



ELECTRICAL

INSTALLATION ENGINEER

NEWS LETTER

TAMILNADU ELECTRICAL INSTALLATION ENGINEERS' ASSOCIATION 'A' GRADE (Regn. No. 211/1992)

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EVENTS

5th-6th December 2013, Malaysia

Asia-Pacific Nuclear Energy Congress 2013



Asia-Pacific's Premier Nuclear Energy Congress: Clean and Safe Nuclear Energy Promotes Economic Prosperity!

Event Profile: ANEC 2013 focuses global Emerging Nuclear Market, such as Vietnam, Indonesia, Malaysia, Thailand, Philippines, India, Turkey and Pakistan nuclear energy markets. Malaysia Radiation Protection Association (MARPA) has been ANEC's endorser

Date: 5th – 6th December 2013

Venue: Kuala Lumpur, Malaysia

Website: <http://www.cdmc.org.cn/2013/anec>



11TH INTERNATIONAL EXHIBITION OF ELECTRICAL AND INDUSTRIAL ELECTRONICS INDUSTRY

ELECRAMA-2014

8-12 JANUARY 2014, BIEC, BANGALORE, INDIA

Event Profile: ELECRAMA-2014 shall be one of the world's largest electrical and industrial electronics exhibition. To experience and preview Electrical Power Transmission and Distribution equipments from 220V to 1200kV, participate in seminars, conferences and discuss future technologies. Delegates comprising of states people, senior utility executives and business people from various nations came together to explore opportunities on many fronts.

Date : 8th – 12th January 2014

Venue: Bangalore International Exhibition Centre (BIEC), Tumkur Road, Bangalore, India

Website: <http://www.elecrama.com/>

WORLD FUTURE ENERGY SUMMIT

20 - 22 JANUARY 2014

ABU DHABI NATIONAL EXHIBITION CENTRE

Event Profile: The World Future Energy Summit (WFES) 2014 will bring together global leaders in policy, technology and business to discuss the state of the art, develop new ways of thinking and shape the future of renewable energy.

Date : 20th – 22nd January 2014

Time : 10:00 AM - 06:00 PM

Venue: Abu Dhabi National Exhibition Company - Abu Dhabi

Website: <http://www.worldfutureenergy.com>



MIDDLE EAST
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Event Profile: Middle East Electricity is the largest meeting place for energy industry professionals from over 100 countries worldwide

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Date & Time: 11th – 13th February 2014

Venue: Dubai International Exhibition Centre

Website: <http://www.middleeastelectricity.com/>

Event Profile: MATELEC EIBT China 2013 has gained herself a strong market position for the future. Based on the enormous industry resources and professional international organization experience, MATELEC EIBT China 2014 will build the most efficient trading platform for 400 exhibitors and 12,000 visitors with 12,000 m² show space.

Date: 25th – 27th March 2014

Venue: No.77, Xing Yi Road, INTEX, Shanghai

Website: www.matelecchina.com



EDITORIAL

Dear Members, Fellow Professionals and Friends

Seasons Greetings To One And All!

"Happy Deepavali And Festival Of Lights"

Both Deepavali and Navarathri Festivals signify the Celebrations with Light. The Invention of Electricity and the Electric Lights have really signaled the advancements in Civilization. The Evolution of Lighting from Incandescent Lamps to Fluorescent Tubes to CFL to present technologies of LED and Induction Lighting are all amazing with increase in efficiencies at all stages.

We just remembered Sardar Patel and Indira Gandhi on the last two days of October and we will be celebrating the memories of Pandit Nehru during November. The contributions of all these three Great Personalities in building a United, Economically Powerful and Strong India are very substantial. Though there are enough and more of problems like any Nation of the world, we can rightly feel proud about the growth over the decades, in Industrial Production, Agriculture and Service Sectors, all contributing to galloping GDP Growth. The Organized growth Planned initially through 'Five Year Plans' for growth of Industries and Agriculture and later initiatives for Defense Productions, Atomic Energy, Space Research and so on are all highly commendable and have all been responsible for all Growth and Pride.

