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Recovery of Sodium Sulphate from Process Waste of H-Acid Industry

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ABSTRACT

India is the second largest manufacturer of H-Acid in the world after China. H-acid is dye intermediate compound used in manufacturing of reactive dyes (To prepare dyeazo coupling in dye manufacturing). Due to its high pollution potential and high treatment cost, most of the countries not allowed H-Acid manufacturing in their countries. Due to usage of high strength acids and alkalies during manufacturing of H-acid, the combined wastewater stream is contaminated with high sulphate content. Sodium salts (Na_2SO_4) get accumulated in H-acid slurry. Decahydrate Sodium sulphate ($Na_2SO_4.10H_2O_4$) known as Glauber's salt and widely used in several industries like pharmaceutical, detergents, glass, paper etc. In H-Acid industry, Glauber's salt is contaminated with mother liquor of H-Acid and contains reddish tinge which hamper market value and industry has sent it to Hazardous Waste disposal site hence it is necessary to find-out economical and sustainable Sodium Sulphate recovery technique. We studied impact of Temperature, pH variation, use H_2O_2 oxidizing agent and coagulating agent to recover desired grade of sodium sulphate by removing unwanted impurities. It observed that, after double filtration of Glauber's salt slurry followed by oxidation and polyelectrolyte treatment then achieved 98% pure Sodium Sulphate crystals. This study is helpful to minimize waste, reduces treatment and disposal cost as well as reduce the production cost and product become economically viable to the industry.

***Keyword**:* H-Acid, Sodium Sulfate,Glauber salt, Waste minimization, Recovery

I INTRODUCTION

Indian dyes and dye intermediates sector is vital sector and it accounts for more than half of the total export value of Indian chemical industry. As per working group report for 12th five year plan (2012-2017) submitted to Ex-planning Commission in November 2011, the dyes and dye intermediates sector has revealed a phenomenal growth in last 15 years and the exports increased from Rs. 100 Crores in 1986-87 to Rs. 7950 Crores in 2000-2001. Indian dyes and dye intermediates industry comprises of large scale manufacturers as well as medium or small scale manufacturers. In India, there are about 50 big manufacturers in organized sector and about 900 small units manufacturing dyes and dye intermediates chemicals. The total production of dyes in India is about 94,000 tons per year out of which 53,000 tons are exported. The total production of dye intermediates is about 250,000 tons out of which 120,000 tons are exported.

The steep rise in exports is due to increased exports to developed countries, which are finding it economical to import from third world countries as environmental regulations in developed countries have become more and more stringent. Indian dyes and dye intermediates industry has grabbed this opportunity without giving sufficient attention to our environment. A number of defaulting industries had closed by judiciary and regulating authorities because they were letting out hazardous wastes without proper treatment. The manufacturers have to compete with China who is flooding the world markets by dyes and dye intermediates at very low price.Most of the H-acid is exported, bringing in valuable foreign exchange to our country. Thus the challenge to Indian dyes and dye intermediates sector, it is necessary to find a balance between environment protection and economic development. To achieve this objective, it is essential to incorporate the principles of green chemistry and green engineering in this process.

Some of the large scale manufacturers are multinational companies and they have their own disposal facilities. Small scale manufacturers send their wastes to common disposal facilities. The process wastes from dyes and dye intermediates manufacture are iron sludge generated in iron-acid reduction, gypsum sludge and sodium sulphate/sulphite sludge. Many industries landfill these sludges without attempting to recover value added products from the same. Only few industries recover sodium sulphate/sulphite and aluminium hydroxide from their respective sludges. (Planning Commission report, 2011)

II H-ACID - DYE INTERMEDIATES

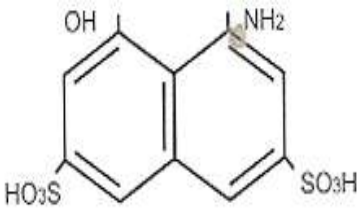
H-acid is one of the leading dye intermediates in the world, used in manufacture of black dyes. India is the second largest manufacturer of H-Acid in the world after China. H Acid is used in the manufacture of a large number of azo-dyes

and pigments. Also it is widely used in detergents and in pharmaceutical preparations. H-acid is responsible for the most polluting industrial effluent in the dye and dye intermediate sector.

NAME OF PRODUCT
H-ACID

CHEMICAL NAME
1-Amino-8-Naphthalene-3, 6-Disulfonic.c Acid

SYNONYMS
1-Amino-8-Hydroxy Naphthalene3-6 Disulfonic Acid



FORMULA
$C_{10}H_9O_7NS_2$

Molecular Weight	319
Physical Appearance	Grayish Powder
Assay, by Nitrite Value	80% Minimum for Dry Powder 55% Minimum for Moist Cake
Insoluble (W/W)	0.5% Maximum
Iron Content (Acid Soluble)	500 PPM Maximum
Koach Acid	0.5% Maximum
Chromo Tropic	1.0% Maximum
Omega Acid	Traces
Solubility	Soluble in water and Dilute Alkaline Solution
Particle Size	100% (20 Mesh) 75% (60 Mesh)
USES	Intermediate for Dyestuffs

(Internet ref – Panoli Intermediates (India) Pvt. Limited)

III PROBLEMS OF H-ACID EFFLUENT

Manufacturing 1 kg of H-acid, results in the generation of 50 kg waste. In other words, it has an E-Factor of 50. The waste is of dark color, strong acidity and contains substituted derivatives of naphthalene compounds. These organic substances are toxic, non-biodegradable, difficult to decolorize and resistant to conventional treatment. It has a very high COD of 1,50,000.Having considered the ill effects of H-acid manufacturing process, currently most of the developed countries have banned it due to their stringent environmental norms. For this reason, the manufacturing was outsourced to countries like China and India where environmental norms are not as strict. (IGCW, 2014)

(a) Glauber's salt
Glauber's salt is common name for sodium sulfate decahydrate, $Na_2SO_4 \cdot 10H_2O$; it occurs as white or colorless monoclinic crystals. Upon exposure to fairly dry air it effloresces, forming powdery anhydrous sodium sulfate. Johann Glauber's salt is water soluble, has a salty, bitter taste, and is sometimes used in medicine as a mild laxative; it is also used in dyeing.

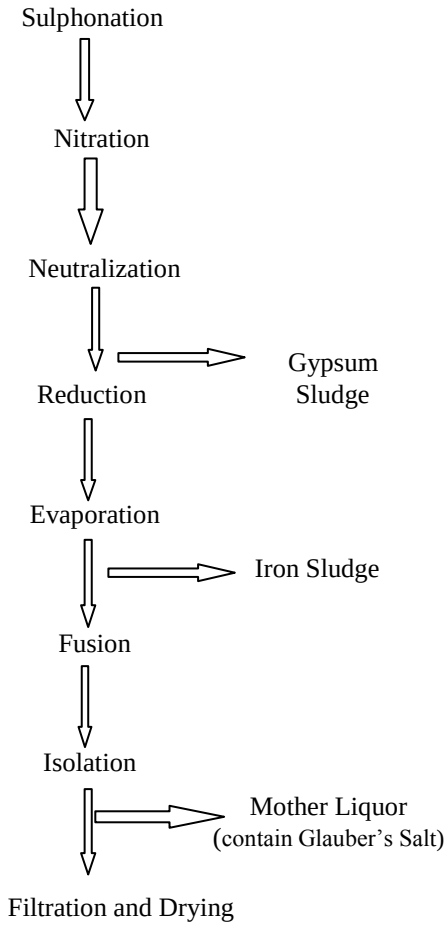


Fig. 1 – Manufacturing process of H-Acid

These are widely demanded in several industries like pharmaceutical, glass, paper and several other products manufacturing industries

(b) Study area

The study area selected for this project is M/s. Shree Hari Chemicals Export Ltd., Plot No. A-8, Mahad MIDC, Dist Raigad, Maharashtra (I).

(c) Need of the project

H-Acid is banned in most of the countries due to high pollution potential. The H-Acid is mostly manufactured in China and India. During Manufacturing of H-Acid, three type of waste mainly generated such as Gypsum sludge during neutralization, Iron sludge during evaporation and Mother Liquor during isolation process. Out of which gypsum and iron sludge has more economic value because gypsum is directly used as raw material in cement industry while Iron sludge is used in paint industry like manufacturing of red oxide. But mother liquor creates problem during treatment of mother liquor. In mother liquor having about 20 to 25% sodium sulphate salt is present in dissolved form. So it is necessary to recover sodium salt from mother liquor and convert it into commercial form to gain economical benefits. At present M/s. Shree Hari Chemicals Export Ltd. is sent this process waste i.e. Glauber's salt recovered from mother liquor at Common Hazardous Waste Treatment Storage and Disposal Facility (CHWTSDF) site and spends lots of money on disposal of this process waste. Hence it is necessary to find out economical and sustainable recovery technique of Sodium Sulfate to sale recovered sodium sulphate in market as valuable by-product or recycle in the process. This study is helpful to minimize waste, reduces disposal cost as well as earns economic benefit to the company.

Table 1
Characteristics of Mother Liquor

Sr. no.	Parameter	Value
1	pH	1.88
2	COD	86400 mg/l
3	TDS	242000 mg/l
4	Acidity	3%

Table 2
Physical Properties of Sodium Sulphate

Molecular formula	Na_2SO_4
Molecular weight	142.04gm/mole (anhydrous) 322.20gm /mole (decahydrate)
Appearance :	White crystalline solid
Odour	Odourless
Boiling point	1429°C(anhydrous)
Flashpoint	800°C
Melting point	884°C (anhydrous) 32.4°C (decahydrate)
Density	2.664gm/ml (anhydrous) 1.464gm/ml (decahydrate)
Refractive index	1.468 (anhydrous) 1.394 (decahydrate)
Solubility	Soluble in water, glycerol and hydrogen iodide and insoluble in ethanol
Use of Sodium Sulphate	• Sodium sulphate is used to dry an organic liquid • As filler in powdered home laundry detergents • As a fining agent which removes small air bubbles from molten glass • Glauber's salt, the decahydrate was used as a laxative which removes the certain drugs such as acetaminophen from the body • For de-frosting windows, in carpet fresheners, starch manufacture • As additive to cattle feed • In the manufacture of detergents and in the Kraft process of paper pulping • Used in tannery

(a) Recovery of Glauber's salt from Mother liquor of H-Acid

During manufacturing of 1 MT H-Acid 1.6 MT Mother liquor generated and in Mother liquor 20 to 24 % Glauber's Salt is present. The mother liquor having following characteristics,

It is known that Glauber's salt can be converted into anhydrous sodium sulphate, (Crystal White) which has a higher commercial value than Glauber's salt, effect the conversion of a relatively small proportion of the total sodium sulphate in the Glauber's salt to the anhydrous salt since only about 16 parts of the 4.4 parts of Na_2SO_4 contained in 100 parts of Glauber's salt

(parts being by weight) are converted to anhydrous sodium sulphate on heating Glauber's salt to its transition point. (Kharat and et al, 2009)

To recover the Glauber salt from mother liquor, temperature of mother liquor reduces bellow 10°C then sodium salt starts crystallizing, the maximum salt present in Glauber salt is crystallized at 4°C. Excess liquid is removed by filtration with simple filter paper and crystallized salt collected and dried. This Glauber salt contains many impurities hence it has brownish colour tinge.

Fig. 2 - Recovery of Glaubers Salt from Mother liquor after temperature reduction

Fig. 1 - Recovered Glaubers Salt from mother liquor after filtration followed by air dyed/dried

Fig. 4 - Recovered Glaubers Salt crystals from mother liquor

Fig. 3 - Glaubers Salt after 1st filtration

(a) Selection of simple technique for the removal of impurities – For removal of brown colour tinge (impurities), we selected simple adsorption technique by filtering the salt solution through activated charcoal filter. For this process we selected charcoal based on sizes and iodine value of the charcoal. The characteristics of selected charcoal is as given below,

Characteristics	Charcoal type		
	Sample 1	Sample 2	Sample 3
Size	5-5.5 mm	1-1.5mm	2-2.5mm
Iodine value	800 mg/gm	1100 mg/gm	600 mg/gm

As iodine value of 2nd sample of activated charcoal was higher than other two charcoal samples, and size is also small, having higher surface area for adsoption, it was selected for the filtration process and it filled in specially designed glass column having 2 feet height and 3 inch diameter.

There are six different permeation and combination techniques selected for experiments. The procedure and results of experiments are described given below -

Experiment 1 - The 10gm of glaubers salt taken and dissolved in water and filtered through charcoal filter. The filtrate was evaporated and sodium sulphate crystals recovered but this crystals still having light brownish colour tinge. Hence again this crystal was dissolved in water and again filtered through charcoal filter and evaporated the solution at 100°C to 110°CtorecoverSodium Sulphate crystals.

Experiment 2- The 10gm of glaubers salt taken and dissolved in water and filtered through charcoal filter. The filtrate was evaporated and recovered sodium sulphate crystals but this crystals having slight colour tinge hence this crystal was again dissolved in water followed by H_2O_2 oxidizing treatment then filtered this solution through charcoal filter and evaporated it at 100°C to 110°C to recover Sodium Sulphate crystals.

Experiment 3:- The 10gm of glaubers salt taken and dissolved in water then oxidize the salt solution using H_2O_2as oxidizing agent followed by increases pH of solution up to 10 using NaOH (1N). Then pH of salt solution is neutralized by using diluted H_2SO_4 (1N) then it filtered through charcoal filter and evaporate this solution at 100°C to 110°C to recover Sodium Sulphate crystals.

Fig. 5 – Recovered Sodium Salphate after Experiment 6

Experiment 4:- The 10gm of glaubers salt taken and dissolved in water then oxidize the salt solution using H_2O_2followedby increases pH up to 10 using NaOH (1N) solution then use alum as coagulant agent to precipitate all impurities present in the salt solution. Then pH of salt solution is neutralized by using diluted H_2SO_4 (1N) then filtered this solution through charcoal filter and evaporate it at 100°C to 110°Cto recover Sodium Sulphate crystals.

Experiment 5:- The 10gm of glaubers salt taken and dissolved in water then oxidize the salt solution using H_2O_2followedby increases pH up to 10 using NaOH (1N) solution then use polyelectrolyte as coagulant agent to precipitate all impurities present in the salt solution. Then pH of salt solution is neutralized by using diluted H_2SO_4 (1 N) then filtered this solution through charcoal filter and evaporate this solution at 100°C to 110°C to recover Sodium Sulphate crystals.

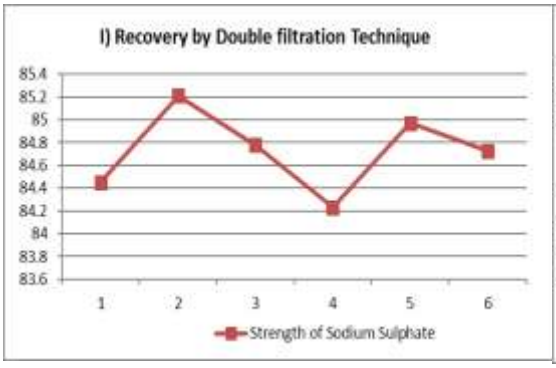
Experiment 6:- The 10gm of glaubers salt taken and dissolved in water then oxidize the salt solution using H_2O_2andfiltered through charcoal filter.The filtrate was evaporated at 100°C to 110°C and sodium sulphate crystals recovered. Again these recovered salts dissolved in water and adjust pH up to 10 using NaOH (1N) solution then use polyelectrolyte as coagulant agent to precipitate all impurities present in the salt solution. Then pH of salt solution is neutralized by using diluted H_2SO_4 (1N)then filtered this solution through charcoal filter and evaporate this solutionat 100°C to 110°Cto recover Sodium Sulphate crystals

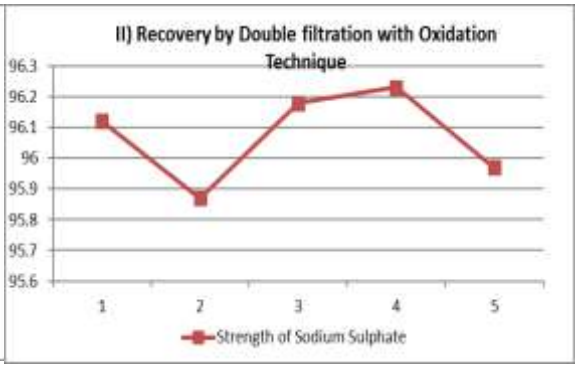
Then strength of all recovered sodium sulphate samples was checked by using titrimetric analysis with $BaCl_2$ and use Sodium Rhodizonateas an indicator. End point ?? The calculated strengths of sodium sulphate is as given below –

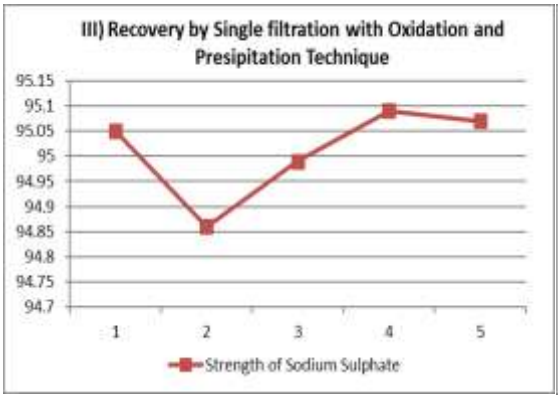
Table 1
Strength of recovered samples of Sodium Sulphate in %

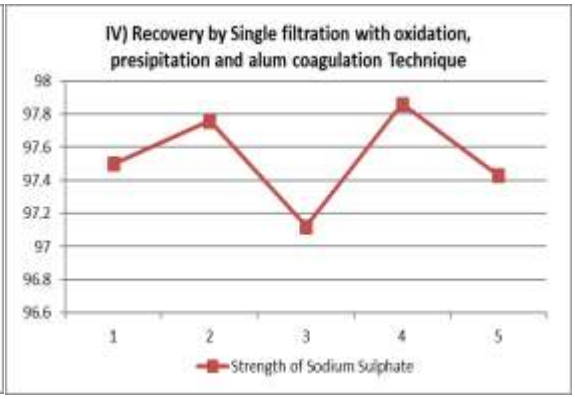
Sample Runs	Strength of Sodium sulphate in %					
	Experiment I	Experiment II	Experiment III	Experiment IV	Experiment V	Experiment VI
1	84.45	96.12	95.05	97.5	98.07	98.78
2	85.21	95.87	94.86	97.76	98.2	98.25
3	84.78	96.18	94.99	97.12	97.77	97.96
4	84.23	96.23	95.09	97.86	97.73	98.66
5	84.97	95.97	95.07	97.43	98.03	98.43
Average %	84.728	96.074	95.012	97.534	97.96	98.416

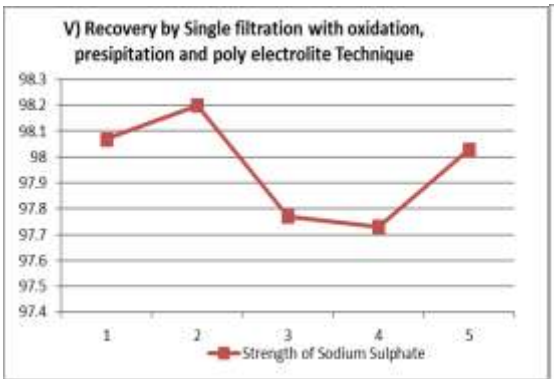
Graphical Representation as given below

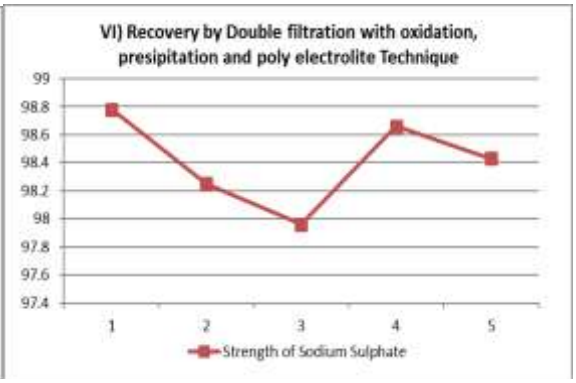

I) Recovery by Double filtration Technique
85.4
85.2
85
84.8
84.6
84.4
84.2
84
83.8
83.6
1
2
3
4
5
6
Strength of Sodium Sulphate

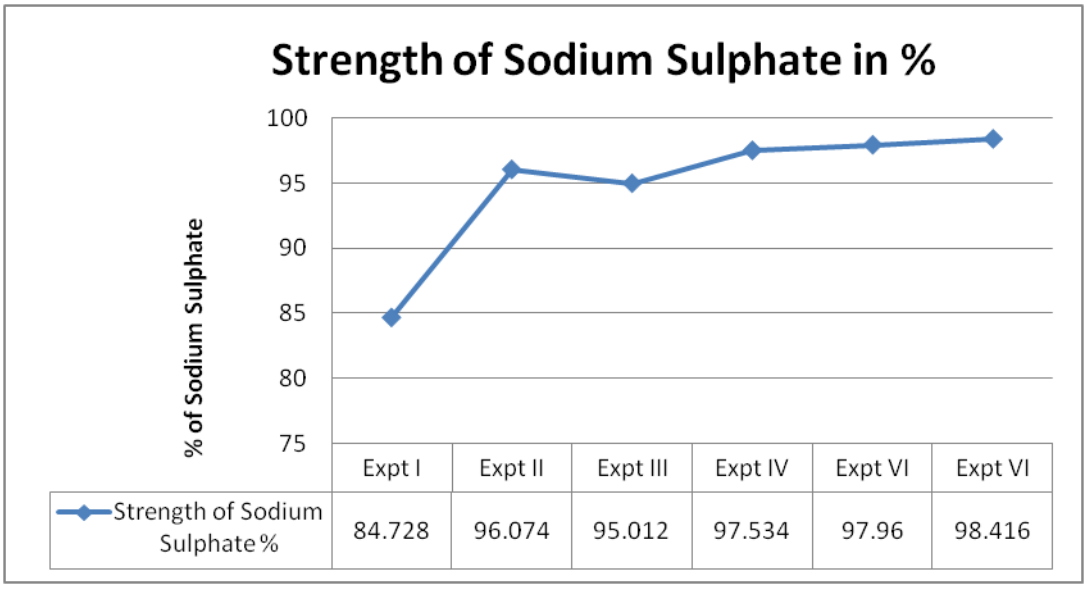

II) Recovery by Double filtration with Oxidation Technique
96.3
96.2
96.1
96
95.9
95.8
95.7
95.6
1
2
3
4
5
Strength of Sodium Sulphate


III) Recovery by Single filtration with Oxidation and Presipitation Technique
95.15
95.1
95.05
95
94.95
94.9
94.85
94.8
94.75
94.7
1
2
3
4
5
Strength of Sodium Sulphate


IV) Recovery by Single filtration with oxidation, presipitation and alum coagulation Technique
98
97.8
97.6
97.4
97.2
97
96.8
96.6
1
2
3
4
5
Strength of Sodium Sulphate


V) Recovery by Single filtration with oxidation, presipitation and poly electrolite Technique
98.3
98.2
98.1
98
97.9
97.8
97.7
97.6
97.5
97.4
1
2
3
4
5
Strength of Sodium Sulphate


VI) Recovery by Double filtration with oxidation, presipitation and poly electrolite Technique
99
98.8
98.6
98.4
98.2
98
97.8
97.6
97.4
1
2
3
4
5
Strength of Sodium Sulphate


Strength of Sodium Sulphate in %
% of Sodium Sulphate
100
95
90
85
80
75
Expt I
Expt II
Expt III
Expt IV
Expt VI
Expt VI
Strength of Sodium Sulphate %
84.728
96.074
95.012
97.534
97.96
98.416

IV CONCLUSION

As per analysis carried out, strength of Sodium Sulphate is achieved 84.72% in double filtration technique, 96.07% in double filtration followed by oxidation process, 95.01% in single filtration followed by oxidation then increase alkalinity followed by neutralization process, 97.53% in single filtration followed by oxidation and use Alum as coagulating agent, 97.96% in single filtration followed by oxidation and use Polyelectrolyte as coagulating agent while **98.41%** in double filtration followed by oxidation and use polyelectrolyte as coagulating agent.

Means double filtration followed by oxidation and polyelectrolyte treatment is showing higher strength recovery of Sodium sulphate i.e. 98% than other methods.

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Analysis of Leakage Power Suppression Technique for CMOS VCO in 45nm Technology

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ABSTRACT
This paper proposed SVL self voltage level technique for the designing of VCO (voltage controlled oscillator) circuit. Certain process parameters should be taken care of while designing of oscillator. With the scaling of transistor size power consumption in the circuit is the main reason for concern for efficient performance of the circuit designed. Having modification in the circuit with techniques SVL have not only enhanced the performance of the circuit but reduced the leakage power in the circuit designed too. By applying leakage reduction techniques in the VCO circuit, efficiency in the circuit has increased with faster speed and lower noise. The circuits are simulated in cadence virtuoso tool at 45 nm technology.

Keywords: VCO, CSVCO, Ring VCO, SVL, Leakage power, leakage current.

I INTRODUCTION

VCO circuit is used in the field of communication system for the generation of the periodic signal. In the digital domain these periodic signal is used for the generation of the timing signals. While in the analog domain it is used as frequency signals. A VCO circuit is a function of voltage and frequency signal. With the change in the applied voltage apparent change in the frequency takes place. Thus VCO circuit for better and efficient performance is the main objective of the designer for designing the circuit in the changing trend of technology. VCO circuit shows linearity when plotted against voltage and frequency. VCO circuit suffers the effect of noise, speed and leakage power in the circuit. So various leakage reduction techniques are being implied the VCO circuit for better output response.

VCO circuit can be designed using various techniques like LC (Inductor-Capacitor) circuit, ring oscillator, Schmitt Trigger etc. For lower power consumption the VCO circuit is designed using the ring oscillator and current starved VCO. Among this other advantages of designing VCO using ring oscillator and CSVCO is that they are easy to design, smaller chip area and have larger signal swing. But while designing the VCO circuit uncertainty jitter should be taken into consideration. In ring oscillator VCO frequency of the circuit is proportional to delay time.

II PROPOSED CIRCUIT

While designing of any circuit, care must be taken in power consumption of the circuit. With the effect of power consumption i.e., static power and dynamic power, speed of the operation is also taken into consideration. Circuit should consume low power and must operate at high speed. SVL leakage reduction techniques are being applied in the circuit for lowering the leakage power in the circuit and for enhancing the performance in the circuit.

Different VCO circuits designed in this paper:

(a) SVL technique in Ring Oscillator VCO
(b) SVL technique in Current starved Oscillator VCO

(a) SVL technique in Ring Oscillator VCO

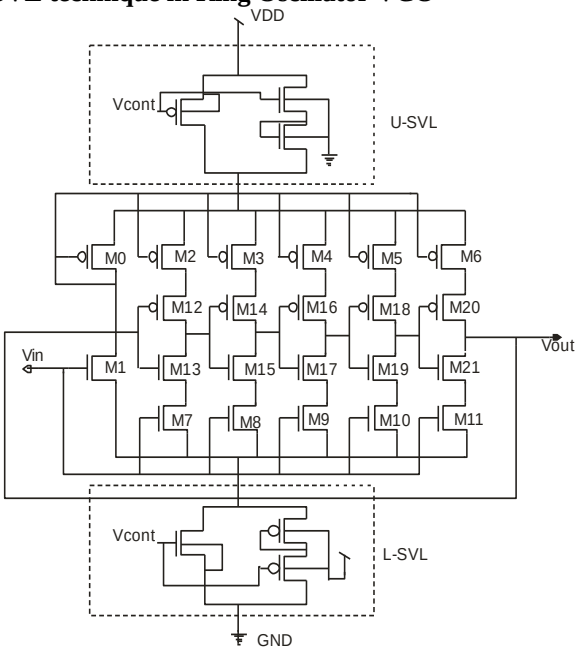

Fig. 1 SVL in VCO Using Ring Oscillator

SVL stands for "Self-controllable voltage level". SVL technique is introduced to overcome the limitations of the MTCMOS technique. It is of two types, L-SVL and U-SVL. It can work separately or both can be introduced in the circuit at the same time. When the oscillator circuit is in active state then Upper Vcont = low (0) and lower Vcont = high (1), then both the sleep transistor in upper and lower part is in ON state. Due to this maximum supply voltage and minimum ground stage voltage is provided to the circuit. Thus the operating speed of the circuit is increased. When the circuit is off then Upper Vcont = high (1) and lower Vcont = low (0). Thus

minimum supply voltage and higher ground level is provided to the circuit. This will effectively decrease the leakage current in the circuit. SVL technique in VCO is shown in Fig1.

(b) SVL technique in Current starved Oscillator VCO

Self voltage level technique is applied on the Current Starved VCO circuit. The SVL circuit commonly consists of a lower SVL circuit and an upper SVL circuit. The lower SVL circuit is formed pull down n-MOSFET switch which is connected in parallel with series connected two p-MOSFET resistors. The pull down n-MOSFET switch and only one of the PMOS resistors are handled by a complement square wave clock (Clk) signal. The upper SVL circuit is formed by a pull up p-MOSFET switch which is joined in parallel with series connected two n-MOSFET resistors. The pull up p-MOSFET switch and n-MOSFET only one resistors are handled by a square wave clock (Clk) signal.

The SVL circuit (lower and upper) is used one by one on the circuit and various circuit parameters were calculated like leakage current, leakage power, noise and power consumption as shown further in simulation results. The circuit has operate in two modes first is the active mode and second is the standby mode. Active mode is the normal operational mode of the load circuit in which the upper and the lower SVL circuit which do one's best to make the load circuit of Current starved VCO act normally to produce its desired functionality. In Standby mode the load circuit avoids its normal operation.

(i) Upper SVL Technique

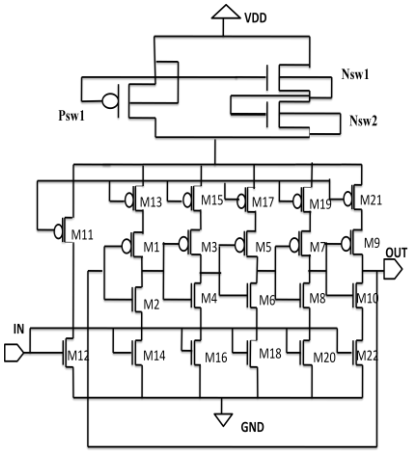

Fig. 2 Circuit Diagram of U-SVL Technique

In the active mode of Figure 2 when the load circuit is active, in this case upper SVL will turn ON p-MOSFET (Psw1) switch and turn OFF both n-MOSFET (Nsw1 and Nsw2) resistors. Thus the ON p-MOSFET switch will connect a direct path connection of the supply voltage Vdd to the load circuit. Hence the circuit operates in standby mode the circuit controlling is low, this low pulse as a complement in upper SVL will turn OFF p-MOSFET switch and turn ON both n-MOSFET resistors and the upper PMOS and NMOS transistor connected in series and supply voltage VDD is applied to the transistor. The gate leakage current maybe decreases in this way.

(ii) Lower SVL Technique

In the active mode of Figure 3 the circuit will turn ON the n-MOSFET (Nsw3) switch and turn OFF both the serially connected Psw2 and Psw3 resistors. Thus ground supply is provided directly by ON n-MOSFET to the circuit for operation. On the other part standby mode as a signal are low then n-MOSFET switch is OFF and both p-MOSFET resistor turn ON connecting a ground supply to the circuit.

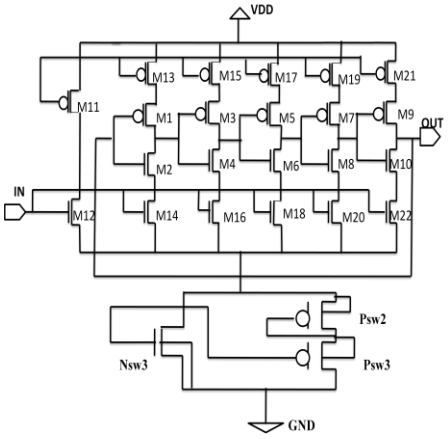

Fig. 3 Circuit Diagram of L-SVL Technique

(iii) Current Starved Voltage Controlled Oscillator Using Combined (LSVL + USVL)

The upper and lower SVL is applied together to the load circuit as shown in Figure 4. To give decreased supply voltage and enhance ground voltage level to the circuit in standby mode of operation and supports normal supply voltage and ground voltage in active mode.

These leakage current waveforms are used for calculating the leakage power and the total dissipated power at respective varying supply voltage.

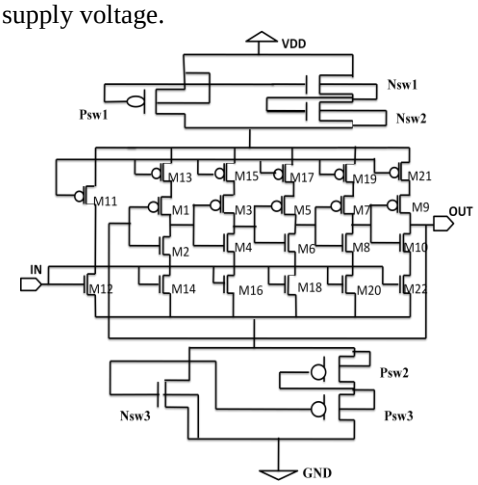

Fig. 4 Circuit Diagram Using Combined (LSVL + USVL) Technique

III SIMULATION RESULT

(a) Leakage Power

The leakage power in the current starved VCO circuit is given as follows in Equation (1)

$$P_{Leakage} = V_{DD} \times \Sigma I_{leakage} \quad (1)$$

$I_{leakage}$ = penetrating leakage current in the turn OFF transistors Leakage power which directly depends upon leakage current from CMOS implemented current starved circuit and SVL (upper and lower SVL) based current starved VCO circuit. Figure 5 reflects graphical analysis of leakage power reduction.

Table 1
Leakage Power in CSVCO

Voltage	Simple Current Starved VCO	U-SVL	L-SVL	Both(L-SVL and U-SVL)
0.7V	12.80nW	9.91nW	6.86nW	0.97nW
0.8V	17.45nW	12.7nW	8.70nW	2.34nW
0.9V	20.90nW	25.09nW	13.02nW	1.67nW
1V	26.01nW	20.95nW	14.89nW	3.99nW

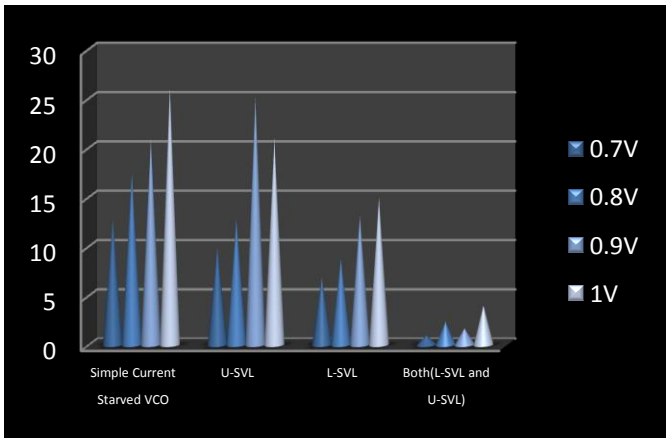

Fig. 5 Graph of Leakage Power in CSVCO

(b) Leakage Current

Leakage current of the current starved VCO is calculated with the help of this equation.

$$I_{leak} = I_{sub\text{-}thr} + I_{gate\text{-}ox} \quad (2)$$

Where, Isub-threshold = sub-threshold leakage current, Igate-ox = gate – oxide leakage current.

Basically leakage current is found in two ways, firstly standby mode and other one is active mode.

Table 2
Leakage Current in CSVCO

Voltage	Simple Current Starved VCO	U-SVL	L-SVL	Both(L-SVL and U-SVL)
0.7V	8.65nA	7.46Na	4.18nA	1.28Pa
0.8V	12.03nA	9.85nA	7.23nA	1.89pA
0.9V	14.98nA	11.53nA	9.12nA	2.99pA
1V	26.99nA	18.21nA	11.22nA	3.59Pa

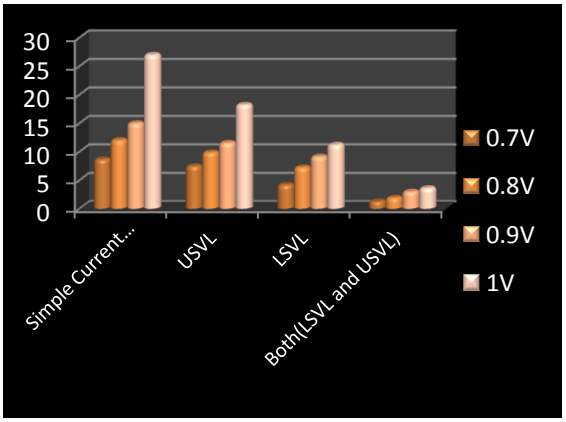

Fig. 6 Graph of Leakage Current in CSVCO

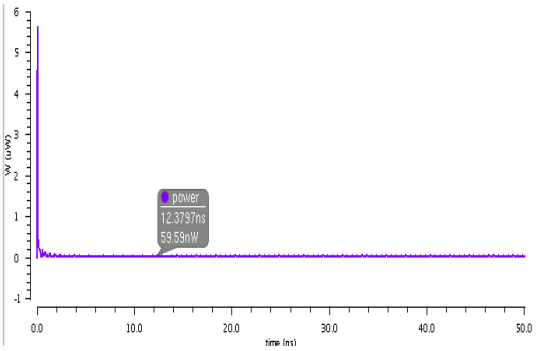

Fig. 7 Leakage power waveform of Current Starved VCO using Combined (LSVL + USVL) Technique

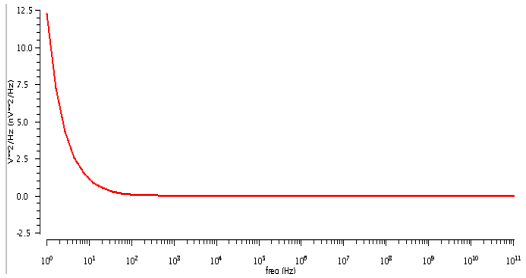

Fig. 8 Noise Waveform of Current Starved VCO Using Combined (U-SVL and L-SVL) Technique

Table 3
of various parameters calculated for the Ring oscillator VCO

Sl. No.	Parameters	SVL in Ring Oscillator VCO
1.	Efficiency (%)	15.76
2.	Voltage Gain (dB)	0.691
3.	Delay (sec)	5.165e-9
4.	Leakage Power (pW)	5.23

IV CONCLUSION

SVL based Current starved VCO circuit is designed and simulated on cadence virtuoso tool at 45nm semiconductor node. In this paper, a new leakage reduction technique is employed to SVL based current starved VCO for performance improvement in terms of leakage, power and noise. The efficiency of the proposed leakage reduction techniques is demonstrated using USVL, LSVL and than combination of both is applied in the circuit. The SVL based current starved circuit also shows a great reduction in terms of circuit noise as the delay reduces to 31 % from the noise analyzed in conventional current starved circuit. In USVL, LSVL and combination of USVL+LSVL based current starved the leakage current observed is 1.89pA at 0.8 volt supply.

V ACKNOWLEDGEMENT

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A Study of Student's Behaviour for Integration of History of Mathematics with Algebra

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ABSTRACT
The motive of this paper is to study the behaviour of the students towards integration of the history of mathematics with algebra. For this research work, 580 students were taken as sample of study. Out of which 261 are girls and 319 are boys. Data collection tool was a questionnaire. The data was analyzed by using mean, percentage, standard deviation and t-test.

Keywords-History, Mathematics, History of mathematics (HOM)

I INTRODUCTION

There is a general opinion that students should learn through inquiry and through the construction of their own. As Von Glasersfeld (1995) state that – "learning is a process of construction in which the students themselves have to be the primary actors".

Using history of mathematics is essential in active learning process. By learning activities of students, we mean their investigational work, problem solving, small group work, mutual learning and experiential learning. While solving a certain problem, every student has been proposed to investigate "mathematical situation" of it with persons own priorities for further inquiry of that problem. I consider "situation" as an issue ,which is a localized area of inquiry with features that can be modified, but in mathematical sense a certain problem was posed for the first time, who was the author, whether that author Proved/Solved a problem on person own. The mathematicians were interested in it, a problem was remained unsolved. I would like to consider the possibility of using principles of active learning in teaching mathematics through such historical environment.

The necessity of the work upon the same and following aroused in my mind:

II RESEARCH QUESTIONS

(a) How are concepts formed in mathematics?
(b) Which factors influence or change the meaning of concepts?
(c) Is there an internal logic and order in the development of mathematical concepts?
(d) What is the status of mathematics at graduate level?
(e) What are the problems faced by the students?
(f) What is the behaviour of students towards integration of the history of mathematics with algebra?
(g) The researcher felt to know the answers of the above questions, the necessity to work upon this area was realized.

III METHODOLOGY

(a) Research Participants- This study carried out in the years 2012-13 in Bhopal city in India. My interest lies in student's belief and behaviour towards integration of history of mathematics with algebra. The unit of sample had students from Science College. The sample was chosen by random sample method.

(b) Method- Keeping in mind the nature of the problem descriptive survey method was suited for the study.

(c) Tool-The tools used were Questionnaire for students. The Questionnaire consists of two sections. Name, gender, Community, category and college name of the student work asked in the section A. Section B of the questionnaire contained 75 statements which are divided into following 11 groups:

(i) Beliefs about: mathematics as a subject-8 statements
(ii) Own mathematical abilities- 5 statements
(iii) Belief Boredom in mathematics-6 statement
(iv) Factors influence or change the meaning of concepts-8 statements
(v) Teaching tools in mathematics-5 statements
(vi) Status of mathematics at graduate level-10 statements
(vii) Problems faced by the students-6 statements
(viii) Behaviour of students towards integration of the history of mathematics with algebra? – 10 statements
(ix) Evaluation of importance of mathematics– 8 statements
(x) Evaluation of the teacher – 8 statements
(xi) Mathematics and future scope -2 statements
(xii) According to the interest the value is given to the statements of the groups, the same are shown below:

Totally agree [Ta] = 5
Partially agree [Pa] = 4
Uncertain [U] = 3
Partially disagree [Pd] = 2
Totally disagree [Td] = 1

(d) Hypothesis- The researcher had relatively no idea regarding the outcomes of this research.
Thus null hypothesis were designed:
H1: There is no significant difference in the behaviour of students towards integration of the history of mathematics with algebra.
H2: There is no significant lacuna between the present curriculum and work done previously in this field.

(e) Statistical technique- The statistical techniques have used likely means, percentage, standard deviation and t-test.

IV DATA ANALYSIS AND INTERPRETATION

Out of 580 students included in the study, 543 completed the questionnaire. Thus, the response rate (93.62 %) was very high. In the following table, the statements are taken from the groups. The columns in the table refer respectively: totally agree [Ta], partially agree [Pa], uncertain [U], partially disagree [Pd], and totally disagree [Td].

The following discussion is not only based on above table but on all the data from the questionnaires. Only a small part of data is presented due to limited space. According to the table above and data, generally there seems to be a small tendency towards more positive beliefs about mathematics amongst students from the survey. Student's behaviour tends to be more fundamental and they are more certain in their statements, especially in relation to the usefulness of the mathematics. Most of the students find that mathematics is a difficult subject and they have to work hard and solve many exercises to be good at mathematics. It appears that when the history integrated with the mathematics, own ability of the students improve to learn mathematics.

There is still a close match of agreement that mathematics is boring. This conclusion is rather striking in the situation where 96.7% of students say that mathematics is important. It means that students have a high motivation to learn but for some reasons they are bored in the mathematics lessons. Indeed, the technology that can help teachers to make mathematics lessons more challenging and fascinating has developed enormously during the 18 years (1995 to till now) but the phenomenon of "being bored" in mathematics lessons is still quite common amongst the students.

Some interesting results from our study include:

(i) 89.11% of students agree that mathematics is important and 78.4% acknowledge the usefulness of mathematics in their lives.
(ii) 46.68% claim that mathematics is boring, while 67.32% are sure they need to know mathematics.
(iii) Most students understand that they have to work hard even if they do not enjoy working with mathematics in lessons (72.3%) and it is their responsibility to learn mathematics (88.9%).
(iv) All the students, except one, find it important to know something about numbers and calculations and only two students think it is important to know how to solve practical problems.
(v) There is still a huge emphasis on "mental calculations" amongst the first year students in upper secondary school as 95.8% acknowledge that it is important to become too good at this.

In this study, the behaviour of students towards use of history of mathematics with algebra was to be determined positive. The study is interpreted in terms of percentage.

The data gathered through questionnaire have been analyzed and interpreted from various angles. Mean, standard deviation, t-test and correlation were applied to analyze the collected data. The mean score of student's behaviour towards integration of history of mathematics in mathematics is 315 out of 580. This indicates that students possess only 54.28% positive behaviour towards integration of history of mathematics with algebra, which is very satisfactory/ sufficient.

V CONCLUSION AND RECOMMENDATIONS

HOM would stand a greater chance of integration if teachers are better informed about different positions and philosophical trends in mathematics and mathematics education, as well as their own philosophical perspective on the nature of mathematic.

Table 1

S.No	Group	(Ta)	(Pa)	(U)	(Pd)	(Td)
1	Beliefs about: mathematics as a subject-8 statements	67	252	91	59	35
2	Own mathematical abilities-5 statements	37	140	70	85	58
3	Being Boredom in mathematics-6 statements	23	23	38	96	73
4	Factors influence or change the meaning of concepts-8 statements	14	46	51	152	160
5	Teaching tools in mathematics-5 statements	16	98	67	165	169
6	Status of mathematics at graduate level-10 statements	11	33	48	113	160
7	Problems faced by the students-6 statements	193	103	90	57	35
8	Behaviour of students towards integration of the history of mathematics with algebra? -10statements	73	98	63	21	60
9	Evaluation of importance of mathematics - 8statements	189	241	28	18	7
10	Evaluation of the teacher – 8 statements	92	111	48	81	37
11	Mathematics and future scope – 2 statements	145	131	109	79	57

I suggest that when the teachers become in tune with their beliefs and are informed about the ways to reflecting on their practices from philosophical perspective, they might be in a better position to recognize and distinguish the controversies, arguments, and alternatives related to their practices. To consider alternatives, one has to be aware of the alternatives. I assert that raising teachers awareness of philosophical orientations should be one of the major goals o mathematics teacher professional development and should include a study of the evolution o the mathematics concepts and their connections. Currently the predominance of an absolute paradigm within the classroom is host to a multitude of infractions which are interfering with students construction of mathematical knowledge. Students are learning mathematics as isolated facts unrelated within the mathematics curriculum and among various other disciplines. Students are under the impression that mathematics has always existed or was discovered as it is usually presented in today textbooks: clean, factual, algorithm and never devoid of a correct answer. Anything outside of this line of thought prompts the learners to consider the do not possess the "math gene." In my view, there is a significant reason for students to view mathematics as a human creation that began thousands of years ago and is ever changing. Students who view mathematics as a set of discrete, unrelated topics may have difficulty in understanding the relation worth of each mathematical concept, its attachment and value to human life. Raising awareness of critical and timely necessary. Teachers must have a vested interest in the role that learning the HOM plays in students construction of mathematical knowledge and they must become aware of the importance that their own philosophical perspective, on the nature of mathematics, has in accomplishing this goal. In this study the researcher tries to investigate students attitude towards integration of history of mathematics with algebra. It is found that attitude level is satisfactory.

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Electrochemical Trace Analysis of Valuable Minerals in Uranophane

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ABSTRACT
Extraction of Uranium from the ores involve various methods like – leaching, hydrometallurgical or pyrometallurgical processes, RAMAN Spectroscopy, Differential pulse Polarography, etc. Physical methods of pre-concentration have unfortunately not been successful in case of uranium ore minerals. The reasons include the impracticality, uneconomical, etc. the accepted uranium resource processing steps consist of : (1) bringing uranium present in solid matrix into solution through leaching, (2) concentration and purification of dissolved uranium, (3) precipitation of the concentrated and purified dissolve uranium into a suitable chemical intermediate. In this work we propose a technique which will eliminate of uranium interferences in uranophane mineral by applying an electrolytic extraction. The purpose of this paper is to provide a review of Uranophane deposits, production and consumption, mining ore processing and above all to explore the Differential Pulse Polarography (DPP) method of instrumental for determination of trace elements in ore.

I INTRODUCTION

Uranophane $Ca(UO_2)_2(SiO_3OH)_2{\cdot}5H_2O$ is a rare calcium uranium silicate hydrate mineral that forms from the oxidation of uranium bearing minerals. Uranophane is also known as *uranotile*. It has a yellow color and is radioactive.

Uranophane occurs as idiomorphic crystals which are prismatic or acicular, sometimes reticulate, but more often in divergent clusters or tufts. Crystals are found most frequently in small vugs, and rarely exceed 1 mm. in length. More commonly the mineral is compact, massive or powdery, and often is seen as scaly incrustations or films on primary minerals, and not infrequently as paper thin sheets in minute cracks. These minerals are refractory in nature. Naturally occurring some common secondary uranium minerals are autonite and meta-autonite, torbernite and meta-torbernite, carnotite, uranophane etc. These minerals are normally bright and occur in different colour shades. The color is rather variable, lemon yellow, canary yellow, orange yellow, and very often very pale yellow. The massive varieties exhibit the greatest variation in color. Various authors have described the luster of the crystals as pearly or greasy, probably an accurate assessment, although the material we studied was so minutely acicular as to appear silky. The massive varieties are earthy to resinous, or waxy for the more compact, scaly type.

There are about more than 100 uranium bearing minerals known. But of these, only a few occur in economic concentration for commercial purpose. Uraninite, pitchblende and davidite are some of the primary uranium minerals.

II EXPERIMENTAL – INSTRUMENTATION

(a) Chemical and Reagents- The element uranium with Atomic number 92 is positioned last in the periodic table amongst naturally occurring elements. It is radioactive and its atomic weight is 238. Uranium is known to occur in three isotopic forms in nature. Their approximate relative natural abundance is as follows.

U238 – 99.27%, U235 – 0.724%, and U234 – 0.006%

The proportion of these isotopes is constant in nature regardless of the type of mineral or deposit in which the uranium is found.

A sizeable quantity of India's uranium ore reserve lies in metasedimentary rocks of Singhbhum Thrust Belt, Bihar. In nature, uranium ions occur normally in 4 and 6 oxidation states.

