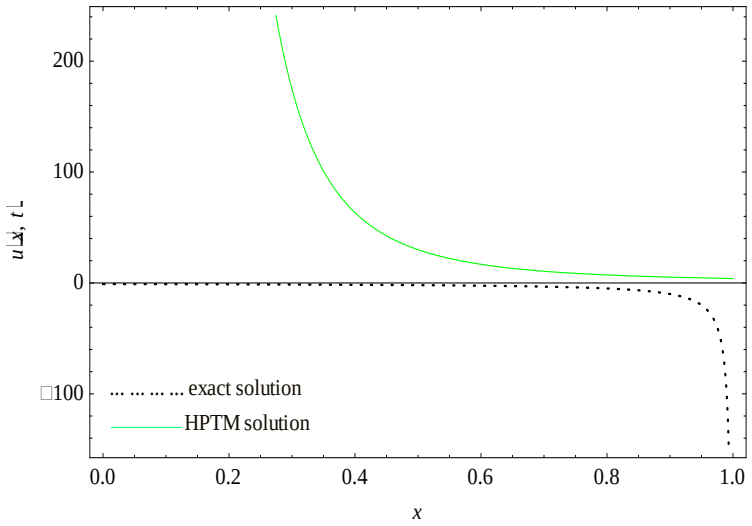


Fig.4.2.The comparison of the exact solution and the 3th order HPTMsolutionfor example 2 at $t = 1$

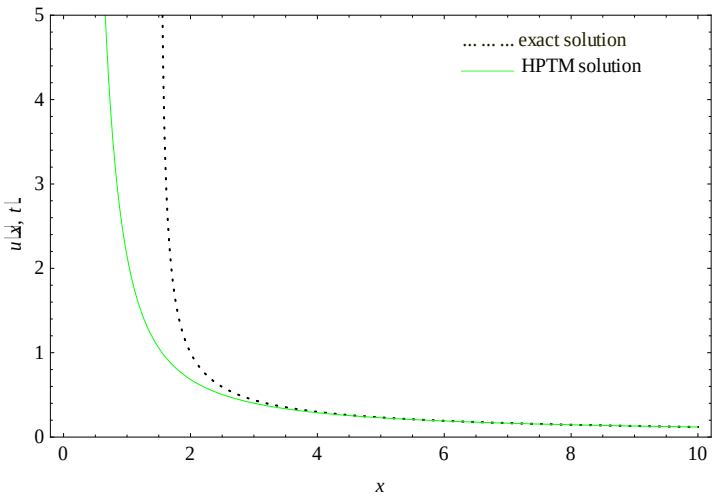
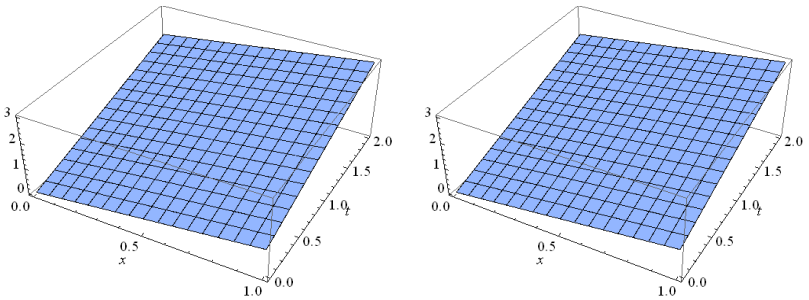
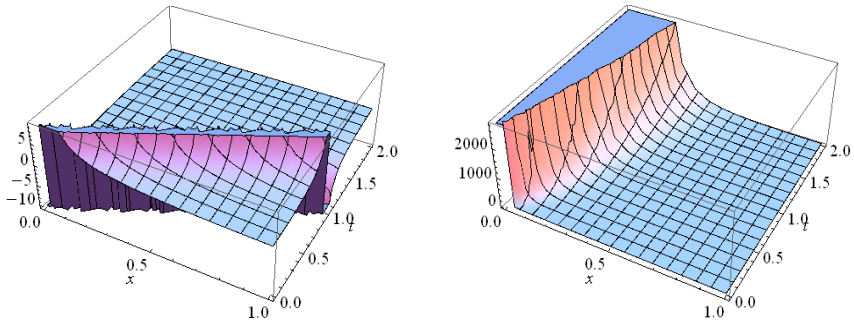


Fig.4.3.The comparison of the exact solution and the 2thorderHPTM solution for example 3 at $t = 1$



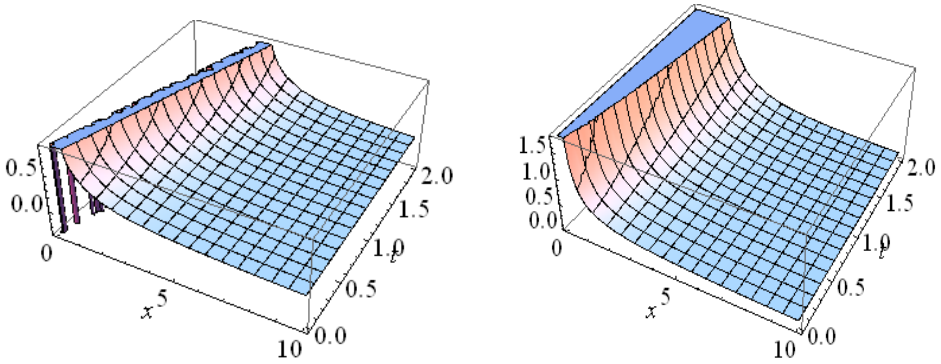
a. Exact solution b.HPTM solution

Fig.4.4.Comparison between the exact solution and HPTM solution of $u(x,t)$ for $m = 1$



a.Exact solution b.HPTM solution

Fig.4.5. Comparison between the exact solution and the HPTM solution of $u(x,t)$ for $m = -1$



a.Exact solution b.HPTM solution

Fig.4.6. Comparison between the exact solution and the HPTM solution of $u(x,t)$ for $m = -4/3$

4. Conclusion

In this paper, the solutions for nonlinear diffusion equation obtained with different powers of m by the homotopyperturbation transform method are an infinite power series for appropriate initial condition, which are the exact solution in the closed form. The results (see Figs.4.1-4.5) show accuracy between HPTM solution and exact solution for different powers of m because in many cases an exact solution in a rapidly convergent sequence with elegantly computed terms. Finally, we conclude that the nonlinear problems have the accurate solution.

Acknowledgments: Theauthors are grateful to anonymous referees for their constructive comments and suggestions.

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American Journal of Engineering Research (AJER)
e-ISSN : 2320-0847 p-ISSN : 2320-0936
Volume-3, Issue-9, pp-233-240
www.ajer.org
Research Paper Open Access

Cloud Computing with Open Source Tool :OpenStack

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ABSTRACT: *OpenStack is a especially scalable open source cloud operating system that is a global alliance of developers and cloud computing technologists producing the ubiquitous open source cloud computing platform for public and private clouds. OpenStack provides series of interrelated projects delivering various components for a cloud infrastructure solution as well as controls large pools of storage, compute and networking resources throughout a datacenter that all managed through a Dashboard(Horizon) that gives administrators control while empowering their users to provision resources through a web interface.In this paper, we present a overview of Cloud Computing Platform such as, Openstack, Eucalyptus ,CloudStack and Opennebula which is open source software, cloud computing layered model, components of OpenStack, architecture of OpenStack. The aim of this paper is to show mainly importance of OpenStack as a Cloud provider and its installation.*

KEYWORDS: *Cloud Computing, OpenStack ,Eucalyptus, cloudStack , Open Nebula*

I. INTRODUCTION

Cloud computing is relatively a new concept for which the resources are dynamically extended, virtualized as well as provided as a service on the Internet, it also allow providers to give users access to a virtually unlimited number of resources i-e outsourcing of resources[1]. OpenStack was founded by NASA and Rackspace Hosting which is rapidly grown to be a global software community of developers collaborating on a standard and massively scalable open-source cloud operating system. Cloud computing is a quite new concept that brings together all technologies (Web services, virtualization, service oriented architecture, grid computing, etc.) and business models used to deliver IT capabilities (software, platforms, hardware) as a service request, scalable and elastic. OpenStack is an industry initiative based on a global collaboration of developers and cloud computing technologists producing the open standard cloud computing operating system for both public and private clouds.

II. CLOUD COMPUTING

Cloud Computing [5] is a modern computing paradigm that providing IT infrastructure and it is very essential requirement for the IT companies. Cloud Computing providing essential service i.e. infrastructure as a service (IaaS), network as a service (NaaS), platform as a service (PaaS), software as a service (SaaS). Cloud computing is a model for enabling ubiquitous, on-demand network access to a shared pool of configurable computing resources such as network, servers, storage, applications, and services that can be rapidly provisioned and released with minimal management effort. Cloud Clients Can access and use the services of cloud applications using browsers, mobile devices, while all the data as well as software is stored on servers at a remote location, which are also used to perform all the heavy duty processing.

Infrastructure as a service (IaaS), is the most basic and essential cloud service model under which virtual machines, load balancers, raw block storage, firewalls and networking services are provided. In The platform as a service model, a computing platform including APIs, operating system, development environments, programming language execution environment and web server are typically provided. But In the software as a service model, cloud providers install and operate application software in the cloud.Overall, a cloud computing layered model is very important as well as main aims to provide benefits in terms of lesser up-front investment in infrastructure during deployment, higher scalability, lower operating costs, ease of access through the Web, reduced business risks and maintenance expenses.

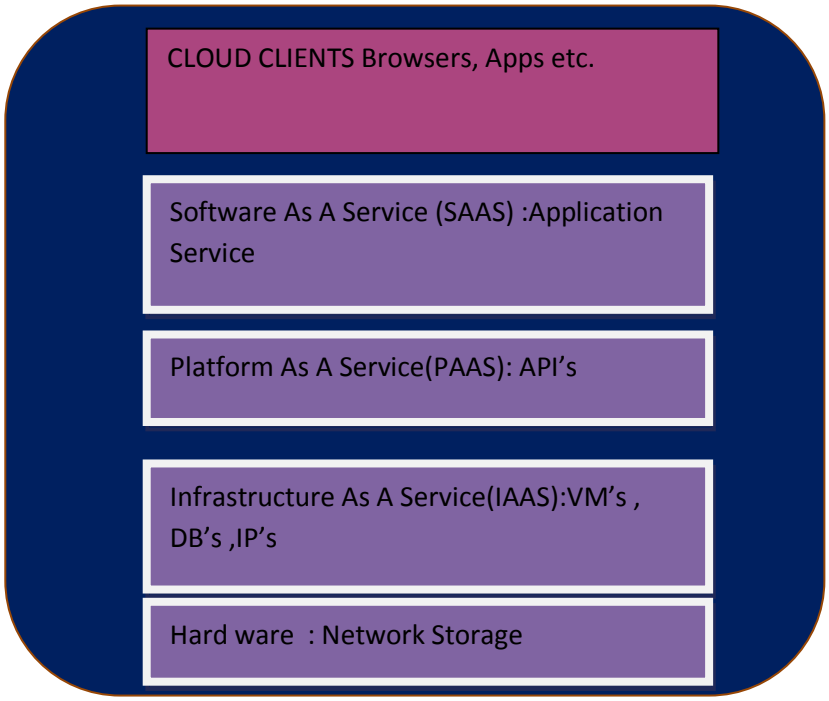


Fig 1. The Cloud-computing layered model

III. OPEN SOURCE CLOUD PLATFORM

A. OpenStack : OpenStack [3,5] is the fastest growing free open source software was announced in July 2010, but initial contributes are NASA and Rackspace. Rackspace contributed their "Cloud Files" platform (code) while NASA contributed their "Nebula" platform (code). OpenStack open source software is a collection of open source software project that cloud computing technologist can use to setup and run their cloud compute and storage infrastructure. OpenStack provides an Infrastructure-as-a-Service (IaaS) solution through a variety of complemental services. Each service offers an application programming interface (API) that facilitates this integration. Dashboard Service project name Horizon Provides a web-based self-service portal to interact with underlying OpenStack services, such as launching an instance, assigning IP ad-dresses and configuring access controls. Compute service project name Nova Manages the lifecycle of compute instances in an OpenStack environment. Responsibilities include spawning, scheduling and decommis-sioning of virtual machines on demand. Networking service project name Neutron Enables Network-Connectivity-as-a-Service for other OpenStack services, such as OpenStack Compute. Provides an API for users to define networks and the attachments into them. Has a pluggable architec- ture that supports many popular networking vendors and technolo-gies. Object Storage project name Swift Stores and retrieves arbitrary unstructured data objects via a RESTful,age HTTP based API. It is highly fault tolerant with its data replication and scale out architecture. Its implementation is not like a file server with mountable directories.

Block Storage service project name Cinder Provides persistent block storage to running instances. Its pluggable driver architecture facilitates the creation and management of block storage devices. Identity service project name Keystone Provides an authentication and authorization service for other OpenStack services. Provides a catalog of endpoints for all OpenStack services. Image Service project name Glance Stores and retrieves virtual machine disk images. OpenStack Compute makes use of this during instance provisioning. Telemetry service project name Ceilometer Monitors and meters the OpenStack cloud for billing, enchmarking,scalability, and statistical purposes. Orchestration service project name Heat Orchestrates multiple composite cloud applications by using either the native HOT template format or the AWS CloudFormation template format,through both an OpenStack-native REST API and a CloudFor-mation-compatible Query API. Database Service project name Trove Provides scalable and reliable Cloud Database-as-a-Service functionality for both relational and non-relational database engines.

B. Eucalyptus : EUCALYPTUS[3,5] is the acronym for Elastic Utility Computing Architecture for Linking Your Program to Useful System, which is an open source private cloud software for building private or hybrid cloud resources for compute, network, and storage that are compatible with Amazon Web Service (AWS) APIs**.** It was developed by University of California-Santa Barbara for Cloud Computing to implement Infrastructure as a Service (IaaS). Eucalyptus [3] provide an Elastic Compute Cloud (EC2) -compatible cloud Computing Platform and Simple Storage Service (S3)-compatible Cloud Storage. Eucalyptus has some high-level components such as Cloud Controller (CLC), Cluster Controller (CC), Storage Controller (SC), and Node Controller (NC). The main benefits to use this open source software for private clouds which provide highly efficient, scalability, organization agility.

C. CloudStack : CloudStack,[5] initially developed by Cloud.com, it was purchased by Citrix then later on released into the Apache Incubator program. The first stable version of CloudStack was released in 2013 and in this time governed by the Apache Software Foundation and supported by Citrix. CloudStack support some commendable features such as storage independent compute, new security features, Smooth Deployment, Scalability, Multi Hypervisor support, Detailed Documentation and Interactive Web UI. **CloudStack's followed monolithic**
architecture which posed some challenges one of them being reduced installation flexibility.