The Growth of Electricity Generation has increased substantially to more than 22 Lakh MW of installed capacity and Generation of over 800 Billion Units per annum, but shortages are always there due to galloping demands. **As Engineering and Technology Professionals, we need to realize that the levels of Efficiencies are still poor in all sectors of Economy and in all forms of use of Energy. It is found that India spends almost 3 times (3X) of Energy, as against the best of the world per unit production of GDP which is the reflection of poor efficiency. Government, through its Bureau of Energy Efficiency (BEE) is vigorously addressing this area and we professionals have a lot to contribute.**

Present debates about Indian Economics and the Indian Currency remaining weak point to one important remedial measure of cutting down on Imports to improve the Balance of Trade. A closer analysis will show that 'Oil' Imports forms the major chunk, which is also increasing steadily. Is there a way out? The answer seems to be 'Yes' with advancements of Technologies with First Generation Fuels of Bio Diesel, Ethanol, Bio CNG etc., Second Generation Fuels of Bio Crude from Biomass and the Third Generation Fuels from Algae etc. India has opportunities to develop and adopt these Technologies with its huge potentials of Renewable Energy Sources which can not only help save our Economy but also contribute to ease Global Environmental Concerns.

We thank all those members who have helped us by participating in the advertisements appearing for the issue October 2013 – Universal Earthing Systems Pvt. Ltd., Abirami Electricals, Power Links, Prolite Autoglo Ltd., Cape Electric Pvt. Ltd., Wilson Power and Distribution Technologies Pvt. Ltd., Hensel Electric India Pvt. Ltd., Pentagon Switchgear Pvt. Ltd., OBO Bettermann India Pvt. Ltd., Electrotherm (India) Ltd., V-Guard Industries Ltd., Galaxy Earthing Electrodes Pvt. Ltd., Ashlok Safe Earthing Electrode Ltd.

EDITOR

LETTER TO EDITOR

Sir,

I acknowledge the receipt of September and October 2013 issues of **Electrical Installation Engineer News Letter** and also thank for your kind response for sending this useful News Letter.

The information found in the above News Letter is very useful to the visitors of this centre's Library. Hence, I request that kindly be sent the above publications regularly on **free subscription basis to our office.**

I request your kind co-operation and do the needful in this regard.

Tmt. D.N. Uma,

Assistant Director (E & E)

Data Bank and Information Centre for Electrical & Electronic Industries,

Department of Industries & Commerce,

Government of Tamilnadu,

Chennai - 600 041.

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338. Meenakshi Electrical Services (2010-12)
339. A.K. Engineering Services (2013-14), *New Member*
340. Volt Amps Consultancy (2013-14), *New Member*
341. Electrotech Engineers (2010-14)
342. Nataraja Electricals (2012-14)

We request other members also to send their contribution for NEWSLETTER early.

(Please help us to serve you better)

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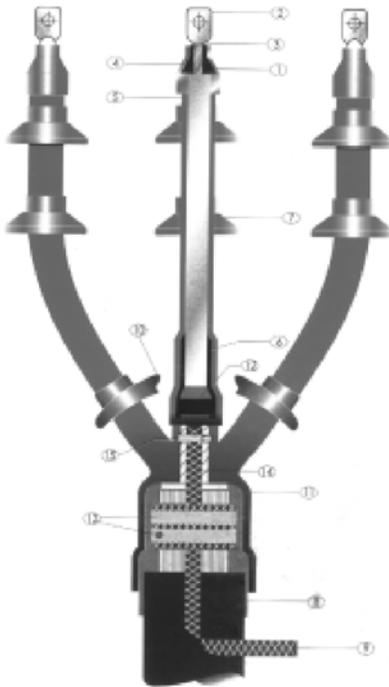
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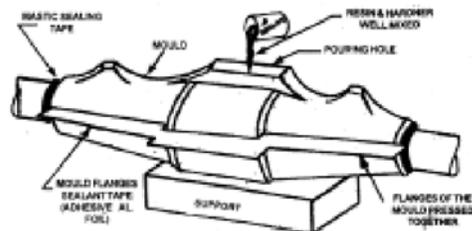
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8.3 Let us continue our journey further.