(b) Preparation of the Sample- The Samples was procured from the Geology department of Dr. Hari Singh Gour Central University Sagar (M.P)Mineral samples were collected from Bodal – Bhandaritola village , Rajnandgaon , Chhatarpur district (M.P.). URANOPHANE MINERAL : 1g finely pulverised mineral sample was dissolved in 10 ml of hydrofluoric acid (26.5N) and final volume made to 100 ml of distilled water.(10)

(c) Preparation of analyte and recording of voltagram/ polarography- The procedure for preparation of analyte, and the pasture of trace analysis, should be simple, convenient, should not leave any contaminating element in the analyte and should not destroy the ions of interest at any level.

The procedure for preparation of analyte from the sample solution is described as follows –

(d) Ore Sample (Uranophane minerals)- The sample solution (10 ml) was mixed with 10 ml of 1 M ammonium tartrate solution as supporting electrolyte and 0.01% gelatin as maximum suppresser was taken in a polarographic cell and, the final volume was made up to 100 ml with distilled water The pH of the test solution was adjusted to 9.0 ± 0.1, with ammonia solution. Pure nitrogen gas was bubbled through the test solution for 15 min and the pH of the test solution was checked before recording the polarogram and voltammograms.

III RESULT AND DISCUSSION

(a) Ore Sample of Uranophane- The DC and DP Polarograms and DPAS Voltammogram of the sample solution (Figure 4.4 a, b and c) shows eight well defined polarographic and voltammetric waves / peaks with $E_{½}$ / E_p values =-0.16/-0.12, -0.48/-0.46, -0.52/-0.54, -0.66/-0.70, -0.74/0.75, -0.94/-0.97 and -1.20/-1.21, -1.40/-1.41, and -1.52/-1.54 V vs. SCE in DCP/DPP mode and E_p values =-0.03, -0.26, -0.35, -0.51, 0.79, -0.99, -1.10, -1.18 and -1.35 V vs SCE, in DPASV mode at pH 9.5 ± 0.1, indicating the presence of Cu(II) , Pb(II), U(VI), Cd(II) , Ni(II), Zn(II) and Fe(III) and Cr(III).

To confirm the presence of said metal ions in the sample, a definite quantity of standard solutions of each metal ion was added to the analyte and the resulting polarogram and voltammogram were recorded. Which increased the observed wave / peak height of each metal ion signal without any change in $E_{½}$ / E_p values.

Some synthetic samples having varying concentration of the above said metal ions were prepared and their polarograme and voltammogram were recorded under identical experimental conditions. The results (Fig 2) shows no change it its $E_{½}$/ Ep values of the metal ions and also the proportionality of concentration of each metal ion ti its wave/ peak height, thus confirming the possibility of an accurate oligo qualitative as well as quantitative determination of the metal ions in the sample. The concentration of each metal ion (taken/found) in synthetic samples using DPP has been given in the

Table-2
Analysis of Synthetic Samples of Uranophane Sample
Compositions of synthetic samples (mg/ 100 ml)

Cu	U	Pb	Cd	Fe	Ni	Zn	Cr
0.04	0.35	0.36	0	0.01	0.02	11.67	0.01
(0.03)	(0.36)	(0.36)	(0.2)	(0.01)	(0.01)	(11.66)	(0.01)
0.07	0.02	0.74	0.01	0.03	0.03	22.33	0.03
(0.06)	(0.02)	(0.73)	(0.01)	(0.02)	(0.03)	(22.33)	(0.02)
0.10	0.01	1.10	0.09	0.04	0.05	34.08	0.04
(0.10)	(0.02)	(1.09)	(0.09	(0.04)	(0.04)	(34.06)	(0.04)
0.13	0.01	1.47	0.01	0.06	0.07	44.67	0.05
(0.13)	(0.01)	(1.47)	(0.01)	(0.05)	(0.06)	(44.68)	(0.05)
0.22	0.15	0.11	0.12	0.16	10.20	0.40	0.72
(0.22)	(0.15)	(0.11)	(0.11)	(0.17)	(10.20)	(0.39)	(0.73)
0.28	0.21	0.20	0.22	0.24	20.20	0.45	0.84
(0.27)	(0.20)	(0.19)	(0.20)	(0.23)	(20.20)	(0.43)	(0.85)

( ) Amount Found * Using DPP Average of four determinations

(b) Minimum tried detection limits of DCP and DPP -The minimum tried detection limits of the techniques for the measurement of the individual and oligo analysis of the metal ion / ions have been mentioned in the Table 4.42 All the metal ions in the sample could be determined in one run. The detection limits were examined by preparing synthetic samples.

Table 2.2
Minimum Tried Detection Limits of Uranophane Sample

Metal Ion		DCP	DPP	DPASV
Cu(II)	Individual	6.3	0.06	6.3
	Combined	6.3	0.06	6.3
U(VI)	Individual	2.4	2.40	0.2
	Combined	2.4	4.80	4.8
Pb(II)	Individual	2.6	0.26	2.6
	Combined	2.6	0.26	2.6
Cd(II)	Individual	1.0	0.06	6.0
	Combined	1.0	0.06	6.0
Fe(II)	Individual	5.6	0.56	2.8
	Combined	5.6	0.56	2.8
Ni II	Individual	0.6	0.06	3.0
	Combined	0.6	0.64	3.0
Zn(II)	Individual	6.4	0.64	12.8
	Combined	6.4	0.64	12.8
Fe(III)	Individual	5.6	0.56	2.8
	Combined	5.6	0.56	2.8
Cr(III)	Individual	0.05	0.05	10.2
	Combined	0.05	0.05	10.2

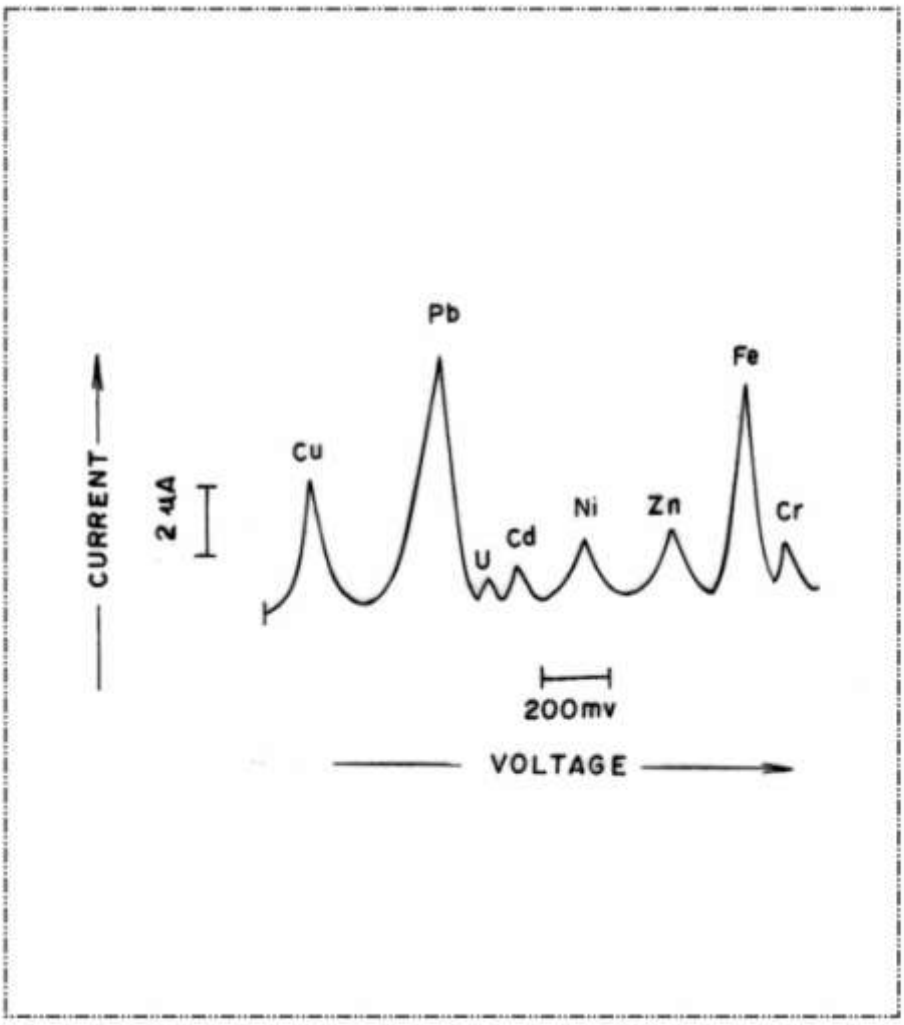

Figure-4.4

(f) Differential Pulse Polarogram of Synthetic Sample Containing Cu(II)1.25 mg U(VI) 0.2 mg, Pb(II) 4.1 mg, Cd(II) 0.10 mg, Ni(II) 0.58 mg, Zn(II)0.65 mg Fe(III)5.0 mg and Cr(III) 0.50 mg in 0.1 M Ammonium Tartrate + 0.001% gelatin at pH 9.5 ± 0.1.

Table 2.3
Final Analysis Results on Uranophane Minera Sample And Their Comparison with AAS

Metal ion	Votammetry & Polarography	AAS
	(mg g^{-1} of the sample)	
Cu (II)	1.36	0.135
U (VI)	0.11	0.10
Pb (II)	14.67	14.32
Cd (II)	0.12	-
Ni (II)	0.58	0.58
Zn(II)	0.65	0.64
Fe (III)	14.67	14.55
Cr(III)	0.52	0.52

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Design & Analysis of Hexagonal Shaped Micro Strip Antenna Using Artificial Neural Network

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ABSTRACT
This paper presents the use of artificial neural network for the estimation of frequency band and bandwidth of a line feed Hexagonal-Shaped Micro strip patch antenna. The results obtained by using ANNs are compared with IE3D simulation and found quite satisfactory. The designed antenna operates in the frequency range (1.856 GHz to2.005GHz). The antenna is designed using glass epoxy between the ground plane and patch and simulated on the Zeland IE3D software and results are compared with the neural network of tool of MATLAB.

Keywords: Micro strip Antenna, Bandwidth, Simulation, Neural Network

I INTRODUCTION

Micro strip antenna's are being frequently used in wireless communication due to its light weights low profile , low cost, directive with high transmission efficiency and ease of integration with microwave circuit and portable communication equipments, that is why it finds place in much applications since 1970's [1-3]. However rectangular micro strip antenna as the drawback of narrow bandwidth and low gain, limited power capacity, poor polarization, purity and tolerance power but researchers have been proposed and investigated many techniques to overcome the drawbacks, Such as slotted patch antennas like U-Slot, C-Slot, E-Shaped, H-shaped, electrically thick substrates, defected ground plane and use of many feed techniques & impedance matching techniques and the use of multiple resonators [11-14]. In the present work an Artificial Neural Network (ANN) is developed to analyze the frequency band and bandwidth of micro strip antenna. The Method of Moments (MOM) based IE3D software has been used to generate training and test data for the ANN [4-10]. It is a computational EM simulator based on Method of Moments numerical methods. It is analysis that a 3D and multi layer structure of general shapes feed point must be located at point on the patch where the input impedance of patch matched the feed for the specific resonant frequency. It is easy to model and easy to match by controlling the feed coordinates. The ground plane is made modified, i.e. cut from the corner.

A modified structure introduces discontinuities on the signal plane and disturbs the shielded current distribution in signal plane. As a result apparent permittivity of the substrate varies as a function of frequency [15-20].

The proposed antenna has been designed on glass epoxy substrate to give a wide bandwidth of 7.718%, covering the frequency range from 1.856GHz to 2.005GHz which is best suitable for personal communication system. The return loss is recorded and that feed point is selected as the optimum one where the RL is most negative i.e. equal to -11.50dB

II DESIGNING THE PROPOSED ANTENNA

The configuration of the conventional antenna is shown in Figure 1. An antenna has 33.4 mm×40.6 mm modified ground plane and 23.8 mm×31 mm of rectangular patch dimensions. The microstrip antenna that has the patch length L along the x-axis and the patch width W along the y-axis is located on the surface of a grounded dielectric substrate with the thickness of h.

The three essential parameters for the design of a Micro strip Patch Antenna are frequency of operation (f_0), dielectric constant of the substrate (ε_r) and height of di-electric substrate (h). The dielectric material of the substrate (ε_r) selected for this design is glass epoxy which has a dielectric constant of 4.4 and loss tangent equal to 0.001.

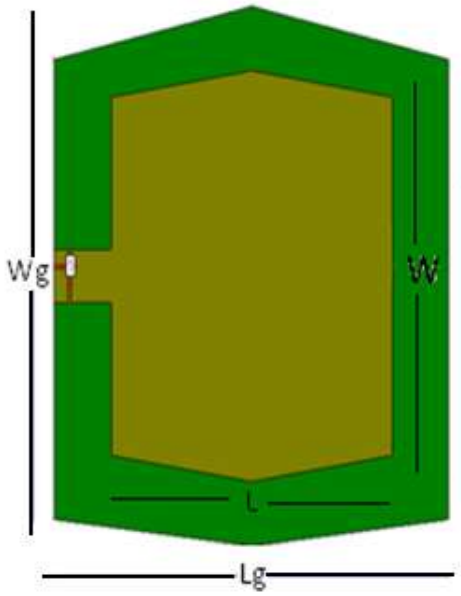

Fig 1. Geometry of proposed micro strip antenna

The substrate selected for this design is glass epoxy with dielectric constant (ε_r) = 4.4 and height of the substrate (h) = 1.6 mm. The low value of dielectric constant increases the fringing field at the patch periphery and thus increases the radiated power. Line feed is given at the point (x, y).

For a single-ended micro strip antenna, the patch width *W* and length *L* that support the operation at the required resonant frequency (or the free-space wave length λ_0) can be design using the formulas as given in [6] as.

$$W = \frac{c}{2f\sqrt{(\varepsilon_r + 1)/2}} \qquad (1)$$

Where c is the velocity of light, ε_r is the dielectric constant of substrate, f is the antenna working frequency,

W is the patch non resonant width, and the effective dielectric constant is ε_{eff} given as,

$$\varepsilon_{eff} = \frac{(\varepsilon_r + 1)}{2} + \frac{(\varepsilon_r - 1)}{2}\left[1 + 10\frac{h}{W}\right]^{-\frac{1}{2}} \qquad (2)$$

The extension length Δ is calculated as,

$$\frac{\Delta l}{h} = 0.412\frac{(\varepsilon_{eff} + 0.300)\left(\frac{W}{h} + 0.262\right)}{(\varepsilon_{eff} - 0.258)\left(\frac{W}{h} + 0.813\right)} \qquad (3)$$

By using the mentioned equation we can find the value of actual length of the patch as,

$$L = \frac{c}{2f\sqrt{\varepsilon_{eff}}} - 2\Delta l \qquad (4)$$

III NETWORK ARCHITECTURE AND TRAINING RADIAL BASIS FUNCTION NETWORK

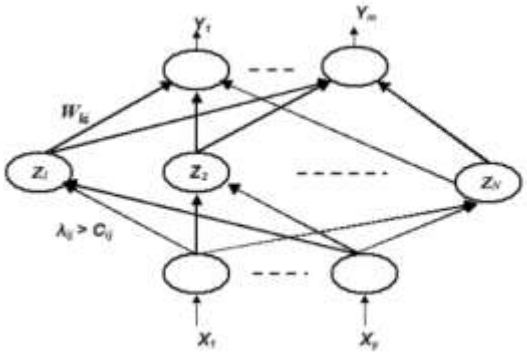

Fig 2. Neural Network approach (Radial Basis Function Network)

In this paper radial basis function (RBF) neural networks is used to analyze hexagonal shaped micro strip patch antenna. Radial Basis Function Network is a feed forward neural network with a single hidden layer that used radial basis activation function for hidden neurons. RBF network are applied for various microwave modeling purposes. The RBF neural network has both are supervised and unsupervised components to its learning. It consists of three layers of neurons-input, hidden and output. The hidden layer neuron represents a series of centers in the input data space. Each of these centers has activation functions typically Gaussian. The activation depends on the distance between the presented input vector and the centre. The further the vector is from the centre the lower is the activation and vice versa the generation of centers and their widths is done using an unsupervised k-Means clustering algorithm. The centers and the widths created by these algorithms then form the weight of device of the hidden layer which remains unchanged once the clustering has been done. A typical RBF network is given in Figure 2 the model of ANN is shown in Figure 3. The feed forward back propagation algorithm of ANN is used to analyze the parameter of Hexagonal Shaped Micro strip Patch antenna (MPA). The results obtained from training and testing of data are very close to each other and shows good agreement with the results available and obtained from formulae. Here models of ANN have been used in the field of electromagnetic of micro strip patch antenna as the most powerful optimizing tools. With the help of this analysis model, we get the accurate value of resonant frequency with width and length of Micro strip Patch Antenna.

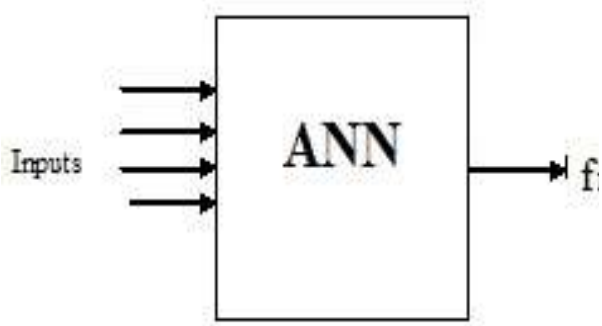

Fig. 3 Artificial Neural Network Model

The parameters C_{ij} and λ_{ij} a centres and standard deviations of radial Basis Activation Functions Commonly used radial basis activation functions are Gaussian and multi quadratic. Given the input X, the total inputs to the i_{th} hidden neurons γ_{ij} is given by

$$\gamma_i = \sqrt{\sum_{j=1}^{n}\left(\frac{x_j - c_{ij}}{\lambda_{ij}}\right)^2}, i = 1,2,3.....N \quad (5)$$

Where N is the number of hidden neurons, the output value of the i_{th} hidden neurons is $Z_{ij} = \sigma(\square_i)$ where Gama is a radial base function. Finally the output of the RBF network are computed from hidden neurons as

$$y_k = \sum_{i=0}^{N} W_{ik} Z_{ki} \quad (6)$$

Where W_{ki} is the weight of the link between the i_{th} neurons of the hidden layer and k_{th} neuron of the output layer Training parameters W of the RBF network include w_{k0}, c_{ii}, λ_{ij}, k = 1, 2, ….. , m, i = 1, 2,….. , N, j = 1, 2,….,n.

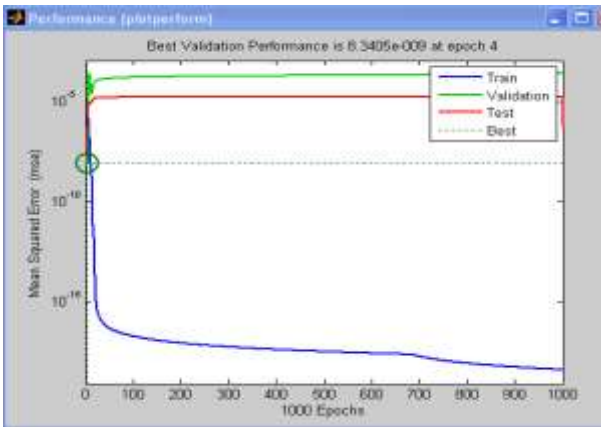

Fig. 4 Training performance showing minimum MSE

Table 1
Training and Test Data of proposed data

Length	Width	Probe (X,Y)	f1	f2	FB IE3D (GHz)	BW IE3D (GHz)	FB FFBPN (GHz)	BW FFBPN (GHz)
4.8	4	(1,21)	1.861	2.042	0.181	9.275	0.181	9.275
4.8	4	(1.25,21)	1.856	2.005	0.149	7.718	0.15	7.769
4.8	4	(1.30,21)	1.846	2.019	0.173	8.952	0.167	8.641
4.8	4	(1.35,21)	1.839	2.029	0.19	9.824	0.189	9.772
4.8	4	(1.40,21)	1.835	2.037	0.202	10.434	0.204	10.537
4.8	4	(1.45,21)	1.832	2.043	0.211	10.89	0.212	10.941
4.8	4	(1.50,21)	1.831	2.048	0.217	11.188	0.215	11.084
4.8	4	(1.55,21)	1.832	2.043	0.211	10.89	0.216	11.148
4.8	4	(1.60,21)	1.833	2.052	0.219	11.274	0.216	11.119
4.8	4	(1.65,21)	1.837	2.053	0.216	11.105	0.216	11.105
4.8	4	(1.70,21)	1.837	2.053	0.216	11.105	0.216	11.105

IV RESULT AND DISCUSSION

Figure5 shows the return loss graph and Figure 6 shows the VSWR of the proposed micro strip antenna. The result are also depicted in Table1 From the table it is evident that the result obtain from IE3D and ANN tool is very closed by and hence given accurate result after several trainings the length and width of the patch is kept constant and the probe position is being changed and the network is trained for the same adjustment. Further it is seen that the network analyzes the almost same frequency band and bandwidth as obtain from the simulator. The ANN tool is just used to study the frequency band and bandwidth of micro strip antenna which is in good agreement with the results obtains from Zeland IE3D software. Figure 5 shows the return loss graph of micro strip antenna which is about -11.5Db. The proposed antenna has frequency range from 1.856GHz to2.005GHz giving a wide band width of 7.718% which is suitable for personal communication system.

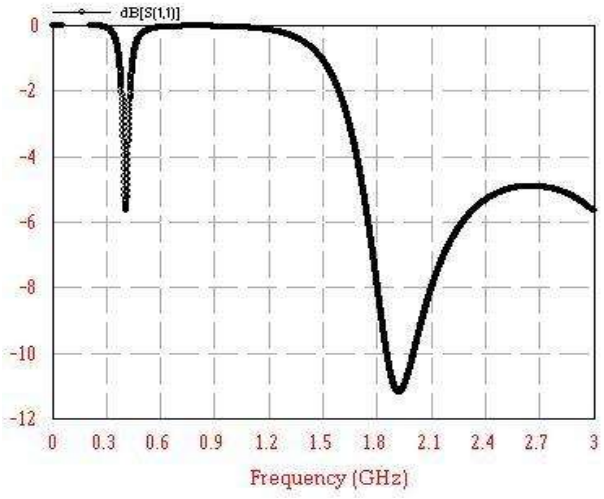

Fig 5. Return loss vs. frequency of proposed antenna.

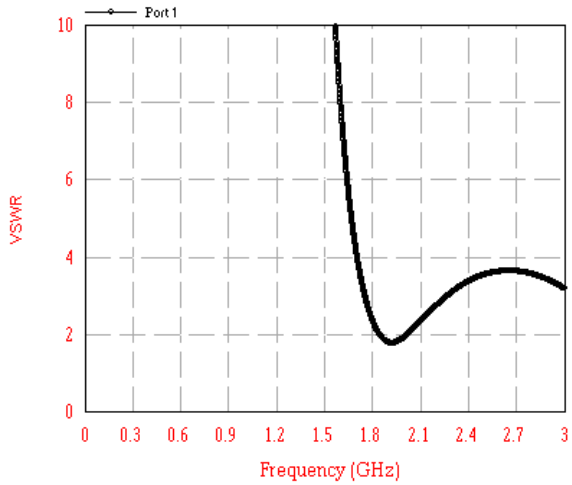

Fig 6. VSWR of the proposed micro strip antenna

V CONCLUSION

This paper presents a design of a micro strip patch antenna with line feed for use in personal communication system application. Glass epoxy substrate with dielectric constant 4.4 is used which gives a wide bandwidth of 7.718% .In this work ANN is used as a tool to study the frequency band and bandwidth of Micro strip Antenna. The results obtain from IE3D and those obtain from ANN are in good agreement and shows almost 99.4% accuracy with minimum mean square error shown in Figure 4. The training and test set has been designed with the data obtain from IE3D simulator.

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Change Point Analysis of Air Temperature in India

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ABSTRACT

Change point analysis was performed on air temperature at different pressure levels in the Indian subcontinent to identify the time at which a major change in trend, if any, has occurred. Pettit test, a nonparametric test to identify change point in a time series was used for this purpose. It tests the null hypothesis that the variable follows one or more distributions that have the same location parameter against the alternate hypothesis that a change point exists. The significance of the change point is determined and if it is greater than the considered level of 90% confidence, then, the change point is considered to be significant. The test was performed on the surface temperature data of the Indian subcontinent for the period 1949–2014, obtained from the NCEP/NCAR reanalysis data set at a resolution of 2.5^o. The results of the test for the dry period indicate that the southern, northern and north eastern parts of India exhibited a significant change point in the nineteen seventies. During the wet season and the south west monsoon season, a significant change was observed in the southern, central and eastern parts of India in the last decade. Analysis of the annual mean temperature revealed that a significant change point occurred in South India in the last decade.

I INTRODUCTION

It has been observed in many studies that the global climate has taken a significant turn in the recent decades. The impact of climate change is projected to have different effects within a country and between countries. Information about such changes is required at global, regional and basin scales for a variety of purposes. According to the assessments by the Intergovernmental Panel on Climate Change (IPCC) 2001, increase in greenhouse gas concentrations caused an increase in the annual mean global temperature by 0.6 ± 0.2°C since the late 19th century (Houghton et al., 2001). According to the estimates by the IPCC (2007), the earth's linearly averaged surface temperature has increased by 0.74°C during the period 1901-2005 (Pachauri and Reisinger, 2007). Weather reports indicate that the global mean surface temperature has risen, approximately by 0.6^{o}C, since 1850. It is expected that by 2100, the increase in temperature could be in the range 1.4-5.8^{o}C (Singh et al., 2008).

The study by Srivastava et al. (1992) on decadal trends in climate over India gave the first indication that temperature trends in India are quite different from that observed over various parts of the globe. They observed that the maximum temperatures show much larger increasing trends than minimum temperature, over a major part of the country and an overall slightly increasing trend of the order of 0.35^{o}C over the last 100 years. Rupa Kumar et al. (1994) have shown that the countrywide mean maximum temperature has risen by 0.6^{o}C. Lal et al. (1995) suggested that increase in the annual mean minimum and maximum surface air temperatures would be of the order of 0.7-1.0^{0}C in the 2040s, when compared to that in the 1980s. Tabari and Hosseinzadeh Talaee (2011) analysed temperature series from 29 stations in Iran for the period 1966-2005 using the Mann-Kendall and Mann-Whitney tests. Results indicated that the annual mean temperature increased at 25 out of 29 stations, of which 17 stations showed significant trends. The analysis also indicated that most of the positive significant change points occurred first in 1972 at all stations except the coastal stations.

Bisai et al. (2014) performed change point analysis for the Krishnanagar weather observatory, West Bengal, India by applying cumulative sum chart and bootstrapping test to the time series of temperature data. They concluded that the major change point in the annual mean temperatures occurred around year 2001. In this study, change point analysis was performed using Pettit's test for air temperature to identify the time at which major changes have occurred in this during the Indian subcontinent.

II METHODOLOGY

(a) Study area

The study area chosen for this study consists of the Indian subcontinent, between 8°4' and 37°6' north latitude and 68°7' and 97°25' east longitude. This area contains a variety of geographical features. The Indian subcontinent is surrounded by the Arabian Sea in the west, the Bay of Bengal in the east and the Indian Ocean in the south. South India is a peninsula

with two coastal lines at the boundaries and a plateau in the centre. North India occurs in the valley of the Himalayas and North Eastern India is mainly the foothills and peaks of the Himalayas. There exists a wide variation in geographical features and this could result in highly varying climatic conditions. The study area is presented in figure 1.

(b) Data used

This study uses the National Center for Environmental Protection/ National Center for Atmospheric Research (NCEP/ NCAR) reanalysis data for the period of 1948-2014. This is the output of an offline run of the T62 operational model in 2.5^0 x 2.5^0 grid. As data assimilation has changed considerably in the satellite era, time dependant in-homogeneities may be present. However, the NCEP/ NCAR data is a reliable basis for analysis of the natural variability over the last several decades, especially in the Northern Hemisphere (Rudeva et al., 2011). Due to the lack of availability of observed meteorological data in extremes terrains like the North Eastern parts of India, the reanalysis data is considered most complete and a physically consistent data set (Simmonds and Keay, 2000; Dell'Aquila et al, 2005). The data assimilation system uses a 3D-variational analysis scheme, with 28 sigma levels in the vertical and a triangular truncation of 62 waves which corresponds to a horizontal resolution of approximately 200 km (Kalnay et al., 1996). As the data points are available only in grids of 2.5^o, the Indian subcontinent was divided into grids of the same measure and 47 data points were identified (presented in Fig. 1).

(c) Pettit's Test

The method was proposed by A.N Pettit in 1979. The Pettit test is a nonparametric method, used to identify a change-point in a time series (Pettit, 1979). Let $X_1, X_2 \ldots\ldots X_n$ be a sequence of random variables; the test statistic $U_{t,T}$ is given by

$$U_{t,T} = \sum_{i=1}^{t} \sum_{j=t+1}^{T} sgn(x_i - x_j) \quad (1)$$

where $sgn(x) = 1$ if $x > 0$, 0 if $x = 1$, -1 if $x < 0$.

A change-point is identified where the value $K_T = |U_{t,T}|$ is maximum. This is performed for each point. The significance of the obtained change point is determined using the formula

$$\rho = \exp\left(\frac{-6K_T^2}{T^3 + T^2}\right) \quad (2)$$

If the value of this parameter is greater than the considered level of 90% confidence (0.90) then, the change point is considered significant (Zhang et al., 2009).

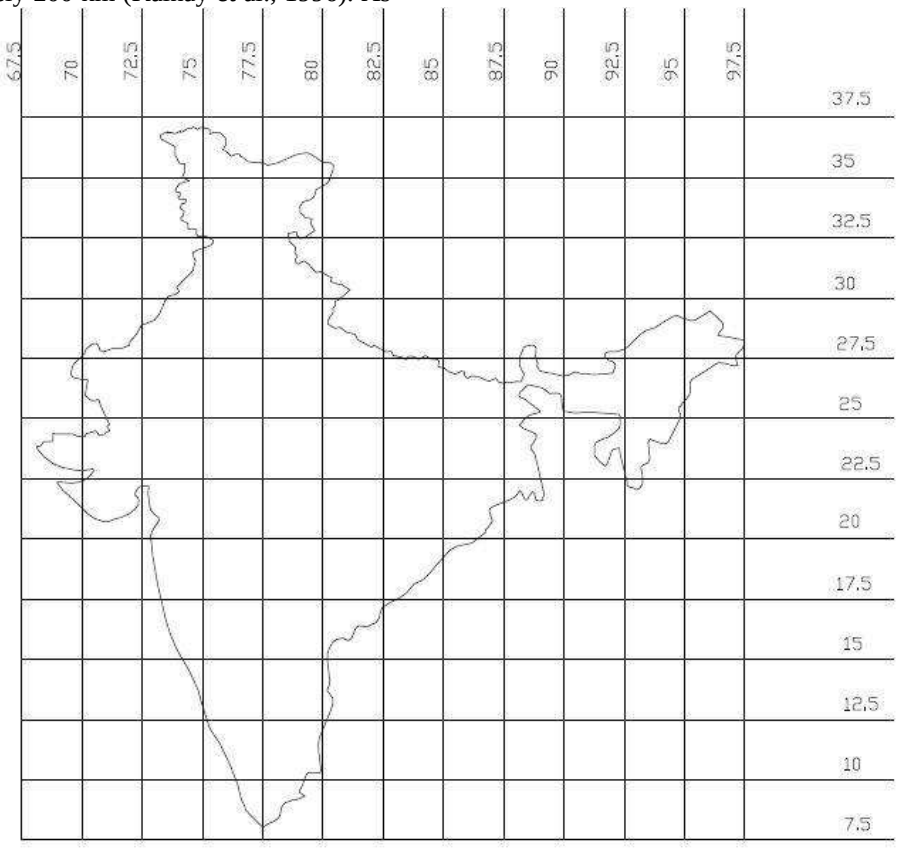


Fig. 1: Latitude and longitude of India

III RESULTS AND DISCUSSIONS

(a) Change Point Analysis

The Pettit's test was conducted for all grid points at various pressure levels in all seasons in the Indian subcontinent.

In the dry season, at surface level, 14 points showed significant change as per Pettitt's test. 10N 77.5E, 12.5N 77.5E, 15N 75E, 25N 87.5E had a change point around the year 1976-'78. 25N 85E, 25N 92.5E, 27.5N 92.5E, 27.5N 95E had a change point around the period 1972 -'73. 35N 77.5E, 35N 80E had a change point in the year 2004. The other points are 27.5N 82.5E, 25.0N 82.5E, 22.5N 87.5E, 12.5N 80.0E which had a change point at 1970, 1966, 1988 and 1997 respectively. This indicates the presence of a change in trend during the period 1976–'78 in South India and 1972–'73 in North Eastern India.

Similarly, a change in trend was detected in level 1000 mb in Southern and Central India during the past decade. Northern plains had a change in pattern of temperature during 1973-'75 at the level 850 mb. Almost all points had a change point in the period 2004–'06 at the level 500 mb. The same is illustrated in the Fig. 2.

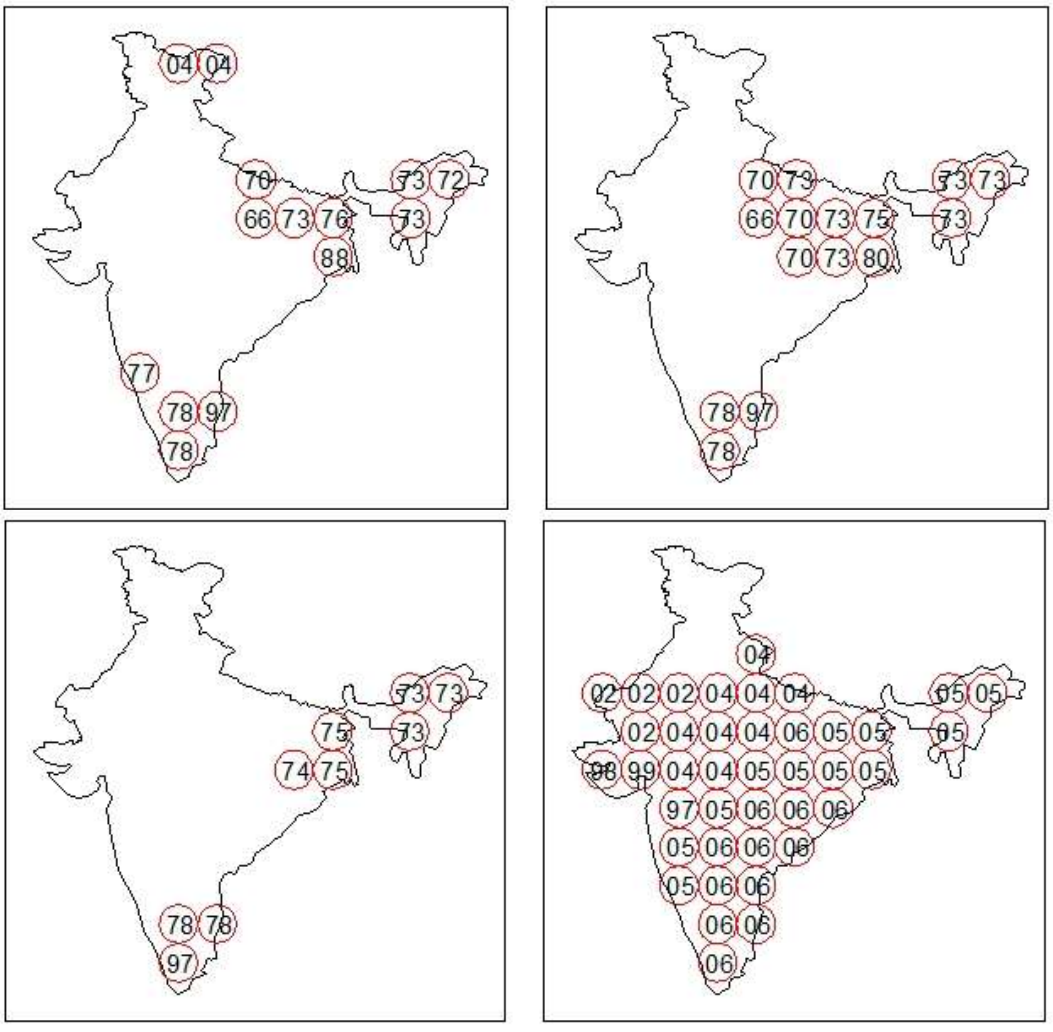


Fig. 2: Significant change points (year) in monthly mean temperature during the dry season estimated using Pettit's test (clockwise from left top: Level surface, Level 1000, Level 500, Level 850)

For wet season, at surface level, it can be concluded that all of southern India and eastern coastal area exhibit a major change in the trend of temperature during the past decade. At level 1000 mb, it is observed that southern India showed a significant change point in the last decade and Kashmir showed a significant change point during 1970–'71. Southern and north eastern India has a significant change point in 2004-'12 at 850mb level. The region

comprising the states of Kerala, Karnataka, Andhra Pradesh and Tamil Nadu has a change in pattern in the period 2006–‘08 and the region consisting of Maharashtra, Madhya Pradesh and Orissa has a change in the period of 1976–‘79 at 500mb level (Illustrated in Fig.3).

During the south-west monsoon season, at surface level, the conclusion drawn is that all of south India, eastern coastal region extending till West Bengal and North East region show a significant change of pattern in the last decade. It is observed that, at 1000 mb level, a change in pattern exists in southern India, the eastern coastal region extending till West Bengal and north- east India during the last decade. Kashmir region showed a significant change point during the year 1971. At 850mb level, southern India, eastern and western coastal regions and north-east India showed a significant change in the pattern of temperature during the period 2004–‘12 (Refer Fig. 4).

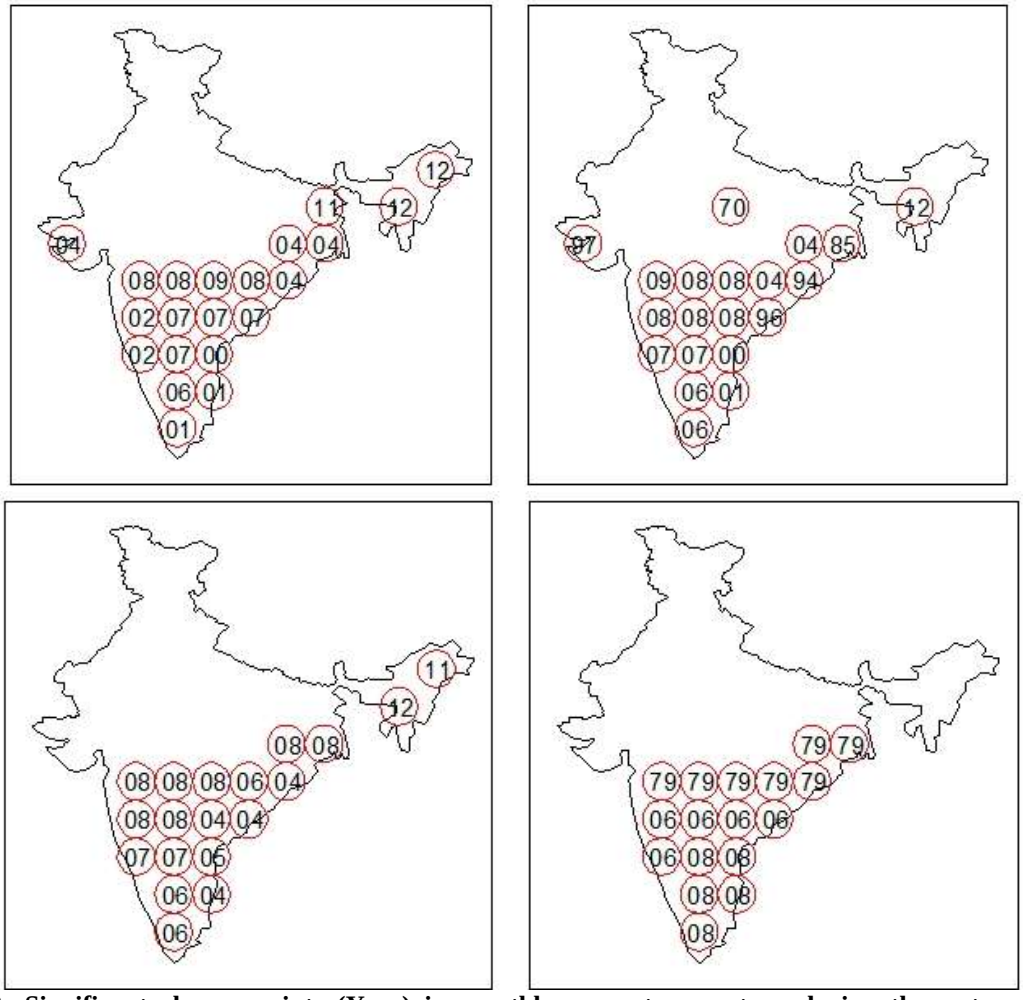


Fig. 3: Significant change points (Year) in monthly mean temperature during the wet season estimated using Pettit’s test (clockwise from left top: Level Surface, Level 1000, Level 500, Level 850)

From these results, it can be observed that the major change points exist in the past decade. In order to identify any other significant pattern before this period, an annual analysis was performed till the year 1999. The monthly data was averaged to obtain annual data for the years and Pettit’s test was performed. The result obtained indicates that, on surface level, south India showed a significant change point in the period 1976–‘84. Central India had a significant change of pattern in the period of 1960–‘73. North and north-eastern India showed a significant change point in the period 1970–‘80. Similarly at 1000 mb pressure level, south India showed a significant change point in 1976–‘97, central India showed a change in pattern in the period of 1960–‘74 and north and north eastern India showed a significant change point in 1970–‘88. At 850mb pressure level, south India had a change point during the period 1976-’97, central India showed a change in the period 1960-’74’ whereas north and north eastern India showed a change point in the period 1970–‘88. At 500 mb level, south India showed a change

point in the year 1979, central India showed a change point during the period 1982–‘83, north and north eastern india had a change point during the period 1957–‘69. This is illustrated in Fig. 5.

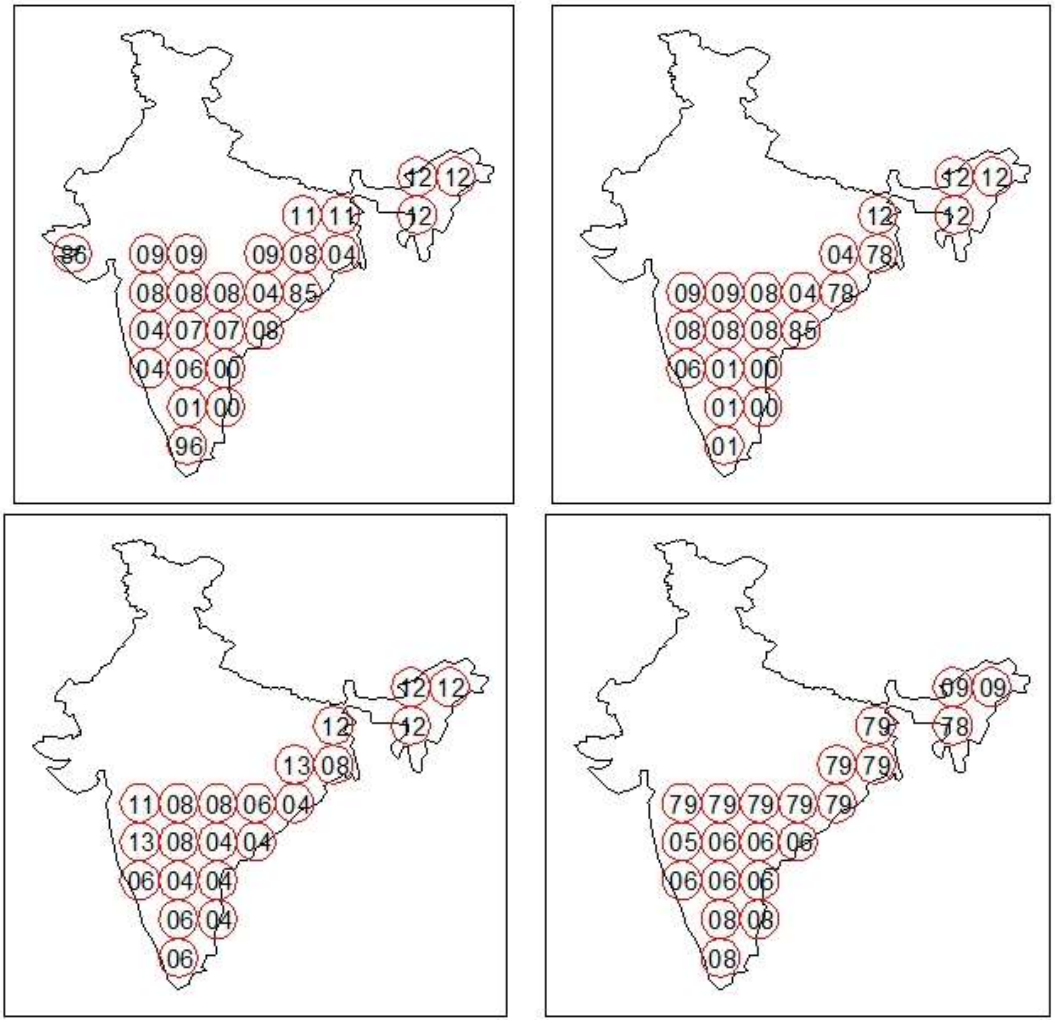
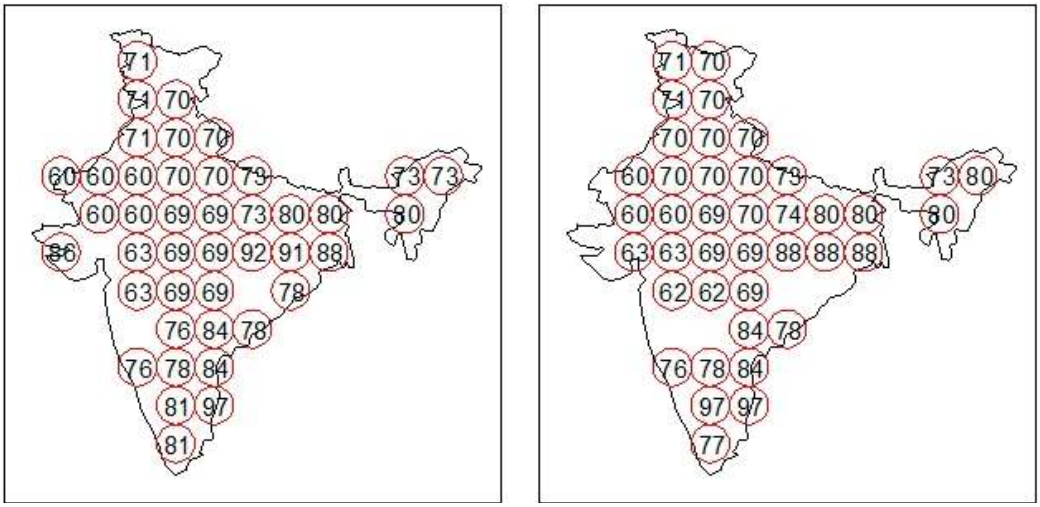


Fig. 4: Significant change points (Year) in monthly mean temperature during the south-west monsoon season estimated using Pettit’s test (Clockwise from left top: Level Surface, Level 1000, Level 500, Level 850)



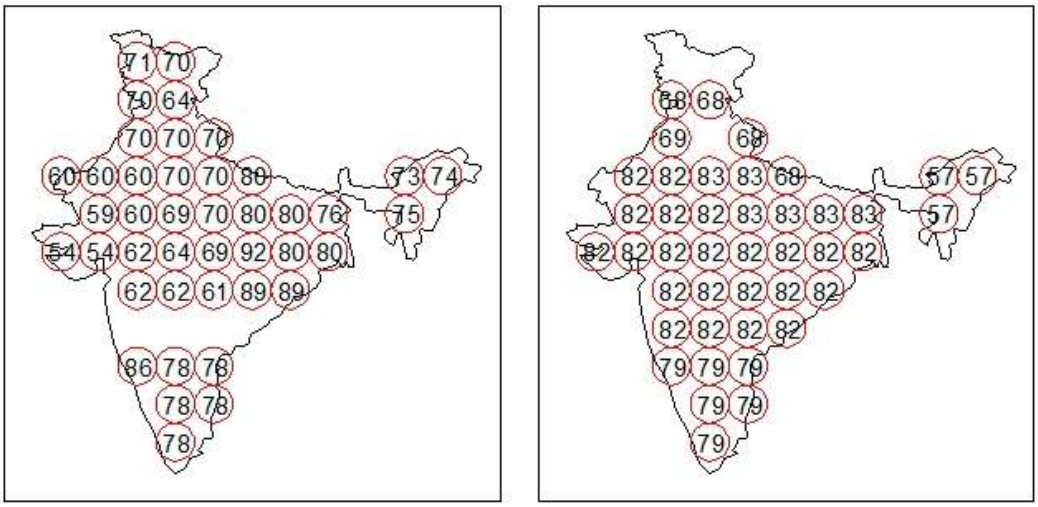


Fig. 5: Significant change points (Year) in annual mean temperature (excluding 2000-2014) estimated using Pettit's test (Clockwise from left top: Level Surface, Level 1000, Level 500, Level 850)

IV SUMMARY & CONCLUSIONS

In this study, change point analysis using Pettit's test was performed on air temperature at different pressure levels. The test was first done on the seasonal subsets and then on the whole data taken annually.

The results indicated that except for the dry season, all other seasonal data showed a change point during the period of 2000–'14 in the southern peninsula and north eastern India. Results for the dry season showed a change point during the 1970s for this region. Further, on analysis of the data, excluding the data for the period since 2000, it is observed that South India had a change of pattern in 1974-'84, Central India experienced the same in the 1960s and North and North Eastern India experienced this during the 1970s.