D. OpenNebula : OpenNebula [3,5,6] was first established as a research project back in 2005 by Ignacio M. Liorente and Ruben S. Montero, which is used by many enterprises as an open, flexible alternative to vCloud on their VMware-based data center. OpenNebula is primarily used as a virtualization tool to manage virtualized infrastructure in the data center, which is usually referred as private cloud and supports hybrid cloud to combine local infrastructure with public cloud-based infrastructure, enabling highly scalable hosting environments. OpenNebula cloud infrastructure provide users with an elastic platform for fast delivery and scalability of services and also support Public cloud by providing cloud interfaces to expose its functionality for virtual machine, storage and network management.

IV. OPENSTACK

OpenStack [4] is a set of software tools for building and managing cloud computing platforms for public and private clouds as well as it is a collection of open source software projects which provides an Infrastructure-as-a-Service (IaaS) solution through a set of interrelated services. In July 2010 NASA and Rackspace Hosting combindly launched an open-source cloud-software initiative which is known as OpenStack. OpenStack [3] code came from NASA's Nebula platform and from Rackspace's Cloud Files platform. OpenStack, project is an open source cloud computing platform which provide the ubiquitous open source cloud computing platform for public as well as private clouds, also it is free and open-source software released under the terms of the Apache License. The cloud is mainly providing computing features for end users in a remote environment, where the actual software runs as a service on reliable, scalable servers rather than on each end users computer. OpenStack give facilities for deploy virtual machines (VMs) and other instances which handle different tasks for managing a cloud environment. It provides horizontal scaling very easy, which means that tasks which benefit from running concurrently can easily serve more as well as less users on the fly by just spinning up more instances[2].

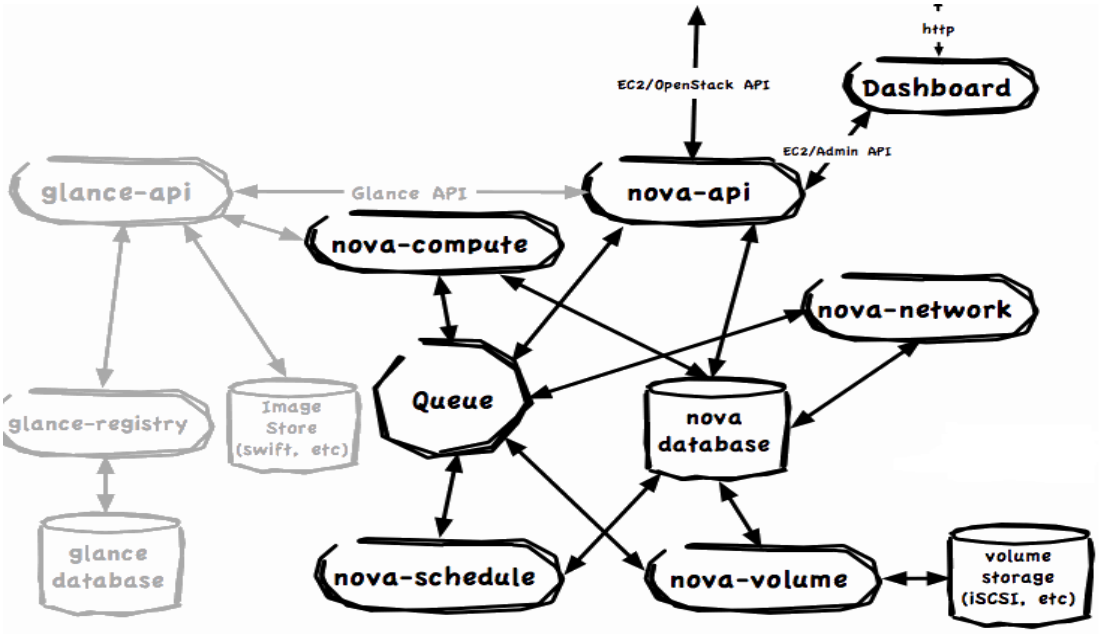


Fig 2. OpenStack Architecture

Components of OpenStack:

- Compute (Nova): OpenStack Compute (Nova) is a cloud computing fabric controller, which is used for deploying and managing large numbers of virtual machines and other instances to handle computing tasks.

- Object Storage (Swift): OpenStack Object Storage (Swift) is a scalable redundant storage system for objects and files. Objects as well as files are written to multiple disk drives spread throughout servers in the data center, OpenStack software only responsible for ensuring data replication and integrity

  across the cluster.

- Block Storage (Cinder): OpenStack Block Storage (Cinder) is a block storage component, which is more analogous to the traditional notion of a computer being able to access specific locations on a disk drive as well as it provides persistent block-level storage devices for use with OpenStack compute instances. In OpenStack, the block storage system manages the creation, attaching, detaching of the block devices to servers.

- Networking (Neutron): OpenStack Networking (Neutron) provides the networking capability for OpenStack and it is a system for managing networks and IP addresses easily, quickly and efficiently.

- Dashboard (Horizon): OpenStack Dashboard (Horizon) is the dashboard behind OpenStack which provides administrators and users a graphical interface to access, provision and automate cloud-based resources.

- Identity Service (Keystone): OpenStack Identity (Keystone) provides identity services for OpenStack or it is a central directory of users mapped to the OpenStack services they can access. It provides multiple means of access, and acts as a common authentication system across the cloud operating system and can integrate with existing backend directory services like LDAP.

- Image Service (Glance): OpenStack Image Service (Glance) provides image services to OpenStack, discovery, registration and delivery services for disk and server images, it also allows these images to be used as templates when deploying new virtual machine instances.

- Telemetry (Ceilometer): OpenStack Telemetry Service (Ceilometer) provides telemetry services, which allow the cloud to provide billing services to individual users of the cloud, it keeps a verifiable count of **each user's system usage of each of the various components of an OpenStack cloud.**

- Orchestration (Heat): OpenStack Orchestration (Heat) is a service which allows developers to store the requirements of a cloud application in a file that defines what resources are necessary for that application.
- Database (Trove): OpenStack (Trove) is a database as a service which provides relational and non-relational database engines.

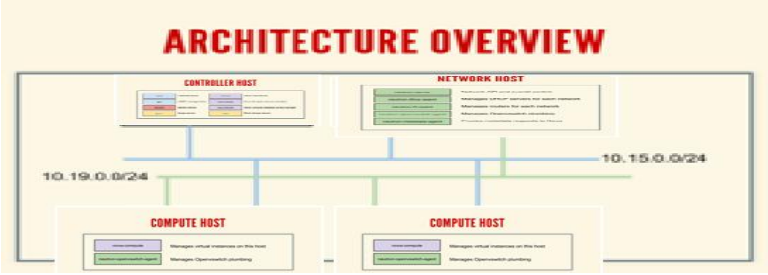
V. RDO HANGOUT: MULTINODE OPENSTACK WITH PACKSTACK

A multinode OpenStack install using packstack contains **One controller, One network hostand Two compute hosts. Following open** tools are needed for installation **CentOS 6.5 ,RDO Havana,Packstack**.

What is packstack?

A command-line tool for automating the deployment of simple OpenStack clouds.

- Single host (--allinone) or multinode
- Proof of Concept ("PoC") deployments



Above figure describes architectural overview of openstack. It contains Controller node, Network host and two compute hosts. In controller host OpenStack provides an Infrastructure as a Service (IaaS) solution through a set of interrelated services. Each service offers an application programming interface (API) that facilitates this integration. Depending on your needs, you can install some or all services. The following table describes the OpenStack services that make up the OpenStack architecture:

Table 1.1. OpenStack services

Service	Project name	Description
Dashboard	Horizon	Provides a web-based self-service portal to interact with underlying OpenStack services, such as launching an instance, assigning IP addresses and configuring access controls.
Compute	Nova	Manages the lifecycle of compute instances in an OpenStack environment. Responsibilities include spawning, scheduling and decomissioning of machines on demand.
Networking	Neutron	Enables network connectivity as a service for other OpenStack services, such as OpenStack Compute. Provides an API for users to define networks and the attachments into them. Has a pluggable architecture that supports many popular networking vendors and technologies.
Storage		
Object Storage	Swift	Stores and retrieves arbitrary unstructured data objects via a RESTful, HTTP based API. It is highly fault tolerant with its data replication and scale out architecture. Its implementation is not like a file server with mountable directories.
Block Storage	Cinder	Provides persistent block storage to running instances. Its pluggable driver architecture facilitates the creation and management of block storage devices.
Shared services		
Identity Service	Keystone	Provides an authentication and authorization service for other OpenStack services. Provides a catalog of endpoints for all OpenStack services.
Image Service	Glance	Stores and retrieves virtual machine disk images. OpenStack Compute makes use of this during instance provisioning.
Telemetry	Ceilometer	Monitors and meters the OpenStack cloud for billing, benchmarking, scalability, and statistical purposes.
Higher-level services		
Orchestration	Heat	Orchestrates multiple composite cloud applications by using either the native HOT template format or the AWS CloudFormation template format, through both an OpenStack-native REST API and a CloudFormation-compatible Query API.

Getting started
Set up ssh
Make sure that you can ssh as root to all your hosts from wherever you're running packstack.
Install packstack
Make the RDO repositories available:
yum install -y http://rdo.fedorapeople.org/rdo-release.rpm
And install packstack:
yum -y install openstack-packstack

The answers file

You can set all sorts of parameters on the command line...

```
packstack --allinone --os-quantum-install=y --provision-demo=n \
  --provision-all-in-one-ovs-bridge=n
```

...but I like to generate an "answers" file and edit it:

```
# packstack --gen-answer-file packstack-answers.txt
```

Run packstack

```
# packstack --answer-file packstack-answers.txt
Welcome to Installer setup utility
Packstack changed given value  to required value /root/.ssh/id_rsa.pub

Installing:
Clean Up...                                  [ DONE ]
Setting up ssh keys...                       [ DONE ]
Discovering hosts' details...                [ DONE ]
Adding pre install manifest entries...       [ DONE ]
Adding MySQL manifest entries...             [ DONE ]
Adding QPID manifest entries...              [ DONE ]
Adding Keystone manifest entries...          [ DONE ]
Adding Glance Keystone manifest entries... [ DONE ]
Adding Glance manifest entries...            [ DONE ]
Installing dependencies for Cinder...        [ DONE ]
Adding Cinder Keystone manifest entries... [ DONE ]
```

What just happened?
- Lots of packages installed
- Configuration in /etc/{nova,glance,cinder,neutron,...}/
- Firewall rules for all services
- MySQL users and databases created
- Services started

Post-install Configuration

Fix Horizon
You may need to fix ALLOWED_HOSTS:

```
# sed -i '/^ALLOWED_HOSTS/ s/=.*/= [ "*" ]/' \
  /etc/openstack-dashboard/local_settings
# service httpd restart
```
Source your admin credentials:

```
# . /root/keystonerc_admin
```

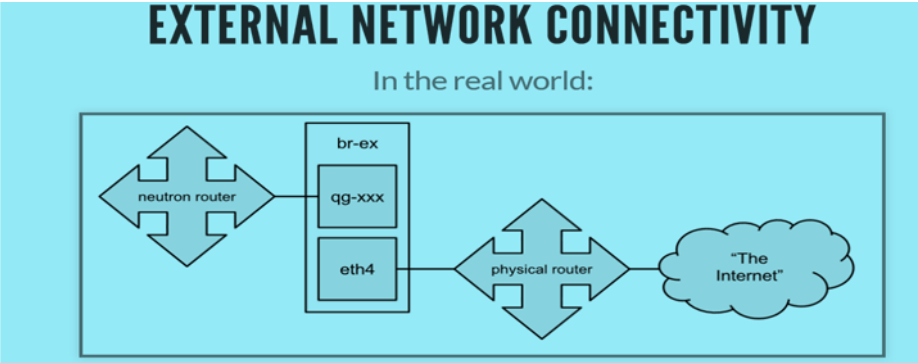
Create a disk image:
```
glance image-create \
  --copy-from http://download.cirros-cloud.net/0.3.1/cirros-0.3.1-x86_64-disk.img \
  --is-public true \
  --container-format bare \
  --disk-format qcow2 \
  --name cirros
```
Create external network:
```
# neutron net-create external --router:external=True
# neutron subnet-create --disable-dhcp external 172.16.13.0/24
```
Create a flavor for testing:
```
# nova flavor-create m1.nano auto 128 1 1
```
This flavor consumes minimal memory and disk so it is better than the default flavors for testing in constrained environments.
Create a non-admin user:
```
# keystone tenant-create --name demo
# keystone user-create --name demo --tenant demo --pass demo
```
And store the credentials in /root/keystonerc_demo:
```
export OS_USERNAME=demo
export OS_TENANT_NAME=demo
export OS_PASSWORD=demo
export OS_AUTH_URL=http://192.168.2.131:35357/v2.0/
export PS1='[\u@\h \W(keystone_demo)]\$ '
```
Switch credentials
From this point on we're going to be operating as the "demo" user:
```
# . /root/keystonerc_demo
```

Create an ssh keypair
Create a keypair:
```
# ssh-keygen -t rsa -b 2048 -N '' -f id_rsa_demo
```

Create tenant networks
Create a private network:
```
# neutron net-create net0
# neutron subnet-create --name net0-subnet0 \
  --dns-nameserver 8.8.8.8 net0 10.0.0.0/24
```

Create security rules
Make sure we allow ICMP and SSH traffic to instances:
```
# neutron security-group-rule-create --protocol icmp default
# neutron security-group-rule-create --protocol tcp \
  --port-range-min 22 --port-range-max 22 default
```

Booting an instance
We'll need the UUID for network net0 that we created in the previous step:
```
# nova boot --poll --flavor m1.nano --image cirros \
  --nic net-id=77cafb07-a793-41cb-8a96-58d04408e10d \
  --key-name demo test0
```
Create and assign a floating ip
Allocate a floating ip address from the *external* network:
```
# nova floating-ip-create external
+-------------+-------------+----------+----------+
| Ip          | Instance Id | Fixed Ip | Pool     |
+-------------+-------------+----------+----------+
| 172.16.13.3 | None        | None     | external |
+-------------+-------------+----------+----------+
```
Assign it to the new instance:
```
# nova add-floating-ip test0 172.16.13.3
```



VI. CONCLUSIONS

This paper compares the four most popular and commonly used open source software which are OpenStack,Eucalyptus CloudStack, OpenNebula and; these all open source software allow users to choose better services according to their requirement. OpenStack is an open
source software used for designed to allow researchers and administrators to deploy infrastructure as a service (IaaS) and provide tools for creating and managing virtual machines (VMs) on top of existing resources.