The equipment monitoring packages are installed in the control cabinet of each SF₆ circuit breaker. The devices are installed either on a wall panel or floor mount bracket depending the availability of space in the breaker-control cabinet. As already described, the monitoring unit consists of a microprocessors and sensors. The sensors collect and bring the required breaker information to the microprocessor through pluggable connections. Once the wiring and installations are completed, the required parameters are set. These parameters are multi-staged. *They define the normal operation range and also prescribe the caution and problem limits. Alarm circuits give signals when the preset conditions like coil energisation time, reaction time, contact speed, mechanism times, interrupter travel time, SF₆ pressure and temperature, and interrupter wear increment levels exceed or reach the caution/problem limit/tolerance levels. During data collection, the monitoring device shows the present condition and the distance or gap that exists between the present level and the alarm limits. Thus it shows the exact operating status or level of the equipment, when it is exposed to the vagaries of the operating conditions.*

8.4 The Asset Optimization software packages currently in use monitor customer Assets regardless of type, and also furnish the required information in one seamless interface which gives a complete view of each circuit breakers health and operating history. It also furnishes all the information connected with the installation, operation and maintenance of equipment like circuit breaker. Among the information brought by this interface are, *Documentation, Operation of alarms, Events faced by the equipment, Real-time picture [Camera feed] of (the prevailing) operating condition, Weather conditions, Maintenance/ repairs carried out.*

Thus it helps to achieve cost savings, and optimization of equipment operation as well. It also makes it possible to have root-cause analysis, problem diagnosis and corrective recommendations. We can also identify whether the changes that occur are sudden or gradual. It also permits the system operator to prioritize and troubleshoot/solve all equipment problems experienced within the substation.

8.5 Reliability studies on the breakers normally point out that most of the breaker failures occur in the main insulation to earth, followed by the problems in the compressors, pumps, operating mechanisms, control elements and the interrupting units. As the monitoring device thus described focuses on all of these areas, increased reliability is possible. It results in reduced maintenance expenditure and other related works.

8.6 *Though it may seem as a repetition, a relook at the journey we have made so far and the information collected on its way will help to have a recollection of the topic in focus. Asset monitoring system plays a significant role in Asset Management. This wireless monitoring system brings into attention the various merits of proactive maintenance and the drawbacks of other maintenance schemes like preventive maintenance and reactive maintenance. The issues/problems faced by the power system equipment, especially the circuit breakers are clearly portrayed by it. This step helps to reduce the breaker outage and repair time, enhances the reliability of the system, decreases maintenance cost and increases the utilization of the available operation and maintenance resources in full. As far as SF₆ breakers are concerned it mainly monitors*

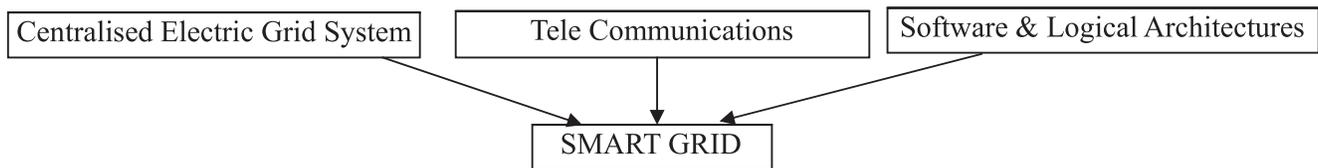
- *Changes in the operating time/speed of the operating mechanism*
- *Interrupter wear*
- *Changes in contact travel and surface of the contacts.*
- *SF₆ gas integrity and its leakage rate. If possible its moisture level and density.*
- *Mechanical integrity of the entire Circuit Breaker.*
- *Trip/ Close conditions*
- *Health status of mechanism charging system and control box heating system.*
- *It furnishes the health and history of each breaker in the substation and also the comparison of its performance with the other breakers in the substation.*

9 **Presently, we are finding the word “SMART” everywhere!** We have Smart phone, Smart protection against mosquitoes, Smart Camera, Smart Computer and Smart Electricity Grid. Now let us peep into the world of “SMART ELECTRICITY GRID”. So our next topic relates to an “overview of the Smart Electricity grid” system. At present Renewable energy sources play a significant role in meeting the demand of electrical energy. Private agencies, in addition to government companies, have a part in it. Thus it becomes necessary to keep the centralized electrical grid system in step with these new developments. That is meeting the needs of both conventional and non-conventional energy producers. This necessity forms the main basis for the development of Smart Electricity grid and its allies like Smart Grid Communication and Smart metering system. It results in a

journey to explore and unlock values from the present centralised electric grid systems. The systems with which the Smart Electricity Grid has close relationships include

- Integration of renewable energy systems with the conventional fossil fuel energy systems
- Distribution management system
- VAR/Voltage management and its Optimization
- Outage management systems
- Distribution Automation
- Infrastructures required for electrical vehicles
- Electric Meter data Management
- Automatic metering infrastructure

The main goal of Smart Electricity grid technology is to keep the needs, comforts and benefits of the consumers (End Users) in view and to ensure them a stable and quality power supply from all available energy sources that include Renewable and Non-Renewable energy sources. In the process of forming the Smart Electricity Grid, the key aspects of presently available centralized, Electric Grid Systems, Metering systems, Telecommunications and Software and Logical Architectures are blended together.