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Promoting Women Entrepreneurship and Empowering the Nation for a Better Tomorrow

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ABSTRACT

Women's empowerment has been an important achievement in the global women's movement. Women of the modern era take control of their lives to stand an equal footing in employment, education and other areas of development. The benefits are many - From greater social development to changes that improve the world- when nations empower ambitious women through entrepreneurship. As key contributors to global economies, rural women make up a great source of power of development in both the developed and developing nations. Empowering rural women not only gives them greater dignity and welfare through entrepreneurship, also aids to improve livelihood. The dynamic changes soar high to the path of growth .Enterprise led by women can generate high productivity without compromising on the quality standards. Although, educational barrier, cultural inhibitions have always been a major barrier for women to pursue entrepreneurship, access to finance is also a major crisis plaguing these women led enterprises. Nevertheless, society is benefited with different solutions to management, organization and business problems through the exploitation of entrepreneurial opportunities. "When women are empowered and can claim their rights and access to land, leadership, opportunities and choices, economies grow, food security is enhanced and prospects are improved for current and future generations" Women entrepreneurs' especially economically and socially become agents of change.

Key Words- Empowerment, Entrepreneurship

I INTRODUCTION

Women can and should have a fundamental role in the development of sustainable livelihoods. Women are the main victims of worldwide poverty, thus preventing societies from fully achieving their development potential. By creating and supporting entrepreneurial opportunities for women, I believe that women can be lifted out of poverty, which will have a positive effect on the economy while promoting social growth and advancing towards gender equality.

While on the surface poverty is often defined as a lack of income or assets, in the day-to-day lives of the very poor, poverty becomes a network of disadvantages, each one exacerbating the others. The result is generation after generation of people who lack access to education, health care, adequate housing, proper sanitation and good nutrition. They are the most vulnerable to disasters, armed conflict and systems of political and economic oppression and they are powerless to improve their circumstances. These conditions often carry with them dysfunctional family and societal relationships, paralyzingly low self-esteem, and spiritual darkness. It's clear that handouts and traditional aid are not enough to solve the problem of poverty and its many entanglements. The following facts reveal the necessity of empowering the rural women through entrepreneurship.

(a) Poverty, Women and Children

(i) 1.4 billion people in developing countries live on $1.25 a day or less.

(ii) Rural areas account for three out of every four people living on less than $1.25 a day.

(iii) 22,000 children die each day due to conditions of poverty.

- 60 percent of the world's hungry are women.
- 50 percent of pregnant women in developing countries lack proper maternal care, resulting in over 300,000 maternal deaths annually from childbirth.
- 1 out of 6 infants are born with a low birth weight in developing countries.
- Malnutrition is the key factor contributing to more than one-third of all global child deaths resulting in 2.6 million deaths per year.
- Every five seconds, a child dies from hunger-related diseases.

India therefore urgently needs to formulate an anti-poverty strategy that is fiscally sustainable and more finely targeted to those who truly cannot benefit from the opportunities offered by growth. To increase their cost effectiveness and extend their outreach to the very poor, safety nets need to be targeted to those who either cannot participate in the growth process or face continuing exposure to risks, which are outside of their control. Rural households are largely uninsured against

agricultural yield shocks, for example. Such as the following

(i) **Effective safety nets** that insure the rural poor against income fluctuations — such as public works programs — are essential in overcoming an important market failure.

(ii) **Entrepreneurship development programmes** as one of the leading programmes for the empowerment of women. Empowerment believes that People's choices have to be enlarged and they must have economic opportunities to make use of their capabilities. The government of India is taking lot of measures for the empowerment of women. Empowerment of women through entrepreneurship makes all the women to take care of herself and her household. It also upholds gender equity in the society.

Empowering women through entrepreneurship creates a sustainable form of livelihood for rural women while enabling the participation of more women in the process .Review shows that women and girls reinvest 90% of their income in their families and community. This statistic reinforces our belief that offering entrepreneurship training for women in developing countries will not only improve their own lives and their families' well-being, but also generate benefits at a larger economic and social development scale.

II REVIEW OF LITERATURE

An article by A. Mehta titled as" Rural women Entrepreneurs in India": opportunities highlights that most of the women live in unacceptable conditions of poverty, in developing countries like India. The gender disparities in economic power sharing are also one of the factors to the poverty of women. Due to circumstances, women contribute to the economy and to combating poverty through both remunerated and unremunerated work at home, in the community and in the workplace. When poverty affects households as a whole, because of the gender division of labour and responsibilities of household welfare, women bear a disproportionate burden, attempting to manage household consumption and production under conditions of increasing scarcity.

Another article that featured in Economic Times about "Empowering Rural women Entrepreneurs'" focuses that Empowerment is now increasingly seen as a process by which the one's without power gain greater control over their lives. This means control over material assets, intellectual resources and ideology. It involves power to, power with and power within.

Another article that featured in IPEDR regarding " Sustainable development of Rural women Entrepreneurs'' as a process of awareness and conscientization, of capacity building leading to greater participation, effective decision-making power and control leading to transformative action. This involves ability to get what one wants and to influence others on our concerns. Women's economic empowerment is a prerequisite for sustainable development, pro-poor growth and the achievement of all the millennium development goals. At the same time it is about rights and equitable societies.

III RATIONALE

Self-sufficiency and quality of life are, of course, relative terms. The so called poverty line is described in many ways but at its most basic it identifies those persons who have such low income that they cannot exist without regularly calling upon the rest of the community for assistance to acquire the most basic things in life - food, clothing, shelter, education and good health. In some instances whole communities are below the poverty line and assistance is not immediately available.

Human resources are the single most important factor in the economic development of a country. People at or below the poverty lines have a negative effect on the total disposable wealth of a country. Income Generating Programmes seek to redress this imbalance by equipping these people with knowledge, skills, attitudes and values such that they become positive contributors to their nation's economy, through entrepreneurship. Income-Generating Programmes and activities, therefore, need to be promoted and implemented in the context of overall national development, in the context of community development and in relation to individual needs. Income generating programmes through entrepreneurship help in the following manner.

(i) More equitable access to assets and services – land, water, technology, innovation and credit, banking and financial services – will strengthen women's rights, increase agricultural productivity, reduce hunger and promote economic growth.

(ii) Infrastructure programmes should be designed to maximise poor rural women's access to the benefits of roads, transportation services, telecommunications, energy and water.

(iii) Employment opportunities need to be improved, at the same time women perform the bulk of unpaid care work. This is an area for greater attention by development factors through increased recognition and valuing of

the ways in which care work supports thriving economies, as women experience barriers in almost every aspect of work.

(iv) Innovative approaches and partnerships are needed to scale up women's economic empowerment.

(v) The aim to improve living standards and to increase the capacity of people to produce goods and services — that is to generate income.

To explore the relationship in the path of connectivity should evaluate entrepreneurial activities in terms of

(a) Poverty Alleviation

A great majority of people in many developing countries are living below the poverty line. In addition the economic conditions of some sections of society even in developed countries need to be improved. This calls for preparing the people with technical, vocational and entrepreneurial skills aimed at income generation in order to solve the problems associated with acute poverty.

(b) Growing levels of literacy

Levels of literacy vary from State to State and group to group ranging from as low as 10 per cent in some instances to almost 100 per cent in others. The overall situation, however, is gradually improving as more and more effort is being made to eradicate illiteracy, through formal, non-formal and other modes of education.

As a result, the number of people requiring, and indeed demanding, continuing education is rapidly increasing. In particular there is a high demand for those continuing education activities which focus on improving the capacity to increase income. There is a growing realization that as literacy skills improves so the capability of generating income improves.

(c) Urban Migration

Many people residing in rural and semi-urban areas are migrating to nearby cities. This is because increased industrialization has restricted opportunities for gainful employment in rural areas. Many social and economic problems arise from this trend. In order to minimize such problems people should be encouraged to stay in rural areas by helping them develop appropriate skills and abilities for improving their income generating capacity through agriculture related businesses and enterprises.

(d) Increasing Aspirations

With increasing literacy and access to information on global development, the aspirations of the people are growing to improve their living conditions and quality of life. The urge for higher levels of income is constantly on the increase. This has resulted in more and more people seeking opportunities to engage in economic activities through acquisition of relevant productive skills and abilities.

(e) Equity and Social Justice

Several kinds of disparities exist in the living conditions among the different sections of society. This is mainly due to differing capacities and opportunities for income-generation. Groups especially disadvantaged in this regard include rural women, unemployed youth, the aged and certain ethnic minorities. In order to minimize disparities and provide social justice, adequate opportunities need to be provided to equip less fortunate people with competencies to raise their levels of income.

(f) Changing Employment Patterns

Due to rapid changes taking place in technological, industrial and economic spheres, the world of work is undergoing rapid transformation. Some jobs and businesses are becoming obsolescent giving place to new ones. The scope for paid employment is not in keeping with the growing demand. Self-employment and co-employment (with partner or cooperative) are on the rise. More and more women are entering the work force. To cope with these trends and changes, people need to be trained and retrained to continually sustain their earning power.

(g) Economic Prosperity

To be less dependent on other nations and obtain maximum advantages from the changing complex interdependent world economy. This is only possible when a great majority of the people is in a position to richly and effectively contribute to the national economy. Hence there is need for involving maximum numbers of people in income generating activities. Prosperity through improved income, investment, saving with reduction in poverty as shown below.

Entrepreneurial infrastructure, as the term is used here, represents a subset of the more general entrepreneurial activities concept. Hence, entrepreneurial infrastructure represents the facilities and services present within a given geographic area that encourages the birth of new ventures and the growth and development of small businesses. To explore the relationship between entrepreneurial infrastructure and new business development, five research questions related to entrepreneurial infrastructure:

(i) Do entrepreneurial companies and entrepreneurs recognize a need for assistance?

(ii) Is the new business or the individual entrepreneur aware of the existence of resources for assistance?

(iii) How urgent is the new business need for assistance?
(iv) Are resources perceived to be adequate in terms of capacity?
(v) Are the resources perceived to be effective?

- Business owners and small firms often require facilitative resources in order to function effectively. For instance, with regard to business creation, potential business owners require adequate capital and physical accommodations. To the extent that physical facilities and installations exist, and are able to accommodate aspiring business owners (e.g., incubators) and growth-oriented businesses (e.g., industrial parks), or that capital sources are adequate (e.g., venture capital firms), the infrastructure support network is effective. Some useful information is useful in making effective decisions, could include economic, market, legal, technical, and other environmentally related data. This information and data could be made available from facilities established within the entrepreneurial infrastructure Opportunity recognition is the cornerstone of the entrepreneurship process. Opportunity entrepreneurs are risk-tolerant and have an internal locus of control, have a higher preference for self-employment.

To carry out their work effectively, new business owners, and small and growing businesses require information. For instance, information is needed regarding the environment. Such helpful information, which can assist business owners. Generally, what the new business owner performs within the operating domain of the business, can be called internal tasks. Such internal tasks include planning, directing, and organizing various functional activities of an enterprise. Likewise, one could consider tasks performed by others, in various functional areas within the boundary of the enterprise, as internal tasks. Using these perspectives pertaining to internal task processes, the decisions of individual entrepreneurs or representatives of businesses to seek assistance in performing their tasks from entities outside the business, can be viewed as decisions to form boundaries with external individuals or organizations).This is explained through the following criteria's. Financial Support (availability of financial resources and equity for new and growing firms, including grants and subsidies)

Government Policies (the extent to which government policies concerning taxes, regulations, and their application are size neutral and/or whether these policies discourage or encourage new and growing firms)

(i) Government Programmes (the presence of direct programmes to assist new and growing firms at all levels of government— national, regional, and municipal)
(ii) Education and Training (the extent to which training in starting or managing small, new, or growing business features in the educational and training system, and the quality, relevance and depth of such education and training in creating or managing small, new or growing business)
(iii) Research and Development Transfer (the extent to which national research and development leads to new commercial opportunities, and whether or not R&D is available for new, small, and growing firms)
(iv) Commercial and Professional Infrastructure (the influence of commercial, accounting, and other legal services and institutions that allow or promote new, small, or growing businesses)
(v) Market Openness/Barriers to Entry (the extent to which commercial arrangements are prevented from undergoing constant change and re-deployment, preventing new and growing firms from competing and replacing existing suppliers, subcontractors, and consultants)
(vi) Access to Physical Infrastructure (access to physical resources— communication, utilities, land space, transportation—at a price that does not discriminate against new, small, or growing firms.

For potential entrepreneurs, the decision whether to start a business is influenced by additional characteristics within the existing business environment. These are referred to as entrepreneurial infrastructures. In order to describe the relationship between entrepreneurial infrastructures and new business development, a conceptual framework constructed provides a comprehensive approach that considered the contributions of entrepreneurial infrastructures for the development of new enterprises. Specifically to recognises that new business development is the result of two parallel sets of activities:

(a) those entrepreneurs associated with opportunity- motivated
(b) those entrepreneurs related directly to necessity-motivated

For most entrepreneurs, the motivation to develop a new firm is influenced by the entrepreneurial infrastructures offered by government and non-governmental institutes or organizations. Necessity-motivated entrepreneurs tend to be unable to participate in entrepreneurial infrastructures. The opportunity-motivated entrepreneurs are those who have choices regarding their participation in entrepreneurial infrastructures.

IV CONCLUSION

Interventions through planning aspects- policy support, information systems, mobilization of resources could make it effective. Varying characteristics of target groups in terms of socio-economic conditions have to be focused .Emphasis to do learning – by- doing approaches, workshops, along with creating awareness and motivation is also key to eradicate poverty through diverse organizations and implementation process. From the programming aspects, rural women are in need of income as they live below the subsistence level seeking opportunities. Basic skills, Trade skills, money-saving skills, book-keeping skills, marketing skills ,enterprise skills could allow optimum utilization of resources facilitating the income generating capability among the downtrodden and weaker sections of the society. The likelihood of participation in entrepreneurial infrastructure will be high as long as government supports and schemes are approached in a clear manner.

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Destination and Moving Direction Based Routing for VANET

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ABSTRACT
One of the major critical issues in vehicular ad hoc networks (VANETs) is Routing. In this paper we are considering the issue of routing in vehicle to infrastructure (V2I) AND vehicle to vehicle (V2V) communications in VANETs. And also proposes a DEstination and MOving DIrection Based Routing (DEMODI) algorithm for supporting V2I and V2V communications. DEMODI takes the benefit of both the destination location and moving directions of vehicles to select the next hop (neighbor vehicle) for forwarding data. Without using other control messages it only uses a single INIT message to acquire or revise routing information, which mainly reduces the control message counts in routing. The packet delivery ratio of the network can be considerably improving by the DEMODI algorithm.

***Keywords*—** Vehicle Direction, VANET routing

I INTRODUCTION

VANETs are an emerging technology for support intelligent transportation systems (ITS) [1]. In a VANET, communication occurs either from vehicle to infrastructure (V2I) or from vehicle to vehicle (V2V). A vehicle needs to transmit data to roadside units (RSU) or other vehicles to provide a better traffic control, inter-vehicle communication and environment monitoring. Before data transmission a path is established from source to either roadside unit (RSU) or destination. Therefore routing is one of a major critical issue in the design of a VANET.

A VANET has some characteristics similar to mobile ad hoc networks (MANETs) such as self-organization, self-management and short-range radio transmission. In addition VANET has some unique characteristics such as highly dynamic topology, adequate energy capacity, and predictable mobility model. Particularly the moving speed of a vehicle can reach 50km/h in a street, average of 100km/h in a highway scenario. If two cars at a distance of 250m are moving in the opposite directions at a speed of 90km/h, the link for communication can last for only 10 seconds. This results a highly dynamic topology of the network, which is a big challenge in the design of a routing protocol. For dissimilar network scenarios various routing protocols have been suggested such as Ad-hoc On-demand Distance Vector (AODV) [2] and Dynamic Source Routing (DSR) [3] to address the unique characteristics of VANETs. These two protocols were originally proposed for MANETs but can also used for VANETs with lower throughput [4]. Furthermore, well-known routing protocol proposed particularly for VANETs is Greedy Perimeter Stateless Routing (GPSR) [5], which can achieve a better performance in a suburban scenario than that of AODV and DSR. Another routing protocol proposed particularly for VANETs is Greedy Perimeter Coordinator Routing (GPCR) [6], developed based on GPSR and no maps can be used. Even though these protocols have been proposed specifically for VANETs, all of them have some limitations in addressing different network scenarios (city, highway and urban) and achieving network performance. Therefore better routing protocols can be expected to achieve better performance in different scenarios.

In this paper, we consider the routing issue in both V2I and V2V communications in a VANET, and propose a DEstination and MOving DIrection based routing (DEMODI) algorithm for supporting V2I and V2V communications. For forwarding data DEMODI make use of both the destination location and the moving directions of neighbor vehicles to select the next hop or to make a routing decision. In case there is no neighbor vehicles found to store and carry its data packets, then a node employs a store-then-forward mechanism until it meets an appropriate neighbor node for forwarding the packets. On the other hand, because of the high moving speed of a vehicle the routing information maintained at each node may quickly become ineffective within a few seconds or minutes in a VANET. Therefore more control messages to be exchanged between different nodes for update the routing information maintained or timely obtain at each node. This is not desirable because this would reduce the resource utilization. To address this problem, DEMODI only uses only one message (INIT) to update or obtain routing information without using any other control messages like REQUEST and REPLY messages. The packet delivery ratio of the network can be considerably improving by the DEMODI algorithm as compared with the AODV (Ad hoc On-demand Distance Vector Routing) algorithm.

The remainder of this paper is as follows. In Section II related work on routing protocols for VANETs, Section III presents the proposed DEMODI algorithm. Section IV evaluates the performance of DEMODI. Section V concludes this paper.

II RELATED WORK

Variety of routing algorithms for VANETs has been proposed in the literature can be classified into the categories: ad-hoc routing, position-based routing, cluster-based routing, broadcasting, and geocast routing [7]. Position-based routing and geocast routing are considered as a promising routing paradigm for VANETs.

AODV [2] used for VANETs is a well-known routing algorithm originally proposed for MANETs. Because of the high mobility of vehicles unfortunately this algorithm cannot achieve good throughput performance. Another algorithm [8], which is proposed based on AODV is PRAODV, and uses the concept of the link and route time estimations. Before the end of lifetime it constructs a new alternate route, predicted based on the location information and speed of vehicle.

Networks which have a large number of vehicles used the Cluster-based routing which clusters the vehicles into a virtual network to provide scalability. Clustering for Open IVC Networks (COIN) [9] is another clustering algorithm, which selects a cluster head based on drivers intentions and vehicular dynamics whereas other clustering algorithms select a cluster head based on vehicle ID or mobility. Conversely, clustering leads to overhead and delay routing. This is not suitable for a network with a highly dynamic topology. The simplest and widely used routing method in VANETs is Broadcasting which causes contentions and collisions leads to affect network performance. A special type of multicasting is Geocast routing [10] in which after a waiting time the received packets were rebroadcasts to avoid contentions and collisions.

Topology assist Geo opportunistic Routing [11] is the position-based routing protocols which makes use of 2-hop beaconing and the topology knowledge to select the best forwarder and also uses opportunistic packet reception to increase delivery ratio of the packets. GPSR[5] which combines greedy routing and facing routing, where facing routing is used to get out of a local minimum when greedy routing is not possible. In a highway scenario GPSR is appropriate for V2V communications. Since direct communication between vehicles may not be possible it is not suitable for an urban scenario. During the routing process Packets needs to travel along a long path may be dropped.

GPCR [6] is based on the assumption that the streets and junctions form a natural planar graph and doesn't use any global information for routing. It consists of two components a greedy routing algorithm and a repair strategy. Compared with GPSR, the greedy routing is restricted to a certain area in the network and data packets are always routed along the streets. In GPSR it assumes that there is always a node at all junction and a routing decision is made by the same node present at a junction. Packet always forwarded to the junction node rather than forwarded directly to a node across a junction. In the repair strategy, a well-known right-hand rule [5] is applied to recover from the local minimum. However In the real world the assumption that there is always a junction node is not a sensible, which limits the use of GPCR. To address this problem, we present DEMODI which does not need a junction node and allows a node to directly make a routing decision or forward data packets in a pre-intersection area.

III MOVING DIRECTION BASED ROUTING PROTOCOL

In this section, we present a new position-based routing protocol named DEMODI for VANETs.

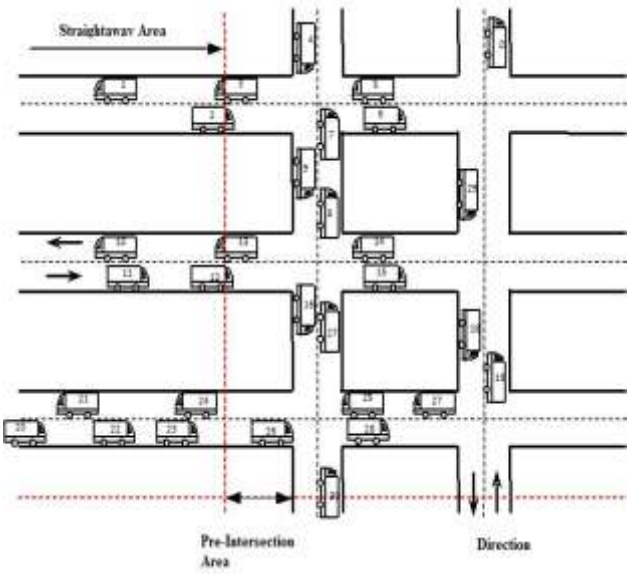

Fig 1 Network Model

(a) Network Model

We consider an urban network scenario, in which the streets are distributed horizontally and vertically, as shown in the above Figure 1. In this, all the two lanes streets are segmented by traffic lights, whose cycle time is set to a constant. Two vehicles can communicate with each other when they are located within the communication range or radio transmission distance of each other.

In the above network model, we assume that a vehicle is equipped with a digital map and a GPS (Global Positioning System) device, which provides the position of the vehicle itself and the location of the destination. There is no limitation on energy and buffer size for all the vehicles. Because of the distance and obstacles between two parallel streets are usually much larger than a vehicle's transmission range, two vehicles from any two parallel streets cannot communicate with each other. The destination of a data packet can be a road-side unit (RSU) which is stationary, or a moving vehicle whose real-time position can be known or obtained by other vehicles through the equipped digital devices.

(b) Routing Strategy

The key idea of DEMODI for forwarding data is to take advantage of the destination location and vehicles moving directions to decide on the next hop. Each vehicle in the network periodically broadcasts a INIT message, which contains the vehicle's ID, exact position, driving direction, and vehicles speed, to discover one-hop neighbors. After a vehicle receives this INIT message, it stores all the information contained in the message and adds the sender's

information to its neighbor table. Each and every vehicle maintains two tables: the neighbor table, a data list locally. Vehicle checks the packet's ID in the data list available in vehicle whenever a data packet is received by them. If it is not already exists, the packet will be added into the list in a first-in-first-out (FIFO) manner, Otherwise the vehicle drops the packet.

(c) DEMODI Protocol Description

DEMODI consists of two procedures: a straightway procedure and a pre-intersection procedure. When a source node generates or an intermediate node receives a data packet, it will first store the packet and then trigger a routing procedure. If the node is located at a position with a distance prior to an intersection, which is based on the transmission range of a vehicle and the width of a street, the pre-intersection procedure is triggered. Otherwise, the straightway procedure is triggered. The above process is repeated until the packet arrives at the destination or the Time Limit (TL) in the packet reaches zero. The procedures of the DEMODI algorithm are described in Figure 2.

(d) Straightway Procedure

The straightway procedure is similar to a conventional greedy routing algorithm. In this practice, if a vehicle does not have any neighbor, it will store and then carry the packet in its data list until it meets another vehicle. Compared with the conventional greedy routing, the difference is that the straightway procedure first compares a packet's destination location with the driving direction and chooses the vehicles whose driving directions are same as the candidate next hops. Then, if the destination is in the neighbor table of the current vehicle, the data packet is forwarded to the destination directly. Otherwise, the vehicle with the shortest distance to the destination will be selected as the next hop. If the current vehicle itself has the shortest distance to the destination, it will continue to carry the packet until it meets a neighbor vehicle closer to the destination.

Figure 1 illustrates an example of the straightway procedure, in which vehicle 20 is driving on a straight way. If the vehicle receives or generates a packet for vehicle D, it triggers the straightway procedure. In this case, its neighbors include vehicles 21, 22, 23 and 24, among which vehicle 24 is the closest to the destination D. However, the moving direction of vehicle 24 is in the opposite direction of the destination. As a result, vehicle 23 is selected as the next hop.

DEMODI Algorithm

```
Let   VID ← vehicle's ID;
      DEST ← packet's destination;
      POS ← vehicle's position;
      0← pre-intersection;
Initialization: VID receives or generates a packet
      If TTL ≠ 0 & VID ≠ DEST then {
          update pos;
          If POS = 0 then{
                Trigger pre-intersection procedure;
                Return;}
          else{
                trigger the straightway procedure;
                return;}

       else{
                store the packet;
                return;}
```

Fig 2 Routing Procedure of DEMODI

(e) Pre-Intersection Procedure

In [6], GPCR assumes that there is always a junction node and routing decision is made only by the same. But in the real world, this assumption is not reasonable because it is not possible to always have a forwarding node at a junction. To address this problem, DEMODI allows a node in a pre-intersection area to make a routing direction without using a junction node. The definition of a pre-intersection area is based on the distance between a vehicle and an intersection, the transmission range of the vehicle and the width of a street. If a vehicle is far away from the destination, the width of a street can be ignored.

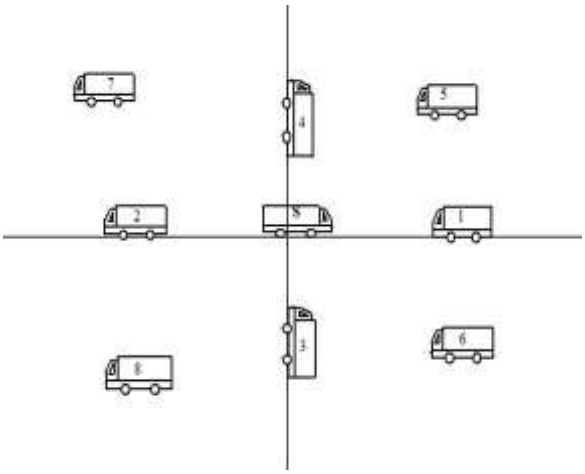

Fig 3 Eight Cases of the Relative Position

Similar to the straightway procedure, the pre-intersection procedure first determines the neighbors of a vehicle and then selects the more appropriate one as the next hop. According to the position of a vehicle and the destination location, the relative position of the destination respect to the vehicle may have eight cases: east, west, south, north, northeast, southeast, northwest and southwest, as shown in Figure 3. If the relative position belongs to the former four cases, the selected neighbor vehicles can only move in one direction, denoted by dir_. Otherwise, the vehicles can move in two directions, denoted by dir1_ and dir2_. For example, if the relative position is southwest, dir1_ is south and dir2_ is west. If the relative position is south, dir_ is south. The procedure at pre-intersection can be described below:

- Step1: A vehicle with a packet checks its neighbor list periodically and if it does not have neighbors then it carries the packet until it meets a neighbor vehicle. Otherwise, resort to step 2;

- Step 2: Based on the vehicle's destination's location and position, the vehicle calculates the relative position of the destination respect to the vehicle itself. If the relative position is in the vertical or horizontal direction, resort to step 3. Otherwise, resort to step 4;

- Step 3: Choose the neighbor vehicles whose driving directions are the same as dir. select the vehicle with the shortest distance to the destination as the next hop from these neighbor vehicles, and forward the packet to it. Otherwise, resort to step 1;

- Step 4: If some neighbors' driving directions match dir1_ or dir2_, resort to step 5; Otherwise, if there are some neighbors driving in dir1_ and some driving in dir2_, resort to step 6; otherwise, resort to step 1;

- Step 5: Select the neighbor as next hop with the shortest distance to the destination and then forward the packet to it.

- Step 6: The neighbors are usually moving with different speed on different streets. According to the car-following theory, if a vehicle drives at a much lower speed than the road speed limit, it is probable that there are some vehicles in front of it. Therefore, compare the speed limits of the road with the neighbor vehicles' speeds, select the vehicle with the maximum speed difference as the next hop, and then forward the packet to it.

Figure 1 also gives some examples to illustrate the pre-intersection procedure. For example, if vehicle 2 is a source node and the destination of a packet is vehicle D. The candidate neighbors are vehicles 3, 4, 5, 6, 7 and 9, and the next hop can be selected according to step 2. Vehicle D is in the northeast of vehicle 30, whose neighbors are vehicles 25, 26 and 28, moving in the east or west direction, and dir1_ and dir2_ are set to north and east, respectively. By step 5, the next hop can be selected. Vehicle 12 is the most complicated case, and just like vehicle 30, dir1_ and dir2_ are north and east. The candidate neighbors include vehicles 8, 13, 14, 15, 16 and 17, which are distributed on different streets with different speed limits. In this case, step 6 is used to select the next hop.

IV PERFORMANCE EVALUATION

In this section, we evaluate the performance of the DEMODI algorithm through simulation results. For evaluation, we compare DEMODI with AODV in terms of packet delivery ratio and latency. The experiments were conducted with a transmission range of 250m and a transmission rate of 2Mbps was used as the underlying MAC protocol. We used VanetMobiSim [13] to generate a 4 x 4 urban grid topology of a 1500m by 1500m area. All streets have two lanes and are bi-directional. All street segments have speed limits and all intersections are controlled by traffic lights.

Table 1
Simulation Parameters

Constraint Parameter	Value
Network simulator	NS2
Mobility simulator	VanetMobiSim
Area of Simulation	1500m x 1500m
CBR rate	512bytes/second
802.11 rate	2Mbps
Transmission range	250m
Simulation runs	10
Average vehicle speed	50km/hr
Simulation time	500 to 1000 sec
Number of vehicles	30 to 50

In VanetMobiSim, the micro-mobility is controlled by the IDM-IM, an extension to the Intelligent Driver Model (IDM) considering intersections. In each simulation run, we randomly selected five sender-receiver pairs, using 512-byte constant bit rate (CBR), an UDP-based packet generation application. In the simulations, the number of vehicles considered is 20 to 40. The running time of each run is 500 to 1000 seconds. All results are an average over 10 runs. Table 1 summarizes the parameters used in the simulations.

Figure 4 shows a snapshot of the network topology with 30 vehicles, where vehicle 2 has a packet whose destination is vehicle 12.

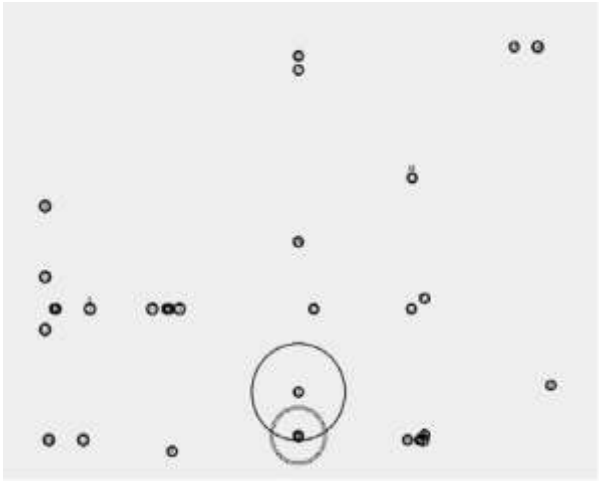

Fig 4 A snapshot of the network topology

It is seen that the packet delivery ratio with DEMODI is larger than that of AODV, which is expected. On the other hand, the average packet delay with DEMODI is also increased as compared with AODV. This is because DEMODI is proposed for delay-tolerant applications. It employs the store-then-forward strategy in routing when a vehicle does not have an appropriate neighbor vehicle to forward its packets. And also the packet delivery ratio increases with the node density. The DEMODI algorithm can significantly improve the packet delivery ratio as compared with the AODV algorithm.

V CONCLUSION

In this paper, we projected a DEstination and MOving DIrection based routing (DEMODI) algorithm for data transmission in VANETs for the urban scenario. DEMODI makes use of both destination and the moving directions of vehicles to select the next vehicle hop for forwarding data. DEMODI also permits a node itself to make a routing decision and forward data packets in a pre- intersection area. Furthermore, it uses an INIT message alone to acquire or revise routing information, which mainly reduces the control message counts in routing. The results have made known that DEMODI can notably improve the packet delivery ratio with an increased average to some extent. In future work we will consider a more practical scenario for the expansion of DEMODI algorithm.

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Double Aero Shape Irregular Polygon Slotted Microstrip Antenna at 2.5 GHZ for Wi-Fi Application

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ABSTRACT
The design of a double aero shape irregular polygon (MSA) microstrip antenna with linear polarization radiation for WI-FI. The antenna have a 1.6mm substrate and having constant 4.4, Where the maximum return loss is -28dB and the output bandwidth is 40%, show that the proposed antenna is able to achieve VSWR less than 2.

I INTRODUCTION

Antennas are a very important component of communication systems. by definition, an antenna is a device used to transform an RF signal, traveling on a conductor, in to an electromagnetic wave in free space the broadband circularly polarized microstrip antennas play a vital role in wireless communication due to its low-profile, small-size and light weight. As well know, a circularly polarized wave can be obtained when spatially orthogonal modes are excited with equal amplitude. Conventional designs of microstrip antennas for circular polarization are usually achieved by truncating patch corners [1], cutting orthogonal slots in the square patch [2], through coupling cross-slot to excite the radiating patch [3],

The distance between the radiating patch and the ground plane is (1.6mm).

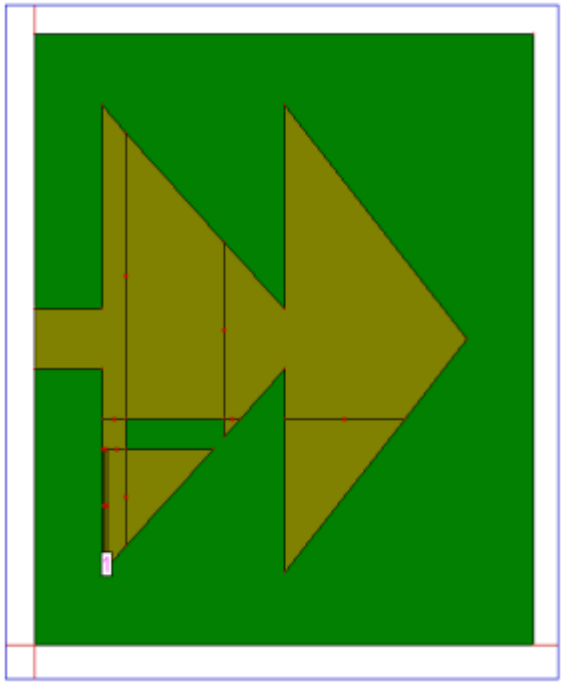

Fig. 1: Geometry of Proposed antenna on IE3D

II ANTENNA DESIGN

Fig. 1 shows the geomatery of the proposed microstrip antenna, The radiating aero shape patch, printed on a substrate of thickness h and relative permittivity 4.4 , has the dielectric material thickness is 1.6mm the length, L=29mm and the width W=31 mm and is excited by the two capacitive feed disks, which are oriented in orthogonal directions and have the distance of feed point is X= 5mm and Y=5.3 mm.

III SIMULATED RESULTS

To validate whether the design technique is applicable, the antenna has been simulated with IE3D shows the return loss and VSWR versus frequency of the proposed antenna .From the simulation results, we observe that the proposed antenna is able to achieve the return loss is -28 dB, and the VSWR less than 2.

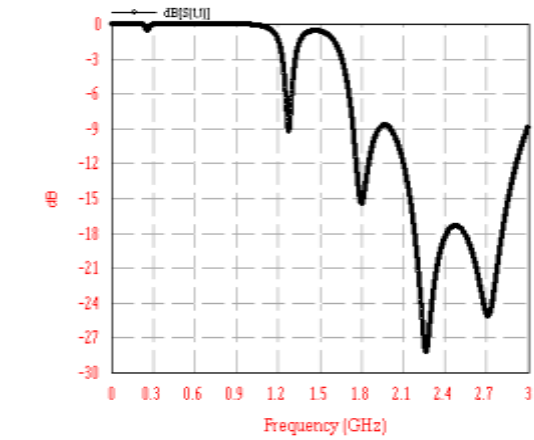

Fig. 2 : return loss Vs frequency.

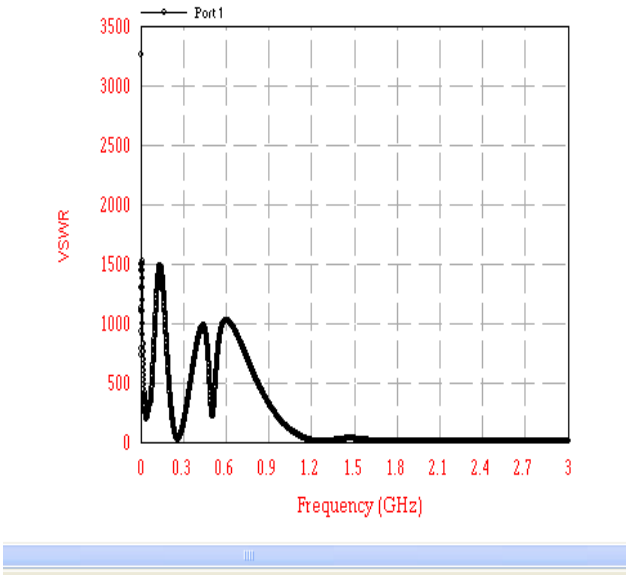

Fig. 3 VSWR versus frequency

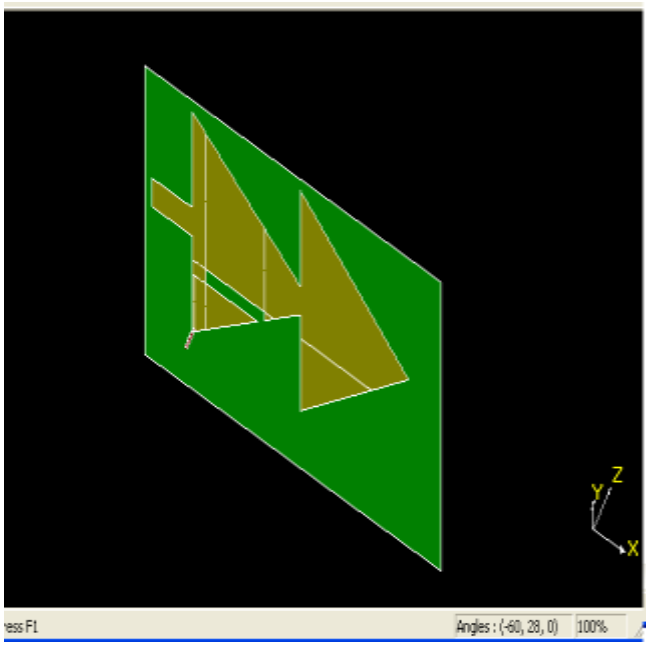

Fig. 5: 3D view of proposed Antenna

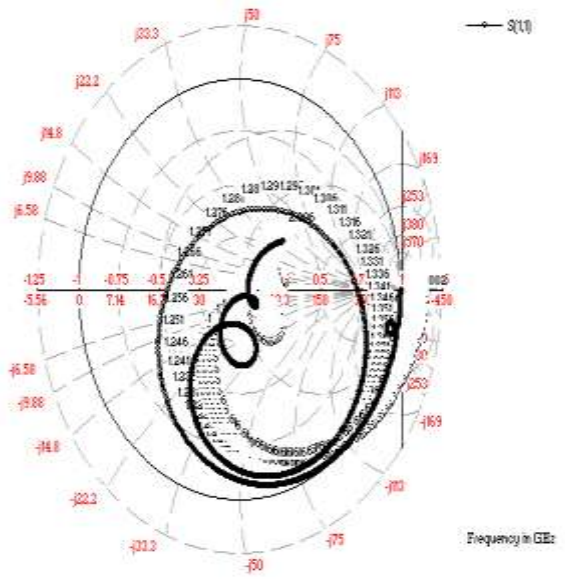

Fig. 4: smith chart of return loss

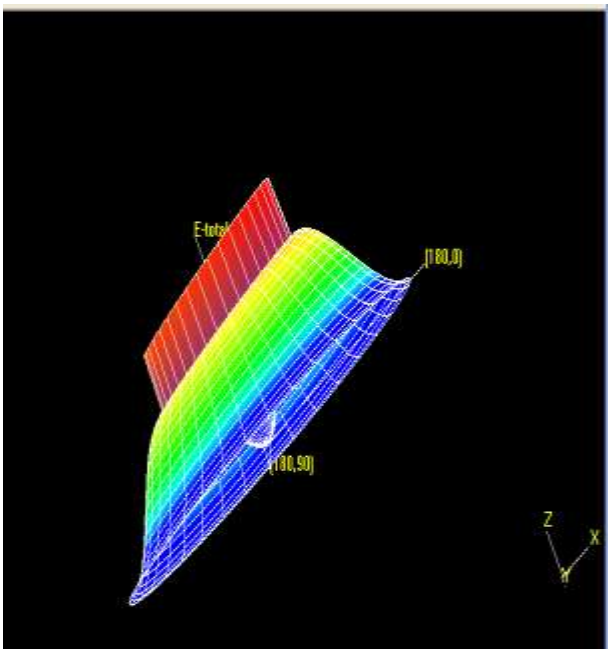

Fig. 6: 3D radiation pattern

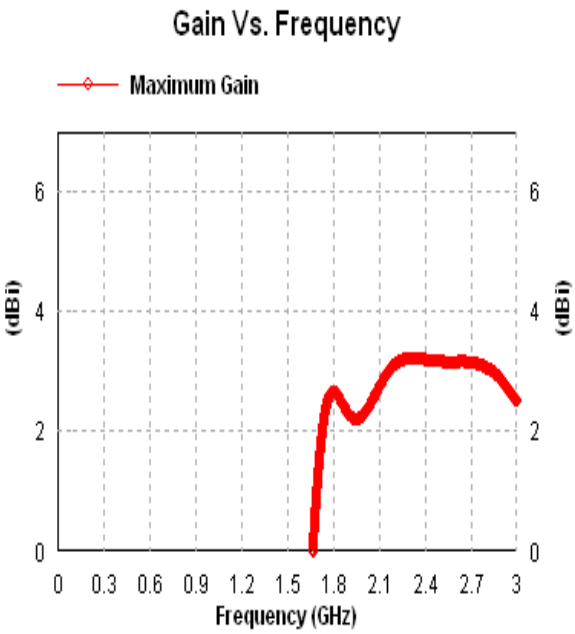

Fig. 7: Gain vs Frequency

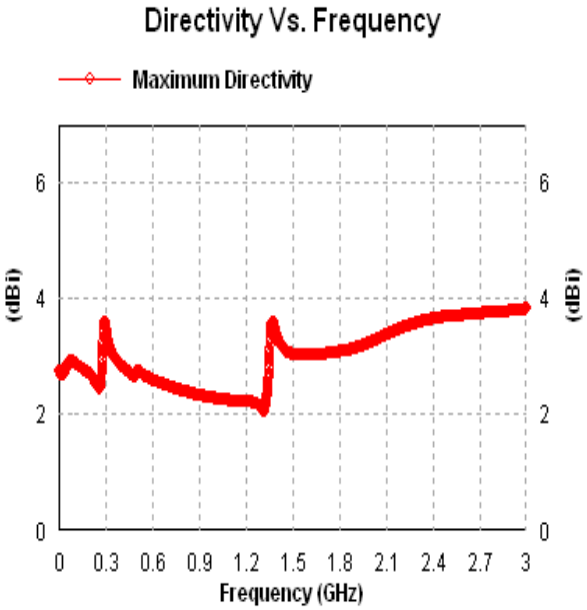

Fig. 8: Directivity vs frequency

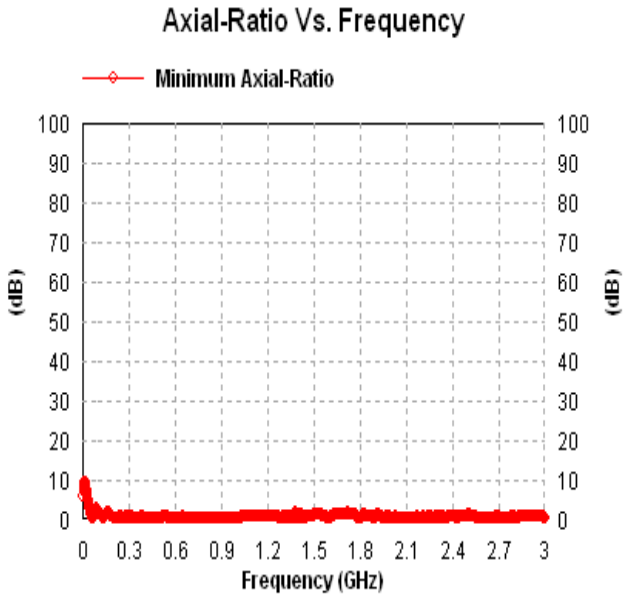

Fig. 9: Axial ratio vs frequency

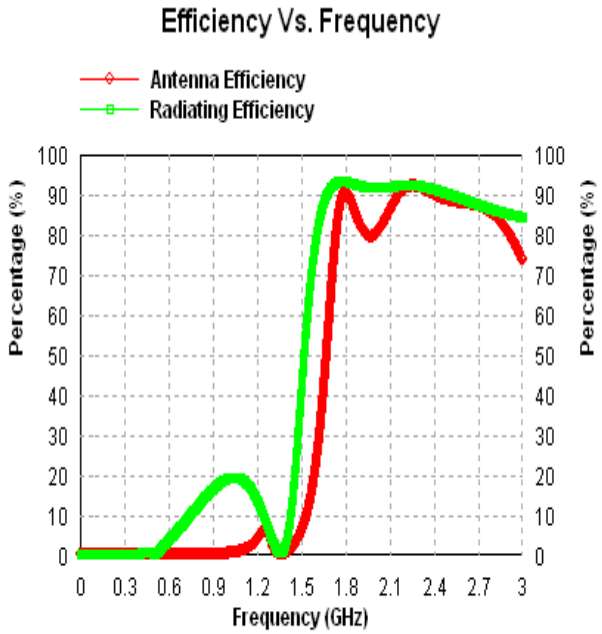

Fig. 10: Antenna and radiation efficiency vs Frequency

Since the feed point connected with the coaxial connector, have good equal amplitude and 180° phase shift, broadband linearly polarized radiation can be achieved [7]. Then, by using the glass Epoxy substrate, much wider LP bandwidth can thus be obtained. The impedance matching of the antenna can be achieved by fine adjusting the feed point position, the distance between the radiating patch and the ground plane (1.6+.0026mm).

In this paper, a double aero shape irregular patch of broadband microstrip antenna with 2.5 GHz design. The antenna have an output by using IE3D and analyses the all characteristics. A Glass Epoxy substrate is used in the present proposed design, and impedance matching is obtained through the radiating patch. proposed antenna is able to achieve VSWR less than 2 and the return loss above the 10.db.

IV CONCLUSIONS

Characteristics of a design of proposed LP aero shape microstrip antenna have been analyzed. The proposed antenna is achieved a bandwidth of 40%. The broadband LP microstrip antenna is able to achieve for VSWR less than 2 and the return loss is -28dB.

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Production of Asphaltene Binders from Solid Waste Generated in Leather Industry

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ABSTRACT

India is one of the major leather producers and nearly 0.75 million tons of raw hides/skins are processed annually. Conversion of 1 ton of rawhide/skin into leather generates nearly 200 – 300 Kgs. of solid waste and rest of the material is converted into leather. Some of the solid wastes such as raw hide/skin trimmings, fleshings, chrome shavings, leather trimmings find uses in other industries, however, waste like buffing dust do not find any use. As they are fine particles and also contain chromium, current practice of dumping in vacant site causes severe health and environmental problems. The obnoxious gases such as oxides of sulphur, ammonia and other volatile organic compounds are emitted from tannery buffing dust during the thermal decomposition. In the present work, an attempt has been made to make leather waste into modified bitumen a pavement material through pyrolysis followed by solidification/stabilization process. The pyrolysed tannery buffing dust was characterized by SEM, FTIR, TGA, and CHNS analyzer. The pyrolysed TBD was effectively solidified/stabilized using aged bitumen. Pyrolysed solid tannery waste is made into modified bitumen and analysed for its rheological characteristics. The leachability of the stabilization of Cr (III) in the solidified matrix was confirmed through TCLP method. Thus, this study illustrates the recycling of buffing dust, a problematic waste in leather making to a societally useful material for road construction.

***Key words**:* buffing dust – pyrolysis – Chromium (III) – solidified blocks – Modified bitumen

I INTRODUCTION

Now days, tanneries are looking for new ideas and initiatives pushing sustainability to a higher innovative level. It is well known that production of leather is one of the major producers of hazardous solid wastes, with high potential impact to the environment. The production of chromium-containing solid waste in tanneries has been recognized as a problem for many years, and increasing pressure from environmental authorities has demanded a solution of such a problem (Gammoun, 2007). Only 20% of wet salted hides/skins could be converted into commercial leather, and 25% mass becomes chromium-containing leather waste (CCLW), and the remnant becomes non-tanned waste or is lost in wastewater as fat, soluble protein and solid suspended pollutants. Shavings, trimmings, buffing dust and splits from the chromium tanning of hides and skins have been disposed of in landfills. Increasing local legislations on waste disposal, unavailability of land, high operation cost incurred in conventional treatment systems like land filling and incineration have stimulated the search for better, cost effective and eco-friendly treatment. Among the pollution abatement strategies, source reduction is good; however, process modifications could not be adapted. Next best available option observed is recycling and reusing of waste materials (Brown, Cabeza, Silveria, Mu, Kamaludeen, Rivela, and Saravanabhavan, 1996a, 1999b, 2002c, 2003d, 2003e, 2004f, 2004g).

Pyrolysis, of wastes is one of the best methods that could render reusing of waste as it can convert wastes into gas, liquid, and solid fractions with different end applications. Also, the energetic efficiency in pyrolysis is lower than that in combustion, makes the process cost effective too. The gas that produced during pyrolysis can be re-used as fuel and the oil can be used as a raw material for chemicals. The carbonaceous residue can be burnt as fuel or safely disposed fixed on the carbonaceous matrix [Cassano, Imai, Petruzelli, Sivaparvathi, Sivaparvathi and Yilmaz, 1997a, 1991b, 1995c, 1986d, 1986e, 2007f).

Solidification/stabilization is another technique for disposal of solid waste containing heavy metals as they can protect the environment from contamination. Stabilization involves mixing of wastes with binding agents like cement, asphalt, fly ash, clay etc. Many research works have been performed using this technique for recycle of leather wastes such as tannery sludge with clay (Basegio, 2002) tannery waste with ceramics (Abreu, 2009), incinerated chrome shavings with alumina[Abreu and Basegio 2009a, 2006b), stabilizing of tannery waste with building materials(Xu, 2009), solidification with cement and aggregates(Abtahi, 2010).