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American Journal of Engineering Research (AJER)
e-ISSN : 2320-0847 p-ISSN : 2320-0936
Volume-3, Issue-9, pp-241-250
www.ajer.org
Research Paper Open Access

Performance evaluation of stabilized GSB mix- A quantitative study

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ABSTRACT : *In general the life and strength of pavements depends on the quality GSB layer. GSB layer is usually provided over subgrade and is influential in distribution of stresses within pavement. In general a GSB layer composes blended aggregates, crushed bricks. The strength of GSB is dependent on the mix proprtions adopted in its preparation. In view of its importance in pavements MORT&H has stipulated guide lines in preparing and grading a GSB layer considering CBR as basis. During recent past improvememt of strength of GSB stabilized with waste materials is gaining popularity. Few of the waste materials adoptable for GSB being granulated blast furnace slag(GBFS) and waste rubber tyre chips(WRT). The utlilization of waste materials for improvement not only reduces costly natural aggregate quantity but also helps in bulk consumption of waste. In the present study an attempt is made to study the performance improvement of various GSB mix stabilized with GBFS and waste rubber tyre chips. The filler material used being stabilized locally available soils with Rice husk ash (RHA) satisfying requirements of MORTH. The results indicated that the strength of GSB can be improved with admixtures. However the improvement is limited owing to the properties of admixture itself and the content of admixture in the stabilized mix apart from test conditions. GBFS has proven to be high performing over waste rubber tyre chips. An improvement up to 1.4 times is observed with GBFS when compared with WRT. Further the effect of soaking test conditions is marginal on both the type admixtured soil.*

KEYWORDS : *GBFS, GSB, performance, standard GSB Mix, WRT*

I. INTRODUCTION

Pavements usually require large quantities of material to be used in various layers. The layers of characterized with their strength i.e CBR and their thickness. In majority of pavements sub base and base course layers are constructed using granular material popular as GSB, The Granular sub base layer (GSB) composed of compacted layers made of aggregate or crushed bricks with soil as filler. The strength of this GSB layer has a limitation owing to the material property and gradation. The thickness of this layer is important for gradual transfer of stresses within pavement. In general weaker subgrades needs stronger GSB layer above it. Indian Road congress(IRC) has provided guide lines for minimum thickness of each course which is based on million standard axles(msa), CBR value of GSB and of subgrade. IRC has suggested material to be as filler being soil comprising definite plasticity properties. In view bulk requirements of GSB, to reduce cost and preserve natural materials locally available weak soils as filler and waste material replacing aggregate can be used. (M. A. Utilization of RHA in soil improves index and engineering properties of soil [1,2].The lime clayey soil mixture exhibits higher strength compare to clayey soil fly ash mixture [3]. The influence of fly ash on organic and inorganic clayey soils is different; strength improvement with varying percentage of fly ash for inorganic soils is high compared to organic soils [4]. Influence of waste sand on engineering properties on clayey soils varies with varying percentages and CBR value increased by 20% with the addition of 20% of waste sand [5]. The influence of sand on cohesive soil is significant and with addition of 15% of fine sand strength of soil is doubled [6]. The lab performance studies are comparable with field for stabilized soft subgrade [7]. Studies using waste material has given good response for GSB improvement [8,9,10,11]. The effect of higher temperatures in concrete pavements and hot mix asphalt can be reduced with admixtures [12,13]. Waste Rubber Tyre (WRT) admixture

has also proved its influence in subgrade and subbase and back fills [14,15,16,17].

II. OBJECTIVE AND SCOPE OF PRESENT STUDY

[1] To improve the Index properties of the soil with Rice Husk Ash as an admixture for utilizing as a filler material in GSB mix.
[2] To identify different proportions of admixtures for preparation of standard GSB mix as MORTH norms
[3] Studies on various GSB mix modified using admixtures GBFS and Waste Rubber Tyre chips for engineering properties and optimum dosage of admixture.
[4] Studies on Performance improvement with GBFS and WRT

III. MATERIALS USED AND METHODOLOGY ADOPTED

In this present work, locally available Red soil, Rice husk ash (RHA), Aggregates, Quarry Dust, GBFS and WRT were used. Aggregates of 20 mm size passing (IS sieve) and Quarry Dust were procured from a nearby crusher. Granulated Blast Furnace Slag collected from steel plant, Visakhapatnam, Andhra Pradesh. Waste Rubber Tyre chips are extracted locally from a tyre shredding plant. The methodology adopted is presented in Fig. 1

IV. DETAILS OF SAMPLES AND PREPARATION OF DESIGN MIX

The tests are carried out on admixture modified coarse aggregate (graded) through replacement of coarse aggregate sample with admixtures. In total three types of admixtures are used in study namely, rice husk ash, GBFS and Waste rubber tyre chips. Rice hush ash is used as admixture to soil for preparing filler material and GBFS & rubber tyre chips are for coarse aggregate. Procedures listed by IS specifications and manuals of MORTH specifications for Road and Bridge works are adopted for carrying out tests. The details of IS codes and MORTH manual are listed in References. Tests are conducted on nine (9) types of samples prepared as per MORTH standards by maintaining their gradation using various blending material, admixture and filler. Of the samples five are prepared using GBFS and the remaining using WRT. The sample preparation and testing is carried out in the following phases as i) Soil samples with varying rice husk ash content are tested for their plasticity properties and sample with Liquid limit below 25 and plasticity index below 6 is selected . This sample is later used as filler, ii) The graded aggregate is prepared by blending quarry dust to coarse aggregate. To the aggregate mix thus prepared filler material is added. The composite mixture is tested with varying admixtures namely GBFS and WRT.iii) The blending materials and admixtures are quarry dust varied from 25 to 40 (%), filler from 1 to 6% , GBFS from 0 to 40% and WRT from 0 to 8% respectively. iv) The performance studies are carried out for CBR maintaining optimum conditions of aggregate proportion, GBFS/ WRT and filler content determined through modified proctor test. The cross section of the CBR mould consists of Aggregate mix with the admixtures GBFS and WRT chips have been show in the Fig.2 and Fig.3 and test set up is shown in Fig. 4(a) and (b) respectively.

V. RESULTS AND DISCUSSION

The results are presented in Tables 1 to 7 and Fig 5 to 8. Results are presented through performance ratio as discussed in subsequent headings.

5.1 Details of performance ratio's and their notation.

Performance ratio are computed as follows.

$$R_f = \frac{\text{modified with Admixture}}{\text{unmodified value}} \quad \ldots\ldots\ldots \quad (1)$$

$$R_{fm} = \frac{\text{modified MDD value with Admixture}}{\text{unmodified MDD value}} \quad \ldots\ldots(2)$$

$$R_{fo} = \frac{\text{modified OMC value with Admixture}}{\text{unmodified OMC value}} \quad \ldots\ldots\ldots(3)$$

$$R_{fcu} = \frac{\text{modified CBR unsoaked value with Admixture}}{\text{unmodified CBR unsoaked value}} \quad \ldots\ldots(4)$$

$$R_{fcs} = \frac{\text{modified CBR soaked value with Admixture}}{\text{unmodified CBR soaked value}} \quad \ldots\ldots\ldots(5)$$

Presentation of OMC and MDD Performance Improvement Ratio: Effect of Admixture In the experimental study tests are carried out on admixtures modified aggregate samples for their engineering properties. The Performance improvement ratio for MDD, R_{fm} and OMC, R_{fo} is presented in Table 4 to 5 and from Fig. 5 to 6. It is observed that the effect of admixture on MDD is marginal. Whereas R_{fo} show's a considerable improvement with admixture. This may be due to the increase in absorption by GBFS, Quarry dust and filler combination. The R_{fm} is found to be decreased from 1 to 0.88 . R_{fo} is found to be increased from 1 to 1.99. Similar results are noticed with WRT admixture also. The same is presented in Fig. 6 and Table 5. The R_{fm} is found to be decreased from 1 to 0.86. R_{fo} is found to be increased from 1 to 2.35 with waste rubber tyres.

Presentation of CBR Performance Improvement Ratio: Effect of Admixture.

The Performance improvement ratio for CBR unsoaked, R_{cu} and CBR soaked, R_{fcs} is presented in Table 6 to 7 and from Fig. 7 to 8.

The Variation of R_{fcu} and R_{fcs} with various percentages of admixture is presented in Table 6 and Fig. 7. The trend is similar in soaked and unsoaked performance with admixture. It is observed that the with admixture the CBR performance for both unsoaked and soaked values has been increased upto 20% and later decreased. The increase in CBR is mainly due to the Granulated blast furnace slag possesses cementitious properties by the virtue of hydration. The R_{fcu} is found to be increase by 1 to 1.41 and then decreases, R_{fcs} is found to be increased by 1 to 1.47 and then decreases.The Variation of R_{fcu} and R_{fcs} with various percentages of admixture is presented in Table 7 and Fig. 8. The trend is similar in soaked and unsoaked performance with admixture. It is observed that the with admixture the CBR performance for both unsoaked and soaked values has been increased upto 2% replacement further increment of admixture tends to decrease in the improvement performance this is due to bad interlocking between the graded sample. The R_{fcu} is found to be increased by 1 to 1.05 and then decreases, R_{fcs} is found to be increased by 1 to 1.07 and then decreases. Upon comparison GBFS is more effective than WRT for obtaining improvement in CBR. It is seen that the optimum improvement with GBFS is 1.34 times to that of WRT. Based on the content of GBFS and WRT at optimum Results i.e., 20% and 2% it will be economical to use GBFS than WRT.

VI. CONCLUSIONS

1. Red soil being in abundant quantity can be used as filler for pavements. However due to the limitation in its plasticity properties, can be used in combination with Rice Husk ash. The combined soil has exhibited reduction in plasticity and is satisfying the MORTH standards. An optimum content of 4% rice husk ash has given the desired plasticity required as per MORTH.

2. The influence of Granulated blast furnace slag and waste rubber tyre chips is marginal on MDD and high for OMC. The OMC is found to increase by 1.9 times with GBFS and 2.3 times with WRT as compared with unmodified aggregate. An optimum filler content of 5% with GBFS and 2% with WRT is recommended for best results.

3. It is concluded that the efficacy of GBFS is higher to that of WRT. At optimum conditions CBR increase with GGBS from 40.78% and 46.60% at 20% GBFS content is very high to that with WRT i.e from 4.71% to 7.7% at 2% .

4. From the results on mix proportions, considering economical aspects and preparation of mix, it is concluded that mix of 1:0.43:0.29 &1:0.54:0.46 with GBFS and 1:0.43:0.03 with WRT will be suitable and adoptable as per MORTH specifications for pavements.

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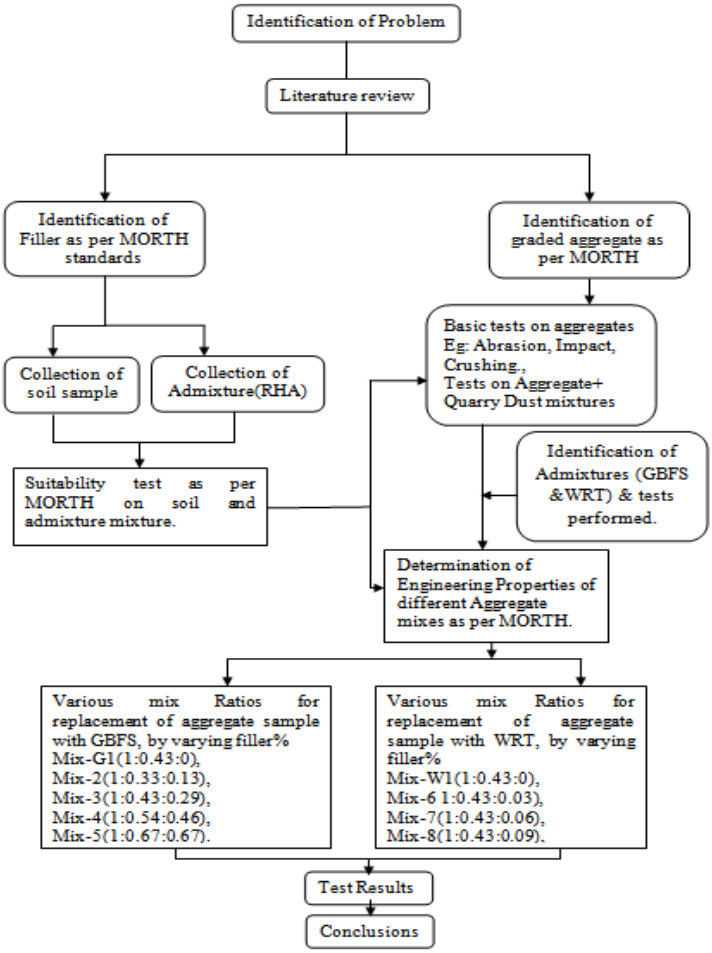

Figure.1 Methodology

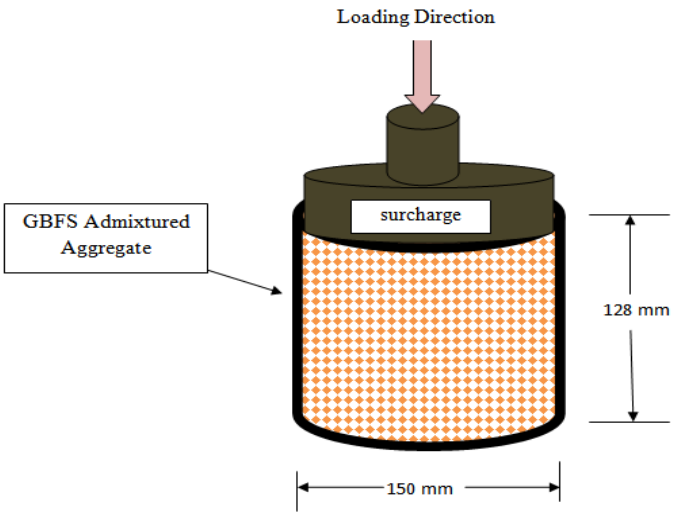

Figure.2 Schematic Cross section of CBR sample with admixture GBFS

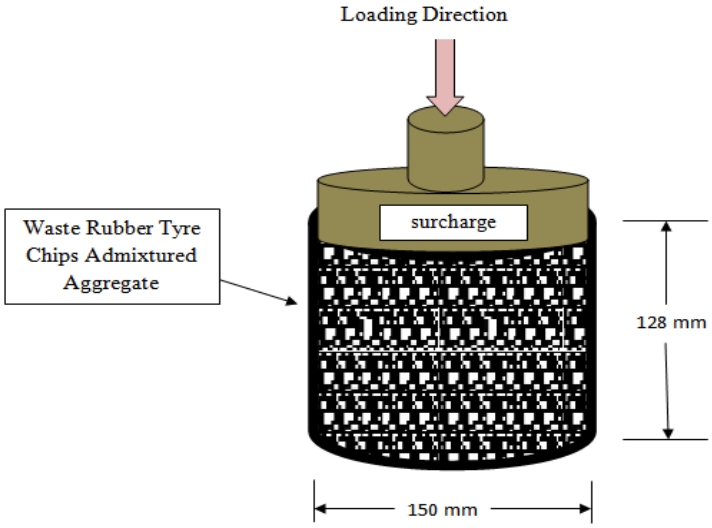

Figure. 3 Cross section of CBR sample with admixture Waste Rubber Tyre Chips

(a) (b)