Let me stop here.

(To be continued)

V. Sankaranarayanan B.E., FIE, Former Addl. Chief Engineer/TNEB
E-mail: vsn_4617@rediffmail.com; Mobile:98402 07703

NATIONAL OFFSHORE WIND ENERGY AUTHORITY TO BE FORMED IN INDIA UNDER MNRE

A National offshore wind energy authority is to be formed in India which is set to make offshore wind power a reality in the BRIC country. Under the aegis of India's Ministry of New and Renewable Energy (MNRE), the National Offshore Wind Energy Authority, or NOWA, will be constituted to act as the nodal agency for offshore wind projects in the BRIC country.

The National Offshore Wind Energy Authority will carry out resource assessment and surveys in the Exclusive Economic Zones (EEZ) of India and simultaneously enter into contract with project developers to build offshore wind power projects in territorial waters of 12 nautical miles.

Renewable Energy Technology first reported on progress on being made to the start of India's offshore wind sector in May 2012, with news that the BRIC country's **first offshore wind farm** could be approved. However, developments went quiet until now.

Committed to offshore wind

The Ministry said the National Offshore Wind Energy Authority will be the single window agency and will coordinate with concerned Ministries/Departments for necessary clearances. However, Shri Ratan P. Watal, MNRE secretary, said NOWA will only act as a facilitator for getting clearance for offshore wind power projects and application for clearance will be dealt in entirety by the concerned Ministry/Department.

Shri Watal added the Government of India is "committed to provide a conducive environment for harnessing offshore wind energy in the country."

A study by Scottish Development International in January 2012 indicated the potential to establish around 1GW capacity of each wind farm along the Indian coastline of Rameshwaram and Kanyakumari in Tamil Nadu. India is estimated to have 350GW of offshore wind energy capacity in total.

The ministries/departments which will be involved in the process of granting clearances for offshore wind farm projects in India include the Ministry of Defence, Ministry of Civil Aviation and the Ministry of Home Affairs.

***The activist is not the man who says the river is dirty.
The activist is the man who cleans up the river. - ROSS PEROT***



EXTENDING TRANSFORMER LIFE BY TAKING CORRECTIVE MEASURES BASED ON OIL ANALYSIS

Introduction

Transformer is one of the critical equipment used in power generation, transmission and distribution. It is considered as a critical equipment because 1) Premature failure halts the production for indefinite period. 2) Cannot be procured immediately as it takes longest time to manufacture. 3) Cannot be kept as ready spare as it blocks huge amount of working capital.

The standard life of a transformer is 35 years. But there is a possibility of failure of transformer within 10 to 15 years of service mainly due to 1) Improper Installation and Commissioning. 2) Improper protection coordination 3) Not taking corrective action based on the periodical oil test report. 4) Frequent exposure of core and coil to the atmosphere for internal inspection / attending leaks etc. 5) Keeping transformer idle for longer time.

The life of any transformer is the life of its insulation. There are two types of insulations - liquid insulation (Oil) which is replaceable and solid insulation (Paper) which is non replaceable. Hence, solid insulation is the most critical component of any transformer since it decides the life of any transformer.

The deterioration of solid insulation may take place mainly due to Chemical degradation, Thermal degradations, and Electrical stress. All the degradation process takes up very slowly and it is reflected in the transformer oil. Hence periodical oil test and taking corrective action based on the oil test report is essential for enhancing the life of any oil filled transformer.

The purpose of the article is to discuss the inference of the oil test report so that corrective action can be taken up in time for enhancing the life of oil filled transformers.

Transformer oil

The basic function of transformer Oil is 1) To act as a coolant. 2) To act as insulation. 3) To protect paper from chemical attack. 4) To prevent building up of sludge 5) To be used as Diagnostic Tool.