In this paper the carbonaceous matrix of the tannery solid waste containing the chromium metal was pyrolysed to produce Micro Fibre Carbon (MFC) and further utilization of MFC for making modified bitumen. The purview of the current

research is to study about the behaviour of chromium after a pyrolytic process and the stabilization process. Chromium is bounded in the pyrolytic residual ash compared to the TSW on both oxidation states Chromium (III) and Chromium (VI).

II MATERIALS AND METHODS

(a) Collection and characterisation of TSW, MFC and Modified Bitumen

TSW used in the study was collected from Blue Diamond leather manufacture industry in Chennai, Tamil Nadu. The TSW and MFC were characterized for moisture content, ash content and Chromium (III) and chromium (VI) according to the DIN protocol, Thermo-gravimetric analysis such as (TGA), elemental analysis like carbon, hydrogen, nitrogen and sulphur (CHNS), studies were carried out to determine the oxidation state of chromium in the TSW and MFC, thermal stability, elemental composition in the TSW and MFC respectively. SEM analysis were carried out to determine the morphology of MFC and Modified Bitumen, Fourier transform infrared (FTIR) studies were carried out to determine the functional groups in the MFC.

III INSTRUMENTAL ANALYSIS

TGA was carried out to determine the weight loss with respect to temperature in order to fix the heating segment pattern of incineration. The dried samples were analyzed under nitrogen atmosphere using Q50 TA instruments. The samples were heated in a platinum pan from 0 to 800^{o}C at the rate of 5^{o}C/min. The elemental CHNS content of the TSW, MFC was determined using CHNS vario micro CHNSO15091002 analyzers. SEM analysis of MFC and modified bituminous mixture was determined using Hitachi S-3500N scanning electron microscope. FTIR of MFC can be determined by Perkin Elmer spectrum two instruments.

(a) Estimation of chromium (III) and chromium (VI)

About two grams of the TSW sample was gently stirred for 3 h with 100 ml of 0.13 moles of dipotassium hydrogen ortho phosphate at pH 8 and filtered. Out of it, 10 ml of the solution was added with 2 ml of 2N sulphuric acid and made up to 25 ml. 2 ml of 0.5% diphenyl carbazide was added followed by the addition of 0.5 ml of ortho phosphoric acid. The solution was kept for colour development for 15 min and the absorbance was measured at 540 nm. The calculated concentration was chromium (VI). Total chromium was estimated using the above method after digesting the samples using acid mixtures (10 ml HNO_3: 10 ml H_2SO_4: 10 ml HClO4) followed by the oxidation using potassium permanganate and sodium azide. Chromium (VI) is subtracted from total chromium to get chromium (III).

(b) Moisture content

The moisture content was calculated by Equation (1). Initially, 2g of sample was taken in the silica crucible and placed in the air oven at 110^{o}C after 1hour, cools the sample and taken the final weight of the sample.

$$\text{Moisture content (\%)} = (\text{Initial weight} - \text{final weight})/(\text{initial weight}) \text{ X } 100 \quad (1)$$

(c) Ash Content

The Ash content was calculated by Equation (2). Initially, 2g of sample was taken in the silica crucible and placed in the furnace at 550^{o}C after 1hour cools the sample and taken the final weight of the sample.

$$\text{Ash content (\%)} = (\text{Initial weight} - \text{final weight})/(\text{initial weight}) \text{ X } 100 \quad (2)$$

IV PREPARATION OF MICRO FIBROUS CARBON (MFC)

The pyrolysis of a TSW in the O_2 atmosphere has been carried out in a stainless steel (316 grades) vertical retort of weight 13 kg, which was placed inside an electrical furnace. The outer jacket of the lid of the pyrolysis vessel was fitted with pipe, it has 7cm thickness in order to prevent condensation of volatile organic compounds back into pyrolysed vessel, which increases energy recovery efficiency and prevents the heat dissipation from the reactor. The Condensed organic compounds are collected in the condenser. The flue gas from the incinerator was scrubbed in a scrubber. The scrubber is a PVC column of height 1.5 and 0.175m diameter to remove acidic vapours using alkaline water. Water required for scrubbing the flue gas was provided through a pump of capacity 0.5 HP. Provisions were made for characterizing the scrubbing solution used in the scrubber. The MFC collected from the Stainless steel vessel.

V SOLIDIFICATION AND STABILIZATION OF MFC

(a) Preparation of bituminous mixture

The residual ash (MFC) was collected from the furnace after pyrolysis of TSW was powdered and quantified. Aged bitumen (HRRC, Tamilnadu) was used as a binder. Asphalt mixer horizontal AIM 575was used to prepare the Asphalt mixture blocks.

This machine is used for laboratory mixing of bituminous materials to prepare the specimens to be used for various asphalt tests. The machine mainly consists of a main frame, variable speed mixer, elevating system, heating pot, electrical control box. About 100g of aged bitumen and various amount of residual ash (1 to 15g) was mixed for making of modified bitumen. It was prepare to mix in the heating pot with the variable speed mixer. The mixing portion taken from the heating pot and transfer to aluminium sample container and AIM 512-1 universal Penetrometer was used to determine the penetration value of modified bitumen.

VI RHEOLOGICAL CHARACTER OF MODIFIED BITUMEN

Penetration Test of modified bituminous mixture was determined to using AIM 512-1 model instrument. The bituminous mixture was taken in the aluminium container and the test is carried out in the room temperature. Softening Point Test of the modified bituminous mixture carried out by AIM 561-1 model instrument, this ring ball method give characteristic nature of the modified bitumen. AIM 532 model instrument is used for determine the viscosity of the modified bitumen.

VII LEACHABILITY TEST

The leachability of the metals from the solidified samples of pyrolysed TSW blocks were determined by Toxicity Characterization of Leachate Procedure test (TCLP). TCLP is designed to determine the mobility of both organic and inorganic analytes present in liquid, solid and multiphase wastes. It is usually used to determine EP toxicity of a hazardous waste. The bituminous mixture of weight 20 g was placed in a TCLP cylinder with 100 ml of extraction fluid (5.7 ml of glacial acetic acid in 500 ml of water and then adjust to pH 4.95). The contents were agitated in a TCLP rotator agitator at 30 rpm for 18 h and the liquid phase was separated from the solid phase by filtration through a 0.6–0.8 µm borosilicate glass fibre under pressure of 50 psi (340 KPa). The liquid phase was analyzed for chromium (III) and chromium (VI) ion to determine metal fixation efficiency.

VIII RESULTS AND DISCUSSION

(a) Characteristics of buffing dust

The moisture content, ash content, Chromium (III) and chromium (VI) of the TSW were 4.51%, 87.51%, 0.73 mg/g, 65.48µg/ml respectively.

(b) Elemental analysis

The elemental composition of the TSW was Carbon 52.7274%, Hydrogen 2.8038%, Nitrogen 8.9150%, and Sulphur 2.8902% (67.3364%). The elemental analysis suggests that 67.3364% of the organic matter in the TSW and remaining 32.6636% were inorganic components like metal salts.

(c) TGA analysis

TGA of TSW (Fig. 1) shows that the weight loss at 94.1^{o}C is due to elimination of moisture as well as organic volatile compounds. The organic compounds of TSW such as tannin, synthetic tannin, protein and fatty substances are hydrophilic in nature and thus the water molecules are held in the bound form and, ammonia, methane compounds are coming in the TGA before turning 100^{o}C because these salts and solvents are used in the leather processing. TGA records a weight loss in the temperature ranges from 240.3 to 576.5^{o}C, which can be attributed to the decomposition of organic compounds in the TSW into intermediate compounds. The intermediate compounds were volatilized off that left behind the ash content in the temperature range from 679.4 to 790.6^{o} C. The ash contains only 5% of inorganic compounds like metals and metal salts. The remaining things are decomposed.

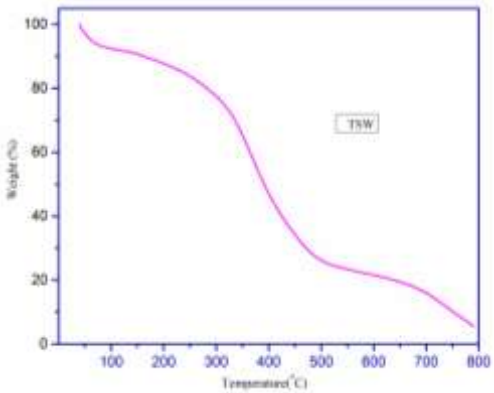

Fig .1 TGA analysis of TSW

IX CHARACTERIZATION OF MICRO FIBROUS CARBON (MFC)

(a) Characteristics of MFC

The moisture, ash, Chromium (III) and Chromium (VI) contents of the MFC were observed to be 2.69%, 74.42%, 0.81 mg/g and 5.50 µg/g respectively.

(b) Elemental analysis

The elemental composition of the MFC was Carbon 49.4282%, Hydrogen 1.2041%, Nitrogen 3.1769%, and Sulphur 1.7624% (55.5716%). The elemental analysis suggests that the MFC contains inorganic components because after pyrolysis most of the organic matters are decomposed and converted to carbon. The carbon contains mainly oxygen and metal so elemental analysis give the idea about the composition of element in the carbon it's further conformed by EDX spectrum.

(c) TGA of MFC

The fig.2 shows the TGA analysis of MFC. Initially the weight loss at 65^{o}C show the moisture present in the MFC and huge weight loss (72%)in the range like 291-347 ^{o}C shows the carbons are easily converted to ash because all organic parts pyrolysed to convert inorganic carbon and remaining inorganic compounds comes at residue at 790^{o} C.

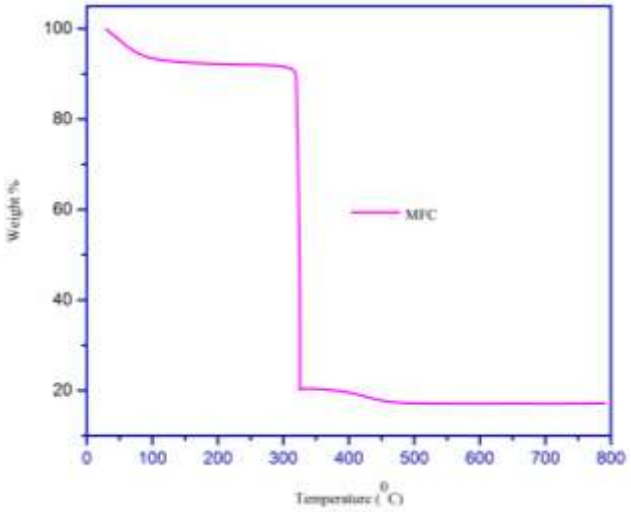

Fig .2 TGA analysis of MFC

(d) FTIR of MFC

The fig .3 shows the FTIR spectrum of MFC. It has a strong and broad band at 3500-3000cm^{-1} for the atmospheric water present in the MFC and band at 1580 and 1145cm^{-1} aromatic and C-O stretching frequency of MFC due to the aromatic group in condensed liquid may comes in the solid part and carbon adsorbed some amount of oxygen in this surface. The peak at 547 and 472cm^{-1} is due to the presence of metal oxide band (chromium oxide).

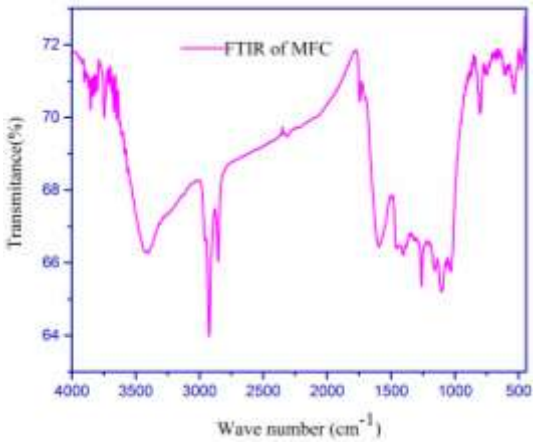

Fig .3 FTIR analysis of MFC

(e) SEM with EDX analysis of MFC

Fig. 4 showed SEM photographs of MFC. MFC prepared through the pyrolysis of TSW, the TSW pyrolysis to 30-800^{o}C at varies time segment produce micro fibres in the resultant residual ash. The shrinkage by the pyrolysis may make the size of residual ash smaller from the TSW in the order of several tens micrometers. The temperature is the most important factor which determines the size and shape of the MFC growth after pyrolysis. The one more factor is presence of metal or metal salts determines the fibrous structure of the residual ash (MFC).The MFC rope (fig. 4(b)) can be easily distinguished and the metal particles are dispersed in the product it is clearly show in the fig. 4(a). The average diameter of the MFC can be determined and the diameter is 129 nm. EDX spectral analysis (table.1 and fig. 5 intensity of metal peaks) reveals that the MFC contains approximately 78.04 Wt% carbon, 0.59 Wt% Chromium, 19.91Wt% oxygen and of, 0.68 Wt% chlorine, 0.78Wt% silicon. The organic compounds in the tannery solid waste are decomposed after pyrolysis and remaining part contains mostly inorganic compound like carbon, metal and metal salts.

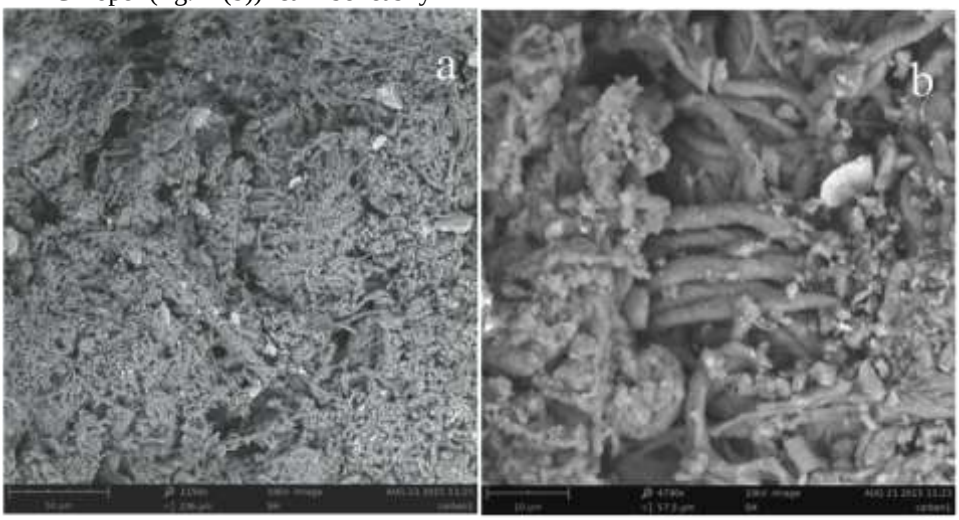

Fig .4 SEM analysis of MFC

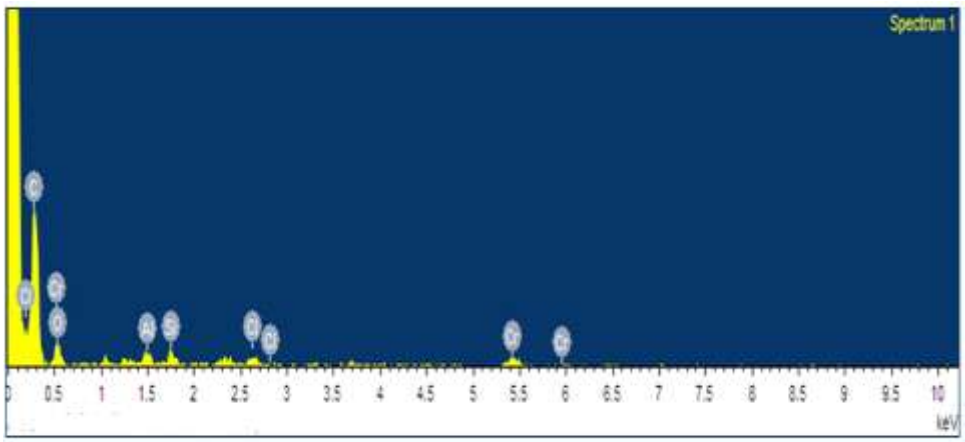

Fig .5 EDX spectrum of MFC

Table 1
EDX spectral data of MFC

Element	Approximate Concentration	Intensity concentration	Weight%	Weight% Sigma	Atomic%
C K	16.86	0.9661	70.33	3.96	78.04
O K	2.11	0.3542	23.90	4.00	19.91
Si K	0.38	0.9304	1.65	0.34	0.78
Cl K	0.37	0.8285	1.81	0.36	0.68
Cr K	0.45	0.7911	2.30	0.60	0.59

X CHARACTERIZATION OF MODIFIED BITUMEN

(a) SEM analysis of modified bitumen

The SEM image of modified bitumen shows in the fig. 6. The both the picture(c and d) tells about the microfiber carbon material bind with the bituminous material due to the fiber structure are show clearly in the second picture at the same time it is show block in colour and some of the cubical particle show in the picture due to the presence of metal in the MFC it also bind with the heteroatom present in the bitumen and MFC penetrate the bitumen due to the presence of layer in the bitumen.

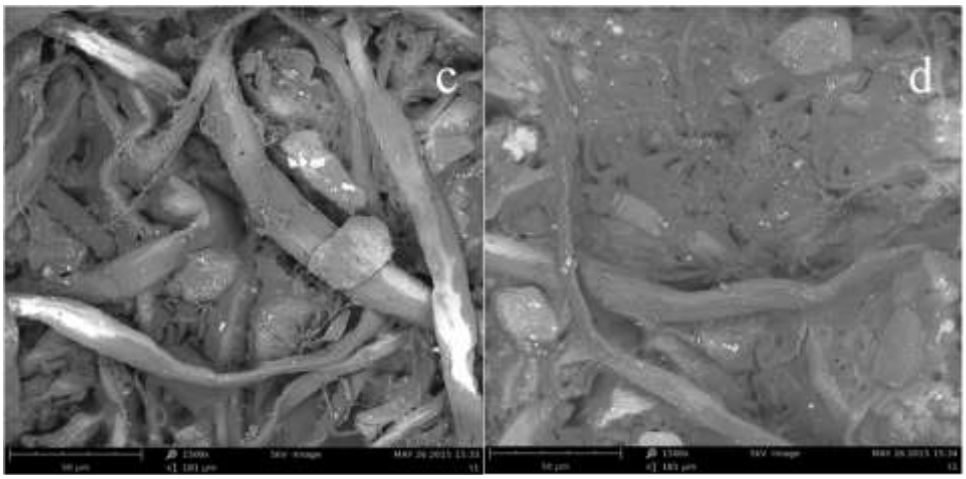

Fig .6 SEM analysis of modified bitumen

(b) Rheological test for modified bitumen

Table 2
Rheological tests for Modified Bitumen

Modified bitumen samples	Penetration values (dmm)	Softening Point (Temperature when ball touches the bottom, ^{O}C)	Viscosity (220 ^{o}C, time taken to flow 50cc of the binder)
Control	31	58	36
5% MFC	27	67	57
10% MFC	23	86	62
15% MFC	21	100	67

(c) Penetration Test for Modified Bitumen

Fig .7(a) and table. 2 show the penetration test for the modified bitumen. The aged bitumen is show the penetration around 31dmm but with the addition of MFC (1to 15g) the penetration value should be decreased because the addition MFC can binding with the aged bitumen and brittleness of the aged bitumen is changed.

(d) Softening Point for Modified Bitumen

The softening point of the modified bitumen is increase compare with control, the addition of inorganic matrix can change heating resistance of the bitumen. So the compound is thermally stable compare with control. Fig 7(b) and table. 2 results indicate the modified bitumen can change the character of the aged bitumen.

(e) Viscosity of Modified Bitumen

Viscosity of modified bitumen is decreasing with time. The modification of the aged bitumen strongly binds with the MFC, its decrease the viscosity of the control at the same time the brittle nature of the control should be changed. In the fig. 7(c) and table. 2 clearly tell this modification decrease the viscosity of the modified bitumen gradually with addition of MFC.

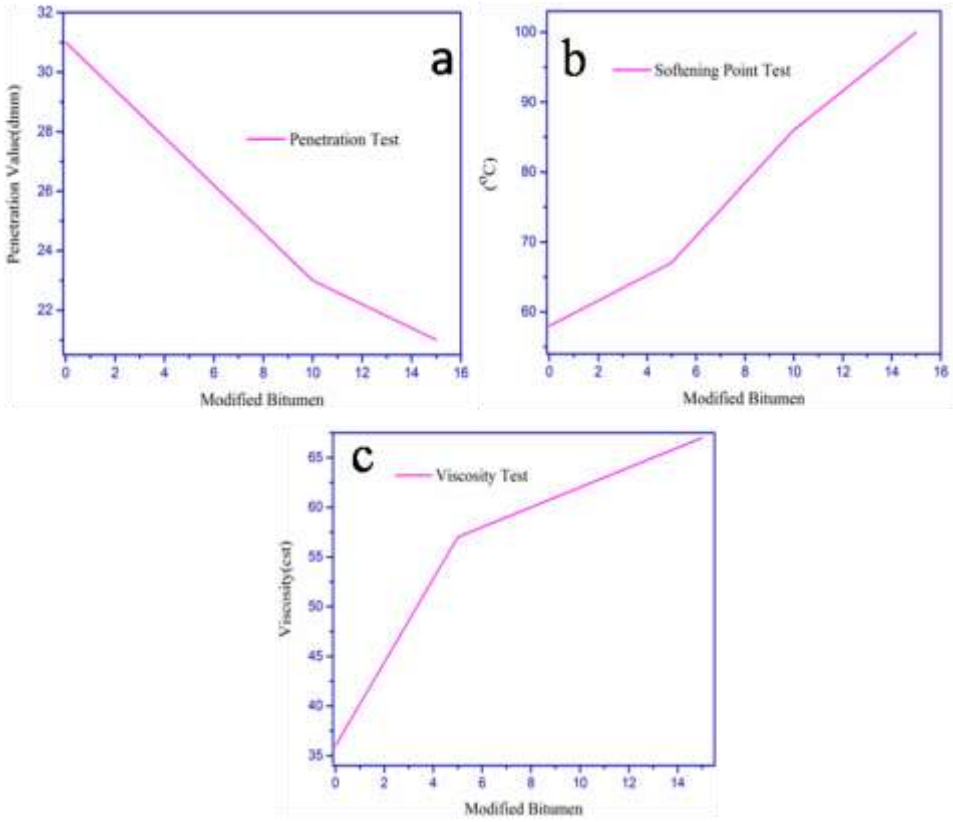

Fig. 7 Rheological character of modified bitumen

XI CONCLUSION

Successful pyrolysis of tannery buffing dust was done and micro fibrous carbon of particle size in the range 50 nm – 70 nm was prepared. The behavior of chromium under pyrolytic process was studied. Solidification and stabilization of chromium as modified bitumen was carried out. The rheological test results shows that the penetration decreases, softening point increases and the viscosity also decreases. The TCLP analysis shows there is no leaching of chromium (III) and chromium (VI) after solidification and stabilization.

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Effect of COD/Sulphate Ratio on Anaerobic Digestion of Sulfate Rich Post Tanning Wastewater at Different F/M Ratios

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ABSTRACT

Anaerobic digestion of post tanning wastewater was performed in batch anaerobic digesters for the influence of various parameters such as COD/Sulphate ratio (0.62, 0.67 and 1.19 (w/w) %) and F/M ratio (0.3, 0.5, 0.7, 0.9, 1.1, 1.3 and 1.5 (w/w) %). Among the studied conditions, F/M ratio of 0.3 was found to be optimum for the removal of COD and Sulfate from the post tanning wastewater. The maximum removal of COD was found to be 53.1, 64.8 & 80.1% and reduction of sulphate was observed to be 32.7, 46.9 & 58.1% at COD/sulphate ratios of 0.62, 0.67 and 1.19 respectively. The reduction efficiency of COD and Sulphate were decreased with increase in COD/sulfate ratios from 0.62 to 1.19 in anaerobic digester, a similar trend was observed for F/M ratio from 0.3 to 1.5% in anaerobic digestion. The production of methane gas at COD/sulphate ratio of 0.62, 0.67 and 1.19 were observed to be 189, 246 and 310 ml/g of COD removed. The maximum concentration of sulfide production was achieved for the sample which reached sulphate concentration of 426 mg/L at COD/sulfate ratio of 0.62, and the anaerobic digestion process was inhibited at this sulfide concentration. These results show that the post tanning wastewater with 0.62 COD/sulfate ratios shows process inhibition in AD.

Keywords: COD/sulfate ratio; F/M ratio; Post tanning wastewater; Sulfate containing wastewater.

I INTRODUCTION

In recent years, anaerobic processes have become popular for the treatment of many organic rich industrial wastewaters. However, there are some industries pulp and paper processing, molasses fermentation, sea food processing, potato starch factories, tannery, edible oil refineries, pharmaceutical production, petrochemical processing, and wine distilleries are not easily amenable by anaerobic treatment due to the presence of a high concentration of sulfate and/or sulfide (Lens et al., 1998;). The application of anaerobic treatment to these wastewaters has been found to be problematic due to the formation of hydrogen sulphide (H_2S). The production of H_2S in anaerobic digesters results from the action of sulphate-reducing bacteria (SRB) which utilize sulphate as terminal electron acceptor and compete with acetogens and methanogens with several key substrates including propionate, butyrate, ethanol, acetate and H_2/CO_2. The reduction of sulphate during the anaerobic treatment of wastewaters are generally undesirable action which substantially reduces the methane yield and reason for the many operating issues such as corrosion, odour and microorganism toxicity caused by H_2S. The direct discharge of tannery wastewater creates environmental threat for its high concentration of dyes, surfactants, sulfonated oils, chromium salts, solid waste fragments, waste skin trimmings and many other inorganic compounds(Durai, G; 2011; Zupancic, G.D, 2010).Generally,post-tanning involves neutralisation and washing steps, followed by re-tanning, dyeing and fat liquoring of hides/skins. The use of sodium bisulphite, sodium metabisulphite and sodium thiosulphate are the prime reason for the high concentration of sulphate ions in the post-tanning wastewater. Moreover, the post tanning waste water contains high concentration of organic matter, suspended solids, sulphide and chromium. (Haydar.S et al., 2009). The highconcentrations of organic ammonical nitrogen, collagen, and nitrogen functional tanning agents made post tanning wastewater more recalcitrant in nature (El-Sheikh, M.A, 2011).

There are parameters such as quantity of inoculum added and the amount of waste (based on the Chemical Oxygen Demand (COD) content) were investigated to understand the appropriate food (substrate) to Microorganisms (inoculum) (F/M) ratio (Gonzalez-fernandez, C.et al 2009;). Particularly, the substrate concentration has been considered as an important factor which influences the efficiency of the anaerobic digestion process (Lianhua et al., 2010; Sanchez et al., 2001). At very low substrate concentrations, there is a risk of low metabolic activity and very low quantity of biogas production. In contrast, if the substrate concentration is high, that might lead to a substrate overload condition in which intermediate products may accumulate, resulting in product inhibition of the process (Tanimu et al., 2014; Zhang et al., 2014). Generally COD to sulphate ratio is a parameter widely used to control biological sulphate reduction, as well as the methanogenic process. The Sulphate reduction and methane formation may take place simultaneously in anaerobic digestion process. Both sulphate reducers (SRB) and methane formers (MPB) may use hydrogen and acetate as a sources for electron donor which leads to a competition for organic substrate exists between SRB and MPB (ref). The consumption of organic content is strongly

dependant on the COD/SO_4^{2-} ratio in organic substrate. (Isa et al., 1986). The ratio of COD/SO_4^{2-} about 0.67, was found to be theoretically enough for complete removal of organic matter as COD by sulphate reducing bacteria (Rinzema and Lettinga, 1988a). If the COD/sulfate ratio less than 0.67, then the amount of organic matter in the wastewater could be insufficient for complete reduction of the sulfate, and additional substrate should be added if the sulfate removal was the primary concern of the treatment.(RinzemaA.,1988). The active competition between MPB and SRB are found to be at COD/sulfate ratios of 1.7–2.7 (Choi and Rim 1991).

The present study focused on the treatment of sulphate rich post tanning wastewater by anaerobic digestion method. The main objective of this work was to study the influence of feeding strategy at different COD/sulfate and F/M ratio on sulfate and COD removal efficiencies.

II MATERIALS AND METHOD

(a) Sample collection (substrates and inoculums) and anaerobic digestion-Batch study

The post tanning wastewater was collected from the common effluent treatment plant (CETP) located in Chennai, The wastewater was collected in a plastic carboy and transported to Environmental Technology Division, Central Leather Research Institute and stored at 4ºC until any experimental study. The dewatered sludge was collected from one of the anaerobic digestion plant and used as an inoculum for the experimental study. The batch experimental study of anaerobic digestion was performed for different COD/SULPHATE ratio (0.62, 0.69, and 1.2). The characteristics of initial wastewater at different COD/SULPHATE ratio were shown in table 1. The F/M ratio was also varied for 0.3, 0.5, 0.7, 0.9, 1.1, 1.3 and 1.5% respectively. The 120 mL serum bottles were taken for the batch experimental study with working volume of 80 mL. The serum bottles were closed by rubber cap and an aluminum seal after nitrogen gas purging at a rate of 15 mL/s (at ambient temperature; pressure, 0.8– 1.0kg/cm^2) for 10 min for the anaerobic condition. The batch reactors were monitored at different retention time upto 108 h.

Table 1
Physico-chemical properties of post tanning wastewater

Parameters	EXP-1	EXP-2	EXP-3
pH	6.88	7.06	7.18
ORP (mV)	-302.96	324	-336.53
Chemical Oxygen Demand (COD) mg/L	3027.33	3097.33	3320
Sulphate (mg/L)	4853.33	4480	2753.66
COD/Sulphate ratio	**0.62**	**0.69**	**1.20**
Sulphide (mg/L)	43.33	38.66	26
VFA (mg/L)	1140	1190	1110

III PHYSICO-CHEMICAL PARAMETER ANALYSES

All the physico–chemical parameters were analysed according to the methodology described in standard methods of water analysis (APHA, 2005).The sulphate and sulphide parameters were immediately fixed after sample collection with 2N zinc acetate at alkaline condition to avoid sulphide oxidation. The fixed samples were centrifuged at 5000 rpm for 5min. The supernatant solution was taken for the analysis of sulphate and precipitate for total sulphides analysis by the iodometric method. The COD parameter was analyzed from the centrifuged sample (without zinc acetate fixation) after acidifying the sample with1N sulphuric acid to strip out sulphides as H_2S gas and fixed by addition of potassium dichromate. The closed reflux digestion was carried by HACHs COD digester (Loveland, USA) for the analysis of COD parameter. The ORP was recorded by Orion 920 (Thermo electronic instruments) and pH was measured using Hanna Instruments, (Model: HI 2212) pH meter. The generation of methane gas was measured by NaOH displacement method based on mariotte principle, i.e., the volume of 1 N NaOH solution displaced is equivalent to volume of methane gas generated. The generation of methane gas was recorded on daily basis.

$$Mmax = M_E/S_L \quad (1)$$

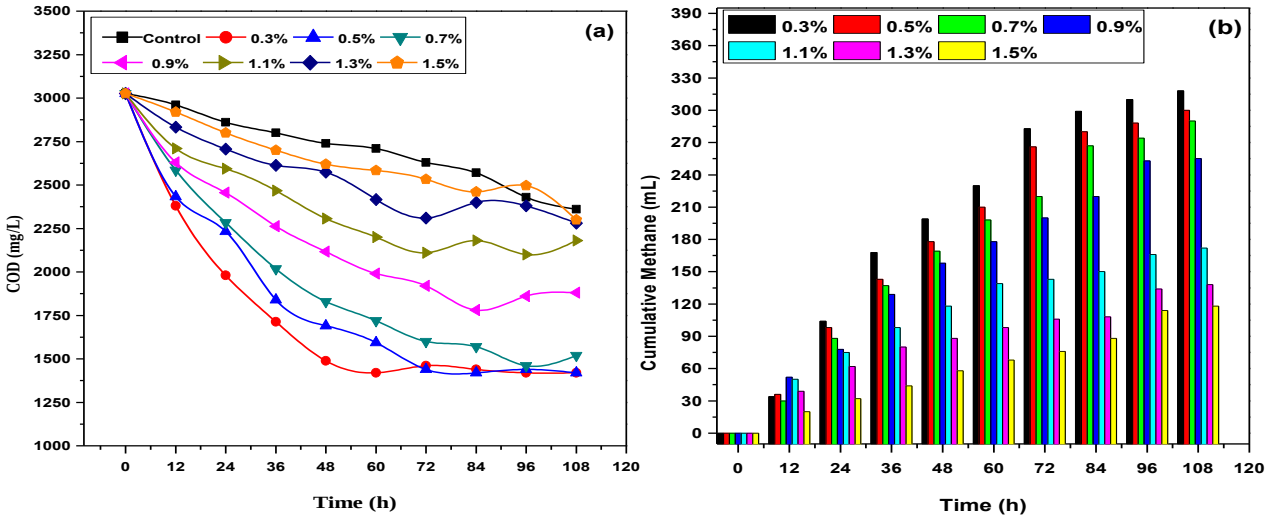
Where Mmax represents the methane yield (L g-COD^{-1} removed),M_E is the total volume of methane gas (ml-CH4) at the end of experiment and S_L is the amount of substrate removed (g-COD) at the end of experiment.

IV RESULTS AND DISCUSSION

In general, if there is a competition between MPB and SRB for a substrates available for anaerobic system, the treatability of wastewater will be highly significant by the presence of sulfate and it influenced much by COD/Sulphate ratio of the substrate (McCartney and Oleszkiewicz, 1991). The minimum COD/Sulphate ratio required for the complete reduction as reported to be 0.67 (Lens et al., 1998). Hence, in this present investigation anaerobic batch reactors were operated for 108 hours at different COD/Sulphate ratios (0.62 0.69 and 1.2). The wastewater collected from the CETP has COD/Sulphate ratio of 1.2 minimum and maximum of 0.67. The effect of F/M ratio on COD and sulfate removal was also studied by varying F/M ratio from 0.3 % to 1.5 %.

V EFFECT OF COD REDUCTION AND METHANE FORMATION AT COD/SULPHATE RATIOS

The reduction of COD was evaluated for different F/M ratios (0.3, 0.5, 0.7, 0.9, 1.1, 1.3 and 1.5%) at



COD/Sulphate ratio of 0.62 and presented in Fig. 1a.

Fig. 1 Anaerobic digestion for post tanning wastewater atCOD/Sulphate ratio0.62 (a) COD removal (b) Cumulative methane formation in mL

The figure shows that the increase in F/M ratio from 0.3% to 1.5%, there was reduction in COD. The maximum amount of COD reduction was achieved for F/M ratio at 0.3 %. The maximum percentage of COD reduction was found to be 53% for 60h incubation period as shown in Fig 4. The other than 0.3 % of F/M ratios showed lower amount of COD removal; this may be explained by less availability of microorganism in the anaerobic reactors. Furthermore, the substrate utilization rate (SUR) was also increased with increase in addition of inoculums. The cumulative yield of methane was recorded for each substrate as a function of time at different F/M ratios and reported in Fig.1b. The methane gas production for the blank samples always nil, hence the values of the blanks are not shown in Fig. 1b, 2b, 3b and 5. Irrespective of different F/M ratio, the maximum cumulative methane generation was observed to be 320 ml for the residence time of 60-84h and remains constant for the batch reactors which operated for maximum residence time of 108h.

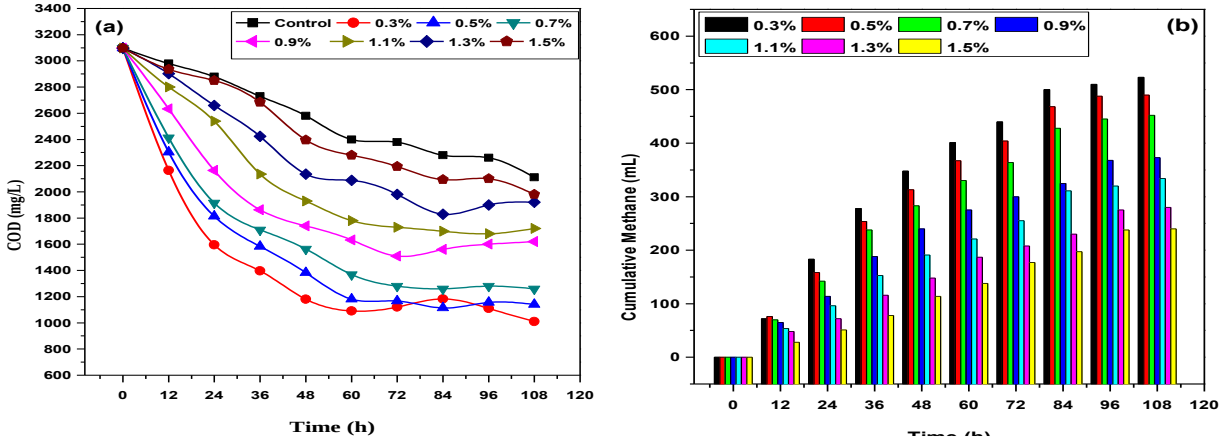


Fig. 2 Anaerobic digestion for post tanning wastewater at COD/Sulphate ratio 0.69 (a) COD removal (b) Cumulative methane formation in mL

The increase in F/M ratio may slow down the methanogen activity which resulting in decrease in generation of methane gas. The production of methane gas was found to be 0.204, 0.189, 0.185, 0.192, 0.185, 0.184 and 0.182 L of methane gas/ g of COD removed for the studied F/M ratios of .3, 0.5, 0.7, 0.9, 1.1, 1.3 and 1.5%. There are similar reports on the batch fermentation using wheat straw as a substrate at different I/S ratio Hashimoto (1989) and Chynoweth et al. (2001) reported that maximum conversion rate of substrate was obtained for the F/M ratio of 0.5.

Fig .2a. Shows the reduction of COD for different F/M ratios from 0.3 to 1.5% at COD/ Sulphate ratio 0.69. Among the studied concentration of F/M ratio, ratio operated at 0.3% showed maximum removal of COD, 64.8 % at 60 to 72 h of incubation time. All the other ratios showed less COD removal shown in Fig 4. The Fig 2b & 5 Shows Cumulative methane gas generation at 0.3 % of F/M ratio was found to be 523 ml and 0.260 L of methane / g of COD removed. Irrespective of different F/M ratio, the maximum amount of methane gas generation was observed for the 72-84h of incubation time for all the F/M ratio values. The effect of COD reduction for different F/M ratio(0.3, 0.5, 0.7, 0.9, 1.1, 1.3 and 1.5%) were studied at COD/ Sulphate ratio of 1.2 as shown in Fig 3a.

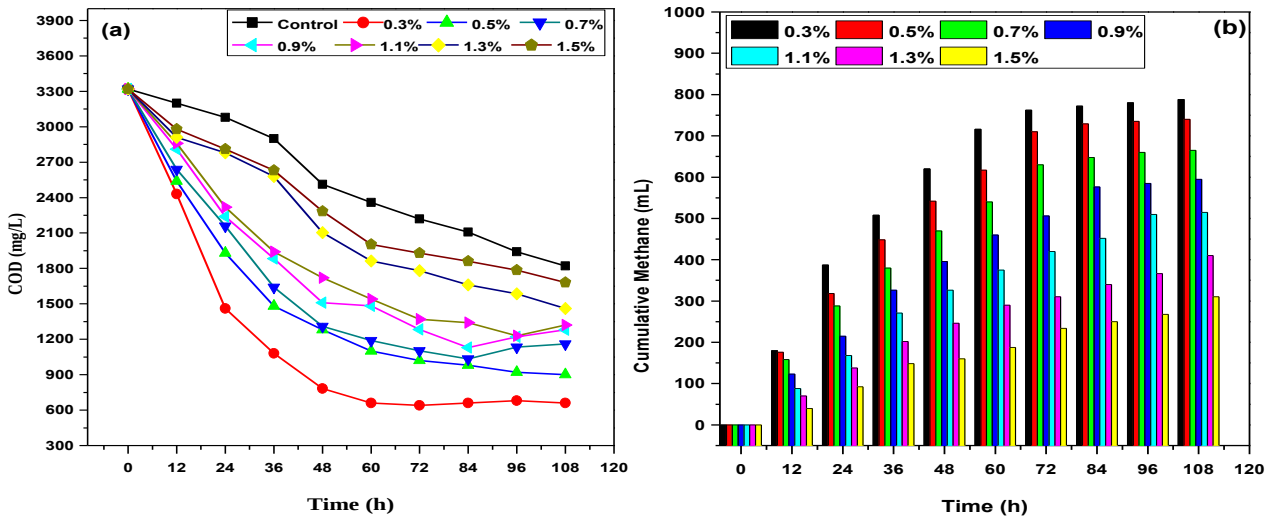


Fig. 3 Anaerobic digestion for post tanning wastewater at COD/Sulphate ratio 1.2 (a) COD removal (b) Cumulative methane formation in mL

The maximum COD reduction was observed for the F/M ratio operated at 0.3 %, the maximum removal of COD at 0.3 % of F/M ratio was found to be 80 % at incubation time of 48 to 60 h.as shown in Fig 4. The Cumulative yield of methane gas generation was observed to be 788 ml with 0.310 L of methane / g of COD removed for 0.3% F/M ratio (Fig. 3b) (Guerrero, L et al., 2013). Either the increase or decrease in value of F/M ratio of 0.3 % showed decrease in amount of methane gas production as shown in Fig 5. This illustrate that the optimum F/M ratio for the treatment of post tanning wastewater is 0.3 %. Irrespective of F/M ratio, the maximum methane generation was observed for all the F/M ratio after the residence time of 60 to 72h. A similar response was observed by Jeong T.Y, 2008 for the wastewater operated at high COD/sulphate ratios with maximum methane production. Further, COD removal efficiency was increase with respect to increase in COD/sulphate ratios from 1.1 to 116(Izumi et al., 2010; Liu et al., 2009).

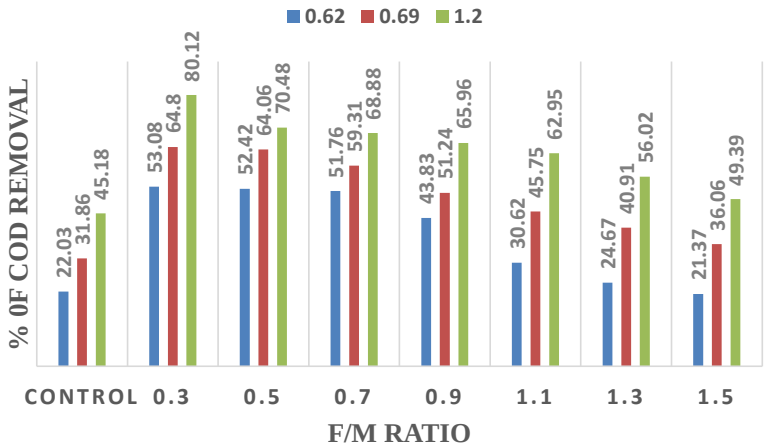


Fig. 4 Percentage of COD removal at different COD/Sulphate ratio and different F/M ratios for the treatment of post tanning wastewaters

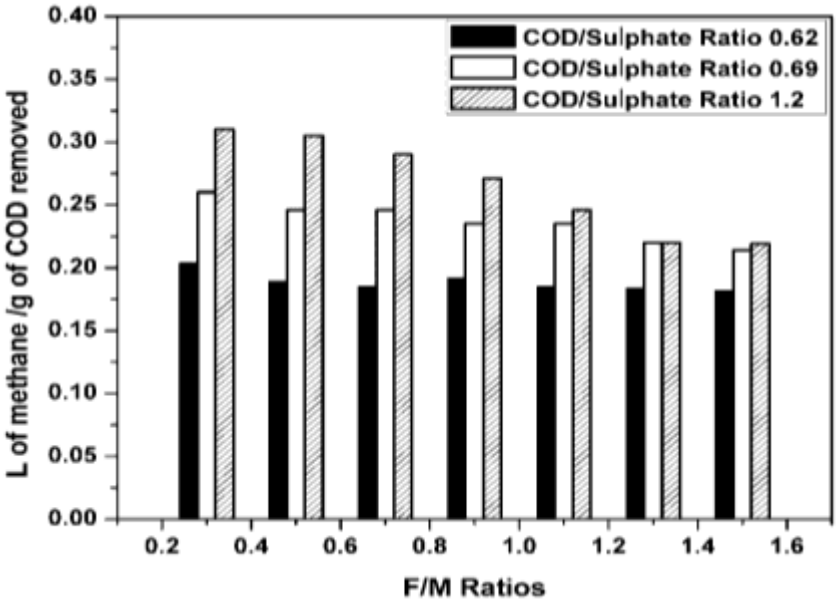


Fig. 5 Profile for the Methane gas generation in L /g of COD removed at different COD/Sulphate and F/M ratios for the treatment of post tanning wastewater

VI REDUCTION OF SULPHATE AND FORMATION OF SULPHIDE IN ANAEROBIC DIGESTION AT DIFFERENT COD/SULPHATE RATIOS

At low COD/Sulphate ratios, due to the availability of high sulphate concentration SRB may grow actively and generates H2S which are found to be many reason for the decrease in solution pH. When the system is operated at high COD/Sulphate ratios, MPB grows with increase in solution pH due to the formation of ionized products such as HS- and S2-. (Biswas, T. 2012). In Anaerobic digestion process the sulphate ions was reduced to sulphide ions by Sulphate reducing bacteria.

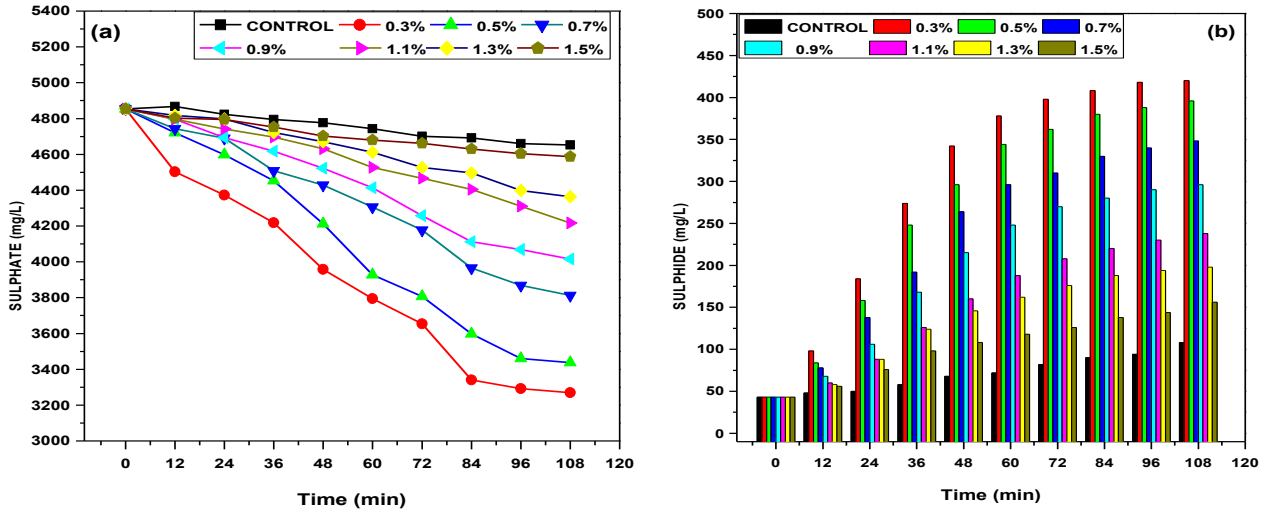


Fig. 6 Reduction of sulpahte and formation of sulphide concentration in anaerobic treatment of post tanning wastewater at COD/Sulphate ratio 0.62 (a) Sulphate reduction (b) Sulphide formation

Fig 6a shows change in sulphate concentration for the anaerobic digestion operated at COD/Sulphate ratio of 0.62. . The results revealed that the maximum sulphate reduction was observed for the system operated at 0.3% F/M ratio. The reduction of sulphate concentration was decreased from 4853mg/L to 3270 mg/L with 32% of sulphate reduction (Fig 9). Further, Fig 6b shows the formation of sulphide concentration during anaerobic digestion. The concentration of sulphide

was found to be 426, 402, 358, 302, 248, 198 and 156 mg/l for the system operated at different F/M ratio (0.3, 0.5, 0.7, 0.9, 1.1, 1.3 and 1.5%). The anaerobic digestion process was found to be inhibited with increase in sulphide concentration for the studied experiments operated at different F/M ratios.

Anaerobic digestion experiment was carried out at COD/Sulphate ratio of 0.69 and presented in Fig.7. The change in concentration of sulphate is shown in Fig.7a and the formation of sulphide concentration are presented in Fig.9.