Figure. 4 (a) Author preparing sample Mix (b) Author performing CBR test

Table-1 Properties of materials

Property	Red Soil	Red Soil+4%RHA	GBFS	WRT	Quarry Dust
Specific Gravity	2.33	2.45	2.38	1.13	2.40
Liquid Limit(%)	28	25	NP	-	NP
Plastic Limit(%)	18.13	21.05	NP	-	NP
Plasticity Index(%)	9.87	3.95	NP	-	NP

Table-2 Details of mix using GBFS admixture according to the MORTH

Sample	Aggregate % (Retained on 4.75mm) & mix proportion	Quarry dust% (Passing 4.75mm) & mix proportion	GBFS %& mix proportion	Filler %	
				Composition	Optimum obtained
S0-4	70 & (1)	30 &(0.43)	0& (0)	2,4,6	4
S10-5	75 & (1)	25 & (0.33)	10& (0.13)	4,5,6	5
S20-5	70 & (1)	30 & (0.43)	20 & (0.29)	3,4,5,6	5
S30-3	65 & (1)	35 & (0.54)	30 & (0.46)	1,2,3,4	3
S40-2	60 & (1)	40 & (0.67)	40 & (0.67)	1,2,3,4	2

Table-3 Details of mix using WRT admixture according to the MORTH

Sample	Aggregate% (Retained on 4.75mm) & mix proportion	Quarry dust% (Passing 4.75mm) & mix proportion	WRT%& mix proportion	Filler%	
				Composition	Optimum obtained
S0-4	70 & (1)	30 & (0.43)	0 & (0)	2,4,6	4
S2-2	70 & (1)	30 & (0.43)	2 & (0.03)	1,2,3,4,5	2
S4-4	70 & (1)	30 & (0.43)	4 & (0.06)	3,4,5	4
S6-4	70 & (1)	30 & (0.43)	6 & (0.09)	3,4,5	4
S8-4	70 & (1)	30 & (0.43)	8 & (0.11)	3,4,5	4

Table-4 MDD & OMC performance improvement ratio with GBFS

Blend Sample Type	R_{fo}	R_{fm}
S0-4	1	1
S10-5	1.32	0.97
S20-5	1.8	0.95
S30-3	1.96	0.94
S40-2	1.99	0.88

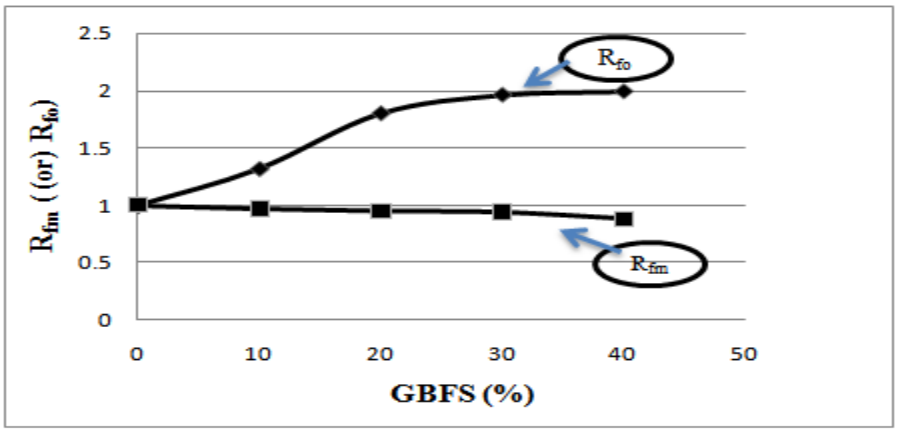

Figure. 5 Performance improvement ratio of MDD & OMC with GBFS

Table-5 MDD & OMC performance improvement ratio with WRT

Blend Sample Type	R_{fo}	R_{fm}
S0-4	1	1
S2-2	1.88	0.93
S4-4	2.03	0.92
S6-4	1.64	0.89
S8-4	2.35	0.86

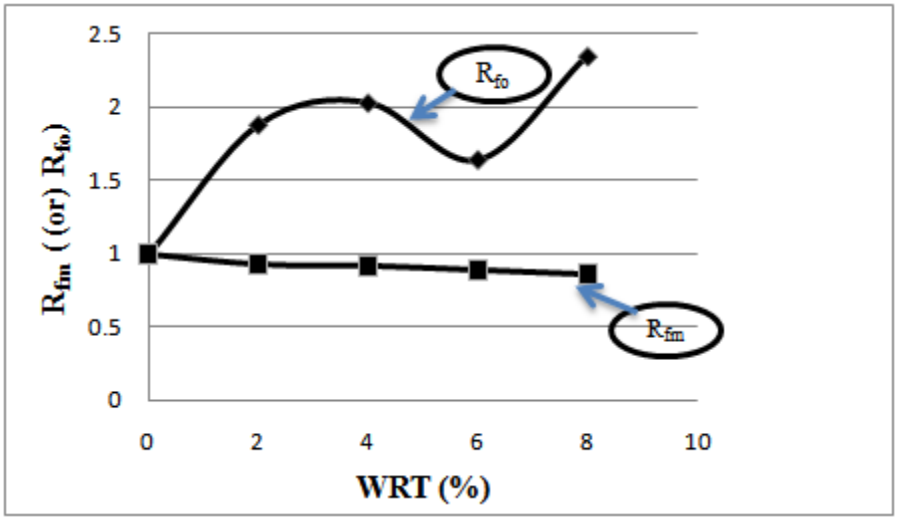

Figure. 6 Performance improvement of MDD & OMC with WRT

Table-6 CBR performance with GBFS in both Unsoaked and Soaked

Blend Sample Type	CBR (%)	
	R_{fcu}	R_{fcs}
S0-4	1	1
S10-5	1.1	1.07
S20-5	1.41	1.47
S30-3	1.29	1.34
S40-2	1.12	1.02

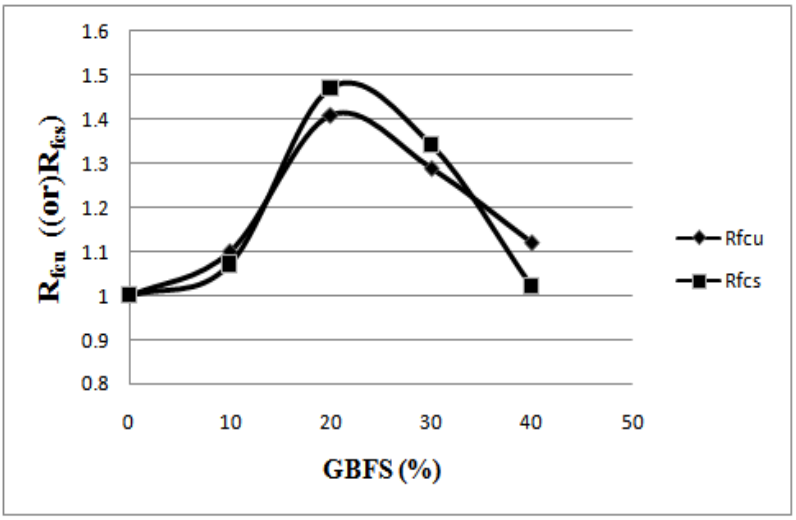

Figure. 7 Performance improvement of CBR with GBFS

Table- 7 CBR performance with WRT in both Unsoaked and Soaked

Blend Sample Type	CBR (%)	
	R_{fcu}	R_{fcs}
S0-4	1	1
S2-2	1.05	1.07
S4-4	0.92	0.91
S6-4	0.59	0.57
S8-4	0.36	0.34

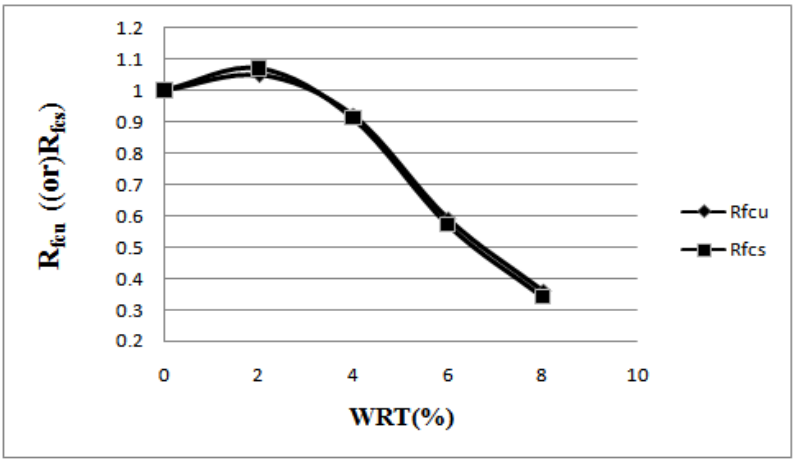

Figure. 8 Performance improvement of CBR with WRT

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American Journal of Engineering Research (AJER)
e-ISSN : 2320-0847 p-ISSN : 2320-0936
Volume-3, Issue-9, pp-251-263
www.ajer.org
Research Paper Open Access

Efficacy of Industrial waste admixture in Improving Engineering Performance of Clayey soil – A quantitative study

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ABSTRACT : *Infrastructure and industrialization serves as a back bone for a country's economy. However due to rapid industrialization there exist a problem in the form of waste accumulation and subsequent problems due to their disposal & effects of waste. In infrastructure development, roads play a major role. In general pavement construction needs bulk quantities of good soil keeping in view of the service and longevity aspects. Due to limitation in availability of good soil, often the cost of projects escalates. An ideal solution lies for reducing project cost, increasing longevity and reduce accumulation of waste shall be through utilization of industrial waste combined with weak soil for pavement construction. Few types of waste materials namely crusher dust, fly ash and Steel slag waste are popular as admixtures in improving weak soils. This paper discusses the performance of admixtures in improving weak soil through mechanical stabilization. Results of tests on index and engineering properties of mechanically stabilized clayey soil with industrial waste admixtures namely, crusher dust, fly ash and steel slag are presented for different admixture contents and test conditions. A comparison is made based on improved performance. It is observed that Steel slag is proven to be effective over other types. From the results optimum content of admixture for a given improvement is suggested.*

KEYWORDS: *Admixtures, Engineering performance, Mechanical stabilization, Subgrade soil*

I. INTRODUCTION

Strength of clayey soil improved with the help of various stabilization techniques like mechanical stabilization, action of reinforcement etc. mechanical stabilization is the process of improving engineering properties of clayey soil treating with industrial waste materials. Around million tons of waste material is produced annually in various industries. Effective utilization of these waste materials brings innovation in mechanical stabilization of soil. Previous studies highlighted two techniques for improving soft subgrade namely, mechanical and with reinforcement. Waste materials from industry and geosynthetics are identified as materials for improving soft subgrade characteristics. Fly ash is being identified as one of the potential admixture [1-4]. Lime clayey soil mixture exhibits higher strength compare to clayey soil fly ash mixture [5]. The influence of fly ash on organic and inorganic clayey soils is different; strength improvement with varying percentage of fly ash for inorganic soils is high compared to organic soils [6].

Recently quarry dust, Steel slag and artificial sand waste obtained from steel plants and quarries has also being identified as stabilizing material. Studies indicated improvement in engineering characteristics [7-15]. Geosynthetics (Geogrids) with high tensile strength used in combination with soil of high compressive strength have been found to be effective in the design of many civil engineering applications. The layer of reinforcement with geosynthetics provided in soil, carry loads thus reducing stresses in soil. Laboratory studies produced successful results in improvement for waste material mix composite systems like soil-fly ash-Geogrid, soil-lime-Geogrid, and soil-pond ash-Geogrid [16]. The field performance of marine clayey soil treated with lime, GBFS and geotextile - clay foundation soil bed has exhibited the justified load carrying capacity in wet season [17, 18]. The performance of clayey silt subgrade can be enhanced using artificial sand. The performance is comparable and similar in field. [19]. In Few complex situations with soft subgrade can be solved by providing stiffer

aggregate layer over soft subgrade and the problem of mixing of subgrade with aggregate can be avoided with separator geotextile provision of stiffer aggregate layer over soft subgrade with geotextile separator improves CBR of composite subgrade [20].

The objective of present study is to use of Fly ash, Steel slag and Quarry dust in bulk quantity for reducing the total cost of construction in addition to providing a solution to an environmental problem. The following objectives are taken up for study.

[1] To study and evaluate few waste materials for their adequacy and bulk utilization through stabilizing a clayey subgrade soil.
[2] To study the effects of stabilization on index and engineering properties of soil using three types of waste materials as admixtures.
[3] To compare and suggest choice of admixture based on their relative influence and optimum content on properties of subgrade soil.
[4] To quantify degree of improvement vis-a vis admixture type and test conditions for utilization as subgrade.

II. DETAILS OF MATERIALS, METHODOLOGY, RANGES OF ADMIXTURES AND TESTS CARRIED OUT

Locally available clayey soils, industrial waste admixtures namely, crusher dust, fly ash and steel slag are used in this present work. Steel slag is obtained from Concast ferro Inc, Dusipeta, Srikakulam district, Andhra Pradesh. The fly ash used in the study is of class-F type obtained from NTPC, Visakhapatnam. The quarry dust was collected from a local quarry. The ranges of admixtures are varied from 0 to 50% w.r.t weight of soil. The outline of work is presented in fig. I

Preparation of samples, details of tests and parameters determined:

Naturally available clayey soils are mixed with admixtures like Quarry dust, Steel slag and Fly ash at varying percentages to the dry weights of soils. Experiments are conducted on the samples blended with these admixtures to determine the index and engineering properties of the modified soils. The following tests are carried out on admixture soil and the parameters determined as

- Index properties (As per IS: 2720 part 5-1987)
- Compaction characteristics (As per IS: 2720 part 8-1987)
- Unconfined compression test (As per IS: 2720 part 10-1991)
- CBR test in Soaked and Unsoaked conditions. (As per IS: 2720 part 16-1987)

The experimental set up is presented in fig. 2 to fig. 4.

III. PRESENTATION OF RESULTS AND DISCUSSION

In the experimental study tests are carried out on admixture modified soil for their index and engineering properties. Based on the results obtained the performance of admixture in improving is computed as R_f given by the following formula. The performance of admixtures on index and engineering properties is quantified with improvement ratios R_f as detailed below. Results of .R_f for different admixture modified soil are presented in the subsequent sections and in tables 3 to 10, from fig. 5 to 12.

Performance improvement ratio (R_f) is calculated as

$$R_{fL} = \frac{MODIFIED \quad LIQUID \quad LIMIT \quad WITH \quad ADMIXTURE}{UNMODIFIED \quad LIQUID \quad LIMIT} \quad \ldots\ldots\ldots\ldots\ldots (1)$$

$$R_{Fo} = \frac{MODIFIED \quad OMC \quad WITH \quad ADMIXTURE}{UNMODIFIED \quad OMC} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

$$R_{fM} = \frac{MODIFIED \quad MDD \quad WITH \quad ADMIXTURE}{UNMODIFIED \quad MDD} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

$$R_{fV} = \frac{MODIFIED\ \ VOID\ \ RATIO\ \ WITH\ \ ADMIXTURE}{UNMODIFIED\ \ VOID\ \ RATIO} \quad \ldots\ldots\ldots\ldots\ldots \quad (4)$$

$$R_{fCS} = \frac{MODIFIED\ \ SOAKED\ \ CBR\ \ WITH\ \ ADMIXTURE}{UNMODIFIED\ \ SOAKED\ \ CBR} \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (5)$$

$$R_{fCU} = \frac{MODIFIED\ \ UNSOAKED\ \ CBR\ \ WITH\ \ ADMIXTURE}{UNMODIFIED\ \ UNSOAKED\ \ CBR} \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (6)$$

$$R_{Fsu} = \frac{MODIFIED\ \ UNSOAKED\ \ CBR\ \ WITH\ \ ADMIXTURE}{UNMODIFIED\ \ SOAKED\ \ CBR} \quad \ldots\ldots\ldots\ldots\ldots \quad (7)$$

$$R_{fU} = \frac{MODIFIED\ \ UCS\ \ VALUE\ \ ADMIXTURE}{UNMODIFIED\ \ UCS} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (8)$$

Presentation of results for R_{fL}-Effect of admixture: The Variation of R_{fL} with various admixtures is presented in fig. 5 and table 3. It is observed that the admixtures are playing an important role in reducing liquid limit. Due to which R_{fL} is found to decrease with Admixture (%). Also is observed that liquid limit is reduced with higher Steel slag than other admixtures. This may be due to a non plastic nature of steel slag over other two types. The R_{fL} is found to decrease from 1 to 0.79, from 1 to 0.77 and from 1 to 0.83 for steel slag, quarry dust and fly ash respectively.

Presentation of results for R_{fO} and R_{fM}-Effect of admixture: The Variation of R_{fO} with various admixtures is presented in fig. 6 and table 4. It is observed that R_{fO} is decreases with Quarry dust and Steel slag due to inert property of Admixture and it is increases for the Fly ash due to the water absorption property. The R_{fO} is found to decrease from 1 to 0.61 from 1 to 0.63 for steel slag and quarry dust respectively and for Fly ash it is increase from 1 to 1.35. The Variation of R_{fM} with various admixtures is presented in fig. 7 and table 5. It is observed that R_{fM} is increases for both Quarry dust and Steel slag due to the remarkable reduction in void ratio as shown in fig. 10 and it is decreases for the Fly ash due to cohesive nature. The R_{fM} is found to increases from 1 to 1.09 from 1 to 1.06 for steel slag and quarry dust respectively and for Fly ash it is decreases from 1 to 0.87.

Presentation of results for R_{fV}-Effect of admixture: The Variation of R_{fV} with various admixtures is presented in fig. 8 and table 6. It is observed that R_{fV} is decreases for both Quarry dust and Steel slag due to similar physical properties and it is increases for fly ash .The R_{fV} is found to decreases from 1 to 0.86, from 1 to 0.71 for quarry dust and steel slag respectively and for Fly ash it is increases from 1 to 1.4.

Presentation of results for R_{fCS}, R_{fCU} and R_{fSU}-Effect of admixture: The Variation of R_{fCS} and R_{fCU} with various admixtures is presented in fig. 9, fig. 10 and table 7, table 8. It is observed that R_{fCS} and R_{fCU} are increases for Quarry dust, Steel slag and Fly ash. It is seen that (40%) Steel slag, (40%) Quarry dust and (30%) Fly ash is optimum percentage of admixture. The R_{fCS} and R_{fCU} are found to increases from 1 to 2.83, 1 to 2.31 and 1 to1.65 times and from 1 to 2.18, 1 to 1.79 and 1 to1.45 times for steel slag, quarry dust and Fly ash respectively. It is observed that improvement (%) of Soaked CBR over Unsoaked CBR with all the admixtures. Ii is observed that influence of admixture in CBR soaked condition is higher than that of Unsoaked condition. Performance improvement ratio (R_{fSU}) for soaked CBR 3.41, 4.23 and 2.76 times more than Unsoaked CBR with addition of (40%) Quarry dust, (50%) Steel slag and (30%) Fly ash respectively.

Presentation of results for R_{fU}-Effect of admixture: The Variation of R_{fU} with various admixtures is presented in fig. 12 and table 10. For UCS similar trend is observed as that of CBR. It is seen that (40%) Steel slag, (40%) Quarry dust and (30%) Fly ash is optimum percentage of admixture. The R_{fU} is found to increases

from 1 to 1.27, 1 to 1.18 and 1 to 1.09 times for steel slag, quarry dust and Fly ash respectively.

IV. CONCLUSIONS

The following conclusions are drawn from the course of study:

1. The effect of all the admixtures on various properties is significant in general and of steel slag in particular. A decrease in consistency limits is observed with admixtures. A decrease of liquid limit to 0.78, 0.77 and 0.82 times and plasticity index decreased by 0.72, 0.34 and 0.74 times with quarry dust, steel slag and Fly ash respectively.
2. The composite soil has exhibited lower void ratios with the addition of Quarry dust and Steel slag. The variation of void ratio is same using steel slag and quarry dust admixture is same. However fly ash showed a different trend.. As fly ash content increases void ratios increases..
3. It is concluded that an in improvement in compaction characteristics namely. increase in maximum dry density and decrease in OMC with steel slag & quarry dust and an opposite trend with fly ash is possible. An increase to 1.06 and 1.09 times for (40%) Quarry dust and (40%) Steel slag respectively and decrease to 0.83 times for Fly ash. Optimum moisture content decreases to 0.73 and 0.63 times for Quarry dust and Steel slag respectively and increase to 1.35 times for Fly ash.
4. Both CBR (Soaked) and CBR (Unsoaked) has been improved with admixtures. However the improvement is more pronounced in Soaked performance over Unsoaked. An improvement ratio of 2.30, 2.81 & 1.65 times for Soaked and 1.79, 2.18 and 1.45 times for Unsoaked is observed for Quarry dust, Steel slag and Fly ash respectively.
5. Performance ratio improved for UCS with the addition of admixtures. 1.18, 1.27 and 1.09 times improvement is observed with addition of Quarry dust, Steel slag and fly ash respectively.

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[23] IS 2720: Part 7: 1987 Methods of Test for Soils - Part 8: Determination of water Content and Dry Density Relation Using Light Compaction.
[24] IS 2720: Part 16: 1987 Methods of Test for Soil – Part 16: Laboratory Determination of CBR.
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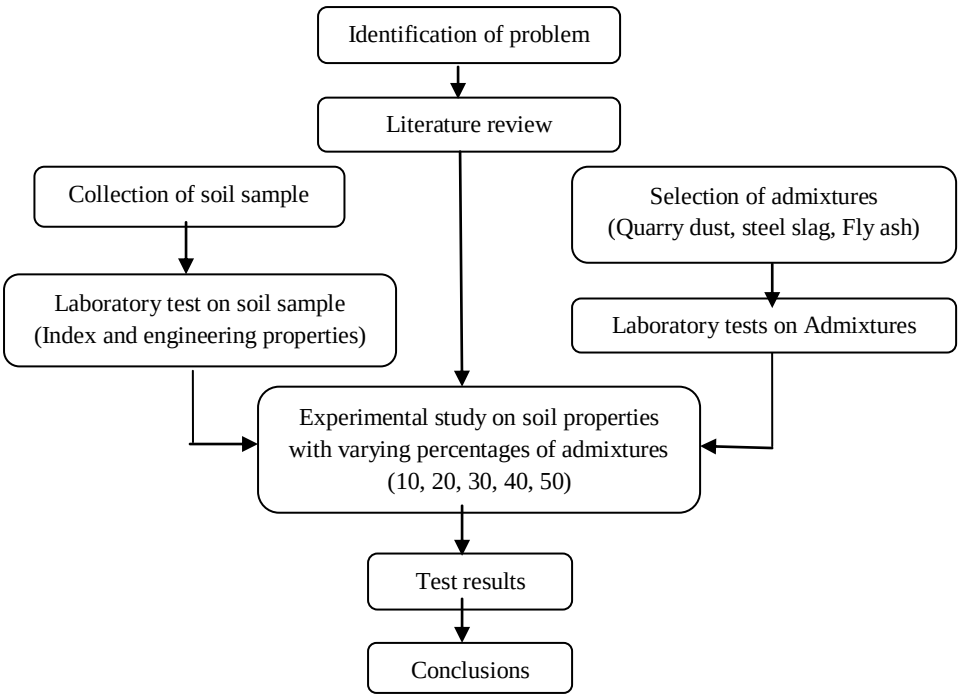
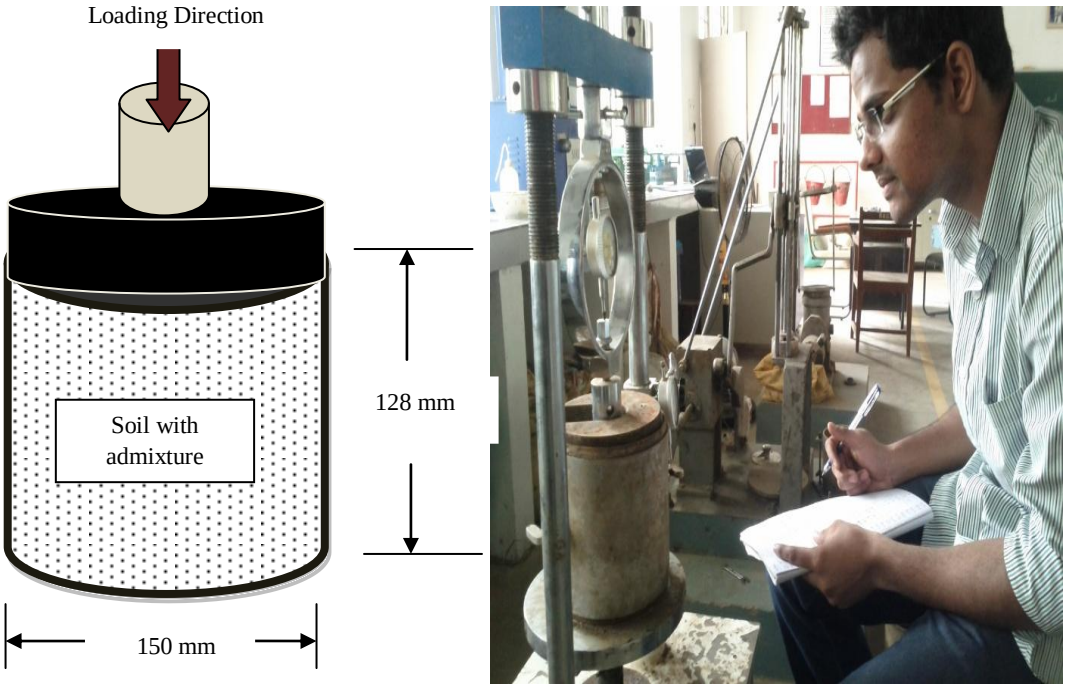


Figure 1 Methodology

Figure 2 Preparation of mixture by author for compaction test

(a) (b)

Figure 3 a) Sample for UCS test b) Author performing UCS test



(a) (b)