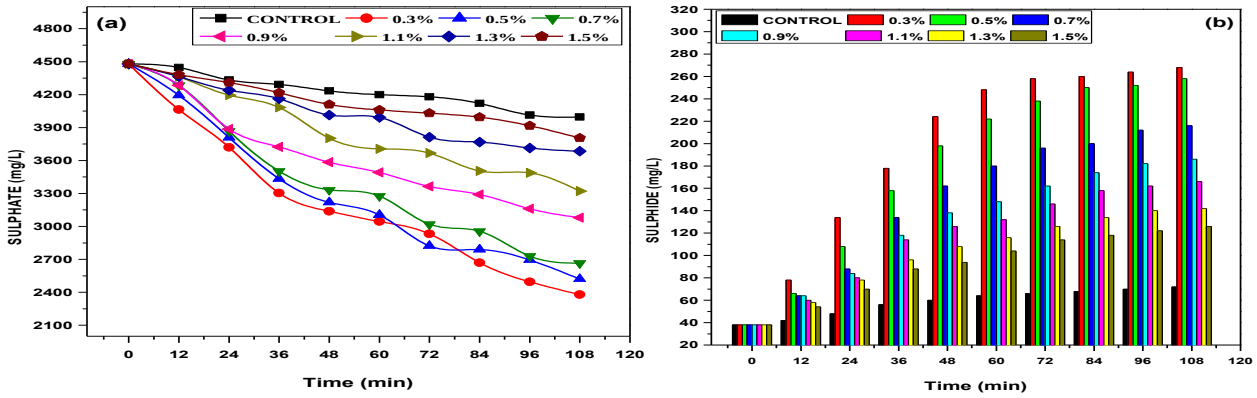


Fig. 7 Reduction of sulphate and formation of sulphide concentration in anaerobic treatment of post tanning wastewater at COD/Sulphate ratio 0.69 (a) Sulphate reduction (b) Sulphide formation

The figures illustrated that the concentration of sulfate was observed to be decreased from 4480 mg/L to 2380mg/L at an F/M ratio of 0.3. The maximum percentage of sulphate reduction was found to be 46.83 % for the AD system operated at 0.3% F/M ratio. Further, the increase in F/M ratio from 0.3 to 1.5% decreased the sulphate removal percentage. The calculated percentage of sulphate removal are 43.7, 40.5, 31.2, 25.9, 17.8, and 15%, for the F/M ratio of 0.5, 0.7, 0.9, 1.1, 1.3 and 1.5% respectively The formation of sulphide concentration at F/M ratios from 0.3 to 1.5% was observed to be 278, 268, 226, 196, 186, 162 and 146mg/L respectively (Fig. 7b). The maximum concentration of sulphide for the AD operated at 0.3% F/M ratio produced more than 200 mg/L in 48h of incubation time. Hence, it failed on anaerobic digestion due to sulphide toxicity to the microorganisms. However, the system operated at 0.5% F/M ratio produced sulphide concentration above 200 at 60h incubation time without sulphide inhibition. This may be due to the high microorganism growth is balanced the sulphide toxicity.

The influence of COD/sulphate ratio operated at 1.2 for different F/M ratio for the reduction of sulphate is shown in Fig 8&9. The maximum decrease in concentration of Sulfate was found to from 2753 mg/L to 1328 mg/L for a studied F/M ratio of 0.3 and the percentage of sulphate was calculated to be 58.1 % (Fig.9).

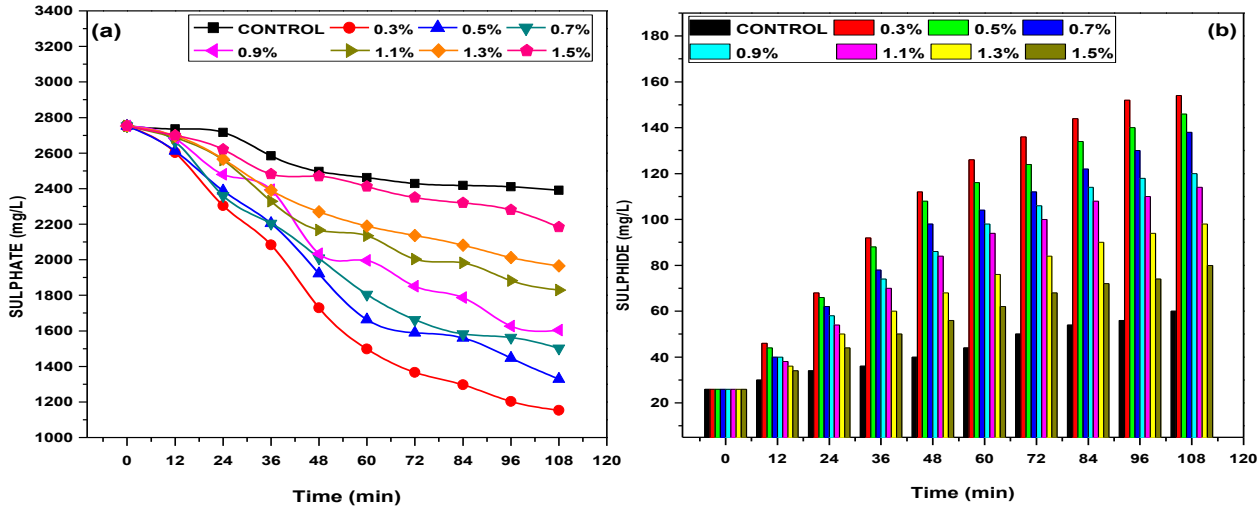


Fig. 8 Reduction of sulphate and formation of sulphide concentration in anaerobic treatment of post tanning wastewater at COD/Sulphate ratio 1.2 (a) Sulphate reduction (b) Sulphide formation

As the increase in F/M ratio from 0.3 to 1.5% decrease the percentage sulphate removal and the values are 51.8, 45.4, 41.7, 33.5, 28.6 and 20.1% respectively for the F/M ratio of 0.5, 0.7, 0.9, 1.1, 1.3 and 1.5%. The formation of sulphide concentration is presented in Fig 12b for the different F/M ratio. The concentration of sulphide was found to be 154, 146, 138, 120, 114, 98 and 80 mg/L for the F/M ratio of 0.5, 0.7, 0.9, 1.1, 1.3 and 1.5% respectively. The results illustrated that the increase in COD/sulphate ratio form 0.62 to 1.2 increased the removal of sulphate for the F/M ratio operated at 0.3 %. However, the increase in F/M ratio decreased the removal of sulphate ion from the post tanning wastewater (Krapivina M et al., 2007).A similar reports on the reduction of sulphate with increase in COD/sulphate ratio by Archilha (2010) reported that the production of sulphide was found to be high for the system operated in low COD/sulphate ratio.

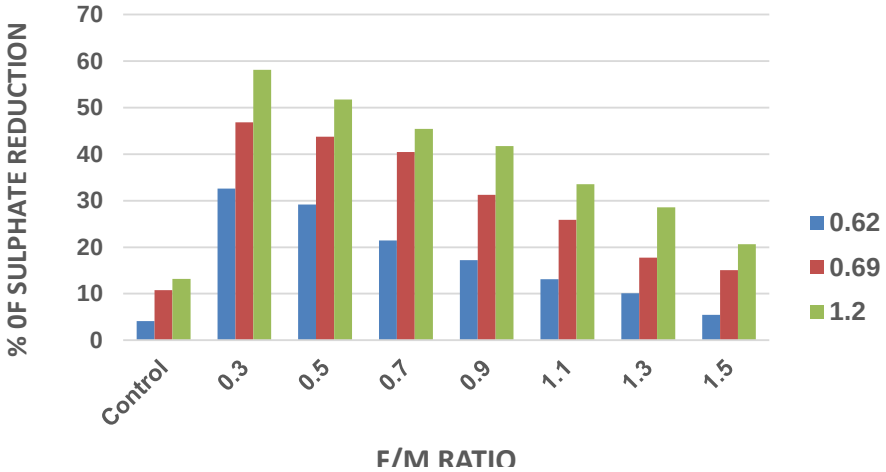


Fig. 9 Percentage of Sulphate removal at different COD/Sulphate and F/M ratios for the treatment of post tanning wastewater

VII CONCLUSION

The post tanning wastewater from CETP'S shows different COD/Sulphate ratios from 0.62 to 1.2%, for all COD/Sulphate ratios the AD shows 0.3% F/M ratio was the optimum to remove COD and Sulphate. Anaerobic digestion of COD/Sulphate ratios for 0.62 shows H_2S production in all F/M ratios, due to H_2S concentration the anaerobic digestion process were inhibited and the inhibition of AD was observed. Anaerobic digestion of COD/Sulphate ratios for 0.69 and 1.2 shows not much process inhibition in AD. So, anaerobic digestion of COD/Sulphate ratios for 0.62 need an alternative pre-treatment method to proceed AD. Otherwise post tanning wastewater with below 0.62 COD/Sulphate ratios were treated separately.

VIII ACKNOWLEDGEMENTS

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Privacy Preservation Protocol for Data Storage in Cloud Computing

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ABSTRACT
In cloud computing, data owners host their data on cloud servers and users (data consumers) can access the data from cloud servers. However, this new paradigm of data hosting service also introduces new security challenges. Information owners must trust cloud providers for all of their security. Since various protocols are implemented for the security of these cloud data Storage. But there is a need of privacy preserving protocol that should keep owner's data confidential against the auditor and verify the correctness of data and user. The proposed methodology provides a secure, dynamic auditing and privacy preserving protocol for the secure access of the cloud data storage. This methodology is implemented using the hybrid combination of Access Policy and Elliptic Curve based Encryption.

Keyword - Cloud Computing, Cloud Storage, Privacy PreservationProtocol

I INTRODUCTION

Cloud computing presents a new way to supplement the current consumption and delivery model for IT services based on the Internet, by providing dynamically scalable and often virtualized resources as a service over the Internet. Clouds can be explained as pools of virtualized resources that can be easily used and accessed. For optimum resource utilization the resources in cloud can be reconfigured dynamically.Cloud computing basically contains virtualization, on-demand deployment, Internet delivery of services, open source software etc. [1].A technique Cloud Information Accountability (CIA) framework is based on the notion of information accountability. Unlike privacy protection technologies which are built on the hide-it-or-lose-it perspective, information accountability focuses on keeping the data usage transparent and traceable [2].

Cloud Computing provides efficient computing by centralizing storage, memory, processing and bandwidth promising lower costs, rapid scaling, easier maintenance, service availability. The main focus needs upon the data security and privacy. Services provided by cloud computing are [3].

(a) Services to large number of distinct end users in opposition to bulk data processing or workflow management for a single user.
(b) Using the data model which consists of sharable units in which all data objects has access control lists (ACLs) with one or more users.
(c) Developers are capable of running applications on a separate computing platform with physical infrastructure, job scheduling, user authentication, base software environment etc. and do not need to implement platform by themselves.

Cloud Computing is based on architecture which is responsible for providing various services and can be categorized into:

(a) Infrastructure as a Service (IaaS) is foundation of cloud services providing clients to access server hardware, use storage services, bandwidth usage & information and other computing resources.
(b) Platform as a Service (PaaS) is builds upon IaaS. It provides clients to access basic operating software. It gives optional services for developing and uses the software applications that are database access and payment service. These services are then not needed to be purchased and the computing infrastructure does not need to be managed.

Software as a Service (SaaS) is builds upon IaaS and PaaS providing clients to access the software applications [4].

II THEORETICAL BACKGROUNDNCLOUD STORAGE

It is a model of data storage where the digital data is stored in logical pools, the physical storage spans multiple servers (and often locations), and the physical environment is typically owned and managed by a hosting company. These cloud storage providers are responsible for keeping the data available and accessible, and the physical environment protected and running.

There are three main cloud storage models:

(a) Public cloud storage services, such as Amazon's Simple Storage Service (S3), provide a multi-tenant storage environment that's most suitable for unstructured data.

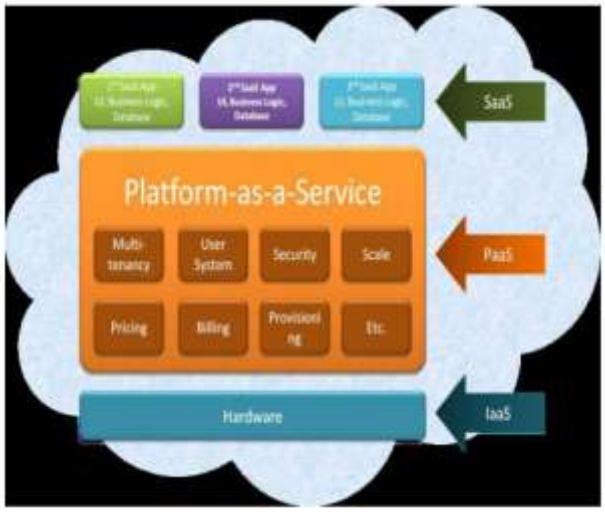

Fig 1. Cloud Computing Services

(b) Private cloud storage services provide a dedicated environment protected behind an organization's firewall. Private clouds are appropriate for users who need customization and more control over their data.

(c) Hybrid cloud storage is a combination of the other two models that includes at least one private cloud and one public cloud infrastructure. An organization might, for example, store actively used and structured data in a private cloud and unstructured and archival data in a public cloud.

An enterprise-level cloud storage system should be scalable to suit current needs, accessible from anywhere and application-agnostic.

III RESEARCH CHALLENGES ON CLOUD STORAGE

In Cloud Computing, data owners may share their outsourced data with a large number of users, who might want to only retrieve certain specific data files they are interested in during a given session. One of the most popular ways to do so is through keyword-based search. Such keyword search technique allows users to selectively retrieve files of interest and has been widely applied in plaintext search scenarios. Unfortunately, data encryption, which restricts user's ability to perform keyword search and further demands the protection of keyword privacy, makes the traditional plaintext search methods fail for encrypted cloud data. Although traditional searchable encryption schemes allow a user to securely search over encrypted data through keywords without first decrypting it, these techniques support only conventional Boolean keyword search, without capturing any relevance of the files in the search result. Ranked search improves system usability by normal matching files in a ranked order regarding to certain relevance criteria (e.g., keyword frequency), as directly outsourcing relevance scores will drips a lot of sensitive information against the keyword privacy.

IV PRIVACY-PRESERVING PROTOCOL

Privacy preservation enables various users to securely transmit their data over cloud network into data storage centers. The main issue that takes place in privacy-preserving is the data privacy. This is because: 1) for public data, the auditor may obtain the data information by recovering the data blocks from the data proof. 2) For encrypted data, the auditor may obtain content keys somehow through any special channels and could be able to decrypt the data. To solve the data privacy problem, our method is to generate an encrypted proof with the challenge stamp by using the bilinearity property of the bilinear pairing, such that the auditor cannot decrypt it, but the auditor can verify the correctness of the proof without decrypting it [5].

V LITERATURE SURVEY

Madhan Kumar Srinivasan [6] analyzed the current security challenges in cloud computing environment based on state-of-the-art cloud computing security taxonomies under technological and process-related aspects.Qian Wang[9]studied the problem of ensuring the integrity of data storage in Cloud Computing. In particular, they consider the task of allowing a third party auditor (TPA), on behalf of the cloud client, to verify the integrity of the dynamic data stored in the cloud. The introduction of TPA eliminates the involvement of client through the auditing of whether his data stored in the cloud is indeed intact, which can be important in achieving economies of scale for Cloud Computing. The support for data dynamics via the most general forms of data operation, such as block medications, insertion and deletion, is also a significany step toward practicality, since services in Cloud Computing are not limited to archive or backup data only. While prior works on ensuring remote data integrity often lacks the support of either public variability or dynamic data operations, this paper achieves both. They first identified the difficulties and potential security problems of direct extensions with fully dynamic data updates from prior works and then show how to construct an elegant verification scheme for seamless integration of these two salient features in our protocol design. In particular, to achieve efficient data dynamics, they improve the Proof of irretrievability model [10] by manipulating the classic Markel Hash Tree (MHT) construction for block tag authentication. Extensive security and performance analysis show that the proposed scheme is highly efficient and provably secure.

Ramgovind S[11] provides an overall security perspective of Cloud computing with the aim to highlight the security concerns that should be properly addressed and managed to realize the full potential of Cloud computing. Gartner's list on cloud security issues, as well as the findings from the International Data Corporation enterprise panel survey based on cloud threats, will be discussed in this paper.Q. Wang[12] adopted the block less approach, and authenticate the block tags instead of original data blocks in the verification process. To achieve efficient data dynamics a new and efficient technique is implemented.Srinivas D[13] proposed a new technique in which the burden of cloud user from the tedious and possibly pricey auditing task, but also alleviates the users' terror of their outsourced data security.ZhuYan[14] suggested efficient provable data possession for hybrid clouds. They focused on the construction of PDP scheme for hybrid clouds, supporting privacy protection and dynamic scalability. In 2009 Qian Wang et al [15] introduced a new scheme which gives remote data integrity and verifiability means dynamic data operations. The method initially identifies the troubles and potential security problems of direct extensions with fully dynamic data updates. Seny Kamara and Kristin Lauter [16] considered the problem of building a secure cloud storage service on top of a public cloud infrastructure where the service provider is not completely trusted by the customer. They survey the benefits such architecture would provide to both customers and service providers and give an overview of recent advances in cryptography motivated specifically by cloud storage. V.Sathiya Suntharam[17] proposed a method to build a trusted computing environment for Cloud Computing system by providing platform in to Cloud Computing system. In this method some important security services including authentication, encryption and decryption and compression are provided in Cloud Computing system. The need for this software can be categorized in two categories: Encryption and Decryption, Compression. JinWookByun[18]propose an efficient conjunctive keyword search scheme over encrypted data in aspects of communication and storage costs. Concretely, they reduce the storage cost of a user and the communication cost between a user and a data supplier to the constant amounts.

VI CONCLUSION

In the Existing systems, the notion of public audit ability has been proposed in the context of ensuring remotely stored data integrity under different system and security models. Public audit ability allows an external party, in addition to the user himself, to verify the correctness of remotely stored data. However, most of these schemes do not consider the privacy protection of users' data against external auditors. Indeed, they may potentially reveal user's data to auditors. This severe drawback greatly affects the security of these protocols in cloud computing. From the perspective of protecting data privacy, the users, who own the data and rely on TPA just for the storage security of their data, do not want this auditing process introducing new vulnerabilities of unauthorized information leakage toward their data security.

The main objectives of our work are as follows:

(a) To provide privacy-preservation in cloud data storage.
(b) To provides security from various attacks.
(c) To provides less computational cost and time for data storage.
(d) To implement an efficient framework for cloud data storage.

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Proportional Study of Data Mining Tools

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ABSTRACT
Today the rapid development of information technology and adoption of its several applications has created the revolution in business and various fields significantly. The growing interest in business using electronics and technology has brought vital improvement in data mining field also, since it's an important part of data accessibility. Data mining and it's applications can be viewed as one of the rising and promising technological developments that provide efficient means to access various types of data and information available worldwide. Not only this, these applications also aids in decision making. A better understanding of these applications helps in asking choice among all available application and tools. The paper gives the complete and theoretical analysis of six open source data mining tools. The study describes the technical specification, features, and interest for each selected tool along with its applications. By employing the study the choice and selection of tools can be made easy.

Keywords: Data, Data Mining, Data Mining Tools, Open Source Tools, Technical Specification.

I INTRODUCTION

There has been a dramatic increase in amount of information and data which is stored in electronic format since last few decades. The size of data base has been in the process of continuous increment and has reached up to terabytes. This explosive rate of data increment is growing day by day and estimations tell that the amount of information in world doubles every 20 months. Data mining is the process of extraction of predictive information from large data masses. It can also be described as a process of analyzing data from different perspective and summarizing it into useful information. With a vast history deeply rooted in machine learning, artificial intelligence, database along with statistics data mining was coined very early. Data mining is strongly associated with data science which involves manipulation and classification of data by applying statistical and mathematical concepts. Data mining is an important phase in knowledge discovery and includes application of discovery and analytical methods on data to produce specific models across data. Data are available everywhere. It can be used to predict the future. Usually the arithmetical approach is used. Data mining is an extension of traditional data analysis and statistical approaches in that it incorporates analytical techniques drawn from a range of disciplines. Due to the widespread availability of huge, complex, information-rich data sets, the ability to extract useful knowledge hidden in these data and to act on that knowledge has become increasingly important in today's competitive world .Thus data mining is analysis of large observational data sets to find unsuspected relationships and to summarize the data in novel ways that are both understandable and useful to data owner. [1]. briefly, data mining is a move toward to research and analysis. [2] It is exploration and analysis of large quantities of data in order to discover meaningful patterns and rules. [3] Sometime, data may be in different formats as it comes from different sources, irrelevant attributes and missing data. Therefore, data needs to be prepared before applying any kind of data mining. Data mining is also known under many other names, as well as knowledge extraction, information discovery, information harvesting, data archeology, and data pattern processing.[4]Many researchers and practitioners use data mining as a synonym for knowledge discovery but data mining is also just one step of the knowledge discovery process. All the techniques follow an automated process of knowledge discovery (KDD) i.e., data cleaning, data integration, data selection, data transformation, data mining and knowledge representation [5]

II TYPES OF DATA THAT CAN BE MINED

(a) Flat files: Flat files are actually the most common data source for data mining algorithms, especially at the research level. Flat files are simple data files in text or binary format with a composition known by the data mining algorithm to be applied. The data in these files can be transactions, time-series data, scientific measurements, etc.

(b) Relational Databases: Briefly, a relational database consists of a set of tables containing either values of entity attributes, or values of attributes from entity relationships. Tables have columns and rows, where columns represent attributes and rows represent tuples. A tuple in a relational table corresponds to either an object or a relationship between substances and is identified by a set of attribute values representing a unique key.

(c) Data Warehouses: A data warehouse as a store house is a repository of data collected from multiple data sources (often heterogeneous) and is intended to be used as a whole under the same combined schema. A data warehouse gives the option to analyze data from different sources under the same roof.

(d) Transaction Databases: A transaction database is a set of records representing transactions, each with a time stamp, an identifier and a set of items. Associated with the transaction files could also be expressive data for the items.

(e) Multimedia Databases: Multimedia databases include video, images, and audio and text media. They can be stored on extended object-relational or object-oriented databases, or simply on a file system. Multimedia is characterized by its high dimensionality, which makes data mining even more challenging. Data mining from multimedia repositories may require computer vision, computer graphics, image interpretation, and natural language processing methodologies.

(f) Spatial Databases: Spatial databases are databases that, in addition to usual data, store geographical information like maps, and global or regional positioning.

(g) World Wide Web: The World Wide Web is the most heterogeneous and dynamic repository available. A very large number of authors and publishers are continuously contributing to its growth and transformation, and a massive number of users are accessing its resources daily. Data in the World Wide Web is organized in inter-connected documents. These documents can be text, audio, video, raw data, and even applications. Conceptually, the World Wide Web is comprised of three major components: The content of the Web, which encompasses documents available; the structure of the Web, which covers the hyperlinks and the relationships between documents; and the usage of the web, describing how and when the resources are accessed.

(h) Time-Series Databases: Time-series databases contain time related data such stock market data or logged activities. These databases usually have a continuous flow of new data coming in, which sometimes causes the need for a challenging real time analysis. Data mining in such databases commonly includes the study of trends and correlations between evolutions of different variables, as well as the prediction of trends and movements of the variables in time.

III DATA MINING TOOLS OVERVIEW

Data mining has a wide number of applications ranging from marketing and advertising of goods, services or products, artificial intelligence research, biological sciences, crime investigations to high-level government intelligence. Due to its widespread use and complexity involved in building data mining applications, a large number of Data mining tools have been developed over decades. Every tool has its own advantages and disadvantages. [6] Within data mining, there is a group of tools that have been developed by a research community and data analysis enthusiast; they are offered free of charge using one of the existing open-source licenses. An open-source development model usually means that the tool is a result of a group of people effort, not necessary supported by a single institution but instead the result of contributions from an international and informal development team. Data mining provides many mining techniques to extract data from databases. Data mining tools predict future trends, behaviors, allowing business to make proactive, knowledge driven decisions. As the number of available tools continues to grow the choice of most suitable tool becomes increasingly difficult. [7] The top six open source tools available for data mining are briefed as below.

(a) Weka- Waikato Environment for Knowledge Analysis.Weka is a collection of machine learning algorithms for data mining Tasks. These algorithms can either be applied directly to a data set or can be called from your own Java code. The Weka (pronounced Weh-Kuh) workbench contains a collection of several tools for visualization and algorithms for analytics of data and predictive modeling, together with graphical user interfaces for easy access to this functionality.

(i) **Technical Specification:**

- First released in 1997.
- Latest version available is WEKA 3.6.11.
- Has GNU general public license.
- Platform independent software.
- Supported by Java
- Can be downloaded from www.cs.waikato.ac.

(ii) **General Features:**

- Weka is a Java based open source tool data mining tool which is a collection of many data mining and machine learning algorithms, including pre-processing on data, classification, clustering, and association rule extraction.
- Weka provides three graphical user interfaces i.e. the Explorer for exploratory data analysis to support preprocessing, attribute selection, learning, visualization, the Experimenter that provides experimental environment for testing and evaluating machine learning algorithms, and the Knowledge Flow for new process model inspired interface for visual design of KDD process. A simple Command-line explorer which is a simple interface for typing commands is also provided by weka.

(iii) **Specialization:**

(i) Weka is best suited for mining association rules .
(ii) Stronger in machine learning techniques.
(iii) Suited for machine Learning.

(iv) **Advantages:**

(i) It is also suitable for developing new machine learning schemes.[8]
(ii)Weka loads data file in formats of ARFF, CSV, C4.5, binary. Though it is open source, Free, Extensible, Can be integrated into other java packages.

(v) **Limitation:**

(i) It lacks proper and adequate documentations and suffers from "Kitchen Sink Syndrome" where systems are updated constantly.
(ii) CSV reader not as robust as in Rapid Miner.
(iii) Not as polished.
(iv) Weka is much weaker in classical statistics.
(v)Does not have the facility to save parameters for scaling to apply to future datasets.
(vi)Does not have automatic facility for Parameter optimization of machine learning/statistical methods

(b) KEEL - Knowledge Extraction based on Evolutionary Learning is an application package of machine learning software tools. KEEL is intended for providing solution to data mining problems and assessing evolutionary algorithms. It has a collection of libraries for preprocessing and post-processing techniques for data manipulate soft-computing methods in knowledge of extracting and learning, and providing scientific and research methods.

(i) **Technical Overview**

- First released in 2004.
- Latest version available is KEEL 2.0.
- Licensed by GNU, general public license.
- Can run on any platform.
- Supported by java language.
- Can be downloaded from www.sci2s.ugr.es/keel.

(ii) **Specialization**

- Keel is a software tool to assess evolutionary algorithms for Data Mining problems.
- Machine learning tool.

(iii) **Advantages**

- It includes regression, classification, clustering, and pattern mining and so on. It contains a big collection of classical knowledge mining algorithms, preprocessing techniques. Computational Intelligence based learning algorithms, including evolutionary rule learning algorithms based on different approach and hybrid models such as genetic fuzzy systems, evolutionary neural networks etc.[9]

(iv)**Limitation:**

- Efficiency is restricted by the number of algorithms it supports as compared to other tools.

(c) C.R.

Revolution is a free software programming language and software environment for statistical computing and graphics. The R language is broadly used among statisticians and data miners for rising statistical software and data analysis. One of R's strength is the ease with which well-designed publication-quality plots can be produced, with mathematical symbols and formulae where needed.

(i) Technical Specification

- First released in 1997
- Latest version Available is 3.1.0
- Licensed by GNU General Public License
- Cross Platform
- www.r-project.org

(ii) **General Features**

- The R project is a platform for the analysis, graphics and software development activities of data miners and related areas.
- R is a well-supported, open source, command line driven, statistics package. There are hundreds of extra "packages" freely available, which provide all sorts of data mining, machine learning and statistical techniques. .
- It allows statisticians to do very intricate and complicated analyses without knowing the blood and guts of computing systems

(iii) **Specification:**

- It has a large number of users, in particular in the fields of bio-informatics and social science. It is also a free ware replacement for SPSS.
- Suited for Statistical Computing.

(iv) **Advantages**.

- Very extensive statistical library.
- It is a powerful elegant array language in the tradition of APL, Mathematical and MATLAB, but also LISP/Scheme.
- Ability to make a working machine learning program in just 40 lines of code
- Numerical programming is better integrated in R
- R has better graphics.
- R is more transparent since the Orange are wrapped C++ classes.
- Easier to combine with other statistical calculations.
- Import and export of data from spreadsheet is easier in R, spreadsheet are stored in a data frames that the different machine learning algorithms are operating on.

(v) **Limitation:**

- Less specialized towards data mining.
- There is a steep learning curve, unless you are familiar with array languages

(d) KNIME

Konstanz Information Miner is an open source data analytics, reporting and integration platform. It has been used in pharmaceutical research, but is also used in other areas like CRM customer data analysis, business intelligence and financial data analysis. It is based on the Eclipse platform and, through its modular API, and is easily extensible. Custom nodes and types can be implemented in KNIME within hours thus extending KNIME to understand and provide first- tier support for highly domain-specific data format.

(i) **Technical Specification**

- Released on 2004.
- Latest version available is KNIME2.9
- Licensed By GNU General Public License
- Compatible with Linux ,OS X, Windows
- Written in java
- www.knime.org

(ii) **General Features**

- Knime, pronounced "naim", is a nicely designed data mining tool that runs inside the IBM's Eclipse development environment.
- It is a modular data exploration platform that enables the user to visually create data flows (often referred to as pipelines), selectively execute some or all analysis steps, and later investigate the results through interactive views on data and models.
- The Knime base version already incorporates over 100 processing nodes for data I/O, preprocessing and cleansing, modeling, analysis and data mining as well as various interactive views, such as scatter plots, parallel coordinates and others.

(iii) **Specification**

- Integration of the Chemistry Development Kit with additional nodes for the processing of chemical structures, compounds, etc.
- Specialized for Enterprise reporting, Business Intelligence, data mining.

(iv) **Advantages**

- It integrates all analysis modules of the well-known. Weka data mining environment and additional plugging allow R-scripts to be run, offering access to a vast library of statistical routines. [8]
- It is easy to try out because it requires no installation besides downloading and un archiving.
- The one aspect of KNIME that truly sets it apart from other data mining packages is its ability to interface with programs that allow for the visualization and analysis of molecular data

(v) **Limitations:**

- Have only limited error measurement methods.
- Have no wrapper methods for descriptor selection.
- Does not have automatic facility for Parameter optimization of machine learning/statistical methods.

(e) RAPIDMINER

is a software platform developed by the company of the same name that provides an integrated environment for machine learning, data mining, text mining, predictive analytics and business analytics. It is used for business and industrial applications as well as for research, education, training, rapid prototyping, and application development and supports all steps of the data mining process. Rapid Miner uses a client/server model with the server offered as Software as a Service or on cloud infrastructures.

(i) **Technical specification:**

- Released on 2006
- Latest version available is Rapid miner 6.
- Licensed by AGPL Proprietary
- Language Independent
- Can be downloaded from www.rapidminer.com.

(ii) **General Features**

- Rapid miner is an environment for machine learning and data mining processes.
- It represents a new approach to design even very complicated problems by using a modular operator concept which allows design of complex nested operator chains for huge number of learning problems.
- Rapid miner uses XML to describe the operator trees modeling knowledge discovery process.
- It has flexible operators for data input and output file formats.
- It contains more than 100 learning schemes for drop classification and cluster analysis. [10].
- Rapid miner supports about twenty two file formats. [7]
- Rapid Miner has a lot of functionality, is polished and has good connectivity.
- Rapid Miner includes many learning algorithms from WEKA.
- Solid and complete package.
- It easily reads and writes Excel files and different databases.
- You program by piping components together in a graphic ETL work flows.
- If you set up an illegal work flows Rapid Miner suggest Quick Fixes to make it legal.

(iii) **Specialization**

- Rapid Miner provides support for most types of databases, which means that users can import information from
  a variety of database sources to be examined and analyzed within the application.
- Specialized for Business solutions that include predictive analysis and statistical computing.

(iv) **Advantages**

- Has the full facility for model evaluation using cross validation and independent validation sets.
- Over 1,500methods for data integration, data transformation, analysis and, modeling as well as visualization –
  no other solution on the market offers more procedures and therefore more possibilities of defining the optimal analysis processes
- .Rapid Miner offers numerous procedures, especially in the area of attribute selection and for outlier detection, which no other solution offers.

(v) Limitations:

- Rapid Miner is the data mining software package that is most suited for people who are accustomed to working with database files, such as in academic settings or in business settings. The reason for this is that the software requires the ability to manipulate SQL statements and files.

(f) ORANGE

Orange is a component-based data mining and machine learning software suite, featuring a visual programming front- end for explorative data analysis and visualization, and Python bindings and libraries for scripting. It includes a set of components for data preprocessing, feature scoring and filtering, modeling, model evaluation, and examination techniques. It is implemented in C++ and Python. Its graphical user border builds upon the cross-platform framework

(i) **Technical Requirements:**

- Developed in 2009.
- Latest version available is Orange 2.7
- Licensed by GNU General Public License
- Compatible with Python, C++, C.
- Can be downloaded from www.orange.biolab.si

(ii) **General Features**

- Orange is a component-based data mining and machine learning software suite.
- It includes a set of components for data preprocessing, feature scoring and filtering, modeling, model evaluation, and exploration techniques.
- Data mining in Orange is done through visual programming or Python scripting.

(iii) **Specialization**

- Open source data visualization and analysis for novice and experts.

- It contains components for machine learning and add-ons for bioinformatics and text mining. Along with it's also packed with features for data analytics. [11].
- Specialized for data visualization along with mining.

(iv) **Advantages**

- It is an open source data mining package build on Python, NumPy, wrapped C, C++ and Qt.
- Works both as a script and with an ETL work flow GUI.
- Shortest script for doing training, cross validation, algorithms comparison and prediction.
- Orange the easiest tool to learn.
- Cross platform GUI.
- Orange is written in python hence is easier for most programmers to learn.
- Has better debugger.
- Scripting data mining categorization problems is simpler in Orange.
- Orange does not give optimum performance for association rules.

(v) **Limitations**

- Not super polished.
- The install is big since you need to install QT.
- Limited list of machine learning algorithms.
- Machine learning is not handled uniformly between the different libraries.
- Orange is weak in classical statistics; although it can compute basic statistical properties of the data, it provides no widgets for statistical testing.
- Reporting capabilities are limited to exporting visual representations of data models.

IVCOMPARATIVE STUDY OF TOOLS

The best six of available open source data mining tools were chosen and analytical study was made by taking into account technical condition and feature.

Table 1 :
Technical Overview of best six data mining open source tools

S. N	Tool Name	Relea Se date	Release date/ Latest version	license	Opera ting system	Lang uage	website
1	RAPID MINER	2006	21NOV 2013/ 6.0	AGPL Propri etary	Cross Platform	Lang Uage Indep endent	www. Rapid miner .com
2	ORAN GE	2009	6 MAY 2013/ 2.7	GNU General Public licence	Cross Platform	Python C++,c	www. Orange .bi
3	KNIME	2004	6 dec 2013/ 2.9	GNU GPL	Linux,os windows	Java	www. Knime .org
4	WEKA	1993	24april 2014/ 3.7.11	GNU GPL	Cross Platform	Java	www. Cs. Waikato. Ac.nz
5	KEEL	2004	5 jun 2010/ 2.0	GNU GPL V3	Cross Platform	Java	www. Sci2s. Ugr.es
6	R	1997	10april 2014/ 3.1.0	GNU GPL	Cross Platform	C,fort ran R	www. Project .org

Table 2:
Analytic of feature of best six open source data mining tools

S. N	TOOL NAME	TYPE	FEATURES
	RAPID MINER	Statistical analysis, data mining, predictive analytics.	• More than 20 new functions for analysis and data handling, including multiple new aggregation functions • File operators to operate directly from Rapid Miner • A macro viewer that shows macros and their values in real time during process execution • Intuitive GUI
2	ORANGE	Machine learning, Data mining, Data visualization	• Visual Programming, Visualization, • Interaction And Data Analytics • Large toolbox, Scripting interface • Extendable Documentation
3	KNIME	Enterprise Reporting ,Business Intelligence ,Data mining	• Scalability , Intuitive user interface ,High extensibility • well-defined API for plug-in extensions • sophisticated data handling, intelligent automatic caching of data, Data visualization • Import/export of workflows, Parallel execution on multi-core systems • Command line version for "headless"," batch executions", Hilting,
4	WEKA	Machine Learning.	• Forty nine data preprocessing tools, seventy six classification/regression algorithms, eight clustering algorithms, fifteen attribute/subset evaluators, ten search algorithms for feature selection. • three algorithms for finding association rules • three graphical user interfaces – "The Explorer" (exploratory data analysis) – "The Experimenter" (experimental environment) – "The Knowledge Flow" (new process model inspired .□ poor documentation
5	KEEL	Machine Learning.	• Classification Discovery, Cluster Discovery, Regression Discovery, Association Discovery, Data Visualization ,Discovery Visualization, a user-friendly graphical interface, evolutionary learning
6	R	Statistical Computing	Data Exploration, outlier detection, Clustering, Text mining, time Series Analysis , Social Network Analysis ,Parallel Computing, Graphics, Visualization of geo spatial data, Web Application Big data

Table 3
Advantages and limitation of tools

S. N	Tool	Advantages	Limitation
1	Rapid Miner	Visualization, Statistical, Attribute Selection, Outlier detection, parameter optimization	Requires prominent knowledge of database handling
2	Oranges	Better debugger, Shortest scripts, poor statistics, suitable for no voice Experts	Big installation, Limited reporting capabilities
3	Knime	Molecular analysis, Mass Spectrometry. Chemistry Development kit	Limited error measurements, no wrapper methods for descriptor selection, poor parameter optimization
4	Weka	Ease of use, can be extended in RM	Poor documentation ,weak classical statistics, poor parameter optimization, weak CSV reader
5	Keel	Evolutionary algorithms, Fuzzy system	Limited algorithms
6	R	Purely Statistical	Less specialized for Data mining, requires Knowledge of array language

VRESULT AND DISCUSSIONS

Of the six data mining packages that have been examined, KNIME is the package that would be optional for people who are novices to such software to those who are highly skilled. The software is simply very robust with built-in features and with additional functionality that can be obtained from third-party libraries. Based on the analysis, Weka would be considered a very close second to KNIME because of its many built-in features that require no programming or coding knowledge. In comparison, Rapid Miner and Orange would be considered appropriate for advanced users, particularly those in the hard sciences, because of the additional programming skills that are needed, and the limited apparition support that is provided. It can be concluded from above tables that though data mining is the basic concept to all tool yet, Rapid miner is the only tool which is independent of language limitation and has statistical and predictive analysis capability, So it can be easily used and implemented on any system, moreover it integrates maximum algorithms of other mentioned tools.

VICONCLUSION AND FUTURE SCOPE

Open-source data mining suites of today have come a long way from where they were only a decade ago. They offer nice graphical interfaces, focus on the usability and interactivity, support extensibility through increase of the source code or (better) through the use of interfaces for add-on modules. They provide suppleness either through visual programming within graphical user interfaces or prototyping by way of scripting languages. The study presented the specific details along with account of various open source data mining tools enlisting the area of specialization. With the recent endeavors of various developers concerning the use of tools in various fields one can expect a more enhanced environment along with more technical improvements. The work can be a helping hand to provide an insight in future to develop an application with more efficiency and availability. The effort may be increased and the development may be a complex process but indeed it can result in an efficient product.

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Seasonal Variation of Groundwater Quality in and Around Laharpur Reservoir Bhopal

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ABSTRACT
Water being a universal solvent has been and is being utilized by man kind time and now. Of the total amount of global water, only 2.4% is distributed on the main land, of which only a small portion can be utilized as fresh water. The available fresh water to man is hardly 0.3-0.5% of the total water available on the earth and therefore, its judicious use is imperative. Variations in availability of water in time, quantity and quality can cause significant fluctuations in the economy of a country the definition of water quality is very much depending on the desired use of water. Therefore, different uses require different criteria of water quality as well as standard methods for reporting and comparing results of water analysis. Groundwater is one of earth's most vital renewable and widely distributed resources as well as an important source of water supply throughout the world..The quality of water is a vital concern for mankind since it is directly linked with human welfare. Groundwater can become contaminated naturally or because of numerous types of human activities; residential, municipal, commercial, industrial, and agricultural activities can all affect groundwater quality Bhopal, the capital city of M.P. has an area of 284.9 km^2 and a population of over 14 lacs. Bhopal has a number of lentic water bodies and Laharpur reservoir is one of them. The Bagmugaliya residential area of Bhopal is situated near the Laharpur reservoir. This is a fast growing residential colony with densely populated human settlements. Every day new settlements in the form of new colonies are developing in the area. The Laharpur reservoir that is situated in the vicinity of the area receives wastewater from almost entire new Bhopal. . This study is an attempt to find out the pollution and to assess the pollution load caused in the groundwater of the area due to the stagnation of sewage in its close proximity.

I INTRODUCTION

Water is the key to life. The available fresh water to man is hardly 0.3-0.5% of the total water available on the earth and therefore, its judicious use is imperative. . The fresh water is a finite and limited resource The utilization of water from ages has led to its over exploitation coupled with the growing population along with improved standard of living as a consequence of technological innovations. Groundwater is one of earth's most vital renewable and widely distributed resources as well as an important source of water supply throughout the world. The quality of water is a vital concern for mankind since it is directly linked with human welfare. In India, most of the population is dependent on groundwater as the only source of drinking water supply.

Bhopal the capital city of Madhya Pradesh is home to a large number of lentic water resources including the famous Bhoj Wetland, the maiden Ramsar site of the state. Despite having a large number of water bodies in and around it, the city witness decreased water supply, especially during the drier months of the year. The majority of Bhopal's drinking water supply is met by two surface water sources: the Upper Lake and the Kolar reservoir. Besides, there are tubewells, hand pumps and a few large diameters dug wells. Bhopal also has an unaccounted number of privately owned dug wells and borewell.

Laharpur reservoir is situated in the southwest of Bhopal city in the state of Madhya Pradesh, with an objective to store water for irrigational purpose.. In last few years the lake became surrounded by habitations with the growth of the city. These developments resulted in anthropogenic pressures on the lake which accelerated the eutrophication process thereby making the water body unfit for human consumption. The higher concentration of bacterial contamination in the water of reservoir may\ possibly contaminates the ground water also. Therefore, the assessment of the variation of water quality parameter is the first and foremost task for the scientific management of reservoir and groundwater, and to find out the suitability of the water for multipurpose. It is in this light that the present study was undertaken to assess the seasonal variations of water quality parameters of underground water located around Laharpur reservoir.

II MATERIAL AND METHODS

Bhopal is popularly known as the city of Lakes. Bhopal gets this distinction because of a large number of lakes, tanks and ponds n the city. The city is relatively away from a dependable perennial lotic water source; hence the administrators had to construct ponds and reservoirs in order to cater the needs of the city. Laharpur dam was constructed in the southwest corner of the city with an objective to store rain water for irrigational use. Earlier the reservoir was in the outskirt of the city that came within the settlement due to gradual expansion of township and now settlement is heading in the command area of the reservoir. The reservoir was constructed for the purpose of storing water for irrigation and make supply to farmers of the command area. The micro-climate of the lake region is very pleasant, warm in winter and cool in summer. The sources of the runoff of the reservoir in the area are precipitation and rainy season provides more than 90% of the total rainfall during the months of July, August and September. The area has a warm climate and sufficient rainfall, suitable for the growth of various plants. The reservoir has multiple functions of irrigation water supply, climate regulating, flood regulating as well as recharging of ground water, aquaculture and aesthetic values. The part of new Bhopal is falling well within the catchment of the reservoir and is receiving untreated sewage through number of sewage fed drains. The surface drain carrying sewage and storm water passes from soil and stony strata get purified before joining to Reservoir. The travel distance is not less than 8 km. in case of Anna Nagar and Shahpura Nalla which provide sufficient retention period to settle down heavy matter and dead organic matter get decomposed before joining the Reservoir. In past decade tremendous development took place in this area and as a result number of private and government colonies came up even in the downstream of the reservoir. The inflow of untreated sewage in the reservoir culminated eutrophication .The identified major environmental problems are: soil erosion, silt and agriculture waste inflow, nutrient enrichment, fluctuation in water level, weed infestation, water quality degradation etc. The pollution level in the reservoir has crossed the threshold limit and self purification capacity.

III SAMPLE COLLECTION

The present study has been designed to take into account the spatial distribution of contaminants accumulating in the laharpur reservoir and their subsequent transfer in the subsurface aquifer of the neighboring areas. The residential areas adjoining the laharpur reservoir almost exclusively depend upon the groundwater to suffice the needs of potable and secondary uses of water.therfore it becomes pertinent to collect water samples from every important locality for the purpose of the study. It has been taken into account while designing the study to collect representative samples from all the major residential colonies.

IV FREQUENCY

In this study the seasonal variability of groundwater quality parameters of residential area in the upstream and downstream areas of Laharpur reservoir were investigated. Analysis was done for pre-monsoon and post-monsoon seasons of the years 2014 and 2015. The physicochemical parameters viz., pH, total hardness, calcium, magnesium, chloride, nitrate, total dissolved solids, iron, dissolved oxygen & total solids were analyzed.

V RESULTS AND DISCUSSION

The water to be used for drinking purpose must meet high standards of physical, chemical and biological purity. The quality of groundwater is mainly influenced by its physical, chemical and biological aspects which vary from place to place, with the depth of water table, and from season to season. The occurrence of groundwater is a natural phenomenon attributed to seepage of surface water into sub-surface layers of earth. While passing water through different strata comprises of clay, sand, alluvial soil, silt, rocks having bacterial flora etc acts as a natural filter for water and retains impurities that are present in dissolved and suspended form. Normally these impurities removed during trickling down of surface water through biophysical filters of natural soil media. The water retained in capillaries of sub-soil strata known as aquifer, which is quite useful in maintaining soil moisture. Because of this popular belief that the groundwater would be relatively uncontaminated it is being consumed without treatment, but accumulation of sewage and solid waste at the ground is constantly polluting the groundwater. The anthropogenic activity further deteriorates water quality, especially in case of urban water system. The increasing number of cases related

to water borne in people consuming the groundwater has caused a worry & made it necessary to assess quality of groundwater being used for potable turbidity point of view season The ground water is generally clear with no color during winter and summer seasons when viewed through normal eye but when compared with bottled water, there is some difference from turbidity point of view.