Figure 4 a) Cross section for CBR sample b) Author performing CBR test

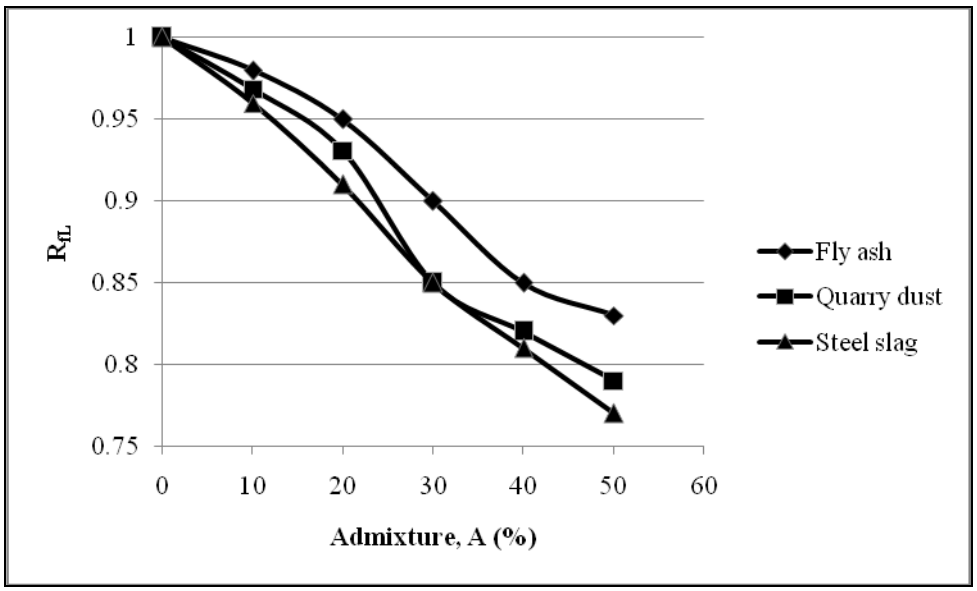


Figure 5 Variation of R_{fL} with Admixtures

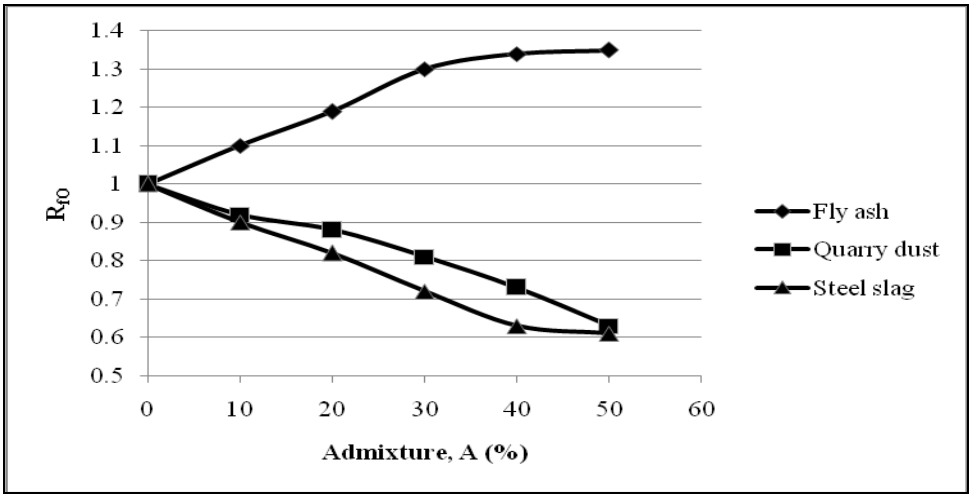


Figure 6 Variation of R_{fO} with Admixtures

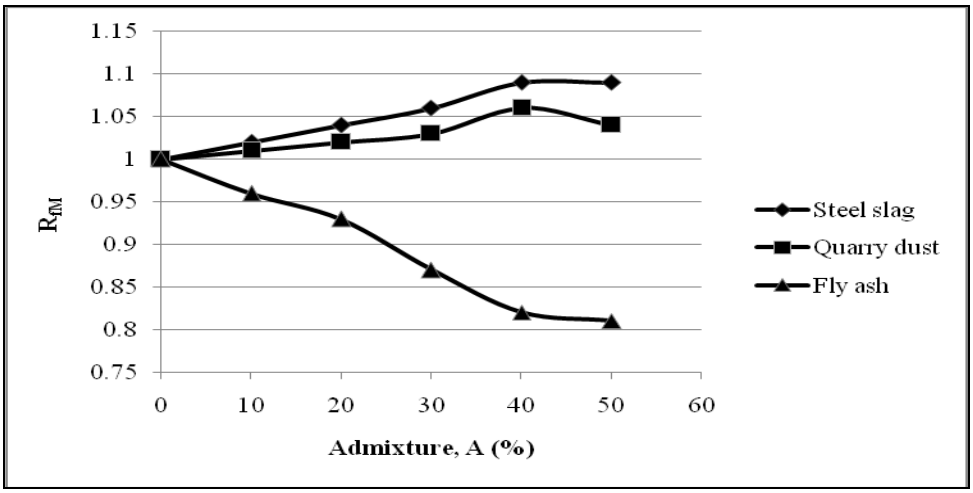


Figure 7 Variation of R_{fM} with Admixtures

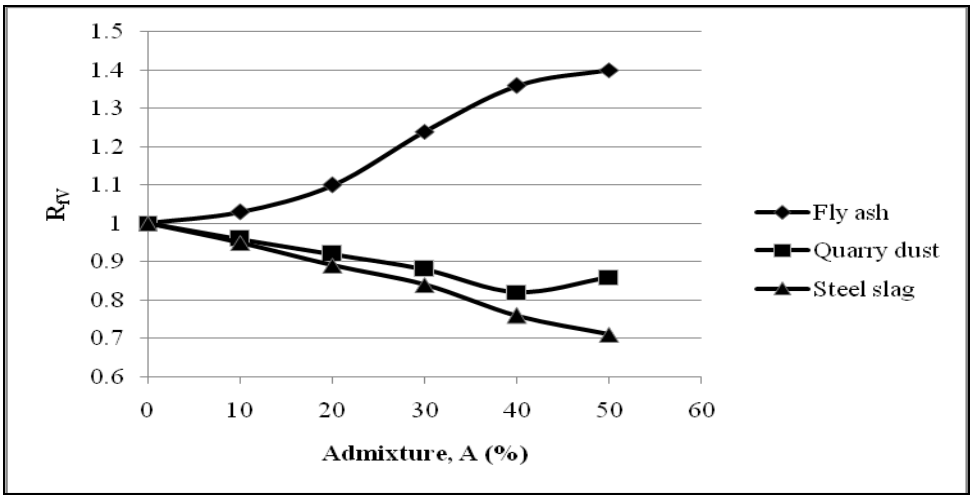


Figure 8 Variation of R_{fV} with Admixtures

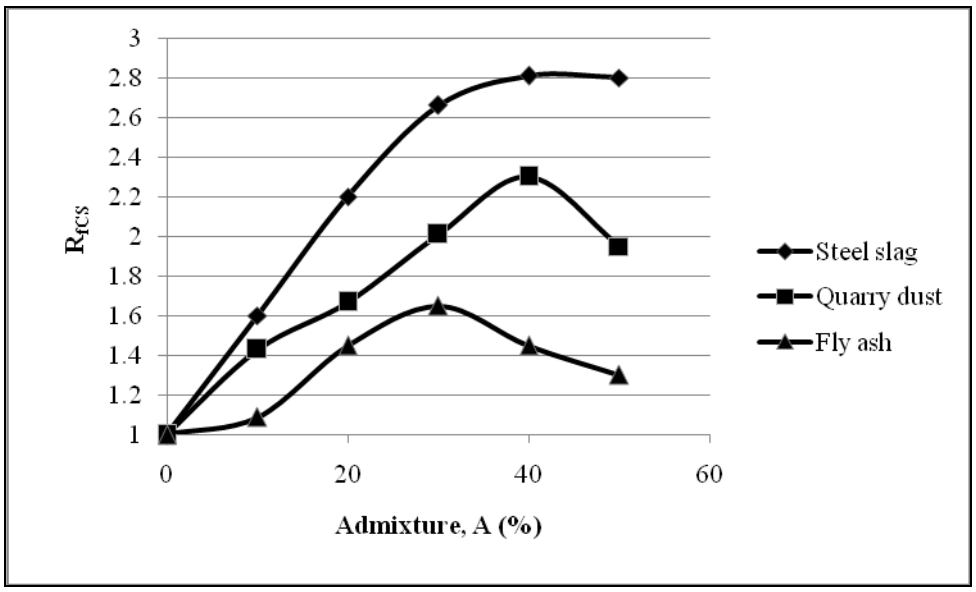


Figure 9 Variation of R_{fCS} with Admixtures

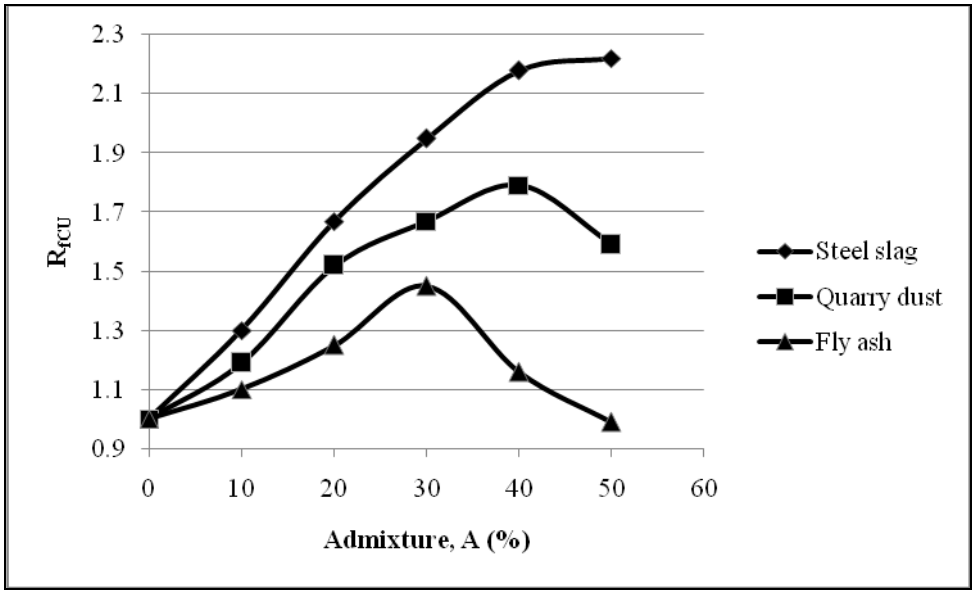


Figure 10 Variation of R_{fCU} with Admixtures

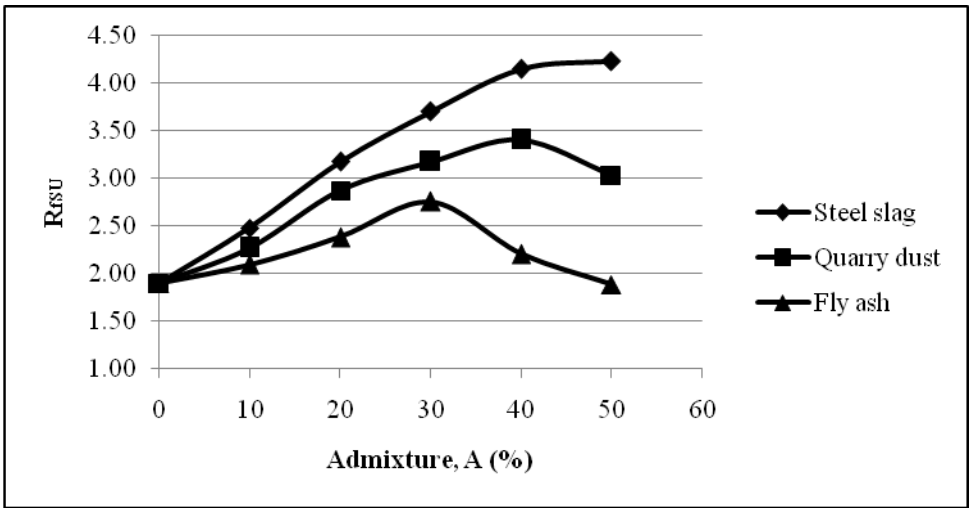


Figure 11 Variation of improvement (%) ratio for Unsoaked CBR over Soaked CBR

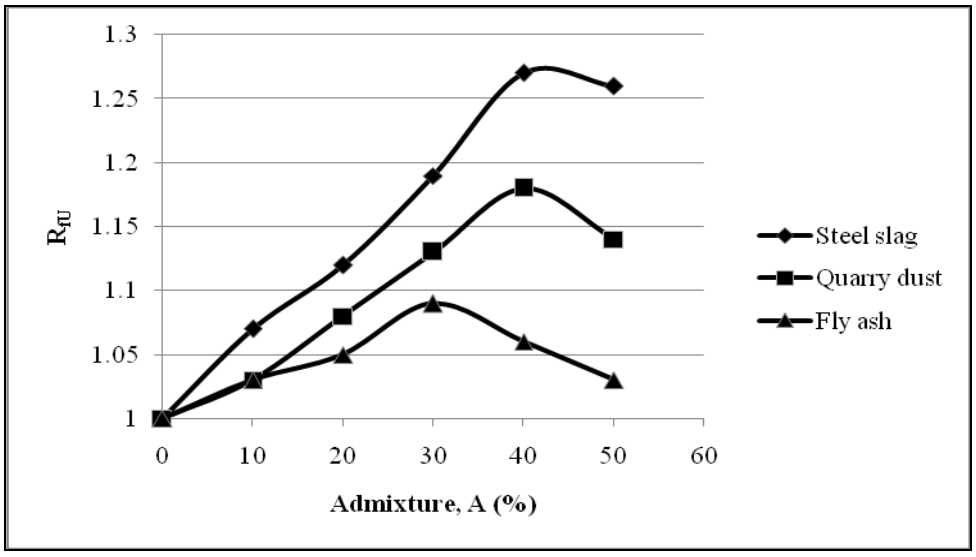


Figure 12 Variation of R_{fU} with Admixtures

Table 1 Index and engineering Properties of soil and Admixtures

Properties	Soil	Quarry dust	Steel slag	Fly ash
Specific gravity	2.60	2.63	2.74	2.10
Liquid limit (%)	47.70	NP	NP	NP
Plastic limit (%)	25.65	NP	NP	NP
Plasticity index (%)	22.05	NP	NP	NP
Gravel size particles (%)	2	1	1	0
Sand size particles (%)	33	97	95	27
Fines size particles (%)	65	2	4	73
Classification as per USCS	CH	SP	SP	NP

MDD (kN/m³)	18.04	17.02	19.77	14.0
OMC (%)	15.80	8.30	7.81	19
CBR (Un-soaked) (%)	3.46	-	-	-
CBR (Soaked) (%)	1.82	-	-	-
UCS (kN/m²)	117.64	-	-	-

Table 2 Notations adopted for each parameter and improvement factor

Parameter considered	**Notation for R_f**
Liquid limit	R_{fL}
OMC	R_{fO}
MDD	R_{fM}
Void ratio	R_{fV}
CBR Soaked	R_{fCS}
CBR Unsoaked	R_{fCU}
CBR ratio for Unsoaked over soaked	R_{fSU}
UCS	R_{fU}

Table 3 Performance ratio, R_{fL} for modified soil with admixtures

Soil+ Admixture	**% of Admixtures**					
	0	**10**	**20**	**30**	**40**	**50**
Soil+ Quarry dust	1	0.97	0.93	0.85	0.82	0.79
Soil+ Steel slag	1	0.96	0.91	0.85	0.81	0.77
Soil+ Fly ash	1	0.98	0.95	0.90	0.85	0.83

Table 4 Performance ratio, R_{fO} for modified soil with admixtures

Soil+ Admixture	**% of Admixtures**					
	0	**10**	**20**	**30**	**40**	**50**
Soil+ Quarry dust	1	0.92	0.88	0.81	0.73	0.63
Soil+ Steel slag	1	0.9	0.82	0.72	0.63	0.61
Soil+ Fly ash	1	1.1	1.19	1.3	1.34	1.35

Table 5 Performance ratio, R_{fM} for modified soil with admixtures

Soil+ Admixture	% of Admixtures					
	0	10	20	30	40	50
Soil+ Quarry dust	1	1.01	1.02	1.03	1.06	1.04
Soil+ Steel slag	1	1.02	1.04	1.06	1.09	1.09
Soil+ Fly ash	1	0.96	0.93	0.87	0.82	0.81

Table 6 Performance ratio, R_{fV} for modified soil with admixtures

Soil+ Admixture	% of Admixtures					
	0	10	20	30	40	50
Soil+ Quarry dust	1	0.96	0.92	0.88	0.82	0.86
Soil+ Steel slag	1	0.95	0.89	0.84	0.76	0.71
Soil+ Fly ash	1	1.03	1.1	1.24	1.36	1.4

Table 7 Performance ratio, R_{fCS} for modified soil with admixtures

Soil+ Admixture	% of Admixtures					
	0	10	20	30	40	50
Soil+ Quarry dust	1	1.43	1.67	2.01	2.3	1.95
Soil+ Steel slag	1	1.6	2.2	2.66	2.81	2.8
Soil+ Fly ash	1	1.09	1.45	1.65	1.45	1.3

Table 8 Performance ratio, R_{fCU} for modified soil with admixtures

Soil+ Admixture	% of Admixtures					
	0	10	20	30	40	50
Soil+ Quarry dust	1	1.19	1.52	1.67	1.79	1.59
Soil+ Steel slag	1	1.3	1.67	1.95	2.18	2.22
Soil+ Fly ash	1	1.1	1.25	1.45	1.16	0.99

Table 9 Performance ratio for Unsoaked CBR over Soaked CBR

Soil+ Admixture	% of Admixtures					
	0	10	20	30	40	50
Soil+ Quarry dust	1.90	2.27	2.87	3.18	3.41	3.04
Soil+ Steel slag	1.90	2.48	3.18	3.70	4.15	4.23
Soil+ Fly ash	1.90	2.10	2.38	2.76	2.21	1.89

Table 10 Performance ratio, R_{fU} for modified soil with admixtures

Soil+ Admixture	% of Admixtures					
	0	10	20	30	40	50
Soil+ Quarry dust	1	1.03	1.08	1.13	1.18	1.14
Soil+ Steel slag	1	1.07	1.12	1.19	1.27	1.26
Soil+ Fly ash	1	1.03	1.05	1.09	1.06	1.03

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American Journal of Engineering Research (AJER)
e-ISSN : 2320-0847 p-ISSN : 2320-0936
Volume-3, Issue-9, pp-264-279
www.ajer.org
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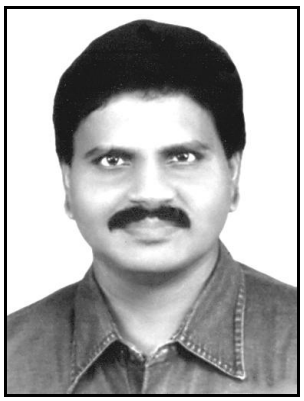
THE PREGNANT MAN?...