The pH values of groundwater range from 7.1-8.1 during dry and wet seasons respectively (Figure-1). The pH values during both seasons fall within the permissible range of 6.5 - 8.5. Fifty percent of analyzed samples have pH values below 8.0 during dry season while this increase to 80% during wet season. This indicates that there is more dissolution of pollutants during the rainy season

The total Hardness (TH) values during dry and wet seasons ranged from 182 to 376 mg/L l respectively (Figure-V) . 10% of the water samples fall under "moderate" class while 70%of water samples fall under "Hard" class during the dry season. During wet season of sample collection, 45 % fall under "moderate" class, 75 % fall under "Hard" class while the remaining 25 % fall under "very hard" class. This may be due to decay of organic matter and weathering of rocks and minerals. The hardness of water is not a pollution parameter, but it indicates water quality mainly in terms of calcium and magnesium. Water containing excess hardness is not desirable for potable purposes, as it forms scales on water heaters and utensils when used for cooking and consumes more soap during washing clothes

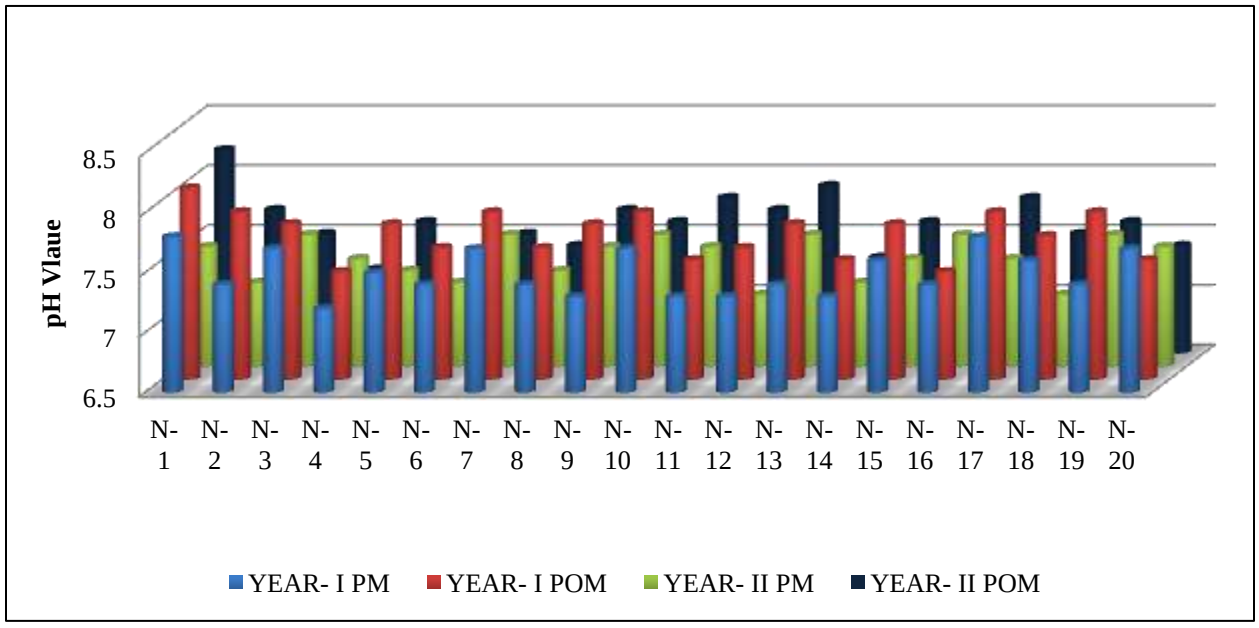

Fig.1 Seasonal variation in pH of groundwater

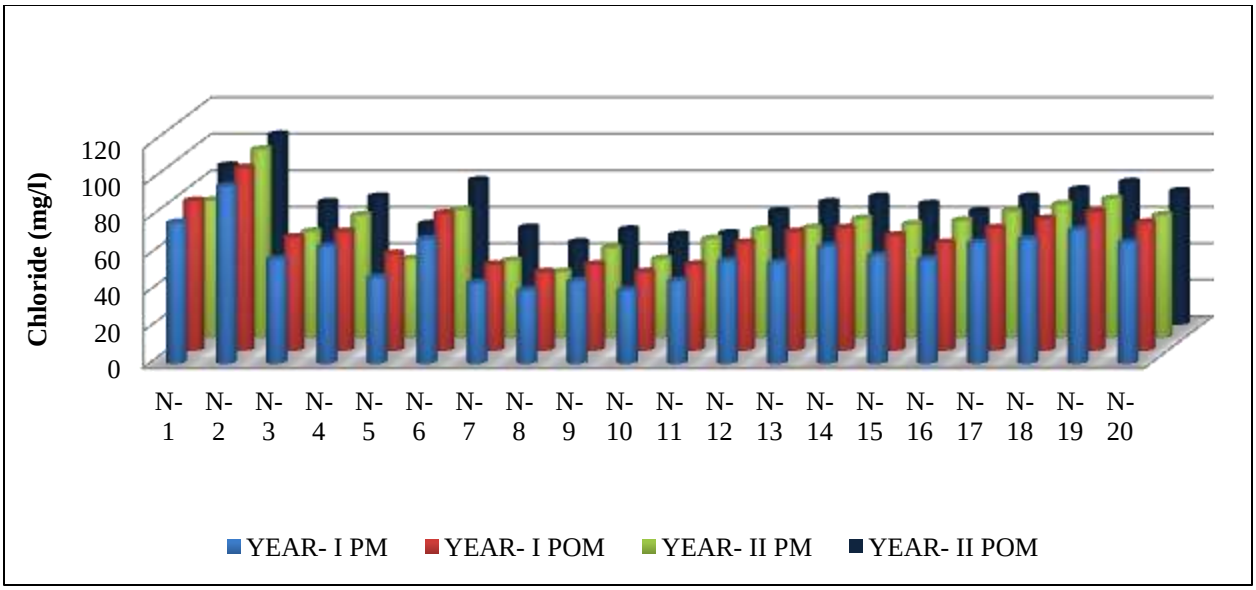

Fig. 2 Seasonal variation in chloride of groundwater

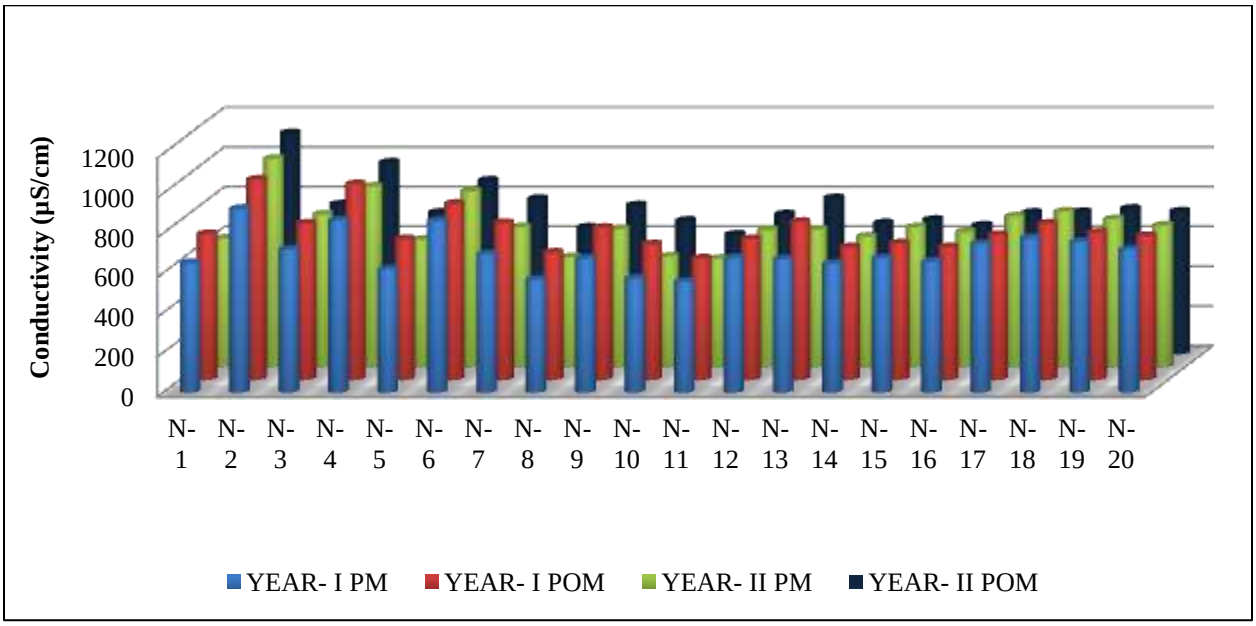

Fig. 3 Seasonal variation in conductivity of groundwater

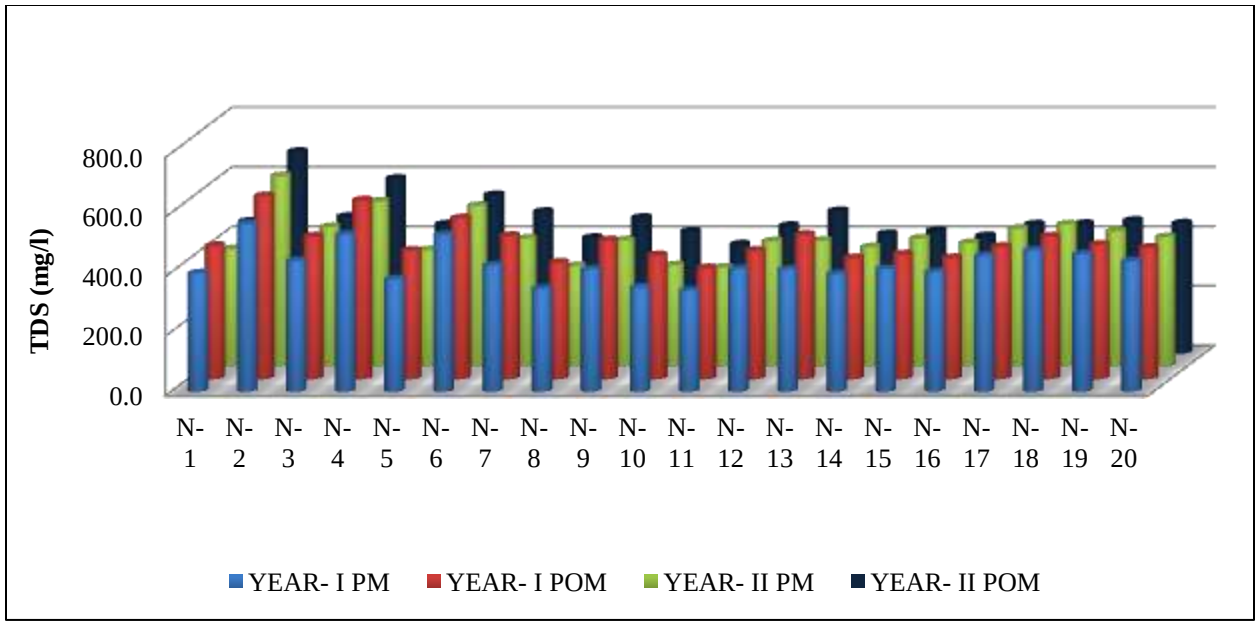

Fig.4 Seasonal variation in TDS of groundwater

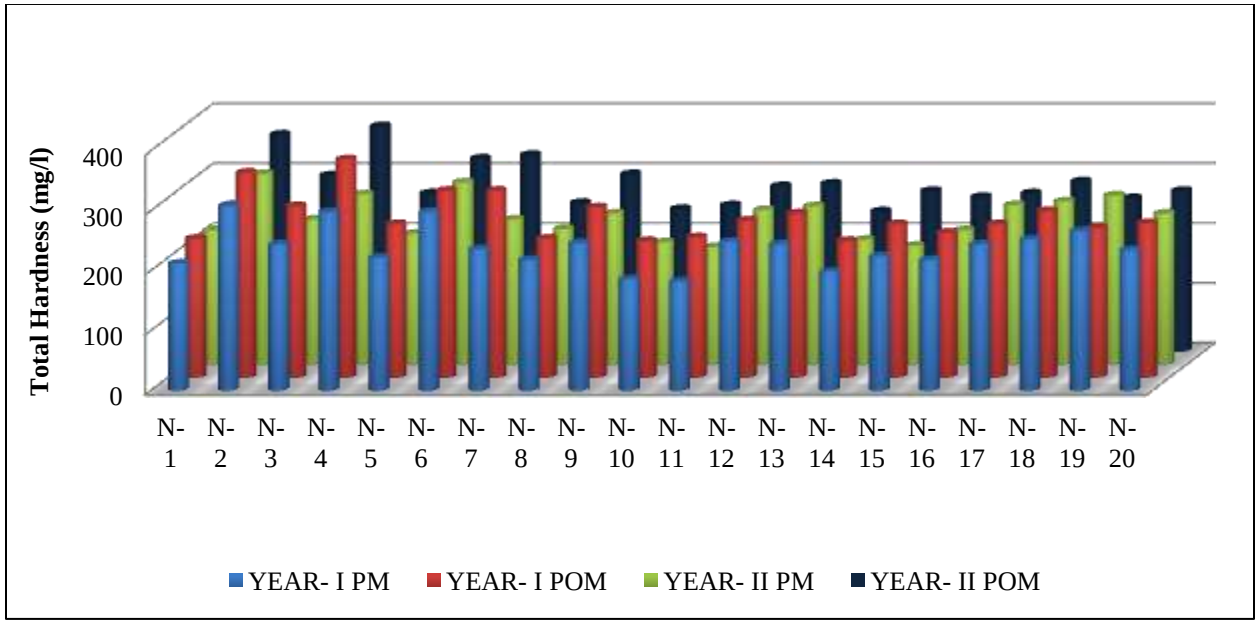

Fig.5 Seasonal variation in hardness of groundwater

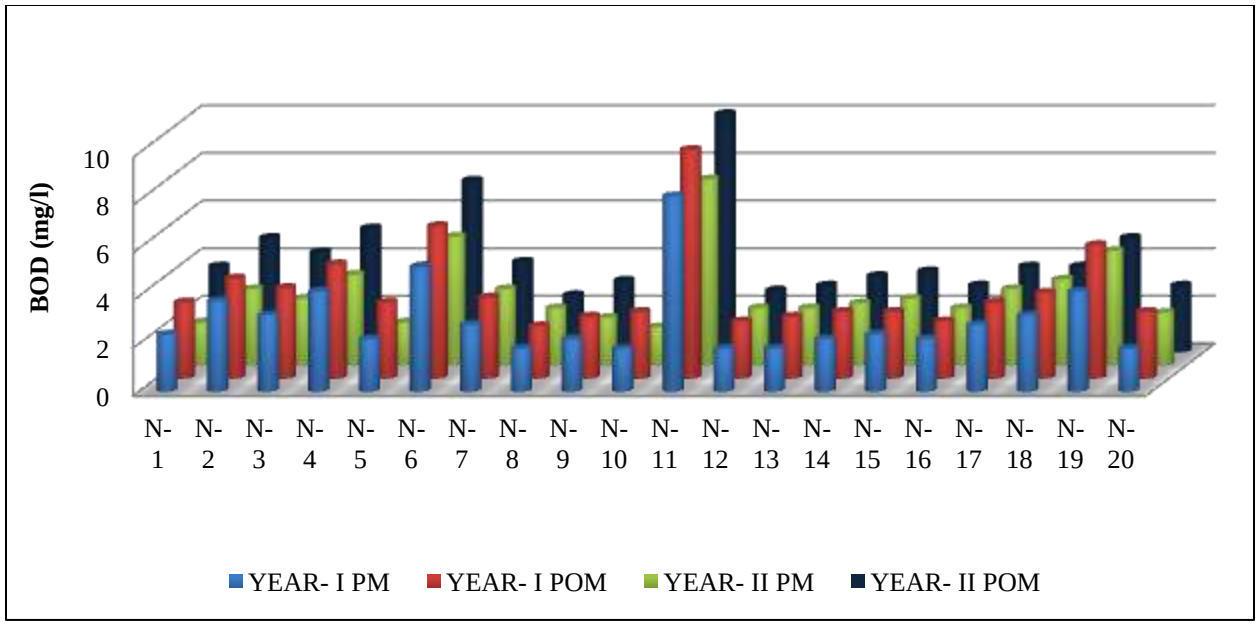

Fig. 6 Seasonal variation in BOD of groundwater

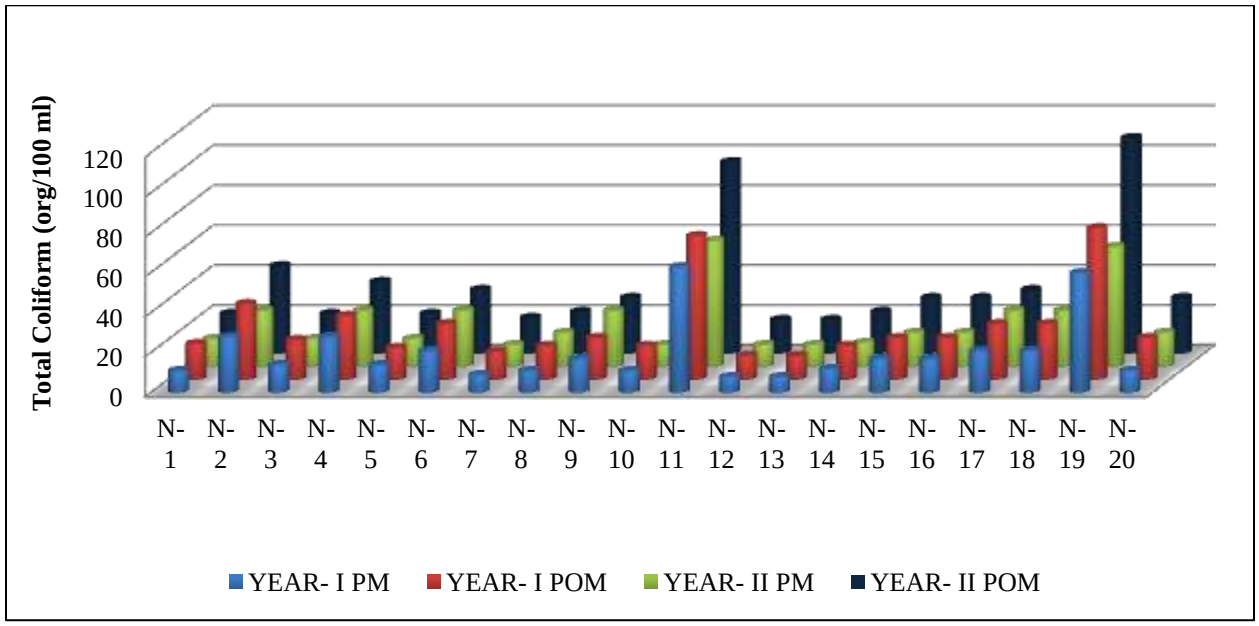

Fig.7 Seasonal variation in Total Coliform of groundwater

The chloride ion concentration values ranged from 39mg/l -103 mg/l during dry and wet seasons respectively and these were found to lie within the permissible level of 250 mg/L (Figure-2). The higher range of Chlorides can be attributed to higher temperature and the dilution of waste during wet season which increases its concentration in ground water samples.

The nitrate values during dry season ranged from 1.32 mg/L. However, during wet season, it ranged from 4.56 mg/L. Unpolluted natural water usually contains only minute quantities of nitrate. The groundwater samples in both seasons have their nitrate values lie below the limit of 50 mg/L Electrical conductivity values range from 558 µS/cm during dry season and 1112 µS/cm during wet season. (Figure-3) The highest value of conductivity

was due to the maximum concentration of soluble salts present in the N1 and N2 during rainy season of the year 2014-15.

The TDS values were 564 mg/l in dry season and 678 mg/l during wet season (Figure-4). This may be due to leaching of various pollutants through sides and bottom of unlined drain.

The concentration of BOD range from 1.8-2.4 mg/l in dry season and from 8.2 to 10 mg/l during wet season (Figure-6) . The higher concentration of organics can be due to mixing of sewage in groundwater. This concentration increases in rainy season due to increase in flow in the drains which causes dilution of solid waste and its percolation in the nearby aquifers.

The concentration of Coliform range from 11-63 org/100 ml in dry season and from 17 to 108 org/100ml during wet season (Figure-7). The major health hazard associated with the consumption of contaminated water is due to presence of pathogenic bacteria. The coliform group of bacteria especially fecal coliform inhibits in intestine of mammals including man and other warm-blooded animals and their presence in water sample directly reflects the mixing of sewage with groundwater. The high concentration of total coliform increases the possibility of presence of pathogenic strains of bacteria like Schigella, Salmonella, Streptococci, Vibrio, Staphylococcus aureus etc thus posing a serious health hazard to its consumers. Almost all water samples have reported high number of coliform count exceeding the desired count at all occasions. None of the samples fulfill the potable water quality criteria in terms of coliform. This renders the water unfit for human consumption for potable purpose and poses the threat of water borne disease to its consumers.

The residential area of the town is surrounded by agricultural area where agricultural activity and usage of fertilizers is very high throughout the year and also by aquaculture area. The open well water is available at shallow depth of 4-5 feet. So seepage of the fertilizers especially NO_3 PO_4 from agricultural field to the aquifer is possible resulting in the contamination of the well water. The very small amount of soluble leachates of organic compounds may also reach the groundwater aquifer whereas major portions of it may get absorbed by the soil during seepage. Thus, the groundwater aquifers were likely to be contaminated by the use of fertilizers. This may be due to increased hardness of the groundwater.

VI CONCLUSION

It revealed from the analysis results of groundwater samples indicate that certain parameters namely, EC, TH, TDS, BOD, chlorides, , were exceeding the desirable limit throughout the investigation period in all locations. This may be due to the percolation of contaminated water into the groundwater. Thus it is evident that stagnation of sewage in the surface water drains and there after in the reservoir is polluting the groundwater. The Bagmugaliya area and other residential colony in proximity of sewage fed drains and reservoir depend largely on groundwater for potable water. The contamination of groundwater is directly related to the health and hygiene of the people therefore it is major cause of worry.

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Trophic State Index of Rankala Lake, Kolhapur (MH) India

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ABSTRACT
Rankala Lake is situated in the heart of Kolhapur city of Maharashtra, India. Five samples are collected from five different locations of Rankala Lake to assess tropic state index (TSI) of the lake. A sample of water is taken from just below the surface water in the morning time. The parameters like Secchi disc Transparency, Dissolved Oxygen (DO), Most Probable Number (MPN), phytoplankton, Net Primary Productivity, Gross Primary Productivity, Chlorophyll-A, Algal Biomass, Phosphates and Pesticide content parameters are studied. The correlations between Trophic Index (TI), chlorophyll (Chl), phosphorus (P), Secchi Depth (SD) are derived and use Carlson's Trophic Indices to arrive at the tropic state Index of the lake. The phytoplankton types are observed under trinocular light microscope while genera observed are classified and listed according to Palmer (1969). The primary organic production is studied by 'Dark' and 'Light' bottle method and by extraction of chlorophyll. As per these guidelines of Carlson's TSI, Rankala lake (TSI = 80.84) can be classified as Hyper-eutrophic water body and are totally unfit for drinking purpose due to it polluted excessively. This is mainly due to excessive discharge of untreated sewage, agricultural runoff, industrial wastes and other wastes which affects the aquatic ecosystem of the Rankala Lake.

***Keywords**:* Tropic state index, Rankala Lake, Hyper-eutrophic, Primary Productivity

I INTRODUCTION

Lakes, water reservoirs and streams are the most valuable drinking water sources for the world's population and they are vulnerable to pollution and degradation of water quality, particularly to eutrophication. The studies of spatial distribution of phytoplankton in relation to various physico-chemical factors are helpful to understand freshwater ecology of the lake. The inland water bodies are closed ecosystems in which phytoplanktons hold a key position in the productivity of water bodies, trophic levels, food chains and energy flow.

Planktons, both producers and consumers, play an important role in the transformation of energy from one tropic level to the next higher trophic level ultimately leading to fish production which is the final product of the aquatic environment. The occurrence and abundance of Phytoplankton in freshwater ecosystem depends on its productivity, which in turn is influenced by physico-chemical parameters and level of nutrients. (Berde 2015)

Classification of lakes based on various methods and indices have been made by various scientist. The classical and most commonly used method developed by Carlson (1977) which is based on the productivity of the water body is the biomass related trophic state index. Carlson's Trophic State Index (TSI) is a common method for characterizing a lake's trophic state or overall health. Carlson's trophic state index mainly uses algal biomass involving three variables that is chlorophyll-A (CA), Secchi disc depth (SD) and total phosphorus (TP). The average values of TSI of these three parameters will be considered in determining the Carlson's trophic state index.

The range of the trophic state index is from 0 to 100. It is easier to memorize units of 10 rather than the decimal fractions of raw phosphorus, chlorophyll-A and secchi's depth values. The three index variables are incorporated by linear regression modes. Any of the three variables can therefore theoretically be used to classify the state of the water body. Chlorophyll-A is given higher priority for classification, because this variable is the most accurate among the three for the prediction of algal biomass (Carlson, 1980).

II STUDY AREA

Fig. 1 - Rankala Lake, Kolhapur, MH (I)

Kolhapur city lies in between 15º43' – 17º17'North Latitude to 73º40' –74º42' East Longitude and located at 550 m above the mean sea level with an area about 66. 82 sq. kms. The Kolhapur city has historical importance because of goddess Mahalaxmi or Ambabai, the deity of Kolhapur hence and it is known as "Dakshin Kashi" Owing to several lakes and water tanks in the city it is also recognized as 'City of Lakes' (Wikipedia)

Rankala Lake is one of the famous lakes and situated in south west of the city. It covers an area of 5.21 sq. km and depth is about 9.5 m (30 feet). This lake developed during 1877 – 1883 by Maharaja (Emperors) of Kolhapur Sansthan, hence Rankala Lake has historical importance. This wide and spacious lake is so called because at its centre lies the temple of Rankabhairav. There is constructed wall around the lake. The total water spread area and the catchment area of the lake is 107 and 700 ha respectively. The average annual rainfall in the lake catchments area is 1000 mm.

This lake provides water for irrigation for about 80 hectares of land in and around the city of Kolhapur. Source of water to the lake is from two major streams flow from southern side. There are three out-lets from which water drains to irrigate about 80 hectares of land of Phulewadi, Mirabag, Dhunyachi Chavi. (MoEF, 2010)

Table 1:
Morphometry of Rankala Lake

Location	:	At Kolhapur, Maharashtra (India)
Name of the Lake	:	Rankala Lake
Year of Impoundment	:	1883
Purpose	:	Initially for Drinking Water Supply, however now for Irrigation and recreation.
Geographical Features	:	The lake has an elevation of @ 567 M above the Mean Sea Level (MSL) and situated on 16^{o} 42' N latitude and 74^{o} 14' E longitude.
Water Spread (Area)	:	10,70,000 Sq. m (1.07 sq. km)
Catchment Area	:	700 Ha (7.0 sq. km)
Max Depth (Meters)	:	approx. 15 m
Total Reservoir Capacity	:	43, 50,141 m^3
Useful Capacity	:	27,45,042 m^3
Length of the stone wall fence	:	3620 m
Shape of the sloping side	:	Like Fan Shape
Circumference	:	approx.4.2 Km

Being the location of Rankala Lake is in the middle of the city, so many sewage drains pouring untreated sewage collected from catchment of the lake hence it is heavily polluted lake. This sewage is contributing organic matter, silt and other toxic material, which accelerate the pollution of the lake. The Rankala Lake is in degraded condition due to pollution from various sources and siltation of the lake bed.

Most of the area in the Rankala watershed is without any provison of sewers and drains. There are certain channels/drains in the catchment area of the lake, which are major wastewater contributors (4.6 to 5.4 MLD) to the lake especially during non-power supply and rainy season. Wastewater flows into the lake through various drains entering the lake on its southern, western and southeastern sides. Excessive nutrient loading has resulted in extensive growth of submerged vegetation as well as free floating weeds. (MoEF, 2010)

III MATERIALS AND METHODS

Sampling was carried out from 05 stations, 5 between 09.00 and 10.00 hr. at sub-surface (0.1 m) water Standard methodology as per APHA (1985) has been used for sample collection, physicochemical and biological analysis of lake water. Surface water sampling was done using 05 liter polythene cans. The can was washed in ambient water before sampling. Sampling was done by carefully dipping the bottles inside, preventing entry of air bubbles.

IV SAMPLING LOCATIONS AND CO-ORDINATES

Table 2
Coordination of sampling locations

Sr. No.	Stations	Co-Ordinates
1	Station – I	$16^0$69’114”N and $74^0$21’109”E
2	Station – II	$16^0$68’882”N and $74^0$20’844”E
3	Station – III	$16^0$68’669”N and $74^0$21’143”E
4	Station – IV	$16^0$68’605”N and $74^0$21’402”E
5	Station - V	$16^0$69’365”N and $74^0$21’363”E

Fig. 2 - Sampling Locations on Google Map

To measure water clarity depth, transparency measurements were taken with the help of a Secchi disc of 20cm diameter. The average of two readings for the depth at which the disc disappears during its descent and reappears on ascent was adopted.

The water samples for phytoplankton were fixed immediately after collection using Lugol’s iodine and brought to the laboratory. The phytoplankton types were observed under trinocular light microscope. The genera observed were classified and listed according to Palmer (1969). The primary organic production was studied by ‘Dark’ and ‘Light’ bottle method and by extraction of chlorophyll. A sample of water was taken in the morning just below the surface, with water samplers already described. This was then immediately poured into three bottles (L.D.I.) of 300ml. each with ground glass stoppers. The bottle ‘I’ was used for immediate determination of initial oxygen content. The second bottle ‘D’ was wrapped in black cloth bag. The bottle ‘L’ was left transparent. The bottles ‘L’ and ‘D’ were removed after 06 hours. The oxygen content of the bottles, ‘L’ and ‘D’ changed during the experimental exposure a compared with the initial oxygen value in bottle ‘I’. It decreased in the bottle ‘D’ and increased in ‘L’

The difference between L - D = Gross primary production

I – D = Respiration (oxygen consumed)

Net primary productivity = Gross primary productivity – Respiration.

To convert the ‘mg/l’ oxygen values to ‘mg/carbon/m^3’ multiply the mg/l values by 375.36. This will give mg carbon/m^3 for the duration of the test period.

Fig. 3 - Sampling Photographs

The plastic containers were rinsed thoroughly before use. The collected samples were analysed by following standard methods (APHA, 1989) and by using online water testing kits manufactured by Rakiro Biotech System Pvt. Ltd., Mumbai, India.

The trophic scale is divided into units based on the base 2 logarithmic transformation of SD. Each 10 unit division of the index represents a halving or doubling of the SD. Because TP often corresponds with the transparency, a doubling of TP often corresponds to halving of SD. CA doubles every seven units (Carlson,1980).

Based on the values of Carlson's TSI the lakes are classified as oligotrophic (low productive), mesotrophic (moderately productive) and eutrophic (highly productive). The range of the Carlson's trophic state index values and classification of lakes are presented in below table 3.

Table 3
Carlson's trophic state index values and classification of lakes

TSI values	Trophic Status	Attributes
< 30	Oligotrophic	Clear water, oxygen throughout the year in the hypolimnion
30-40	Oligotrophic	A lake will still exhibit oligotrophy, but some shallower lakes will become anoxic during the summer
40- 50	Mesotrophic	Water moderately clear, but increasing probability of anoxia during the summer
50-60	Eutrophic	Lower boundary of classical eutrophy: Decreased transparency, warm-water fisheries only
60-70	Eutrophic	Dominance of blue-green algae, algal scum probable, extensive macrophyte problems
70-80	Hypereutrophic	Heavy algal blooms possible throughout the summer, often hypereutrophic
>80	Hypereutrophic	Algal scum, summer fish kills, few macrophytes

V RESULTS AND DISCUSSION

The study of physico-chemical parameters and their effects on the biological parameters are important in understanding the trophic state of a water body. Each factor plays its role in regulating the ecosystem of the water body. The concentration of the various constituents along with factors such as rainfall, agricultural runoffs are also of equal importance. The change in one factor is directly or indirectly related to the other factors.

Table 4
Analysis data for various parameters pertaining various stations

Sr. No.	Parameters	Units	Station I	Station II	Station III	Station IV	Station V	Drinking Water Standard BIS:10500
1	Colour (apparent)	….	Greenish	Greenish	Greenish	Greenish	Greenish	…..
2	pH	….	7.5	7.4	7.4	7.5	7.6	6.5 to 8.5
3	Secchi disc Transparency	cm	26.4	26.3	26.5	26.8	26.2	….
4	Dissolved Oxygen	mg/l	3.4	3.2	3.3	3.5	3.2	….
5	MPN	No.	240	240	240	240	240	<10
6	Net Primary Productivity	mg C/m3 /day	225.21	375.36	300.29	300.28	593.78	……
7	Gross Primary Productivity	mg C/m3 /day	450.43	675.64	600.57	525.50	894.06	…….
8	Chlorophyll-a	ug/l	40	38	41	36	46	…….
9	Biomass	Gm/ m3	2680	2546	2747	2412	3082	……..

Note:- MPN – Most Probable No

Table 5
Phytoplankton observed in Rankala lake water

Sr. No.	Scientific name	Family
1	Spirogyra sp.	Chlorophyceae
2	Fragillaria sp	Bacillariophyceae
3	Nitzschia sp	Bacillariophyceae
4	Scenedesmus sp	Chlorophyceae
5	Microcystis sp	Cyanophyceae
6	Oscillatoria sp	Cyanophyceae
7	Melosira sp	Bacillariophyceae

Table 6
Algal Cell Density for all algae groups (number of cell/l)

Sr. No.	Species	Station-I	Station-II	Station-III	Station-IV	Station-V	Mean
	Chlorophyceae						
1	*Spirogyra sp.*	80	96	115	76	64	86.2
2	*Scenedesmus sp*	84	136	106	98	92	103.2
	Total	164	232	221	174	156	189.4
	Bacillariophyceae						
1	*Fragillaria sp*	40	58	62	45	24	45.8
2	*Nitzschia sp*	56	72	68	94	38	65.6
3	*Melosira sp*	24	32	30	18	10	22.8
	Total	96	130	130	139	62	134.2
	Cyanophyceae						
1	*Microcystis sp*	160	192	156	165	148	164.2
2	*Oscillatoria sp*	348	312	346	484	292	356.4
	Total	508	504	502	649	440	520.6
	Total Algae	768	866	853	962	658	844

Calculating the Trophic State Index (TSI) of Carlson:

TSI for Chlorophyll-a (CA) TSI = 30.6 + 9.81In Chlorophyll-a (ug/l)

TSI for Secchi depth (SD) TSI = 60 - 14.41In Secchi depth (meters)

TSI for Total phosphorus (TP) TSI = 14.42 In Total phosphorous (ug/l) + 4.15

$$\textbf{Carlson's TSI} = \frac{[\textbf{TSI (TP)} + \textbf{TSI (CA)} + \textbf{TSI (SD)}]}{3}$$

Table 7
Average value of Transparency, Chlorophyll-A, and Total Phosphorus of Rankala lake

Sr. No.	Parameters	Units	Station I	Station II	Station III	Station IV	Station V	Average
1	Secchi disc Transparency	cm	26.4	26.3	26.5	26.8	26.2	26.4
2	Chlorophyll-A	ug/l	40	38	41	36	46	40.2
3	Total phosphorus	mg/l	0.53	0.61	0.72	0.60	0.60	0.612

Table 8
Trophic State Index (TSI) of Rankala Lake

Name of Ponds/ Lakes	Total P, mg/l	Total Chl-A mg/l	Secchi Depth in cm	Total P, µg/l	Total Chl-A µg/l	Secchi Depth in mtr	TSI (TP)	TSI (T Chl)	TSI (SD)	TSI	Trophic State
Rankala lake	0.612	0.0402	26.4	612	40.2	0.264	96.58	66.79	79.16	80.84	Hyper-eutrophic

VI CONCLUSION

As per the guidelines of Carlson's TSI (ref table no. 2), Rankala lake (TSI = 80.84) can be classified as "Hypereutrophic" water body and are totally unfit for drinking purpose due to it polluted excessively. This is mainly due to excessive discharge of untreated sewage, agricultural runoff, industrial wastes and other wastes which affects the aquatic ecosystem of the Rankala Lake.

Also Dissolved Oxygen (DO) is an important limnological parameter indicating status of water quality and organic production of any lake. Survival of aquatic organisms, especially fishes, depends upon the suitable concentration of dissolved oxygen in water. The DO values once excellent in Rankala Lake now have been gradually reduced to alarming level. Low concentration of oxygen in lake water has created anaerobic conditions. Decaying of organic matter releases the free carbon dioxide and it causes depletion of oxygen which usually leads to anaerobicity resulting in foul smell and fish mortality. Hence it is necessary to stop inflow of pollutant into the lake, removal of floating and sub-merged aquatic weed and revival of ecosystem of the Rankala Lake by developing sustainable catchment treatment plan.

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Cloud Computing utilization in Indian Universities: A Brief Conceptual Study

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ABSTRACT
Cloud Computing is an important name in the field of computing and information technology. Cloud computing is actually a kind of virtualization. Here computing is gear up with virtual platform which helps online and remote place availability of hardware, software, IT resources, application packages. It supports eco friendly atmosphere and indirectly based on green computing principles as well as practice. Cloud computing is applicable in several organizations and institutions including profit making or not profit making, government or private. Universities are today getting help of various computing and information technological tools and weapon. Cloud computing may improve university education and administration many ways; this paper is actually inform these aspects briefly.

Keywords:-Cloud computing, computing, IT application, universities, India, higher education, online education, e learning, virtual education, corporate universities, Information Transformation, Information Management

I INTRODUCTION

Cloud computing is an architecture which lies on virtualization principles and promote online and round o clock computing platform and services. Information Technological tools like monitor, printers, database and other application and packages. Cloud computing is also known as cloud platform and cloud architecture. This helps many ways for cost saving as it does not requires extra software, hardware, and IT packages. And also side by side make online availability. It saves initial cost as it is provided by third party and service seeker no need to connect the service provider. Here internet plays an important role to provide actual level of hardware, software and IT applications. Universities are the higher learning and research institutes needs IT for several purposes like official administration, teaching and learning, tele conferencing and some other activities. India has several universities and institutions some of them are adopting cloud computing and intelligent IT; where most of the universities still not using cloud computing for several reason. Though some new fields are there where use of cloud computing utilizations is possible.

II OBJECTIVES

The main aim and objectives of this study include:-

(a) To learn about cloud computing and its basic principles;
(b) To find out main advantages of cloud computing;
(c) To learn about Indian education systems, briefly and find out the places where cloud computing application is possible;
(d) To find out the emerging and possible cloud computing application in online education, virtual education, e learning and similar facet;
(e) To find out main challenges and issues related to cloud computing application in India.

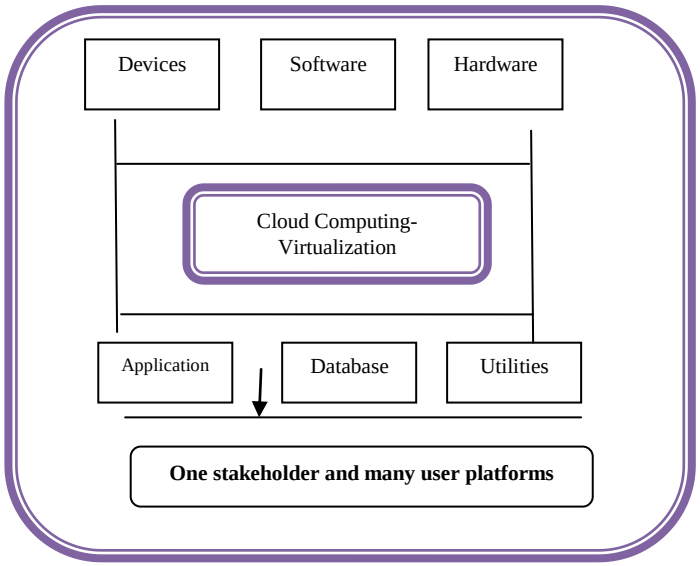

Fig: 1- Showing component of virtualization at a glance

III CLOUD COMPUTING

Cloud computing is actually a computing platform and mechanism. Practically it is not at all a technology. It is a kind of architecture which uses and inspire for less computer, hardware, IT Delivery and side by side limited software and application. Here concentration is given on virtual and online hardware and software services, where one service provider is equipped with almost all type of service and thus one organization may get their required services only by cable and communication medium, regardless of physical hardware and software. Cloud computing is also supports green computing strategy as it involves in less devices and simultaneously for that uses carbon emission is possible with cloud computing strategy or models. Cloud computing is the latest advance gift of computing world and emerging most rapidly.

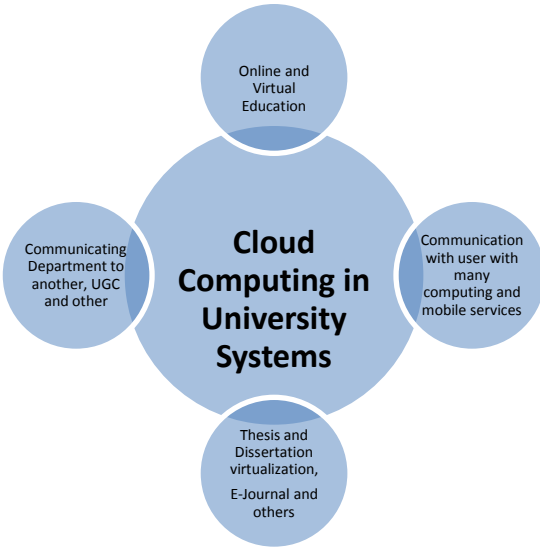

Fig: 2: Showing some applications of Cloud Computing in University systems

IV UNIVERSITIES AND COMPUTING

For several years, computing is application in several places of universities and higher educational institutions which includes offices, administration, teaching and learning, information and knowledge seeking, document management, libraries, defense and private educational mode and other potential areas.

In fact, apart from universities some colleges and institutions are also using information technology for several purposes. Official administration may communicate each other with IT weapon and faster delivery of work is also become easier with computing platform India is the largest education system in the world and has near about 600 universities as on March, 2013. It also deals with near about 20000+ colleges, providing education to the common people. Thus larger periphery and dimension are key responsible for cloud computing introduction in the university systems.

V CLOUD COMPUTING AND UNIVERSITIES

Cloud computing may be applicable in several places:-

(a) In general office practices may suit cloud computing practice as universities does not need to buy huge and heavy computing peripheral and no need to take care about software up gradation and others;
(b) In house and department to department or university to university communication may be happened with cloud power;
(c) Distance education may grow rapidly where universities can provide the course ware, software via online mode;
(d) As like distance education, online education may get wider and sophisticated benefit from the cloud computing platform where students can get his/her required assignments, resources through the dedicated information services;
(e) Universities are today providing several services like internet services, intranet services and other academic and administrative unit; and thus they need to use several computers and other equipment which are power consuming; thus here utilization of cloud computing is possible;
(f) Various library activities like, library networking, user centric services may deal with cloud computing architecture;
(g) Corporate education; which is to some extend newer concept and industrial education integrated thus it may use cloud computing principles;
(h) Connecting affiliating colleges and research centre may get the affiliation of cloud computing.

VI CLOUD COMPUTING IN UNIVERSITIES: CHALLENGES

Cloud computing no doubt has several challenges and issues as far as university system is concerned:-

(a) Cloud Computing based education needs interrupted internet connection which is to some extend tough in several cases, like place of educational institutions/ universities, service provider availability and others;
(b) Initial interest to switch Cloud Services is an important issue, in many cases universities or educational institutions may not involved cloud computing; just because of fear of extra jobs;

(c) Initial manpower and able skilled computer professionals are required to run these services;
(d) Ready and availability of service provider is an important and emerging matter; without them it is not possible to switch cloud computing services;
(e) Still planning from educationalist, planning commission, education departments, UGC and other statutory is not satisfied;
(f) Integrating online education, distance education with cloud computing is really a tough job in many perspective.

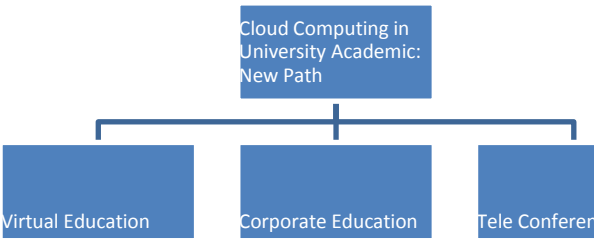

Fig: 3- showing some new area in higher education where utilization of cloud computing is possible

VII FINDINGS

(a) Cloud Computing is a latest name in the field of Computing;
(b) Cloud Computing is helpful in the developing country's computing practice, several ways;
(c) Cloud computing is establishing smart university systems and intelligent education systems;
(d) Initial interest, funding, availability of service provider is very much important.

VIII SUGGESTION

(a) Government need to take proper step to introduce cloud computing mechanism;
(b) University authority need to introduce cloud computing to interact them with UGC or to its affiliating colleges, preferably;
(c) There should be online education, virtual education, e learning through cloud computing and so on;
(d) During selection of service provider it is essential to check service provider's credentials, quality of services, reputation and other matter.

IX CONCLUSION

Cloud computing is gaining popularity in all most all the circle whether agriculture, government, commerce and trade, politics, e commerce and so on. Thus there are huge possibilities available to run cloud computing service in the educational domain included administration, teaching-learning, research and development and others.

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Stream flow Estimation Using Swat Model over Seonath River Basin

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ABSTRACT
Water availability is one of the major issues that needs attention from the present generation across the whole world to attain sustainability. Spatial variation of water resources and further climatic changes are main reasons for extremes like droughts and floods. This urges for the quantification and forecasting of availability of the basic need of life. At the river basin level, stream flow is considered as the most crucial parameter to assess water availability, which can be estimated by simulation or modelling approaches. This article presents about the hydrological modeling using a semi-distributed model namely SWAT (Soil and Water Assessment Tool), applied to Seonath river basin, Chhattisgarh, India. The CFSR (Climate Forecasting System Reanalysis) meteorological data for the period of 1979-2014 (35 years) is used and the runoff is generated, which is calibrated using the observed flow at the basin outlet. The results reveal the observed flow and modeled flow to be very poorly correlated. The major causes of such mismatch are identified and possible improvement options are discussed.

I INTRODUCTION

Seonath basin is the largest sub-basin of Mahanadi river basin and it covers a significant portion of the state Chhattisgarh, India. The various problems related to the basin are not being given much attention. Like most parts of India, majority of population in Chhattisgarh is also directly dependent on agriculture for fulfilling their basic amenities. Although Mahanadi basin is highly vulnerable to flooding, the impacts of flood are never so thought provoking for Chhattisgarh. But the rainfall anomalies leading erratic stream flow may be a cause of headache, when the entire world is facing problems due to water scarcity. According to the report of the National Commission for Integrated Water Resources Development, Government of India, various countries have been classified for water scarcity on basis of per capita Annual Water Resource (AWR). The countries with per capita AWR less than 1000 cubic meters are regarded to be in water stressed conditions. The number of countries in water stressed condition in 1990 was 20, which is expected to be detrimental to cause two-third of world population to face water stressed condition by 2050 (Gosain et al., 2006). Furthermore, according to IPCC (2007) reports, the global surface warming has occurred at a rate of 0.56-0.92 0C during the period 1906-2005 and impact of climate change may become severe to cause reduction in the freshwater availability. They have also predicted the decrease in annual average runo_ and availability of water up to 30% by middle of the 21st century. Also, the impact of climate changes will be severe for developing countries like India (Swain, 2014; Swain et al., 2015).

At the river basin level, stream flow is considered to be the measure for estimating the water availability. For estimation of stream flow, various models have been developed. In the last two decades, the hydrological models are extensively used to assess the water availability and prediction of extremes. SWAT (Soil and Water Assessment Tool) is one such model, which incorporates on Digital Elevation Model, land use map, soil map and meteorological parameters to generate runoff at basin scale. The model uses two basic equations for estimating runoff i.e., SCS-CN (Soil Conservation Services- Curve Number) method and Green Ampt- Mein Larsen equations (Arnold et al., 1998; Abbaspur et al., 2009; Setegn et al., 2010; Bekele and Knapp, 2010).

II STUDY AREA AND DATA USED

The study area is Seonath basin, having an area of 30560 square kilometers. The entire basin is within Chhattisgarh state. This basin is situated between 20° 16’ N to 22° 41’ N Latitude and 80° 25’ E to 82° 35’ E Longitude. The predominant soil of watershed is sandy clay loam. Sandy loam, loam and clay are also found in the watershed. Seonath basin has a tropical wet and dry climate, temperatures remain moderate throughout the year, except from March to June, which can be extremely hot (Galkate et al., 2015). The area under Seonath basin is mainly fertile plains.

The meteorological data (rainfall, maximum and minimum temperature, wind speed, solar radiation and relative humidity) are collected for 24 stations, as shown in Fig. 1. These data were downloaded from CFSR (Climate Forecasting System Reanalysis) database simulated by National Centers for Environmental Prediction (NCEP) and Texas A

& M University, United States. Digital Elevation Model (DEM) is downloaded from ASTER website (30m Resolution) which was used in watershed delineation. Soil map is collected from Chhattisgarh Council of Science and Technology (CCOST), Raipur (C.G.) which was used in HRU Analysis. Land use/land cover map is downloaded from BHUVAN (LISS III), National Remote Sensing Centre (NRSC). Topographical sheets (for creating shape files) were collected from Survey of India.

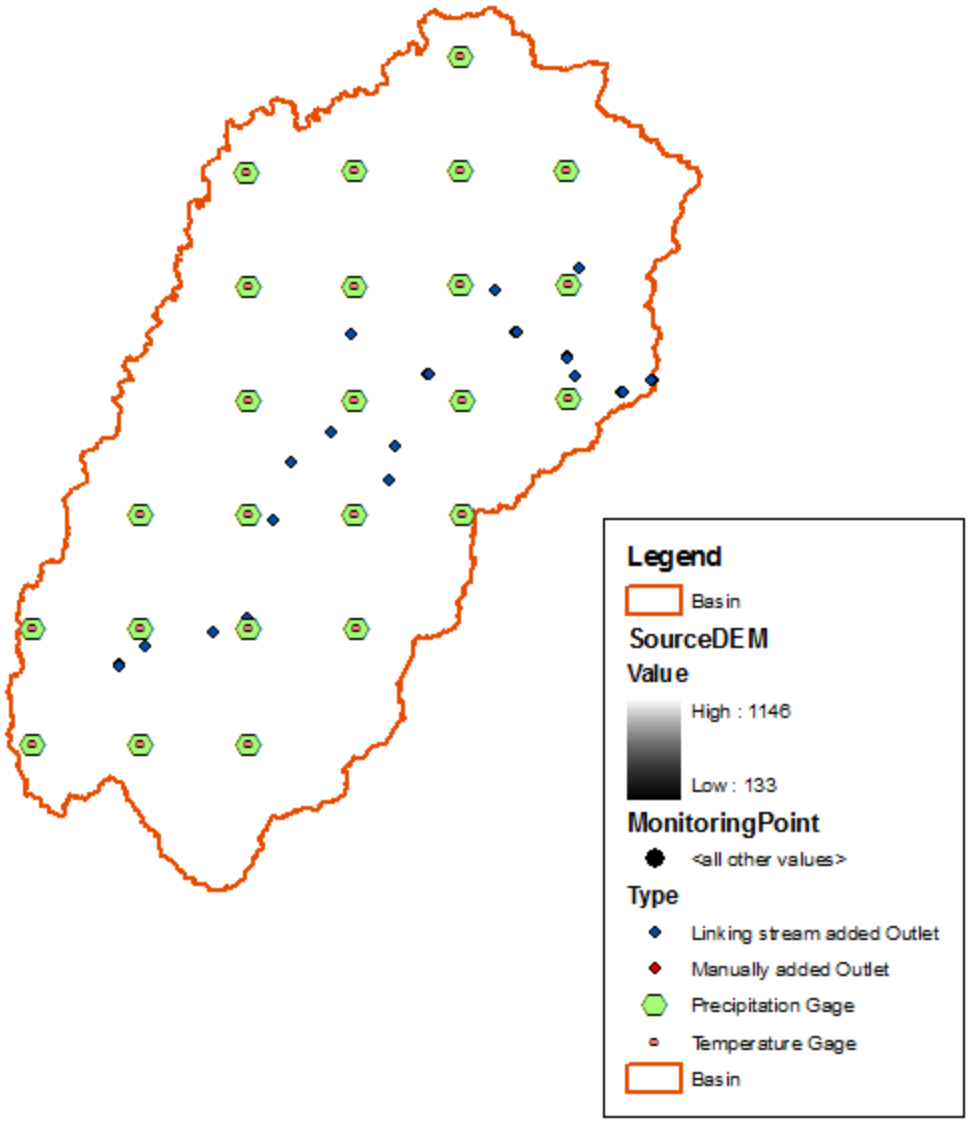

Fig. 1. Location of CFSR stations in Seonath basin

III METHODOLOGY

The various steps of running SWAT model are as follows: 1. Automatic Watershed Delineation, 2. HRU (Hydrological Response Unit) Analysis, 3. Write Input Tables, and, 4. SWAT Simulation. 5. Calibration using SWAT-CUP.

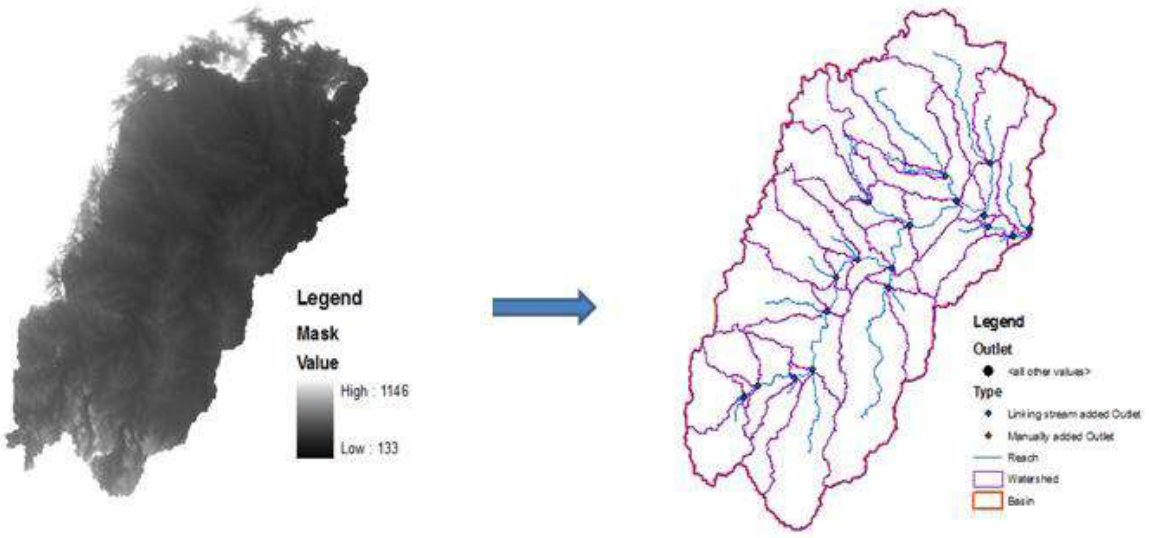

Fig. 2. Automatic Watershed Delineation from DEM through SWAT

First of all, the SWAT project is set up with ArcGIS as an interface. Then automatic watershed delineation is carried out from the DEM provided as input file. Fig. 2 shows the process of delineating the watershed from DEM. The outlet point of the basin is also fixed by SWAT automatically based on DEM. In the second step, analysis of Hydrologic Response Units is carried out through the model. The land use and soil map of the basin is provided as input and based on these; the whole basin is sub-divided into various homogenous units. The HRU is obtained based on the response of soil and land use of different parts of the basin. The reclassification of both the maps is done in this step. Fig. 3 and fig. 4 presents the reclassification of the input land use/ land cover and soil map respectively. Table 1 and table 2 represent the attribute table of the LULC map before and after reclassification respectively. After HRU analysis, comes the writing of input tables. In this step, the weather generator data and all the input meteorological data are written in specified tabular format, for the simulation to run.