*(A New theory on "**Male Pregnancy**")*



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ABSTRACT: *This scientific research article focus that the "**Human Ancestor**" lived in **"Mars Planet'** in the early universe shall be considered having distinguished genetic characteristics compared to **"Modern Human"** living in **earth Planet** especially in reproduction of population. This research further focus that **MALE PARENT** shall be considered as **"become pregnant"** and responsible for child birth. During the course of **"Space"** and **"Time"** of expanding universe the mars populations consider have descended to Earth planet due to **varied climatic condition** and **FEMALE PARENT** become pregnant and responsible for child birth at later stage of **"Nuclear age"***

MODEL MALE PREGNANCY
(MARS Planet)

It is hypothesized that male parent might have "**laid egg"** for the reproduction. Projected belly of male (**Beer belly**) is due to excess deposit of fat cell?... **No… No… No…** It is due to gene transfer of **male parent Pregnancy.**

*"The **uterus** need not be considered as an essential organ for reproduction for **human child birth**" in the early universe.*

- Author

KEY WORDS:

a) Philosophy of "**Male Pregnancy**"?...
b) Philosophy of "**Angel**" and "**Man**" family?...
c) Philosophy of "**Infant**" and "**child**"?...
d) Philosophy of "**trisomy**" and "**transgender**"?...
e) Philosophy of "**sea-horse**" and "**amoeba**"?...
f) Philosophy of "**Jayam+**"?...
g) Philosophy of "**J-Cloning**"?...
h) Philosophy of "**J- Plant**"?...
i) Philosophy of "**Third Copy**"?...
j) Philosophy of "**Trisomy Ape**"?...

I. INTRODUCTION:

This research article focus that **"child birth"** in human life is **"Gift of nature"** rather than effort of parents. It is a general trend in human society on child birth to ask that the child looks like **"Father**" (or) "**Mother**" and used to ask grown child that you are **mother's child**?... (or) **Father's child**?... The child some time **simply smiles** without answering…

If the child do not resemble either like father (or) Mother, treated as **"THIRD COPY"** and mother being tortured by mother-in-law and husband and sometime lead to state of **Thalak… Thalak… Thalak**…

This research further emphasize that for **reproduction**, the act of **"Sex Indulge**" and "**Uterus Mechanism**" not essentially required and many reptiles, plants can generate the populations without the mechanism of uterus and by Process of **Partheonogenisis** (Asexual reproduction). The state of inheritance of sexual reproduction and **Female pregnancy** shall be considered originated during origin of Life in **Earth Plant** at later stage.

(i)

THOMAS BEATIE
(It is not Beer Belly)

(ii)

NO WORRY...
(It is not Mine)

*"In the early universe there is no torture problem of **'Mother-in-law'** to **daughter-in-law** as the **"son"** is responsible for **male pregnancy and child birth".***

- Author

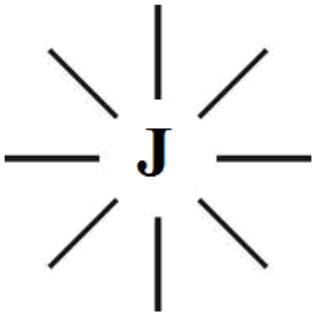
II. HYPOTHESIS AND NARRATION

a) Is male pregnancy possible?...

Medical Science claims that **female parent** in human is only responsible for pregnancy and child birth. **Why not male parent?... Male Parent do not know the pain of child birth?... Male Parent can't conceive?...**

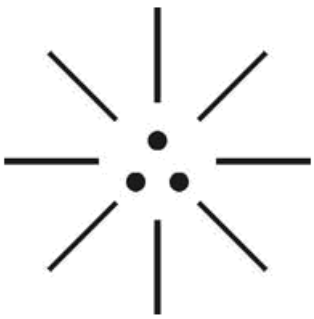
It is hypothesized that **"Human Ancestor**" lived in Mars planet considered responsible for **'reproduction**" through **male pregnancy** by **laying of "Egg".** The egg shall be considered formed through impact of **"J-Radiation**" (Zero hour radiation of Universe) also called as **Virgin light**. The egg shall be considered exist under **"zero gravity", "high Endothermic environment".** The **"embryo**" formed within the egg shall be considered as contains fundamental **Akki-e particles** (also called as **God particles**) photon, Electron, Proton having **zero mass.**

(i)



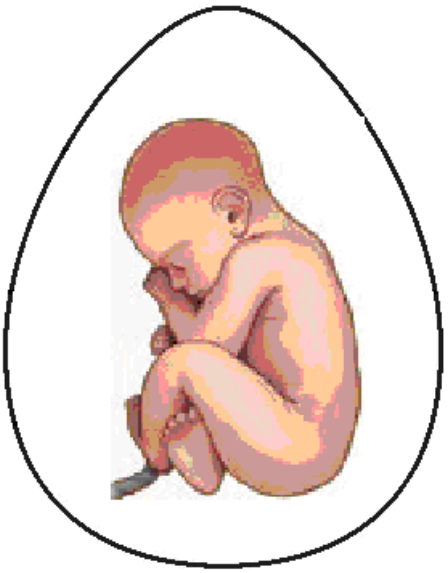
VIRGIN LIGHT
(White Logic)

(ii)



(Radiant Embryo)

(iii)



(Model MARS Egg)

It is further focused that the egg shall be considered as grown within the **'stomach'** of male parent till mature without the mechanism of **'conventional uterus'** exist in Female Parent.

b) Has human ancestor ever laid egg?...

Darwin Sir did not confirm in his evolution theory that human ancestor ever laid egg for regeneration purpose even in primates. Further cases study shows that a baby girl at the age of 16 to 20 weeks of progress ovaries, female fetus contain 6 to 7 million **"eggs"** and gradually decreased in every **women's menstrual cycle** and completely exhausted during menopause stage. **It is the question of Author where did the ovary eggs come from?...**

It is hypothesized that **ovary eggs of women** shall be considered as derived from eggs of **male parents**. It is further focused that global level research is going on regarding origin of **Y chromosome** in origin of life. It is hypothesized that Y chromosome might be derived from the **male pregnancy egg** of human ancestor lived in **Mars planet**. The philosophy of Y chromosome transfer shall be described as below.

Prehistroic chromosome structure

c) Do Angels have "Navel"?...

It is hypothesized that the **'Angel population'** shall be considered as born of **'Egg'** and lived under **'low gravity'** environment in the upper part of universe (mars planet). The **Female Angel** shall be considered as simply assisting **Male Pregnant Angel** for safe delivery. The Female angel shall be considered as "**Queen"** controlling the **Male Angel**.

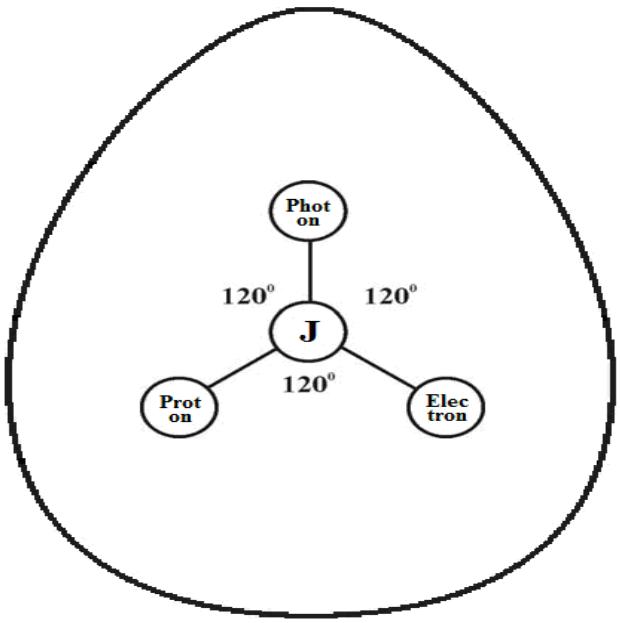
It is focused that the existence of "**umbilical chord**" attached to navel of female parent shall be considered as exist in later generation population **(living on earth planet).** It is focused that the population of mars planet shall be considered as having **"No Navel**". It is further focused that the philosophy of **"angel", "Alien**" might be derived from the etymology of proto Indo Europe language root **"Alle-e". "Alle-e"** shall mean family name where male parent responsible for **"Egg laying".**

It is further focused that the **"Female Angel**" shall be considered as having **'Flat chest"** (Without developed breast) as feeding of child is not required after birth as the child born of high immunity.

d) Is 'Sex act" required for reproduction?...

Pregnancy scientifically refers to fertilization of germ cells (Egg and Sperm) by sexual act of Male and Female development of one or more off-spring known as embryo or fetus processed within the **Female uterus.**

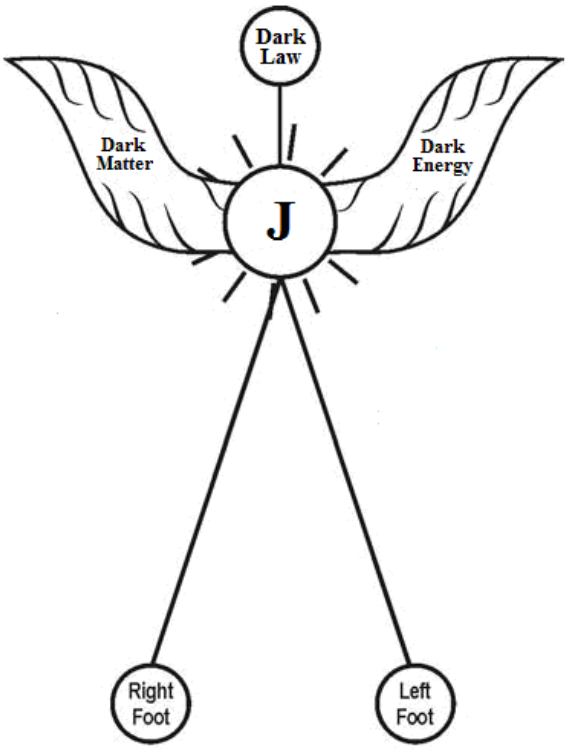
It is hypothesized that Angel population shall be considered as **"asexual"** and born of Egg formed due to impact of **"J-Radiation**" consists of **three-in-one** fundamental particles photon, electron, proton responsible for formation of **'White Embryo"** also called as **"Radiant embryo"** (White Logic).



(MODEL FERTILISED EGG)

The **INFANT ANGEL** born of Egg and **asexual means** shall also be called as **Jayam+** (Cloning birth)**.** In proto Indo Europe language **"Jayam"** shall mean **Chei** or **Chisu".**

(i)



JAYAN
(Male Angel)

(ii)

JAYAM^{+}
(Cloning Birth)

*"**Jayam+** shall mean godly child born of Egg without involvement of sex act of parents" (**Partheonogenisis**).*

- Author

e) Philosophy of Infant, child?...

It is hypothesized that '**Infant**' and '**child**' shall be considered as having distinguished genetic characteristics. Infant shall mean **"Alien"** pertain to Angel family, living under '**Upward Gravity'**. Child shall mean **Earthly man**. Pertain to man family living under **downward gravity.**

(i)

ANGEL FAMILY
(ஸ்திரி)

(ii)

MAN FAMILY
(திரியம்)

f) Philosophy of Temple and Family?...

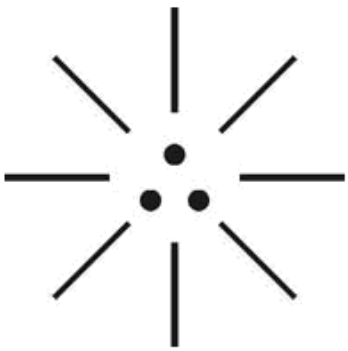
It is hypothesized that **"Temple"** shall mean pertain to **"Angel family"** born of Egg laid by male parent. **"Family"** shall mean pertain to **"man family"** of parents of **Female pregnancy**.

g) Philosophy of 3 Kingdom of life?...

In biological science taxonomy of life is classified fundamentally under two divisions, say **"Animal Kingdom**" & **"Plant Kingdom**". It is hypothesized that **human origin** shall not be classified within the scope of animal kingdom but it shall be considered as separate kingdom, say **"Angel Kingdom",** (Born of male pregnancy) because of distinguished generation lineage.

It is further hypothesized that the origin **of human life, animal life, plant life** shall be considered as originated in **Mars Planet** in the early universe due to impact of "**J Radiation"**. The **J Radiation** comprises of **billions of rays** and each ray shall be considered as responsible for **genetic-characteristics** of each organism. Further it is hypothesized that the smallest unit of each ray shall be considered as composed of **three-in-one nuclei** of each life matter and having only **"three chromosome"** on origin derived one each from **Photon, Electron & Proton**. The three Chromosome shall be considered as **"TRISOMY**". Trisomy shall mean "state of **Male Pregnancy".**

During the course of expanding universe the "**trisomy organism"** shall be considered as undergoing **plasma stage** like "**trans-gender"**, "**amoeba", "prokaryotes",** etc., before full-fledged genetically developed life matters on the **earth planet.** Further, the concept of "**female pregnancy"** with ovary eggs formation might have been derived from fundamental "**male parent eggs"** of **Mars Planet**. In various animals billions of genetically varied eggs in the ovary of animals shall be considered derived from the eggs of Mars Planet. Similarly billions of different **"seeds"** of the **plants** shall be considered as **genetically varied distinguished egg Nuclie** derived from the eggs of **Mars Planet**. The philosophy of **three hypothetical kingdom of life** with distinguished male and female genetic characteristics origin shall be described as below.



(Model Kingdom Class)

i) Right dot - **Plant Kingdom** (Like Proton)

ii) Left dot - **Animal Kingdom** (Like Electron)

iii) Centre dot - **Angel Kingdom** (Like Photon)

Sl. No.	Category (Family)	Mars Planet Life (Origin)	Plasma Stage (Transformation)	Earth Planet Life (Origin)
1.	Angel Kingdom **(Alle-e)**	Trisomy Human (Male Pregnancy)	Trans-gender human (No sex identity)	Tribe Population (With female pregnancy)
2.	Animal Kingdom **(Archaea)**	Trisomy Animal (Male Pregnancy)	Amoeba (No sex identity)	Procaryotes, eucaryotes, bacteria (With female pregnancy)
3.	Plant Kingdom **(Aceae)**	Trisomy Plant (Male Pregnancy)	Marijuna (No sex Pregnancy)	Cannabis (With Female Pregnancy)

h) Case Study on Male Pregnancy?...