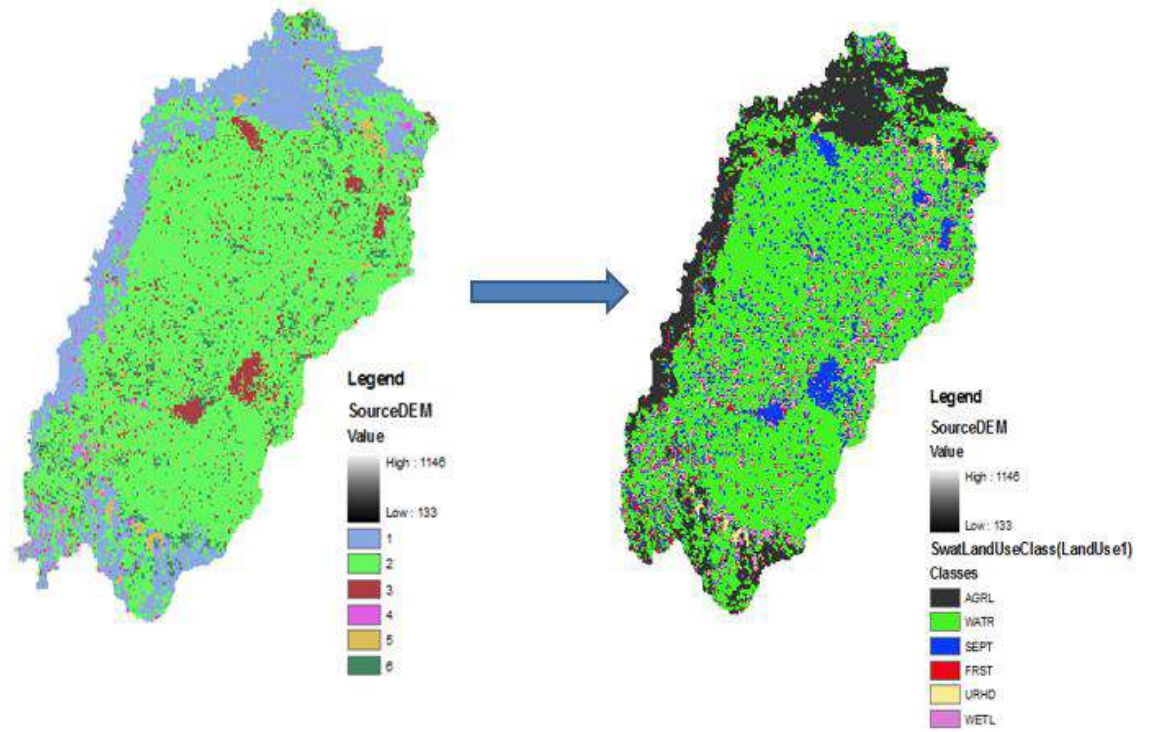

Fig. 3. LULC Map Reclassification in HRU Analysis

Table 1:
Attribute Table before Reclassification of LULC

Rowid	VALUE*	COUNT	LU_CODE
0	1	8439	Forest
1	2	27232	Agricultural Land
2	3	2277	Build Up
3	4	579	Tree Clad Area
4	5	1139	Water Bodies
5	6	2170	Wastelands

Table 2:
Attribute Table after Reclassification of LULC

Rowid	VALUE*	COUNT	Object ID	LUArea1.Area	LUArea1.LUSWAT
0	1	6677863	0	19.843	AGRL
1	2	22033842	1	65.472	WATR
2	3	1843005	2	5.476	SEPT
3	4	428189	3	1.272	FRST
4	5	917401	4	2.726	URHD
5	6	1753325	5	5.21	WETL

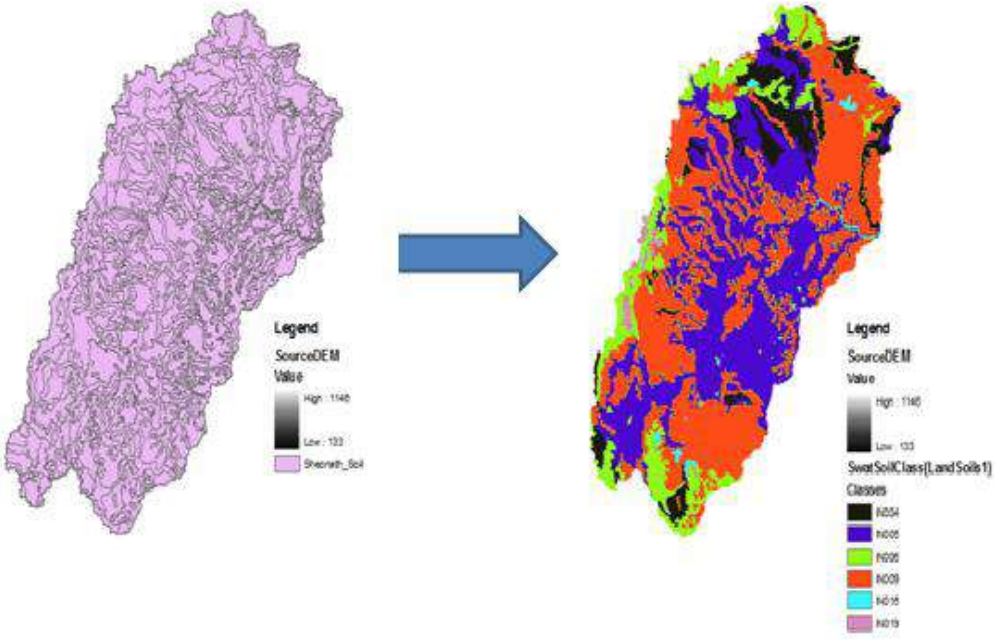

Fig. 4. Soil Map Reclassification in HRU Analysis

In the next step, the model is run for the required period i.e. from January 1979 to July 2014. The simulation is carried for the duration whose required data are already provided as input for SWAT simulation. We have to provide the starting and ending date of the stream flow that we require as output. The stream flow data can be generated as hourly, daily, monthly or annually output. Here, it has been printed for daily output, where the rainfall distribution is chosen as Skewed normal distribution. At the end of this step, when the execution is successfully completed, the output file of stream flow at basin outlet for the required duration will be generated, which needs to be checked with that of actual observed runoff at the outlet so as to calibrate the model.

The Calibration of the SWAT model is made by a software SWAT-CUP (Soil and Water Assessment Tool- Calibration and Uncertainty Procedures), which is used for the auto-calibration SWAT simulated outputs. The software uses various types of tools out of which Glue, Sufi2 and ParaSol are widely used. For the auto-calibration of the SWAT model for Seonath basin, Sufi2 is used here. The number of simulations carried was 50 and out of them, the closest values to that of observed data is considered.

IV RESULTS AND DISCUSSION

Out of the 24 sub-basins, the runoff is generated at sub-basin numbered 15. The actual observed value of runoff at the outlet and number of simulations required has to be provided as input for SWAT-CUP and it was given 50 for this case. More the number of simulations, more accurate is the calibration. At the end of the simulation, the model gives the 43rd simulation as the best simulation, which is most close to the observed values. But the results are having a clear mismatch with respect to that of observed data. The Nash-Sutcliffe efficiency and the coefficient of determination are found to be 0.07 and 0.31 respectively, which denotes that the model does not produce satisfactory results for the basin.

There are some prominent reasons for such a disagreement between the observed and the model generated stream flow. First of all, the meteorological data used are collected from CFSR and the observed runoff data is collected from Water Resources Department, Chhattisgarh. As there was no meteorological data available for temperature, wind speed etc. from WRD, the CFSR data were used for analysis. This might have accounted for the mismatch. Secondly, the observed data is collected at Jondhra outlet, whose location is not congruent to that of the outlet denoted by SWAT after automatic watershed delineation. Although they are close, since their exact locations are different, addition or loss to the stream flow may occur in the distance between these two points, which may definitely affect the final output. Thirdly, the default values of HRU thresholds have been used in the model, which may contradict to the original case. Moreover, there might also be errors in stream flow data during collection due to lack of updated instruments and human errors.

V CONCLUSION

The problems of water availability have raised itself as a crucial issue, which is addressed by assessing the runoff over Seonath river basin, Chhattisgarh, India. SWAT model was applied to the basin for a period of 35 years to check if the model can be used for future application. With a number of assumptions and using default values, the model was run and the stream flow generated by the model clearly showed disagreement with that of observed runoff values. The Nash-Sutcliffe efficiency and coefficient of determination were less than 0.5, for the best matched simulation. The various causes of the mismatch are also found, which needs to be focused upon to check the applicability of the model for further use over the basin.

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Eco-Treatment Zone in Open Drain

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ABSTRACT
In India of the 233 class I cities situated in 14 major river basins, only 24% are having proper sewerage systems and class II cities don't have any sewerage system for collection of domestic wastewater. Just collection of the sewage is not enough; further treatment facility to purify the sewage is also a necessity. So, all these city wastewaters are naturally taken to the nearby rivers and lakes by nallas and odhas (streams - natural drains). These natural drains in the cities are serving as sewerage lines. The studies published by CPCB in 2013 reveal the pathetic condition and inadequacy of pollution treatment infrastructure in India. Then Planning Commission has suggested developing "treatment zones" in city drains. It's a very innovative approach acknowledged by Government of India which needs to be strengthened further by very scientific implementations by scientists who have mastered the art of eco-treatment of polluted waters. From the case studies of Udaipur's ecological restoration of Ahar River and Allahabad's ecological treatment Rasoolabad Stream Complex, it can be said that such types of ecotechnological in-situ treatment –Green Bridge– system deliver more than expectations in the form of extended social and ecological capitals. The capital and operational costs of ecological treatment processes are comparatively less than conventional engineering approaches.

***Keyword**:* Eco-treatment, ecotechnology, non-point sources, Green Bridge

I INTRODUCTION

In the developing cities, it is estimated that more than 90 percent of sewage is discharged directly into rivers, lakes, and coastal waters without treatment of any kind (www.nyop.unep.org; www.unep.or.jp). Over two billion people are expected to live in metropolises, mega-cities of developing countries leading to aggravation of problems of river and lake pollution. In most of the developing countries governments are fighting to eliminate fecal contamination from rivers and lakes which are sources of drinking water. In India, cities produce nearly 40,000 million litres of sewage every day and barely 20 percent of it is treated[2].

Central Pollution Control Board (CPCB) carried out study on status of Municipal wastewater generation and treatment capacity in Metropolitan cities, Class I cities and Class II towns of India and published a document. As per the CPCB report, there are 498 Class-I Cities (including Metropolitan cities) having population more than 1 Lac as per 2001 census. Sewage generated in class-I cities is estimated about 35558.12 MLD Total Sewage treatment Capacity of class-I cities is 11553.68 MLD. Out of 11553.68 MLD sewage treatment capacities in Class I Cities, only 8040 MLD exists in 35 Metropolitan cities i.e. 69%. The capacity of sewage treatment in remaining 463 Class-I cities is only 31%. While total sewage generation in class-II towns is 2696.70 MLD, out of which total sewage treatment capacity in Class-II towns is 233.7 MLD which is just 8% of the total sewage generation. Actual sewage treatment, due to inadequacy of the sewage collection system, shall be low compare to capacity. (CPCB 2013)

The 150 years old conventional aerobic and anaerobic treatment systems are yet to be accepted worldwide as they are cost intensive and complicated to maintain. Investment of crores of rupees in the Ganga Action Plan could not give the results due to unavailability of electricity to run the modern facilities of state-of-the-art-treatment systems, technologies and inadequate sewer collection and conveyance facility. Same was the case with Yamuna Action Plan and Dal Lake Pollution Control Plan.

Centralization of sewage treatment facility has many engineering and management difficulties such as –

(a) Disorganized construction of buildings, townships and roads leading to backlog of sewage treatment facilities
(b) Already constructed areas do not have effective sewage collection, conveyance, and treatment systems

Due to lack of proper conveyance/infrastructure facility to collect all sewage generated from already developed/constructed area or remote places in the city, sewage is directly coming into the surface fresh water bodies like lakes and rivers through channelized and un-channelized drains. Consequently all city's storm water or natural drains are converted into the sewage carrying drains. If we are able to treat and reuse this water for non consumptive purposes, our fresh water demand will be reduced and we will be able to save our fresh water resources from pollution which will lead to sustainable development of our cities.

Ex Planning Commission, Government of India's **Report of the Working Group on Urban and Industrial Water Supply and Sanitation for the Twelfth Five-Year-Plan (2012-2017)** spells out explicitly the guidelines and line of action to reduce the pollution of rivers and lakes due to inadequate sewage and effluent treatment facilities in urban and industrial sectors. The studies published by prime pollution authority of India – Central Pollution Control Board (CBPC) in 2013 reveal the pathetic condition and inadequacy of pollution treatment infrastructure in India. May be because of that, Ex Planning Commission have suggested to develop "treatment zones" in city drains. It's a very innovative approach acknowledged by Government of India which needs to be strengthened further by very scientific implementations by scientists who have mastered the art of eco-treatment of polluted waters. The original text of Ex Planning Commission's report is cited here –

(a) Make drains treatment zones

Sanitary engineers-turned-pollution managers have a one-size fits all solution – first build underground sewerage network (however long it takes), then connect households to the system (even if there is resistance or delays) and then once the pipeline has been officially inaugurated, it will transport official waste to the treatment plant (built earlier but not working because of lack of sewage). This will be done and pollution will be controlled.

So, the question is how the waste – generated in households and conveyed through open drains and then into the river can be cleaned? The drains exist – lead to stench, disease and unlivable conditions. Instead of waiting for the end-day when the drain will be transformed into the storm water carrier it was meant to be and the sewage will disappear mysteriously into underground chambers, new solutions can be found. The drain, open and unhygienic, can be used as a treatment zone. The sewage can be treated in the open drain, intercepted in the open drain and then conveyed for after-treatment to the already built sewage plant. This is not to say that this open-air treatment will clean sewage and turn it into drinking water. But it will certainly reduce pollution and also turn the drain, from a stinky and dirty sewer to a planted waterway, which will be part of the city's landscape.

Again, this is not a tired or easy solution. But experiments to clean stretches of drains, using bioremediation technologies have been conducted, with success. The challenge is now to up-scale this approach and to integrate it into the pollution plans of the country. It is also a challenge to compute the costs of this emerging technology and to develop indicators for its performance so that projects do not become new scams, this time in the name of pollution. The bottom line is that the city has to invest in sewage management, but it has to invest to do things differently.(Reference - Report of the Working Group on Urban and Industrial Water Supply and Sanitation for the Twelfth Five-Year-Plan (2012-2017) November 2011)

Environomics - environmental economics of sewage treatment with a changing urban scenario and pressure of clean technologies due to climate change, one is looking for the better option in sewage treatment technologies which are economic, sustainable and eco-friendly. Based on the experience of huge spending in Ganga Action Plan NRCD (National River Conservation Directorate) has strongly recommended using energy less methods to treat sewage. The ecotechnologies are much cheaper than energy intensive conventional mechanistic sewage technologies. It is normally observed that conventional systems cannot deliver as desired, if not properly maintained with designed electric supply and skilled man power. (SERI news, 2009)

As for the existing treatment system the treatment process can be selected as per the output requirements but even with the most sophisticated treatment facility, a recycle and reuse of the treated water is must, as it will not only reduce the fresh water demand but also will reduce the sewage generation. The idea of target specific and tailor made solutions are important for prevention of pollution in local water bodies. Also awareness among people for the proper maintenance of public water bodies is of at most importance and social and cultural differences should not come in its way.

II ECOTECHNOLOGIES

Core of ecotechnological treatment system is based on ecosystem approach. Conventional systems generally exploit elements of nature - a few groups of microbes supported by infrastructure, energy and chemicals for degradation of waste matters while ecotechnological treatment systems rely on ecological interactions and biological improvement in natural web of life.

Natural streams, rivers and lakes have their own in - built purification system which is comprised of biotic – abiotic factors such as winds, natural slopes, stones for biological growth and complex food web help in the purification process. This food web is nothing but utilization of one's waste by another as it's own food. Nature has her own living machinery of detritivorous microbes and other living species to consume wastes. These principles have been harnessed in the treatment of polluted streams using STAC (Saprobic Trophic Absorption and Cycling) system comprised of grafting of

ecotechnological horizontal eco-filtration – green bridges.

Detritus food chain in the nature has capacity to assimilate sewage constituents and transfers them into ecological cycles of nutrients. There is need to bring paradigm shift in design concepts from calculable concentration models and performance criteria to ecosystem approach of using detritus induced complex food chain and nutrient cycles. Use of ecological processes in treating and assimilating nutrients from the sewage reduces capital as well as operational costs substantially. Conventional treatment systems reduce carbonaceous BOD only but remaining COD and non-carbonaceous BOD then lead to permanent undesirable changes in ecosystem of receiving water bodies. This can be evaded by use of ecosystem approach and ecological engineering to treat the sewage to convert into ecologically corrected water. (SERI news, 2012)

There is two types of actions involves in the natural system, one is consumption of pollutants as nutrient source in detritus food chain while other is to use of wastes generated from this process are useful for green plants growth .

The scheme involved application of ecological engineering to remove organic and inorganic pollutants from the water and to utilize them as nutrient in the ecological cycles. Green Bridge is developed using filtration power of cellulose / fibrous material with stones. All the floatable and suspended solids are trapped in this biological bridge and the turbidity of flowing water is reduced. Green plants on the bridges increase the DO level in water, which in turn facilitates the growth of aerobic organisms, which degrade organic pollutants.

Vegetation being significant ecological elements of any landscape, biomass and diversity play key role in ecosystem dynamics and global cycles. Vegetation is a biological sink for atmospheric carbon (CO_2), as 50% of their standing biomass is carbon only.

Applications of ecological engineering principles, environmental chemistry, microbiology, interactions of organisms and succession of biological communities are very useful to consume organic and inorganic pollutants from the wastewaters and bioconvert them into non-toxic form, finally transferring the elements in the ecological cycles. These eco-transformations, eco-conversions and degradation or bio-utilization of pollutants - nutrients are the part of ecological cycles - biogeochemical cycles. In the ecotechnology, attempt has been made to apply natural flora and fauna in well-designed manner to develop technologies like Green Bridge, Green Lake Eco-Systems, Green channel, Biox (biological oxidation) and Stream Eco-Systems.

III ADVANTAGES

(a) Availability of pollution-free water for non-consumptive use
(b) Clean water for agriculture reducing the accumulation of toxic metals into crops and grains, thereby improving the production efficiency, quality and price
(c) Increased biodiversity
(d) Improvement in groundwater quality over a period of time
(e) Control of nuisance insects and odour
(f) Improvement in healthy environmental conditions for the population in the adjacent areas
(g) No failure of system due to breakdowns and non-availability of electricity
(h) Site for the ecological tourism and education

Though ecotechnology is comparatively new option, polluter has got a very cost effective technique to control the pollution and convert it into resources. Ecotechnology harnesses bio-powers to assimilate anthropogenic wastes into ecological cycles without putting demand for man-made electricity. Conventional waste management systems need a lot of electricity which in turn does not become a candidate for carbon credits. But, ecotechnological treatment units having multiple uses like carbon sink, reduction in use of electricity and minimizing release of methane like GHGs are more useful in getting carbon credits at international levels. These techniques are more useful for the developing countries which cannot afford the cost of sophisticated mechanized auto control techniques to manage the waste.

While talking about the various process parameters for studying performance of the treatment system, the significance of Dissolved Oxygen (DO) as indicator of quality of treated water. Maintaining the proper level of DO in the local public water body not only signify the quality of water, but also plays a significant role in sustaining the entire food chain depending on the water body, which will also improve the overall aquatic ecosystem.

Assessment criteria will involve ecological – ecosystem quality indices, health indices and socio-economic parameters. These indices shall be involved in order to cost futuristic trends for reforming action plans, resetting targets and revisiting policy principles.

IV CASE STUDY I

Ecological Restoration of Rasoolabad Stream Complex on the banks of Ganga River, Allahabad (Patil, 2012)

Rasoolabad is cremation Ghat also known as Chandrashekhar Aazad Ghat is situated on banks of holy River Ganga in Allahabad UP. Rasoolabad stream complex was group of 3-5 slender lined-unlined streams. It passes through settlements (Jhondwal, Rasoolabad, and Mehdori Colony) near Rasoolabad Ghat and carries the raw sewage and domestic effluents from the residential complexes and drain into the River Ganga.

Ganga Seva Abhiyan is complete peaceful and non-violence movement under the devotional guidance of Swami Avimukteshwaranand Saraswati ji (disciple and representative of Sri Shankaracharya Swami Swaroopanand Saraswati ji Maharaj). The main object of this Rasoolabad Stream Complex was to prevent the drainage of industrial waste and human pollutants flowing into holy Ganga River along its long flow line. With clear intention of making Ganga River free of pollution, Ganga Seva Abhiyan decided to take up some demonstration projects on five selected nallah treatment using ecotechnology treatment system, so they invited Shrishti Eco-Research Institute, Pune to design and implement the restoration of 5 polluted streams in Rasoolabad Area. It was implemented by Green Infrastructure as per the design given by Shrishti Eco-Research Institute.

Each stream traversing through dense population joined Ganga River, emptying in it a huge quantum of pollution. Each stream/drain became brownish/black coloured and emitting foul odour because of city wastewaters and massive solid waste disposal. At all sites, it is observed that due to lack of oxygen and absence of biodiversity of phytoplankton and zooplankton, anaerobic degradation makes water unsuitable for any type of use. Overall organic load in the Rasoolabad stream complex was about 3 tons per day (50 – 60%% is biodegradable by conventional methods), and load of suspended solids is about 2.16 tons per day.

(a) Ecological treatment system installed under Rasoolabad Stream complex -

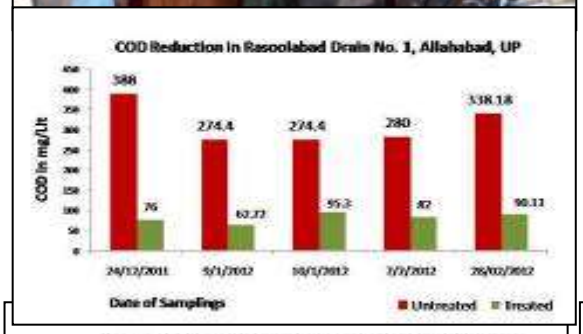
(i) On three line drains – green rolls in different structures were installed to sustain the high velocity of flow and wetland for the streams having flow in the range of 0.5 – 0.8 MLD
(ii) Zero electricity, no skilled maintenance and in-built eco-equilibrium of bio-degradation and bio-absorption processes using green rolls, and wetland systems
(iii) Combination of plants and bacteria for eco-remediation of Rasoolabad stream complex

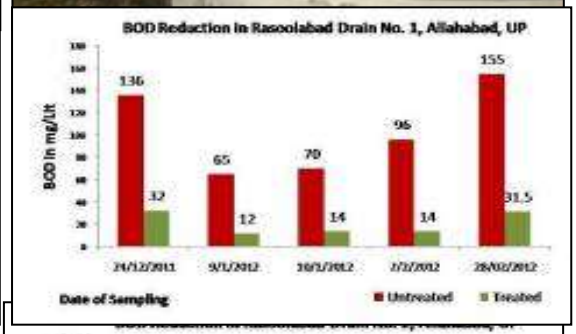
Eco-restoration project at Rasoolabad stream Complex shows improved water quality of nallahs. Reduction in TSS and Colour improves physical appearance along with Increased DO. Biodiversity status along nallah premises also gets improved. Social engineering helps to create public awareness regarding environment issue and bound locals to project. This is the unique ecorestoration project that shows the effective consortium of saints, technology and localities with mandatory permissions from government. Important point to be noted about ecorestoration by ecotechnology is very low maintenance and low capital cost that it improves water quality by 70-80% without electricity and. which may act as filler that was ignored in Ganga action plan mainly the unavailability of electricity and improper waste management systems.

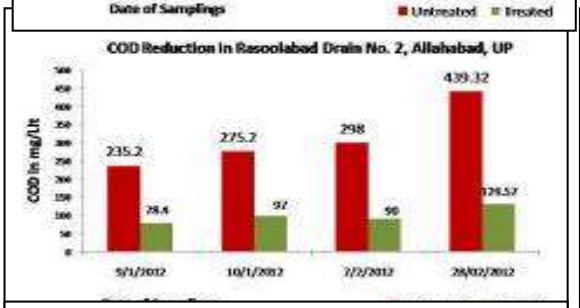
Some important highlight of the project -

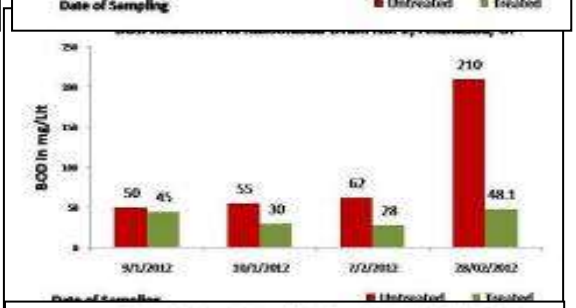
(i) Social engineering of local residents & cooperation from women to reduce the plastic waste in drains
(ii) Support from local administration to provide bins to collect everyday's solid waste
(iii) Control of foul odour & black colour in the drains
(iv) Reduction (50 – 90%) in pollution draining into Ganga River by 5 waste streams (Graphical presentation given below)

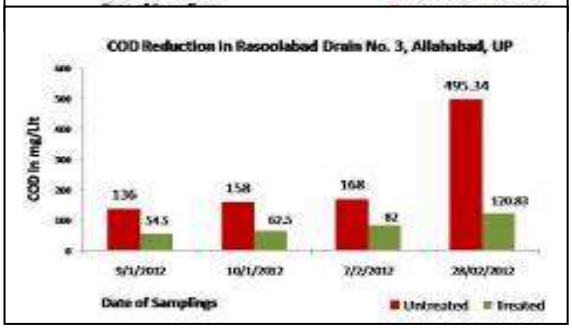
The quality of water of drain is clearly visible in photographs of before and after installation of ecological treatment system in below fig.-

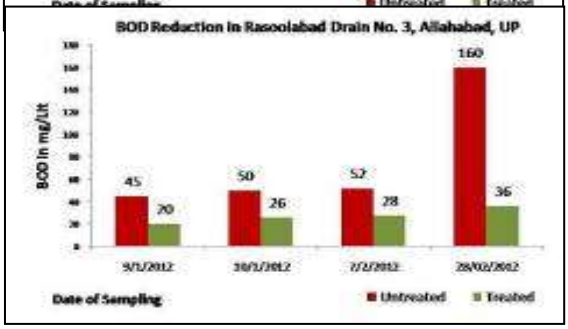












V CASE STUDY II

Ecological Restoration of Udaipur's Ahar River (Kodarkar, 2010)

Ahar River is flowing through Udaipur city, Rajasthan (I) and its non-monsoon flow is 150 MLD (Million Litres per Day). Ahar River was highly polluted due to enormous discharge of untreated city's wastewater and industrial wastewater into the river. It affected the ecological

health of river and downstream water reservoir - Udaisagar Lake - a source of livelihood of villagers. The river water was not suitable for any activities also lost its biodiversity and developed bad odour due to anaerobic degradation. There was no suitable water quality for survival of any aquatic organisms as well as river was infested with water hyacinth in certain stretches leading to elimination of other resident species of the river like turtles, water snakes, fishes and freshwater micro invertebrates (2) (Kodarkar and Joshi, 2010)

A Udaipur based non-government organisation - Jheel Sanrakshan Samiti (JSS) initiated ecorestoration project by creating social awareness of the masses to support this river restoration programme with technological support and guidance by experts of Shrishti Eco-Research Institute (SERI) of Pune - a research organisation having experience of 16 years in the ecotechnological systems for point and non-point sources of pollution.. This project was funded by Udaipur Chamber of Commerce and Industries (UCCI).

The treatment site was selected before the confluence with receiving water body i.e. Udaisagar Lake to install ecotechnological based treatment units for water purification and revival of ecological health of river. Ecological restoration activities started with removal of aquatic weed water hyacinth mingled with non-biodegradable plastic material at a selected point 10 km downstream of Udaipur. One screen made up of MS with anti-corrosive painting shall be installed upstream of Kanpur Pulia. The treatment scheme is comprised of Six horizontal in-situ eco-filtration system - Green bridges (2 Near Kanpur Pulia and 4 Before Sukha Naka Bridge) were developed in the course of river in a distance of about 1.6 km. Green bridges were seeded with mixed bacterial cultures helpful in treating organic and inorganic wastes and local green plants were grown to support the activity of microorganisms symbiotically.

The reviving self-purification capacity of the Ahar River was increased by improved level of dissolved oxygen up to 8 ppm in the river previously which was zero. Dissolved oxygen content also increased multifold triggering growth of aerobic organisms. This resulted in exponential increase in phytoplanktons and zooplanktons which attracted the subsequent trophic levels including fish as toxicity of wastes neared to zero. It is a bio-indication of reduction in pollution levels in Ahar River. The entire river stretch got its life again with return of turtles, snakes and increased number of bird species in and around the river.

Change in Ahar River after installation Green Bridge shown in following pictures -

Microscopic Picture of zooplanktons and phytoplanktons

On-site testing of water carried out by CPCB Team, They noted that D.O Level was 8 ppm of treated water while before Green Bridge installation it was zero.

Foam reduction before and after implementation of Green Bridge system

Analysis of Ahar River
Dissolved Oxygen of sample water at various depths and locations
Sample taken between 1.40 pm – 4.30 pm

Sr. No.	Sampling Station	Left Bank			Middle			Right Bank		
		0.1 mtr	0.25 mtr	Bottom	0.1 mtr	0.25 mtr	Bottom	0.1 mtr	0.25 mtr	Bottom
1	Before screen	7.6	7.1	6.3	6.4	5.2	NA	7.3	6.2	NA
2	After screen	10.6	10.2	9.8	10.3	10.2	9.8	10.1	9.7	7.4
3	After Green Bridge 1	10.8	9.7	NA	11.2	10.9	NA	7.9	7.6	NA
4	After Green Bridge 2	10.7	10.1	NA	7.9	6.7	NA	8.6	8.4	NA
5	After Green Bridge 3	11.2	10.9	10.6	7.8	7.6	6.7	10.2	10.1	NA
6	After Green Bridge 4	10.8	10.4	9.4	10.3	10.2	8.9	10.5	10.4	NA

Transparency of river at various locations

Sr. No.	Sampling Station	Unit	Transparency
1	Before screen	cm	12.6
2	After screen	cm	14.9
3	After Green Bridge 1	cm	15.4
4	After Green Bridge 2	cm	17.6
5	After Green Bridge 3	cm	21.5
6	After Green Bridge 4	cm	24.2

Important point to be noted about ecorestoration of any water bodies by ecotechnological treatment systems are very low maintenance and low capital cost that it improves water quality by 70-80% without electricity which may act as filler that was ignored in Ganga Action Plan mainly the unavailability of electricity and improper waste management systems.

VI CONCLUSION

(a) The role of eco treatment is supplementary, complimentary for the existing or upcoming treatment facility; as it will enhance the efficiency as well as it will make the entire treatment process more eco-friendly by reducing land and energy footprint.

(b) Acknowledgement and encouragement of eco-treatment for city drains being zero energy footprint, negligible space footprint, eco-friendly process

We require cost effective and sustainable solutions like ecotechnology that not only corrects water ecologically but also saves energy and improves biodiversity and help water body to regain its self purification capacity along with benefits for people attached with water body. Ecological treatment can give economical and sustainable treatment option to make waste water reusable. This ecologically corrected water will be more beneficial for agriculture, landscaping etc.

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A Low Gate Count UWB Transmitter Circuit

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ABSTRACT
To satisfy the different radiated power requirements for the ultra-wideband (UWB) data transmitting in the implantable electronic devices or the wireless component inter connections, a novel low-power high- speed UWB transmitter with radiated power tuning was proposed. The tunable radiated power is achieved by a UWB RF buffer with a peak value controller. The designed low-complex narrow pulse generator and digital ring on–off VCO ensure a high speed transmitting. The low power is realized by using a sub tractor to eliminate the base-band component from the output of the VCO and making the UWB RF buffer and the VCO operating in standby mode. The design was fabricated by a standard 0.12 μm CMOS technology. The count gates are 34 instead of 45 to the previous work, simulate frequency bandwidth from 5 to 13 GHz and 1.104Mw power consume by circuit area of 0.12mm^2.

I INTRODUCTION

The ultra-wide band (UWB) communication technology meets the crucial requirements for future high data rate and low-power wireless applications of component inter connection and implantable electronics [2–5]. A licensed UWB radio-frequency (RF) signal must satisfy regulations such as U.S. Federal Communications Commission (FCC) spectrum mask regulation. FCC defined that UWB characterizes transmission systems with instantaneous spectral occupancy in excess of 500MHz, mean while regulated power level sarevery low (below 41.3 dBm in the 3.1–10.6 GHz frequency band), which allows UWB technology to overlay currently available services [2]. The rear several methods to generate licensed UWB RF signals. One way is that a base-band narrow pulse is shape do filtered out to satisfy the FCC regulation. However, it needs to integrate a large area of LC circuit which is not beneficial to the miniaturization of the devices [6–8]. Another way is to transpose a base-band signal in the licensed frequency band of operation using a mixer and a voltage controlled oscillator (VCO) with a few of LC components [9–11]. Although the second way has good performance in signal peak magnitude, it is not suitable to the low-power and high-speed design for its high static power consumption and long start-up time. The third way is to use an all-digital method to generate licensed UWB RF signal by combining multiple base-band single- pulse to meet FCC regulation [12, 13]. Such technique requires an accurate relative delay control of each pulse, resulting in some design difficulties. In order to meet the crucial requirements for future high data-rate and low-power wireless applications, the performances of UWB transmitter should be improved in area, power consumption, speed, complexity and implementation. In order to reduce the interferences too their facilities and wireless communications, the output power spectrum density (PSD) for UWB transmitting should be designed as low as possible be sides meeting FCC regulation. However, for implantable devices application, the sensitivities of different biological tissue to the microwave radiated power are not the same in the implantable biomedical environment. Therefore, a suitable intensity of the radiant power should be chosen to ensure that the signal can pass through the living skin and at same time not damage the tissue of them ensured organism such as the brain. While for the application of the wireless component interconnection, there is also a requirement to choose an applicable radiated power to deal with different transmission distances, different obstructions and different interferences. In this paper, a novel 5–13 GHz UWB transmitter is proposed to adapt to the different application requirements of implantable electronic devices and wireless component interconnections. The radiated power tuning is realized by introducing a novel UWB RF buffer with standby mode. Low power design is also considered by making the transmitter operating in burst mode and employing a sub tractor to remove the static current consumption of a novel on–off voltage controlled oscillator (VCO) and hence to reduce the base line power dissipation of the transmitter.

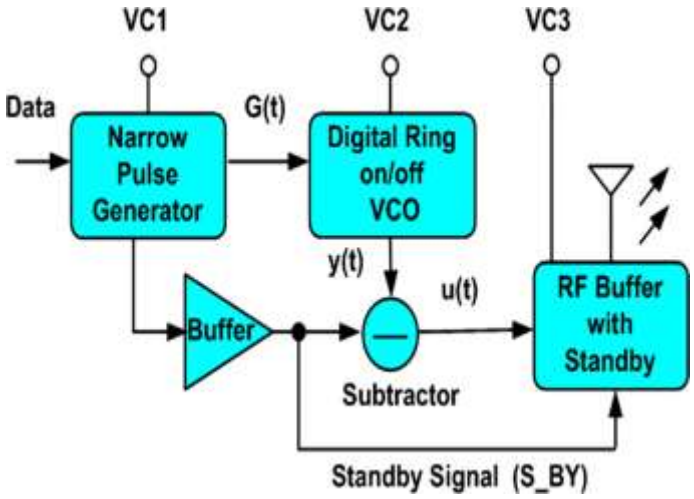


Fig 1 Block Diagramme of Proposed Tx

II TRANSMITTER STRUCTURE AND WORKING PRINCIPLE

Fig.1 is the block diagram of the proposed tunable UWB transmitter which includes a narrow pulse generator, a digital ring on–off VCO, a sub tractor and a UWB RF buffer with standby function. In Fig. 1, the unipolar return to zero (RZ) code D (t) is transported to the base-band narrow pulse G (t) by the narrow pulse generator. The G (t) controls the digital ring on–off VCO operating in the burst mode. Thus, the modulation of the UWB on–off keying (OOK) is implemented. y (t) is the output of the VCO and can be expressed as

$$y(t) = G(t)[A + A\cos(\omega t)] = AG(t) + AG(t)\cos(\omega t) \quad (1)$$

Where ω is the radian frequency of the digital ring on–off VCO and A is the direct current (DC) component from the VCO. Apart from the dc component A, it is seen from Eq. (1) that there is also a base-band component [AG (t)] in the y (t). In order to avoid the base-band component [AG (t)] reducing the radiated efficiency and violation of the licensed UWB RF signal spectrum mask of the UWB transmitter, a subtractor is employed. The output of the buffer from the narrow pulse generator is [AG (t)]. The output of the sub tractor u (t) can be express as

$$u(t) = y(t) - AG(t) = [AG(t) + AG(t)\cos(\omega t)] - AG(t) = AG(t)\cos(\omega t) \quad (2)$$

Eq. (2) shows that after sub tractor the base-band component A.G (t) included in y (t) is eliminated and the OOK UWB RF signal u (t) is obtained. Finally, the u (t) corresponding to the unipolar RZ code D (t) can be radiated by the UWB RF buffer with standby mode. The feasibility of the proposed UWB transmitter is firstly validated by the Matlab software. The power spectrum density (PSD) of the output from the transmitter with and without the sub tractor is shown in Fig.2. Obviously, the base-band energy is eliminated by the sub tractor. Thus, converting the base-band narrow pulse G (t) to the OOK UWB RF signal u (t) was implemented by the digital ring on–off VCO combining with the sub tractor and the energy efficiency of the transmitter is improved.

Because of employing the OOK modulation, controlling the bias voltage VC1 can regulate the pulse width of the base-band narrow pulse G (t) and hence can calibrate the frequency band width of the UWB RF signal u (t). Calibrating the center frequency of u (t) can be achieved by regulating the oscillation radian frequency ω of the VCO through the control of the bias voltageVC2. The radiated power of output UWB RF signal can be adjusted by controlling the bias voltage VC3 conveniently. Moreover, before the base-band narrow pulse G (t) turning up; the proposed VCO and RF buffer keep in standby mode. Therefore they can only operate during very short pulse duration (can be less than 1ns), and hence the base line power dissipation can be reduced significantly. In this way, the novel solution of the UWB transmitter for future high data rate wireless applications was achieved, which has benefits of low-complexity, low-power, and radiated power tuning. The detail of the design will be discussed in the next section.

III KEY CIRCUITS DESCRIPTION

(a) Narrow pulse generator

In order to provide a dependable base-band narrow pulse for OOK UWB modulation, a feasible low-complexity pulse generator circuit was employed and shown in Fig 2 The circuit consists of transistors NM1, NM2 and a INV and a AND gate. In order to achieve the pulse width adjusted, the INV (inverter) and transistors make up a pair of delay as well as opposite pulse with the reference signal, tunable delay by controlling the charging and discharging current of the transistor NM1 to the NMOS-connected capacitor NM2. The advantage of employing delay structure is that the relative time delay between the two paths can be controlled by the bias voltage easily. Finally, after an INV gate and an AND gate, a dependable base- band narrow pulse G (t) for OOK UWB modulation is generated.

From Eq. (2), after OOK UWB modulation, the frequency band width (B) of the UWB RF signal u (t) controlled by VC1 can be approximately written as:

$$B \approx 2/[\tau + (t_r + t_f)/2] \quad (3)$$

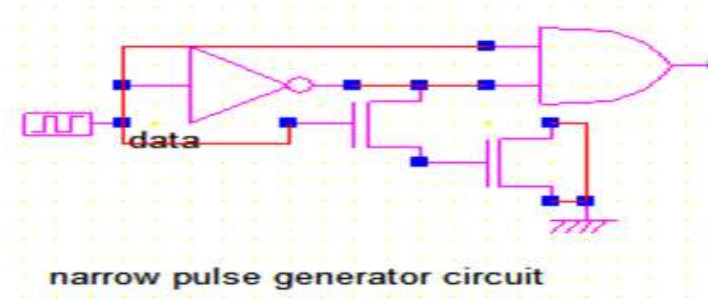
where τ is the pulse width of G (t), tr and tf are the rise time and fall time of the G (t), respectively. In this design, the frequency band width of the UWB RF signal u (t) , needs to be calibrated from 5 to 13 GHz (corresponding to the pulse width 1ns of the base-band narrow pulse G (t)). For achieving the function mentioned above, the adjustment redundancy mentioned above has been taken in to account.

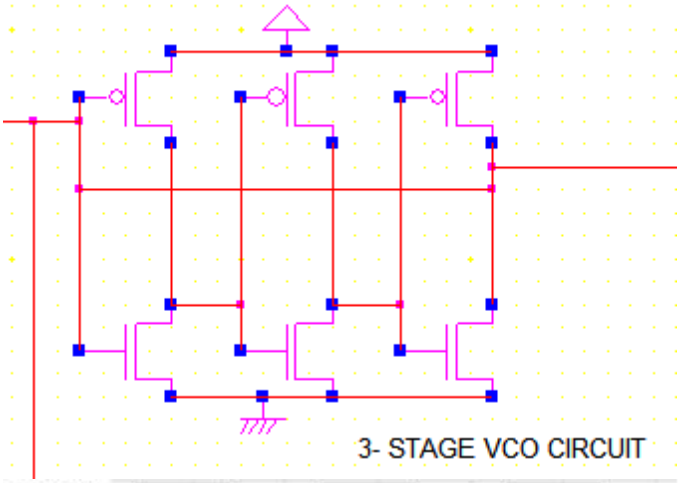
(b) Digital ring on–off VCO

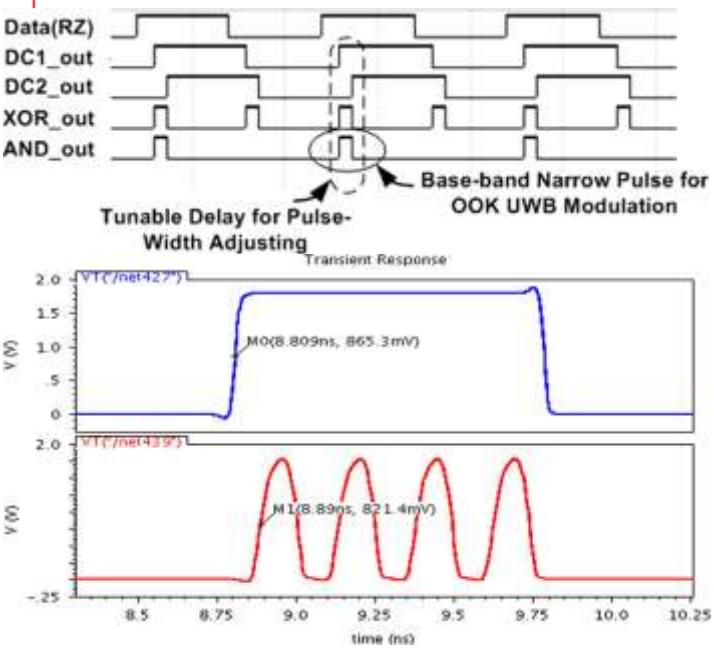
The core circuit of the novel digital ring on–off VCO for OOK UWB modulation is shown in Fig 3. The proposed VCO consists of an on- off digital ring oscillator employed [14], but it is not beneficial to the miniaturization of the chip. Therefore a sub tractor is employed in this design. The principle diagram of sub tractor is shown in , This circuit is based in the delay of the inverter gate switch. The output of each inverter changes in a finite amount of time after the input has changed, and then the loop of an odd number of inverter gates creates an oscillation. To reduce the frequency of oscillation is necessary to add more inverter gates to the loop, increasing the total propagation delay. The VCO based on this architecture uses the alimentation of the inverter gates to change the delay time, changing the global oscillation frequency. Two VCO's were added in order to create two different waves for comparison in the output.

The on–off mode of the VCO is implemented by controlling the transistor M1 and M2 through the base-band narrow pulse signal G (t).When the narrow square pulse G (t) turns up, the switch (M1) closes the oscillation loop, the oscillation occurs, the G (t) is up-converted to UWB RF frequency band. When the G (t) pulse vanishing, the switch (M5) breaks the oscillation loop, the oscillation turns off the static current does not occur. The VCO should constantly remain in standby mode, except when the G (t) turning up. Since the oscillation occurs only in very short pulse duration (some times can be even short to a nanosecond), the energy efficiency of the transmitter is greatly improved. Based on the principle of digital ring oscillation, the VCO has a fast transient response to ensure a sufficient oscillation during very short pulse duration. The start-up time of this ring VCO shown in Fig. 4 is close to 41ps, which is closed to the start-up time of conventional digital ring VCO. But like other VCOs based on the principle of digital ring oscillation, when the oscillation turns off, the output of the VCO will be connected to the power or the ground, inducing a high base-band energy corresponding to the

base-band switch pulse, shown as Eq. (1). In order to eliminate the base-band component A.G (t) LC filter can be







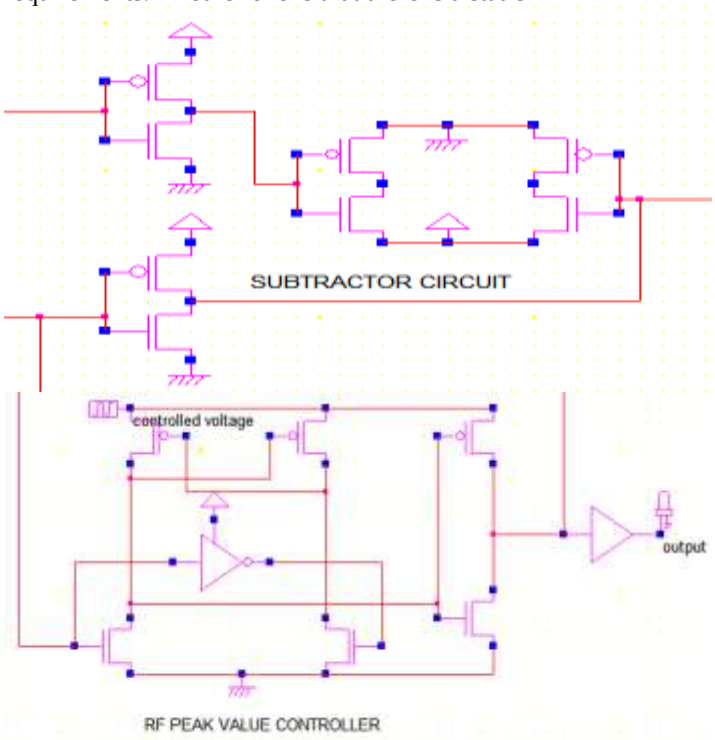
Through inverters the signal A.G (t) will become –AG (t). After signals –AG (t) and y(t) passing through the analog multiplexer, the base-band energy component will be eliminated, and the pure output UWB radio-frequency signal u(t) will be obtained theoretically. The center frequency of the VCO output radio-frequency signal u(t) is determined by the transmission delay of each inverter in the oscillating loop, and can be expressed as:

$$CF \approx \frac{1}{2}\cdot\frac{1}{t_1+t_2+t_3}=\frac{1}{2}\cdot\frac{1}{2t_1+t_3}=\frac{1}{2}\cdot\frac{1}{2\left(0.693\frac{1}{R_{M1}C_{M1}}\right)+t_3} \quad (4)$$

where t1, t2 and t3 are the transmission delay of inverter M1, M2 and M4–M6, RM1 is the equivalent transmission resistance of M1, CM1 is the output equivalent capacitance of M1, t3 is depended on the transmission resistance and output equivalent capacitance of M5 and M6, the dynamic charging current provided by M4.

(c) UWB RF buffer with standby mode

There were some problems with traditional RF buffers when they were used in the UWB transmitter for future high data rate Wireless component interconnection sand implantable electronic applications. One is that the radiated power of the RF buffer is fixed and not adjustable to adapt to different radiated power requirements. Another one is that there is a static

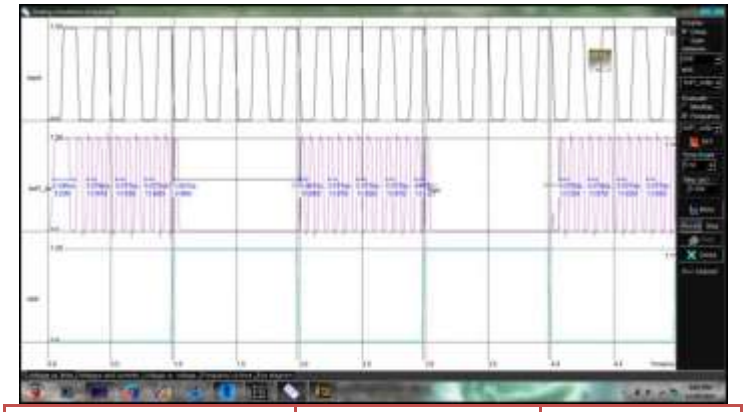


current in the buffer, which will increase the power consumption. In order to solve above problems, a peak-value-controlled UWB RF buffer with standby mode is designed. The simplified circuit of the proposed RF buffer is shown in Fig.4.6. Its out voltage level can be changed by regulating the value of controlled voltage and then tunes the radiated power of the UWB transmitter through transistor. The output drive capability of the peak value controller is improved due to the cross-coupled positive feedback (M11andM12). Similar to the VCO mentioned above, the RF buffer would constantly keep standby mode so that the static current does not occur, except when the stand by signal S_BY (same as G (t) shown in the Fig. 4.1) turning up. Thus, the RF buffer only operates during the very short pulse duration and

hence has high energy efficiency. In this design, the adjustment range of controlled voltage is finite with the range from0.1V to 0.9V.