Case study shows that Male pregnancy refers to incubation of one or more embryos or Fetus by male member of any species in nearly all heterogamous, animals species, off-spring or ordinarily carried by the female until birth. But in the Fish of "**SYNGNATHIDAE FAMILY"** male perform his function (pipe fish, sea-horse)is best known for being one of the **only male family in the world to get pregnant**. The female deposits her eggs into his brood. Then he fertilize eggs.

MALE PREGNANCY
(Senior to Amoeba)

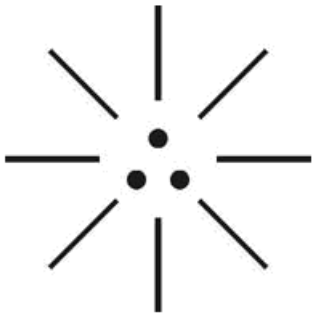
It is hypothesized that "**sea-horse"** shall be considered as the earliest known family lived in the **mars planet** and descended to earth plant and lived on the earth planet. It is further hypothesized that **sea-horse animal** shall be considered as **"trisomy**" animal (Male Pregnancy) and originated much before origin of **Amoeba, Procaryotes, eucayotes** and **bacteria** on the earth planet**.**

i) Philosophy of "J-Plant"?...

It is focused that J-Plant shall be considered as the source of life matter having only three chromosome called as **TRISOMY.** The J-Radiation considered composed of billions of rays, each ray having common Trisomy chromosome with distinguished mass level of PHOTON, ELECTRON, PROTON. Each ray shall be considered as soul of each organism evolve at once.

j) Philosophy of "Third Copy"?...

It is focused that medical science claims that the formation of embryo of human chromosome has set of **two copies** inherited one from male parent and another one from one female parent. It is hypothesized that the organism lived in Mars Planet (Male Pregnancy) shall be considered as **THREE COPIES** in each chromosome derived one each from PHOTON, ELECTRON, PROTON particles of **J-Radiation** as described below.



(MODEL TRISOMY)

The three tiny dots representing three copies in each chromosome considered having defined molecular structure and having predefined genetic value as described below.

[1] Right dot is like **proton** (responsible for functional part say **DNA**)

[2] Left dot is like **electron** (responsible for structural part say **HARMONE**)

[3] Center dot is like **photon** (responsible for control sequence part say **RNA**)

k) Philosophy of 'Male Chauvinist"?...

Case study shows that **"Male Chauvinist**" refers to a person who has an aggressive and unreasonable belief that their own country is better than all others. It also considers refer to **"male egoism**" over female that male is **superior sex** than female.

It is hypothesized that male chauvinism shall be referred to "**male pregnancy"** that male parent is responsible for laying "**reproductive egg"** for growth of human populations. It is further focused that growth of **'Belly'** in so called modern human shall be considered as "**genetic reflection of male pregnancy"** of early universe rather than deposit of fat cells in the stomach. In proto Indo Europe root **"Chauvinism'** shall mean **"Chanmam", Chananam.**

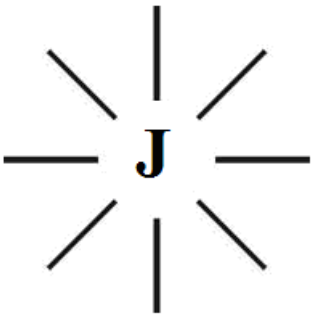
*"The philosophy of "**female chauvinism"** considers refers to state of egoism of **"female pregnancy"** on the earth planet".*

- Author

l) "Egg" is associated with word "Zero"?...

"Zero" means no value?... No… No… No… Zero shall mean origin of high energetic value of **"Egg Nuclei"** due to impact of **"J-Radiation"** (Zero hour radiation).

It is further focused that Billions of various seeds of plants, Animal eggs shall be considered as genetically varied **"Rain drops"** like **Jana Nayagam, Pana Nayagam, Marutha Nayagam, Peria Nayagam, Pramma Nayagam, Nabigal Nayagam, Arumai Nayagam, Valli Nayagam, Deiva Nayagam** etc derived from common source of **"White clouds".** In Proto Indo Europe language the white cloud shall be called as **"MUKIL"** (NAYAKI).



NAYAKI
(White Cloud)

m) Case study on "Cloning"?...

Case study shows that **Clones** are organisms that are exact **genetic copies** of parent cell. Modern Scientists came out with Medical advancement of making cloning in two different types say "**Artificial embryo twinning", "Somatic Cell Nuclear Transfer (SCNT)"** popularly known as **Cloning the organism, Cloning the gene.**

It is the question of Author that **"Is it possible to make exact genetic copy of one organism by cloning?... No… No… No…**

In the **expanding universe** the genetic value of matters, organisms considered undergoes **Micro Micro** level changes **every second, every minute, every hour…** then where is the question of making **"exact genetic copy"** one organism by cloning process?... Further is it possible to make **"Universal Chromosome compatible cloning"?...**

It is hypothesized that "**J-CLONING"** shall mean natural cloning produces **billions of varied allele matter** from **PARENT TIRSOMY CELL** having consistent distinguished genetic value irrespective of varied pressure, temperature, density.

It is further hypothesized that in the early Universe billions of matters considered originated from single tirsomy organism called as "**J-PLANT**". During the course of expanding Universe the chromosome of

each organism consistently varies to adopt different environmental conditions. Human also have different chromosome level in different nuclear age as stipulated below. It is focused that the chromosome level of human and heart beat shall be considered closely associated with **natural frequency of earth planet** as stipulated in **Schumann resonance**. The growth of chromosome level shall be considered varying consistently due to increased level of natural frequency of earth in three nuclear ages.

i. Human origin - Trisomy

[1] Plasma age - 20

[2] First Generation - 30

[3] Second Generation - 40

[4] Third Generation - 46

"J-CLONING" *shall mean "****CREATION WITHOUT TOUCH****".*

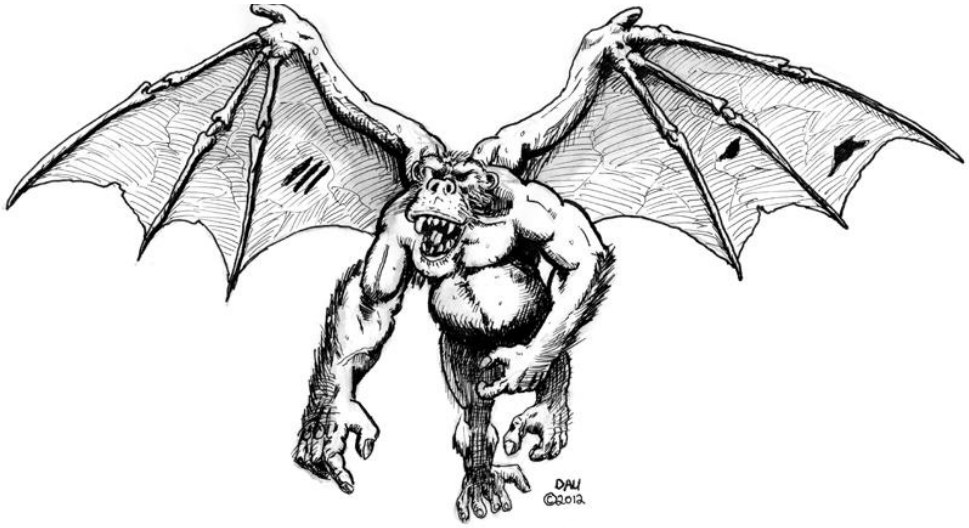
Author

III. CONCLUSION:

It is focused that **'Darwin Sir'** has claimed that "Human Ancestor" consider originated from **"Apes family**". It is hypothesized that Human ancestor shall be considered born of **"Egg"** laid by male parents pertain to **"Angel family"** (Trisomy) rather than descended from Apes family of Earth Planet having **"48 Chromosome".**

DARWIN BELLY
(Male Pregnancy)

The Belly of Male Pregnancy shall also be hypothetically called by Author as **"Darwin Belly".** It is further focused that Mars Ape shall be considered as having only three chromosome (male pregnancy) compared to earth apes.



MARS TRISOMY APE
(Male Pregnancy)

"Male Pregnancy would certainly possible by having an embryo implanted in a Man's abdomen with a placenta attached to an internal organ such as bowl and later delivered by ***Caesarean Section."***

- Robert Winstor
(Pioneer of Vitro Fertilisation)

IV. PREVIOUS PUBLICATION:

The philosophy of origin of first life and human, the philosophy of model Cosmo Universe, the philosophy of fundamental neutrino particles have already been published in various international journals mentioned below. Hence this article shall be considered as **extended version** of the previous articles already published by the same author.

[1] Cosmo Super Star – IJSRP, April issue, 2013
[2] Super Scientist of Climate control – IJSER, May issue, 2013
[3] AKKIE MARS CODE – IJSER, June issue, 2013
[4] KARITHIRI (Dark flame) The Centromere of Cosmo Universe – IJIRD, May issue, 2013
[5] MA-AYYAN of MARS – IJIRD, June issue, 2013
[6] MARS TRIBE – IJSER, June issue, 2013
[7] MARS MATHEMATICS – IJERD, June issue, 2013
[8] MARS (EZHEM) The mother of All Planets – IJSER, June issue, 2013
[9] The Mystery of Crop Circle – IJOART, May issue, 2013
[10] Origin of First Language – IJIRD, June issue, 2013
[11] MARS TRISOMY HUMAN – IJOART, June issue, 2013
[12] MARS ANGEL – IJSTR, June issue, 2013
[13] Three principles of Akkie Management (AJIBM, August issue, 2013)
[14] Prehistoric Triphthong Alphabet (IJIRD, July issue, 2013)
[15] Prehistoric Akkie Music (IJST, July issue, 2013)

[16] Barack Obama is Tamil Based Indian? (IJSER, August issue, 2013)
[17] Philosophy of MARS Radiation (IJSER, August 2013)
[18] Etymology of word **"J"** (IJSER, September 2013)
[19] NOAH is Dravidian? (IJOART, August 2013)
[20] Philosophy of Dark Cell (Soul)? (IJSER, September 2013)
[21] Darwin Sir is Wrong?! (IJSER, October issue, 2013)
[22] Prehistoric Pyramids are RF Antenna?!... (IJSER, October issue, 2013)
[23] HUMAN IS A ROAM FREE CELL PHONE?!... (IJIRD, September issue, 2013)
[24] NEUTRINOS EXIST IN EARTH ATMOSPHERE?!... (IJERD, October issue, 2013)
[25] EARLY UNIVERSE WAS HIGHLY FROZEN?!... (IJOART, October issue, 2013)
[26] UNIVERSE IS LIKE SPACE SHIP?!... (AJER, October issue, 2013)
[27] ANCIENT EGYPT IS DRAVIDA NAD?!... (IJSER, November issue, 2013)
[28] ROSETTA STONE IS PREHISTORIC "THAMEE STONE" ?!... (IJSER, November issue, 2013)
[29] The Supernatural "CNO" HUMAN?... (IJOART, December issue, 2013)
[30] 3G HUMAN ANCESTOR?... (AJER, December issue, 2013)
[31] 3G Evolution?... (IJIRD, December issue, 2013)
[32] God Created Human?... (IJERD, December issue, 2013)
[33] Prehistoric "J" – Element?... (IJSER, January issue, 2014)
[34] 3G Mobile phone Induces Cancer?... (IJERD, December issue, 2013)
[35] "J" Shall Mean "JOULE"?... (IRJES, December issue, 2013)
[36] "J"- HOUSE IS A HEAVEN?... (IJIRD, January issue, 2014)
[37] The Supersonic JET FLIGHT-2014?... (IJSER, January issue, 2014)
[38] "J"-RADIATION IS MOTHER OF HYDROGEN?... (AJER, January issue, 2014)
[39] PEACE BEGINS WITH "J"?... (IJERD, January issue, 2014)
[40] THE VIRGIN LIGHT?... (IJCRAR, January issue 2014)
[41] THE VEILED MOTHER?... (IJERD, January issue 2014)
[42] GOD HAS NO LUNGS?... (IJERD, February issue 2014)
[43] Matters are made of Light or Atom?!... (IJERD, February issue 2014)
[44] THE NUCLEAR "MUKKULAM"?... (IJSER, February issue 2014)
[45] WHITE REVOLUTION 2014-15?... (IJERD, February issue 2014)
[46] STAR TWINKLES!?... (IJERD, March issue 2014)
[47] "E-LANKA" THE TAMIL CONTINENT?... (IJERD, March issue 2014)
[48] HELLO NAMESTE?... (IJSER, March issue 2014)
[49] MOTHERHOOD MEANS DELIVERING CHILD?... (AJER, March issue 2014)
[50] E–ACHI, IAS?... (AJER, March issue 2014)
[51] THE ALTERNATIVE MEDICINE?... (AJER, April issue 2014)
[52] GANJA IS ILLEGAL PLANT?... (IJERD, April issue 2014)
[53] THE ENDOS?... (IJERD, April issue 2014)
[54] THE "TRI-TRONIC" UNIVERSE?... (AJER, May issue 2014)

[55] Varied Plasma Level have impact on "GENETIC VALUE"?... (AJER, May issue 2014)
[56] JALLIKATTU IS DRAVIDIAN VETERAN SPORT?... (AJER, May issue 2014)
[57] Human Equivalent of Cosmo?... (IJSER, May issue 2014)
[58] THAI-e ETHIA!... (AJER, May issue 2014)
[59] THE PHILOSOPHY OF "DALIT"?... (AJER, June issue 2014)
[60] THE IMPACT OF HIGHER QUALIFICATION?... (AJER, June issue 2014)
[61] THE CRYSTAL UNIVERSE?... (AJER July 2014 issue)
[62] THE GLOBAL POLITICS?... (AJER July 2014 issue)
[63] THE KACHCHA THEEVU?... (AJER July 2014 issue)
[64] THE RADIANT MANAGER?... (AJER July 2014 issue)
[65] THE UNIVERSAL LAMP?... (IJOART July 2014 issue)
[66] THE MUSIC RAIN?... (IJERD July 2014 issue)
[67] THIRI KURAL?... (AJER August 2014 issue)
[68] THE SIXTH SENSE OF HUMAN?... (AJER August 2014 issue)
[69] THEE… DARK BOMB?... (IJSER August 2014 issue)
[70] RAKSHA BANDHAN CULTURE?... (IJERD August 2014 issue)
[71] THE WHITE BLOOD ANCESTOR?... (AJER August 2014 issue)
[72] THE PHILOSOPHY OF "ZERO HOUR"?... (IJERD August 2014 issue)
[73] RAMAR PALAM?... (AJER September 2014 issue)
[74] THE UNIVERSAL TERRORIST?... (AJER September 2014 issue)
[75] THE "J-CLOCK"!... (AJER September 2014 issue)
[76] "STUDENTS" AND "POLITICS"?... (EJAE September 2014 issue)

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