IV SIMULATION RESULTS

To simulate the functions of the transmitter circuit with a standard 0.12 µm or 120nm RF CMOS process shown in Fig. 8 The transmitter is compact and highly integrated without inductor. The core is 0.12mm^2 excluding pads. The transmitter operates with1.2V supply and the input data is unipolar return-to-zero (RZ). The output power is obtained by Microwind2.6 software eye pattern 5-13 GHz frequency is generated to the proposed transmitter circuit. The maximum power consumption of the transmitter is 1.104mW, showing that employing standby mode in the proposed VCO and RF buffer with a sub tractor can save the power efficiently. Table1 shows the performances comparison with previously reported UWB transmitter.



References	Proposed Work	Paper Work
Process (µm)	0.12	0.18
Core area (µm^2)	0.12	0.18
Used Gates	34	45
Frequency (GHz)	5-13	3-5
Power consumption	1.104mW	2mW
Energy(pJ/s)	0.38	11

V CONCLUSION

This paper has shown that there are four major factors that can limit the performance of high-speed, reduce circuit complexity, increase frequency as well as signal bandwidth, and timing accuracy for the UWB transmitter. The proposed UWB transmitter consists of a UWB RF buffer with stand by operating mode, a digital ring on–off VCO, a subtract or for eliminating base-band component from the output of the VCO and a narrow pulse generator. The novel digital ring on–off VCO makes it reliable to transmit a maximum high speed data-rate data band width of 5–13 GHz. By adding a peak value controller of the UWB RF buffer, the radiated power of the UWB transmitter can be tuned from. The static power of the transmitter is reduced by making the UWB RF buffer and the VCO operating in standby mode. In this way, the transmitter has consumed low-power 1.104mW of 0.38 pJ/bit and small circuit area of 0.12mm^2.

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Water Productivity in Cropping Systems Alternate to Rice-Wheat under Conservation Agriculture Practices

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ABSTRACT

Identification of a cropping system (CS) alternate to rice-wheat system in the Indo-Gangetic Plains under conservation agriculture (CA), which can improve crop and water productivity, is needed. Therefore, the experiment was undertaken at IARI farm, New Delhi in collaboration with CIMMYT-India during Kharif and Rabi season of 2011-12 and 2012-13 on a sandy clay loam soil. Treatments comprised of 3 cropping systems, viz., cotton-wheat (C-W), pigeon pea-wheat (P-W), maize-wheat (M-W) and 7 tillage-and residue-management practices, viz., conventional till flat-sown, zero-till (ZT) permanent narrow bed (PNB), zero-till permanent broad bed (PBB) with residue (R), zero-till flat bed with R, zero-till flat bed conventional (flat sowing after normal tillage), laid-out in a split-plot design with three replications. Results revealed that in all cropping systems, system water productivity (SWP) was highest in zero-till broad bed with residue. Among CSs, C-W resulted in higher water and system productivity compared to P-W and M-W systems. It was found 60.3, 67.9 and 63.5% irrigation water savings whereas total water savings of 49.4, 56.1 and 58.7% in C-W, P-W and M-W CSs, respectively and 215.4, 172.5 and 150.8% higher SWP compared to conventional till transplanted rice-wheat system. PBB + R and ZT + R technologies have a wide scope for adoption in these cropping systems in this region and similar agro-ecological conditions, as both technologies had much higher system grain and water productivities compared with farmers' practice.

I INTRODUCTION

Water is a critical input for sustainable agriculture, which consumes more than 80% of available water resource. With increasing demand from other sectors, availability of water to agriculture is going to decline. By 2025, two-thirds of the world's population could be under "stress conditions" (500-1000 m^3/year/capita), and 1800 million people are expected to be living in countries or regions with "absolute water scarcity" (<500 m^3/year/capita). But the fact is that 1% of water productivity gain in agriculture means 10% increase of availability for other uses. The pressure to reduce water use in irrigated agriculture is mounting, especially in Asia where it accounts for 90% of total diverted fresh water. Worldwide, rice area is estimated to be 150 Mha, 50% of which is irrigated. It consumes about 70% of the available irrigation water in India (Biswas, 2010) and certain projections indicate rice yield reductions in the near future (Adusumilli and Bhagya Laxmi, 2011) mainly due to growing water scarcity. Scientists have estimated that by 2025, 15-20 Mha of irrigated rice will suffer some degree of water scarcity (IRRI, 2013). Due to growing demand of water for non-agricultural uses, water availability of irrigation is continuously declining. Rice –wheat cropping system (CS) covering 10.3 Mha area is the major consumer of irrigation water with low water-use efficiency, particularly in the Indo-Gangetic plains of India (Tripathi, 1990).The sustainability of the rice-wheat system in the Indo-Gangetic Plains (IGP) is at risk owing to higher water requirement of the rice crop and the conventional production practices resulted in high cultivation cost and inefficient use of inputs. In the western Indo-Gangetic Plains (IGP) water is increasingly becoming scarce because agriculture is facing rising competition from the urban and industrial sectors (Toung and Bhuiyan, 1994). In many parts of the region, overexploitation and poor groundwater management has led to decreased water table and negative environmental impacts (Saharawat et al., 2010). Deterioration of land quality due to different forms of soil degradation and excess residue burning are other pervasive problems in the region (Bhattacharyya et al., 2013a; Das et al., 2013). These factors lead to consideration of conservation agriculture (CA) for better sustained productivity, profitability and soil quality (Kassam, 2011). This calls for identification of suitable cropping systems other than the rice-wheat under irrigated conditions in the region. Maize, cotton and pigeonpea are suitable alternative crops to rice in the *kharif* (rainy) season in north-western IGP because of their relatively low water requirement.

Conservation agriculture has the following four principles: (i) minimizing mechanical soil disturbance and seeding directly into untilled soil to improve soil organic matter (SOM) content and soil health; (ii) enhancing SOM using cover crops and/or crop residues (mainly residue retention). This protects the soil surface, conserves water and nutrients, promotes soil biological activity and contributes to integrated pest management (IPM); (iii) diversification of crops in associations, sequences and rotations to enhance system

resilience and (iv) controlled trafficking that lessen soil compaction (FAO, 2012). The CA technologies involving no- or minimum-tillage with direct seeding, and bed planting, innovations in residue management (mainly residue retention) to avoid straw burning and crop diversification. Bed planting generally saves irrigation water (Gathala et al., 2011), labour consumption without sacrificing crop productivity (Hobbs and Gupta, 2000; Ladha et al., 2009b). The permanent bed planting technique has been developed for production cost reduction and conservation of resources (Lichter et al., 2008). Permanent raised beds permit the maintenance of a permanent soil cover on the bed for greater rainwater capture and conservation (Govaerts et al., 2005, 2007). The advantages of permanent raised bed planting over conventional ZT (ZT with flat planting) are that it saves irrigation water and weeding and fertilization application practices are easily performed by trafficking in the furrow bottoms and the fertilizers can be banded through the surface residues reducing potential nutrient losses (Limnon-Ortega and Sayre, 2002). Past research suggests some advantages of broad beds over narrow beds in maize-wheat system. For example, Akbar (2007) reported that there was about 36% water saving for broad beds and about 10% for narrow beds compared to flat sowing and grain yield increased by 6% for wheat and 33% for maize in Pakistan. In both cases, the furrows act as pathways for drainage in excessive rain and conserve rainwater in dry spells (Astatke et al., 2002). However, there is a need for wider scale testing of these new technologies under diverse production systems for productivity and water efficiency as the CA technologies are site specific and therefore, their evaluations are important to have significant adoption (Ladha et al., 2009a). Again without the systems approach, planting a crop without tillage will have problems and the producer will likely fail, blaming no-till, not the lack of management (Hobbs and Gupta 2003). However, little research has been done to verify these benefits. Jalota et al. (2008) study the direct and interactive effects of date of sowing and tillage-plus-wheat residue management practices on growth and yield of cotton and wheat and to increase the profitability by reducing the tillage operations, which costs about 50% of the sowing cost. Yields were 23–39% higher in tillage treatments than minimum-tillage. In wheat, grain yield in tillage treatments were at par. Water productivity amongst the tillage treatments in cotton was 19–27% less in minimum tillage than others tillage treatments. Considering these facts, four experiments under conservation agriculture were conducted during 2011-12 and 2012-13 to explore the better alternatives to rice-wheat cropping system and also to device a better option within the rice-wheat cropping system for saving the irrigation water by investigating the impacts of CA technologies (ZT alone, ZT with residue retention and ZT with residue retention and bed planting) on the performance of a rice-wheat, cotton-wheat, pigeon pea-wheat and maize-wheat cropping systems in the western IGP.

II MATERIALS AND METHODS

(a) Experimental site

The experiments on rice-wheat, cotton-wheat, pigeon pea-wheat and maize-wheat cropping systems were conducted during 2011-12 and 2012-13 at the 14B block of research farm of the Indian Agricultural Research Institute (IARI), New Delhi with the treatments shown in Table 1 and 2. A uniformity trial on wheat was undertaken during *Rabi* 2009-10 so as to ensure uniform soil fertility in the entire field. The climate of the research farm is semi-arid with dry hot summer and cold winters. May and June are the hottest months with mean daily maximum temperature varying from 40 to 46^{o} C, while January is the coldest month with mean daily minimum temperature ranging from 6 to 8^{o} C. The mean annual rainfall is 710 mm, of which 80% is received during southwest monsoon from July to September and the rest is received through 'Western Disturbances' from December to February. Air remains dry during most part of a year. The mean wind velocity varies from 3.5 km hr^{-1} during October to 4.3 km/ hr in April. Pan evaporation varied between 3.5 to 13.5 mm d^{-1} and reference evapotranspiration from 9-15 mm/d. Mean daily values (during different weeks) of meteorological parameters recorded at the IARI meteorological observatory adjoining to the experimental site during the *kharif* and *rabi* seasons of 2012-13 are presented in Figs.1 (a) & 1(b). The soil texture of the site was sandy clay loam.

(b) Crop management and biophysical data recording

Bt-cotton hybrid 'Bollguard II Nikki', Pigeonpea 'Pusa 992' and Rice 'PRH 10' for nursery were sown by May-end each year and harvested in the second fortnight of November whereas Maize 'HQPM-1' and rice were sown in first week of July and harvested in November. Wheat cv. 'HD 2932' was sown by November-end using seed drill at 23 cm row spacing. A zero-till seed-cum-fertilizer drill was used for rice and wheat sowing on flat surface, while a bed planter was used for sowing under the raised-bed system. Recommended dose of fertilizers were applied in each crop. In the first year before the initiation of the experiment, wheat was harvested from the experimental plots and wheat residues were retained in the PBB + R or PNB + R plots. Wheat straw yield of 2009–2010

(the immediate past crop was 6.5 kg/ha. It was estimated that in all years, about 4.5% of wheat straw remained as stubble in the CT and other residue removal plots. Similarly, as stated earlier, about 40% of wheat straw was returned in the residue retention plots in cotton in all years. In the second year, wheat residues (40% of 6.5 kg/ha i.e. 2.6 kg/ha were retained in the newly introduced ZT+R plots. All herbicide applications and pest controls were done by using recommended practices. In addition, one manual weeding was also performed in all the crops at 40 days after sowing, while no manual weeding was required in wheat.

Straw weight was determined after oven-drying at 70^0C to a constant weight and expressed on an oven dry-weight basis. Yields of seed and grain as well as straw/stover were taken from the net plot area after discarding the border rows. In each treatment, there were 12 rows for narrow-beds and six rows for broad-beds. For cotton, pigeon pea and maize and narrow-beds (row to row spacing = 0.7 m), central four rows constituting 5 m length was harvested for yield measurement whereas, for wheat and for narrow -beds, four central beds with 3 wheat rows in each bed. For broad-beds, wheat yield measurements were taken from two central beds with 5 wheat rows in each bed. For ZT/CT plots (where conventional flat sowing was done), crops were harvested from an area of 2.8 m × 5.0 m for yield measurements. To express the overall impact of treatments in terms of comparable yield data, the entire grain and seed yield were converted into wheat equivalent yield (WEY) and then system productivity was determined by taking *kharif* and *rabi* crop as a system.

(c) Measurement of irrigation water, total water applied and water productivity

The irrigation water depth applied to each experimental plot was measured using a digital velocity meter and the wetted area of the field channel. At the starting of the experiment a rating curve was generated showing the relationship between flow depth and discharge in the main channel and then an exponential equation was developed. Afterwards every time at the time of irrigation only flow depth was measured in the channel and corresponding discharge was determined using either the rating curve or the exponential equation developed. Irrigation water depths indicated by the soil moisture deficit (SMD) in each treatment was calculated using soil moisture content before irrigation and root zone depth of plant besides bulk density using the Eq. 1 and time taken to fulfil the SMD.

$$SMD = (\theta_{Fc} - \theta_i) \times D_{RZ} \times B_d \quad (1)$$

where, SMD: soil moisture deficit (mm), θ_{Fc}: soil water content at field capacity (%), θ_i: soil water content before irrigation (%), D_{RZ}: root zone depth (mm), Bd: bulk density of soil (Mg m^{-3}). Soil moisture content at any time was measured by TDR (Time domain reflectometer), calibrated using gravimetric method. Daily rainfall data were collected from a rain gauge located at about 500-m away from the experimental plots. Effective rainfall was calculated using standard methods given by FAO and then total amount of water applied was computed as the sum of water applied through irrigations and effective rainfall. Water productivity (kg grains $ha^{-1}.mm^{-1}$ of water) was computed using equation 2 as given by Bhushan et al. (2007):

$$\text{Total water productivity} = \frac{\text{Grain yield (kg ha}^{-1})}{\text{Total water applied (mm)}} \quad (2)$$

III RESULTS AND DISCUSSIONS

(a) Yield under different cropping systems

Based on the two years' mean data it was observed that wheat equivalent yield of rice-wheat system ranged from 6.51 to 8.35 t/ha. The highest wheat equivalent yield (WEY) was found in case of DSR with zero tillage and rice residue with moongbean residue whereas it was minimum in case of conventional transplanted. It was also observed that yield was more in case DSR with zero tillage and residue retention. Similarly from the first year, the plots under PBB + R with zero tillage had significantly higher cotton and pigeon pea compared with CT plots (farmers' practice), resulting in a higher system productivity (wheat equivalent yield; WEY). But in case of maize flat zero tillage with residue yielded more grain. WEY in case of cotton, pigeon pea and maize ranged from 11.71 to 14.78, 9.43 to 10.49 and 7.88 to 8.89 t/ha.

(b) Water productivity under different cropping systems

Total water applied in rice-wheat, cotton–wheat, pigeon pea-wheat and maize-wheat were shown in Table 2 and 3). It was observed that in both years total water applied were highest for the CT plots, whereas PBB + R plots received the least water in both years. Residue retention invariably reduced the amount of water applied in both years. There was irrigation water saving from 44 to 69%, total water saving from 35 to 58% and system water productivity increased from 91 to 171% (Table 4) in all the system compared to transplanted rice-wheat system. This shows the effectiveness of all the cropping systems tried and can be used as

alternate cropping systems to replace rice-wheat cropping system in the region.

Similar results were found by Gathala et al. (2013) that zero-tillage direct-seeded rice (ZT-DSR) with residue retention and best management practices in north-western Indo-Gangetic Plains (IGP) provided equivalent or higher yield and 30–50% lower irrigation water use than those of farmer-managed puddled transplanted rice (CT-TPR). Similarly Hobbs and Gupta (2003) showed water savings of 30% due to the adoption of zero tillage in rice-wheat systems. Humphreys et al (2005) showed a 20% to 35% savings in irrigation water under zero tilled wheat compared to conventionally till in the rice-wheat belt of the Indo-Gangetic plains. Permanent raised beds demonstrated 13%, 36% and 50% higher grain yield, water saving and water productivity, respectively, for the wheat crop at Garden city, Kan (Hassan et al., 2005).

IV CONCLUSION

The major aim of this study was to evaluate the impacts of promising conservation agricultural practices on crop and water productivity and finding alternate cropping systems to replace rice-wheat system in the western IGP. Results indicated that permanent beds with residue addition (PBB + R plots) had a gain in the mean (of last two years) all wheat based cropping system in cotton and pigeon pea except maize, where in maize flat sown with zero tillage and residue reflected higher yield and water productivity. Among rice-wheat cropping system zero tillage with residue gave highest yield and water productivity. Thus, these results are of tremendous importance in terms of identification of a suitable sustainable management practice under a non-rice based cropping system and are very novel in the South Asia and showed the importance of conservation agriculture for saving the irrigation water.

V ACKNOWLEDGEMENT

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Table 1
Treatment details and plot design

Treatments	Treatment notations	Treatment description							
		Cotton, pigeonpea, Maize				Wheat			
		Tillage practice	Bed type	Residue retention	Row to row spacing; distance of the first row from the furrow (cm)	Tillage practice	Bed type	Residue retention	Row to row spacing; distance of the first row from the furrow (cm)
CT-Flat bed	CT-F	Conventional tillage	Flat beds	No	70	Conventional tillage	Flat beds	No	22.5
ZT-Narrow bed	ZT-NB	Zero tillage	Narrow bed (40 cm bed and 30 cm furrow)	No	70; 20	Zero tillage	Narrow bed (40 cm bed and 30 cm furrow)	No	13.0; 7.0
ZT-Narrow bed + residue	ZT-NB+R	Zero tillage	Narrow bed (40 cm bed and 30 cm furrow)	Yes; about 30% wheat residue	70; 20	Zero tillage	Narrow bed (40 cm bed and 30 cm furrow)	Yes; about 20% cotton residue	13.0; 7.0
ZT-Broad bed	ZT-BB	Zero tillage	Broad bed (100 cm bed and 40 cm furrow)	No	70; 15	Zero tillage	Broad bed (100 cm bed and 40 cm furrow)	No	21.5; 7.0
ZT-Broad bed + residue	ZT-BB+R	Zero tillage	Broad bed (100 cm bed and 40 cm furrow)	Yes; about 30% wheat residue	70; 15	Zero tillage	Broad bed (100 cm bed and 40 cm furrow)	Yes; about 20% cotton residue	21.5; 7.0
*ZT- Flat bed+residue	ZT-F+R	Zero tillage	Flat beds	Yes; about 30% wheat residue	70	Zero tillage	Flat beds	Yes; about 20% cotton residue	22.5
*ZT- Flat bed	ZT-F	Zero tillage	Flat beds	No	70	Zero tillage	Flat beds	No	22.5

*Introduced from the second year of the experiment.

Table 2
Impacts of tillage and residue management on water productivity (kg wheat grain/ha.mm) under the Rice-wheat system

Treatment	Mean of two years	
	Total water applied in the system (mm)	System water productivity (kg wheat grain/ha.mm)
DSR-ZTW	1592.34	6.26
DSR-ZTW+BM	1563.84	6.65
DSR-ZTW+RR	1558.34	6.41
DSR-ZTW-BM+RR	1545.34	6.82
DSR-ZTW-MR	1734.34	7.04
DSR-ZTW-MR+RR	1657.34	7.96
TPR-ZTW	2286.54	3.99
TPR-CTW	2279.54	3.99

Note: DSR- Dry seeded rice, ZTW- zero tillage with wheat, BM- brown manuring, RR- rice residue, MR- moogbean residue, CTW- conventional transplanted with wheat

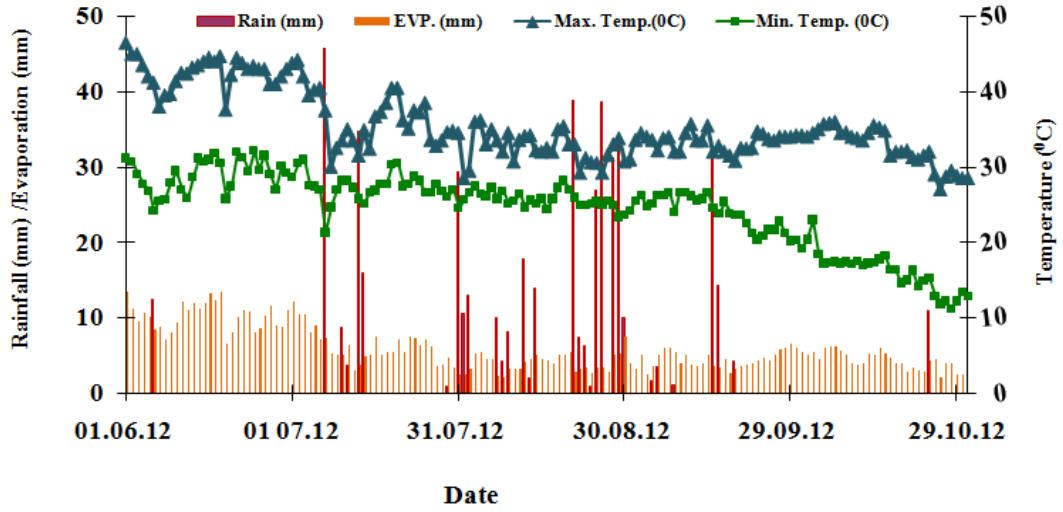
Table 3
Impacts of tillage, bed planting and residue management practices on water productivity (kg wheat grain/ha.mm) (mean of two years) under the different CA systems

Treatments	Cotton-wheat		Pigeon pea-wheat		Maize-wheat	
	Total water applied in the system (mm)	System water productivity	Total water applied in the system (mm)	System water productivity	Total water applied in the system (mm)	System water productivity
CT-F	1374	8.52	1153	8.17	1035	7.60
ZT-NB	1253	10.33	1080	8.86	940	8.16
ZT-NB+R	1232	11.24	1055	9.52	933	8.84
ZT-BB	1210	10.96	1027	9.73	913	8.96
ZT-BB+R	1176	12.58	1002	10.47	894	9.83
ZT-F+R	1280	11.14	1071	9.74	958	9.26
ZT-F	1349	10.13	1100	8.75	1029	8.13

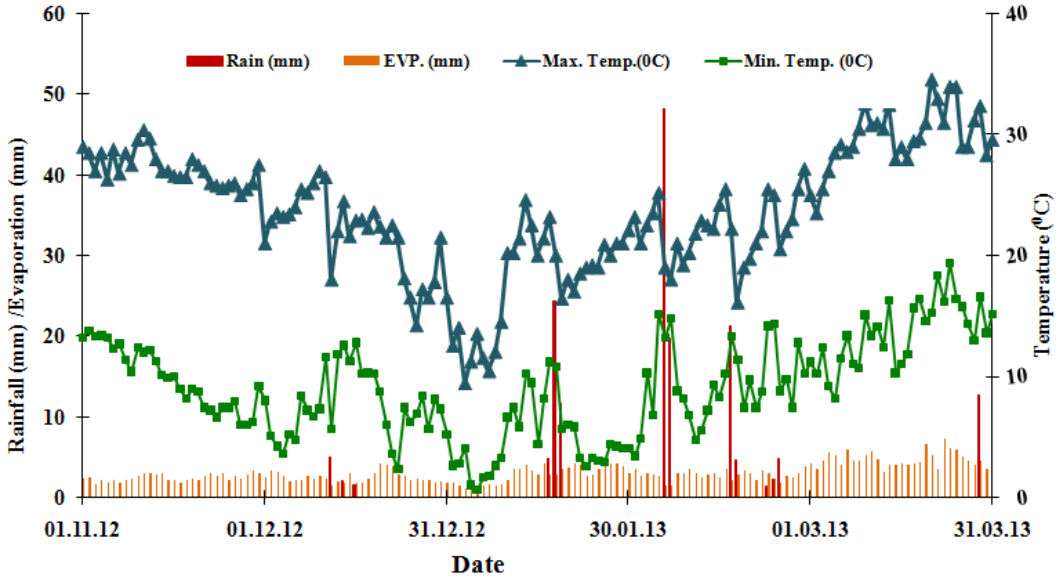
Table 4
Comparison of water savings under different cropping system in conservation agriculture (mean of 2011-12 and 2012-13)

Cropping system	Best Technology	% irrigation water saving	% total water saving	% increase SWP
Cotton-wheat	ZT+ Broad bed with residue	66.08	54.09	170.68
Pigeon pea -wheat	ZT+ Broad bed with residue	68.80	56.52	169.33
Maize-wheat	Flat zero tillage with residue	67.36	58.44	138.41

DSR-wheat	MBR-DSR-ZTW+RR+SMB)-wheat	43.61	35.18	90.81
TPR-wheat		-	-	-



(a)



(b)

Fig.1 Daily meteorological data of (a) *kharif* (1/06/12 to 31/10/12) and (b) *rabi* seasons (1/11/12 to 31/03/13)

Wearable Electro-Textile Microstrip Patch Antenna with Tuning Holes

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ABSTRACT
We investigate the possibilities and properties of the applications of wearable electro-textile antenna by using of Minkowski fractal geometry with tuning holes for the miniaturization of Microstrip patch antenna and compare its performance with those of the usual fractals such as Minkowski fractal geometry without tuning holes. As a result the antenna Miniaturization, maintenance of its gain and increase of its relative frequency bandwidth are achieved Antenna are designs for WLAN application Antenna structure is designed at a height 2.85mm from the ground plane by using Computer Simulation Technology (CST) software. The operating frequency of the design antenna is 2.45 GHz. Antenna simulation results are carried out over the frequency range of 1 GHz to 6 GHz for Flectron antenna under investigation. The simulation result reveal that the Flectron wearable antenna operating frequency of 2.538GHz, 2.395GHz, 2.351GHz and 2.340Ghz for zeroth,1st ,2nd and proposed iteration respectively. Corresponding -10dB return loss bandwidths are 115MHz, 109MHz, 104MHz and 82 MHz respectively. This involve that antenna operating frequency has been reduced considerably with each successive iteration without changing the overall antenna dimensions and thereby miniaturization is achieved. In its first and second iteration antenna designed are optimize and tuned to WIPRO band and in the proposed tuning hole iteration antenna are further miniaturized and can use for multiband frequency in order to make them suitable for GSM 1900 application.

Keywords: Fractal Antenna, Antenna Tuning.

I INTRODUCTION

In the essential outline these antennas are proposed for WLAN applications and hence specifically tuned by tuning holes designed over the patch. With the help of tuning holes we provides multilevel frequency for is different application. The patch antenna with tuning holes gives an augment of impedance bandwidth though the change in material offers and addition of an impedance bandwidth by is appropriate holes.

Dissimilar iterations are also considered to make them suitable for GSM 1900 applications. In this analysis the performance and limitations of these designs in accordance with their separate operating environment are also compared. Antenna properties such as minimized Size simple creation mechanical adaptability and ease are crucial necessities to plan antennas for wearable applications. The idea of creating reduced antennas by applying scaling down procedure utilizing fractal geometry was already proven technique. The fractal parts produce "fractal loading" and permit the formation of smaller sized antennas for a given frequency of operation. Normally 50-75 percent shrinkage is achievable by utilizing a fractal configuration while maintaining the performance.

II FRACTAL LOOPS

Loop antennas are well understood and have been studied using a variety of Euclidean geometry. They have dissimilar limitations however. Two probable fractals fed as Loop antennas are illustrated in Fig.1

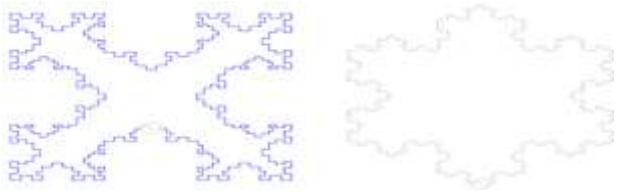


Fig 1: Two possible fractal loop antennas

Fractals loops have the characteristic that the boundary increases to infinity while maintaining the volume in use.

This increase in length and decreases the essential volume in use for the antenna at resonance. For a miniature loop this increase in length progress the input resistance. Microstip patch antenna can be more easily matched to a feeding transmission line by raising the input resistance

III FRACTAL GEOMETRIES

These geometries were in general not needed as unshaped but Mandelbrot discovered that certain special features can be related with them. Several naturally happening phenomena such as lightning are better analyzed with the give support to fractals antenna. One important material goods of all these fractals antenna is indeed their irregular nature. Some examples of fractals are given in Fig.2. So many geometries are infinitely sub-divisible with each separation a copy of the parent. This particular nature of these geometries has led to several exciting features exceptional with Euclidean geometry.

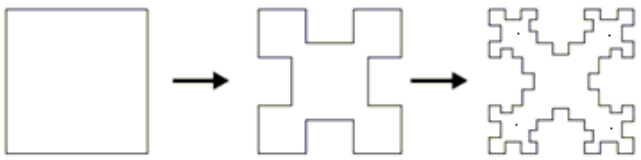


Fig 2: Minkowski Fractal Geometry

IV DESIGN PROCEDURE

In the characteristic design procedure of the Microstrip patch antenna the desired resonant frequency thickness and dielectric constant of the substrate are known or selected originally. In this design of rectangular Microstrip antenna, Flectron dielectric material (ε_r=1.44) with dielectric loss tangent of 0.02 is selected as the substrate with 2.85mm height. Then a microstrip patch antenna that operates at the specified operating frequency f_0 = 2.4 GHz can be designed by the following steps using transmission line model equations. The antenna is existed by the INSET feed away from the center of the patch.

Steps required for calculating width (W) and Length (L) of microstrip antenna

- ✓ Step 1. Initially, select the desired resonant frequency, thickness and dielectric Constant of the substrate.
- ✓ Step 2. Obtain Width (W) of the patch by inserting ε_r and λ_0.
- ✓ Step 3.Obtain Length (L) of the patch after determining ΔL and ε_r.

For the design of a rectangular Microstrip Patch Antenna the three important parameters given bellow.

Basic parameters for design of fractal antenna are given by:

Table1:
Propose Design parameters

Sr.No	Geometry parameter	Value
1	Operating frequency	2.45 GHz
2	Relative dielectric constant	1.44
3	Loss tangen δ	0.02
4	Substrate thickness(h)	2.85mm

(a) Calculation of the width W of antenna which is given by:

$$W = \frac{c}{2f_0\sqrt{\frac{(\varepsilon_r+1)}{2}}}$$

(b) Calculation of Effective dielectric constant (ε_{reff}): The effective dielectric constant is:

$$\varepsilon_{reff} = \frac{\varepsilon_r+1}{2} + \frac{\varepsilon_r-1}{2}\left[\frac{1}{\sqrt{[1+12\frac{h}{W}]}}\right]$$

(c) Calculation of the effective length Leff which is given by:

$$L_{eff} = \frac{C}{2f_0\sqrt{\varepsilon_{reff}}}$$

(d) Calculation of the length extension ΔL which is given by:

$$\Delta L = 0.412*1.58\left[\frac{(\varepsilon_{reff}+0.3)(\frac{W}{h}+0.264)}{(\varepsilon_{reff}-0.258)(\frac{W}{h}+0.8)}\right]$$

(e) Calculation of the effective length extension of patch L which is given by:

$$L = L_{eff} - 2\,\Delta L$$

(f) Calculation of the ground plane dimensions (L_g and W_g):

V ANTENNA STRUCTURE

To design started with, rectangular shape of size 38mm X 48.4mm X 0.1524 mm (Flectron) with Indentation factor of 0.5 and iterated for the 2 times over the substrate of dimension 120 mm X 120 mm X 2.85 mm and with same size of ground plane however the material and thickness of the ground plane are same as of patch. Now the formed antenna tructure is fed by an aperture using microstrip line. The microstrip feeder line dimensions are taken for 50ohm characteristic impedance.

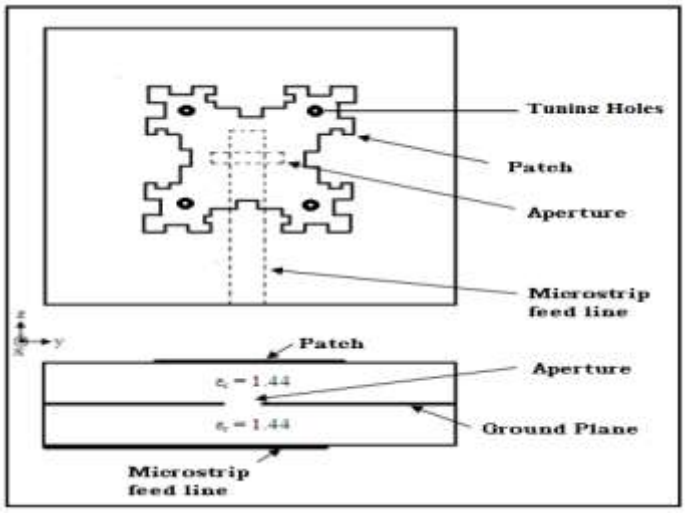


Fig 3: Structure of antenna with tuning holes

VI PERFORMANCE CHARACTERISTICS

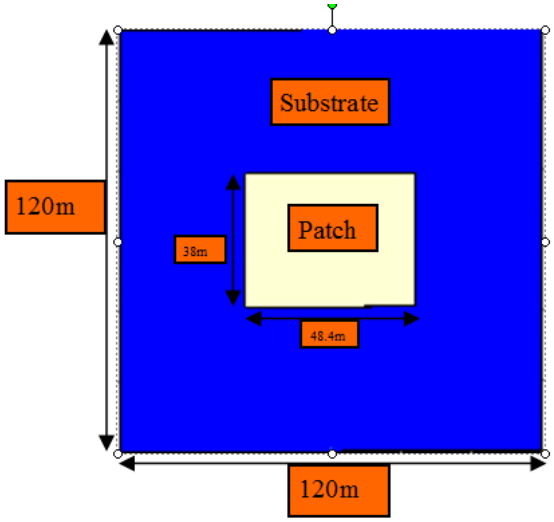


Fig 4: 0th Iteration design of Minkowski fractal geometry

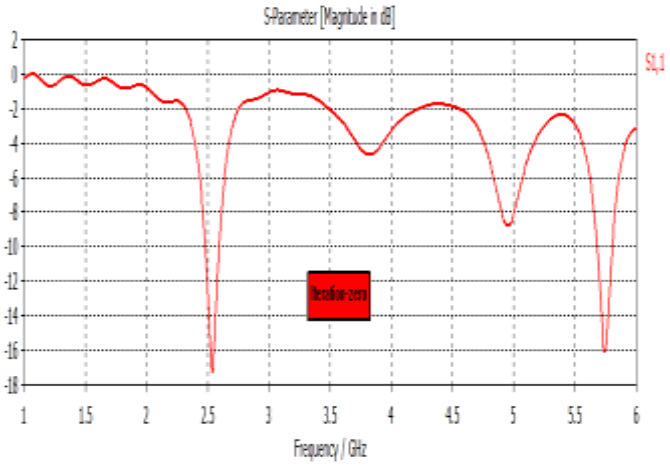
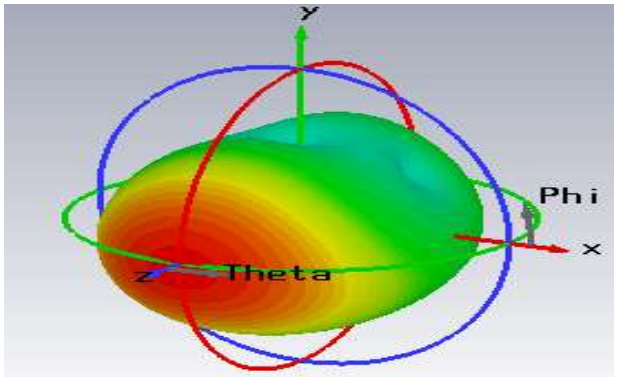
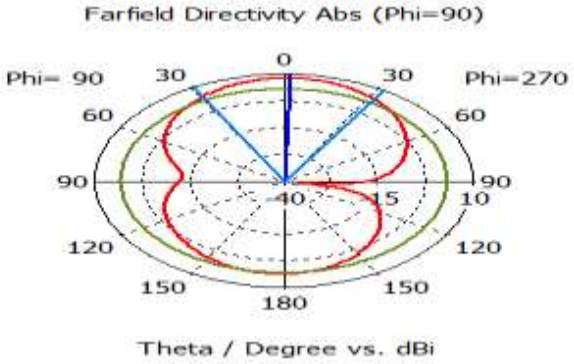


Fig 5: 0th Iteration S11-Parameter at of Minkowski Fractal geometry



Type	Farfield
Approximation	enabled (kR >> 1)
Monitor	farfield (f=2.4) [1]
Component	Abs
Output	Directivity
Frequency	2.4
Rad. effic.	-0.7436 dB
Tot. effic.	-2.914 dB
Dir.	7.802 dBi

Fig 6: 0th Iteration Radiation patterns of antenna



Frequency = 2.4
Main lobe magnitude = 7.81 dBi
Main lobe direction = 2.0 deg.
Angular width (3 dB) = 60.4 deg.
Side lobe level = -4.7 dB

Fig 7: Farfield Directivity polar result of Radiation Pattern at 0th iteration of Minkowski fractal geometry.

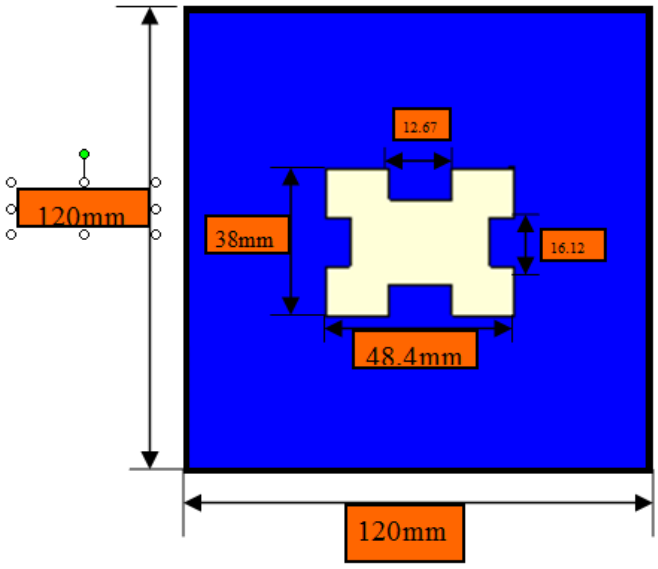


Fig 8: 1st Iteration design of Minkowski fractal geometry

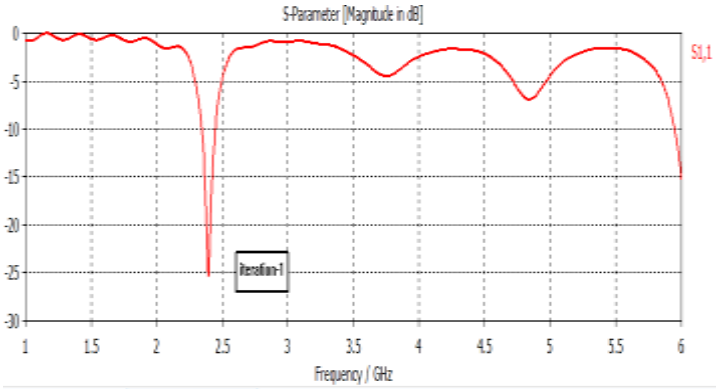
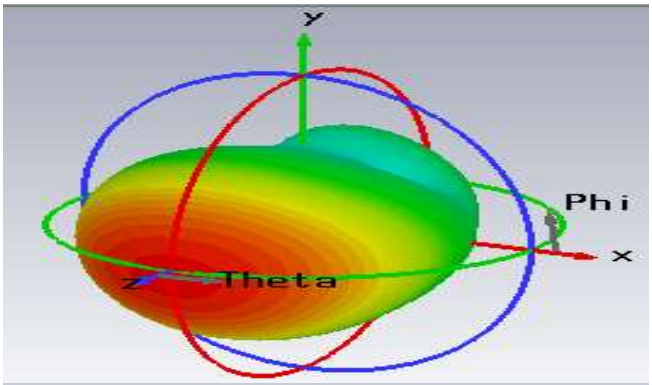


Fig 9: S11-Parameter at 1st iteration of Minkowski fractal geometry



Type	Farfield
Approximation	enabled (kR >> 1)
Monitor	farfield (f=2.4) [1]
Component	Abs
Output	Directivity
Frequency	2.4
Rad. effic.	-1.417 dB
Tot. effic.	-1.437 dB
Dir.	8.475 dBi

Fig 10: 1st Iteration Radiation patterns of antenna

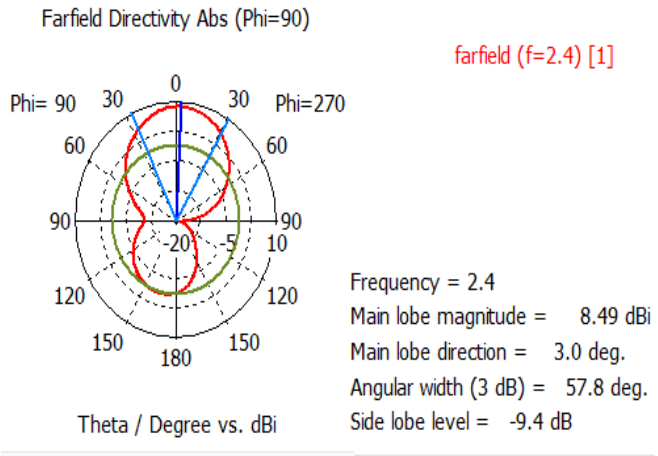


Fig 11: Farfield Directivity polar result of Radiation Pattern at 1st iteration of Minkowski fractal geometry.

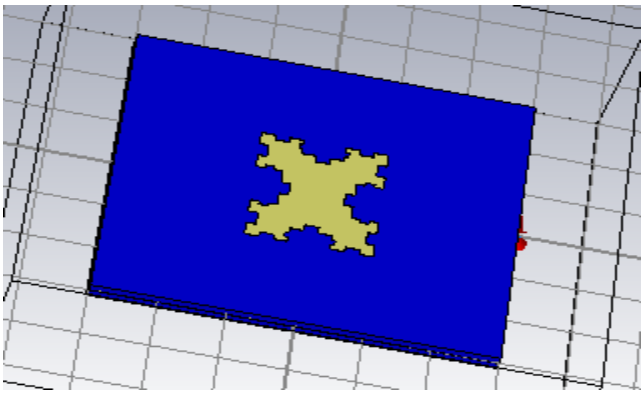


Fig 12: 2nd Iteration design of Minkowski fractal geometry

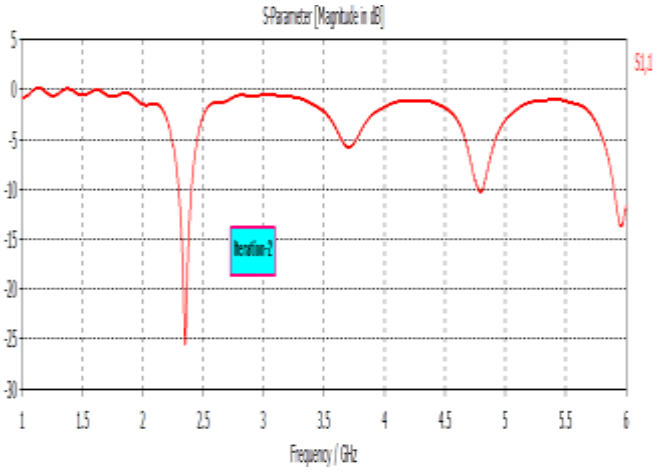
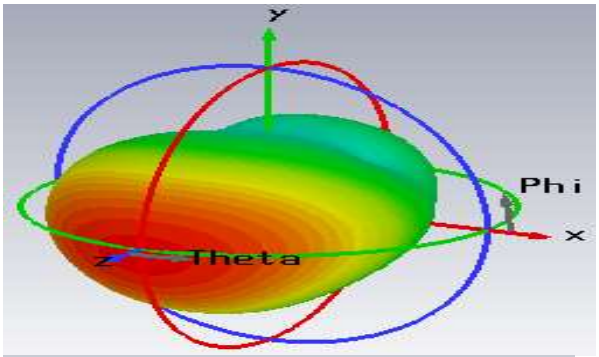


Fig 13: S11-Parameter at 2nd iteration of Minkowski fractal geometry



Type	Farfield
Approximation	enabled (kR >> 1)
Monitor	farfield (f=2.4) [1]
Component	Abs
Output	Directivity
Frequency	2.4
Rad. effic.	-1.357 dB
Tot. effic.	-1.780 dB
Dir.	8.346 dBi

Fig 14: Radiation patterns of 2nd Iteration antenna

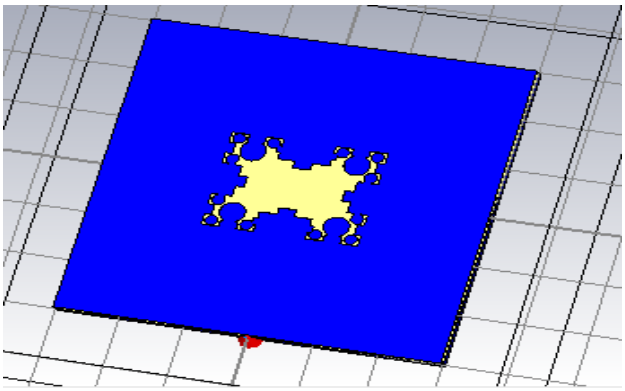


Fig 15: Proposed iteration design of Minkowski fractal geometry.

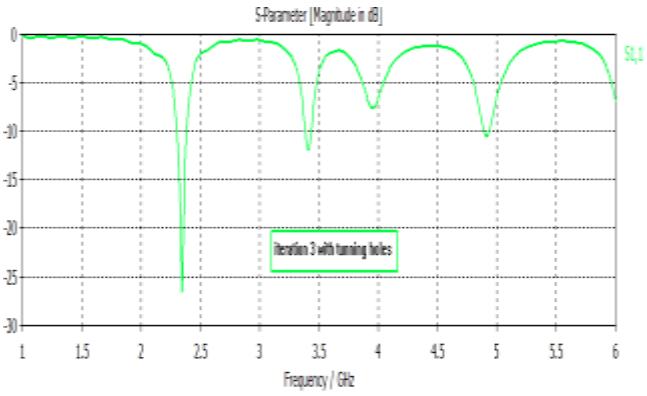


Fig 16: S11-Parameter at Proposed iteration of kowski fractal geometry

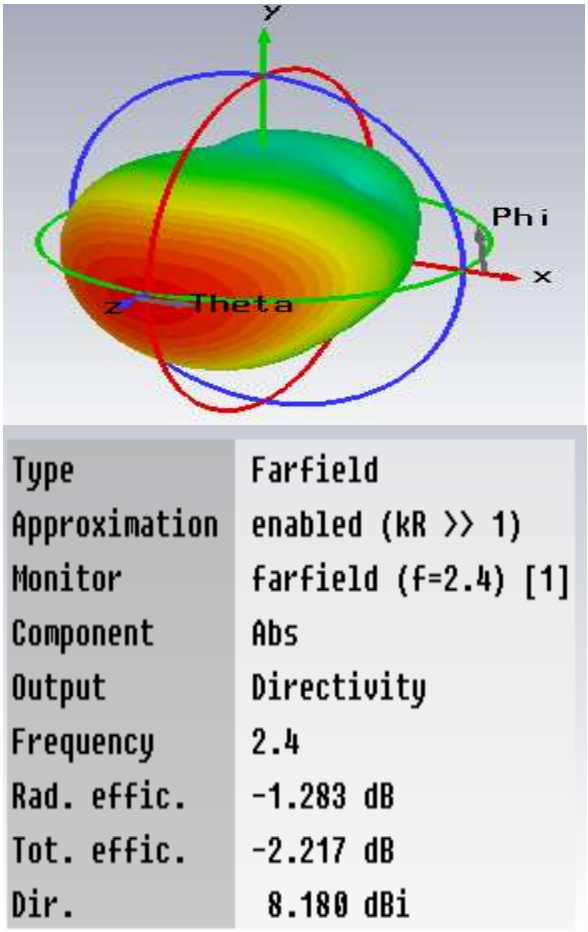


Fig17: Radiation patterns of proposed antenna

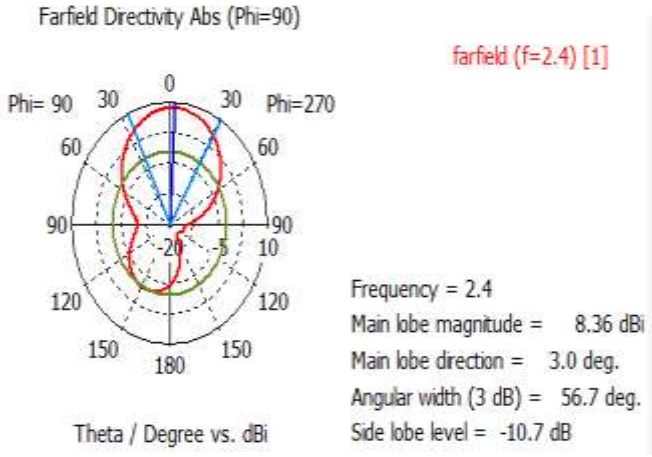


Fig 18: Return loss characteristic of proposed antenna for all iterations.

VII COMPARISON OF PROPOSED ANTENNA RESULT.

Here we provide a comparison of zelt antenna result and Flectron antenna result with different iterations.

Table 2:
Comparison of Proposed Antenna Result

Parameters	Zelt-Iteration No.			Flectron –Iteration No			
	0^{th}	1^{st}	2^{nd}	0^{th}	1^{st}	2^{nd}	pro-posed
Directivity (dBi)	8.6	8.4	7.7	7.81	8.46	8.33	8.15
Efficiency (%)	76.0	72.1	45.6	51	71	66	60
3 dB beam width (E)	73^0	75.1^0	76.2^0	94.7^0	44.8^0	85.4^0	102.2^0

VIII CONCLUSION

In this paper a wearable electro-textile patch antenna is designed by using Minkowski fractal geometries with tuning hole for 0th, 1st and 2nd iterations. In the 1st and 2nd iterations the fractal geometry parameters are fine tuned for WIBRO and GSM 1900 bands. The proposed antenna show a significant size reduction compared to the conventional microstrip patch antenna. The size of antenna is reduced to 20.212% at second iteration from the conventional patch. A conventional rectangular microstirp patch antenna has been successfully designed having a central frequency of 2.44 GHz. The results shows that the designed antenna provides gives good performance characteristics in all the three frequency bands and the tuning hole could be used to fine tune the antenna without increasing the complexity and compromising the rigidness of structure. Hence, the designed antenna is compact enough to be placed in typical wireless devices.

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