Table I: Transformer oil test schedule

Test Parameters	Test Method	Ref Standard
Interfacial Tension	Ring Method	IS: 6104-1971
Flash Point	Pensky Martens	IS: 1448 (P-21)-1992
Neutralization Value (Acidity)	Chemical Test	IS: 1448 (P-2)-1967
Di-Electric Strength (BDV)	Electrode Type	IS: 6972-1992
Specific Resistance (Resistivity)	3 Terminal Cell	IS: 6103-1971
Moisture (Water) Content	Karl Fischer Titration	IS: 13567-92
Di-Electric Dissipation (Tan δ)	3 Terminal Cell	IS: 6262-1971
Sludge Content	Chemical Test	IS: 1866 annex-A
Dissolved Gas Analysis (DGA)	Gas Chromatograph	IS: 10593 & IS: 9434-1992

For achieving these functions, the physical, chemical and electrical properties of the oil must be within the range as specified in relevant standard.

Due to continuous service, oil properties gets deteriorated slowly with time as an effect of exposure to different operating and climatic condition. This change in oil properties can be traced when oil test shown in the table I is

conducted periodically. Other than these normal tests, special tests like Furan Analysis of oil and DP test of paper are also conducted, as and when required to know the residual life of transformer (Solid insulation) indirectly and directly.

Hence transformer oil is tested mainly for knowing - I. Aging status, II. Dielectric Status, III. Internal status (Table II)

Table II: Logical sequence for conducting various tests and their inference

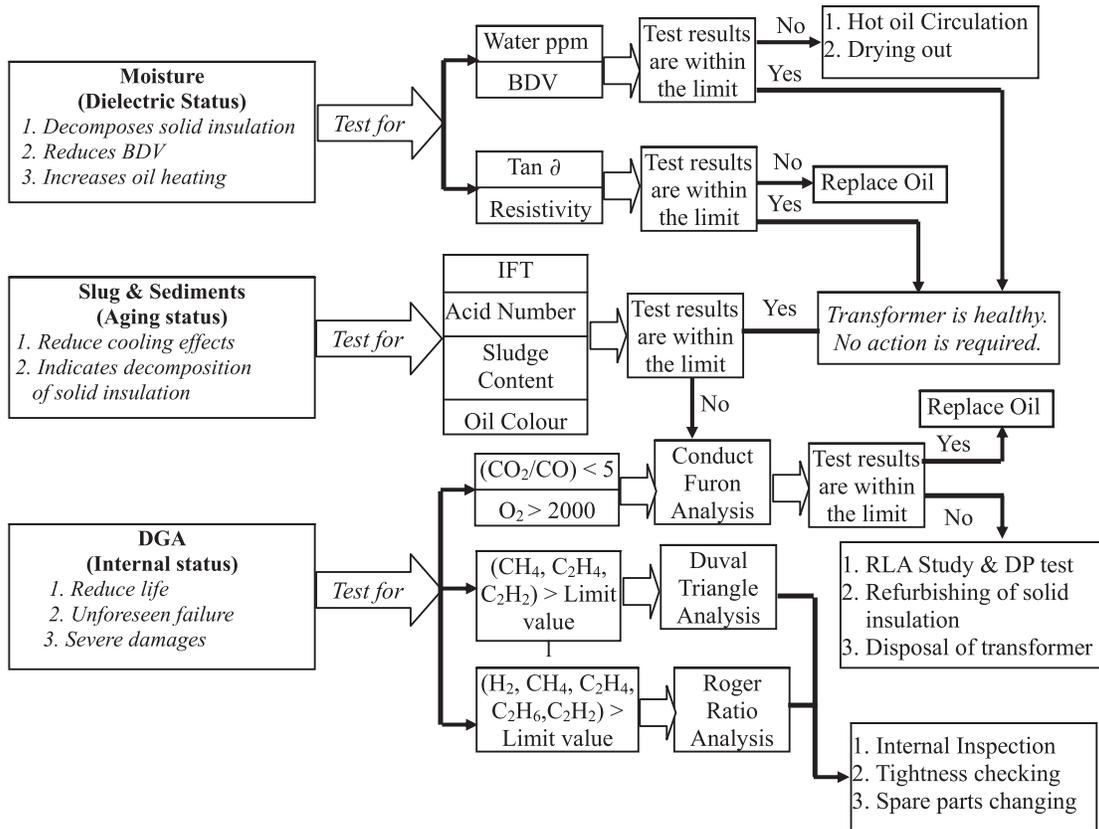
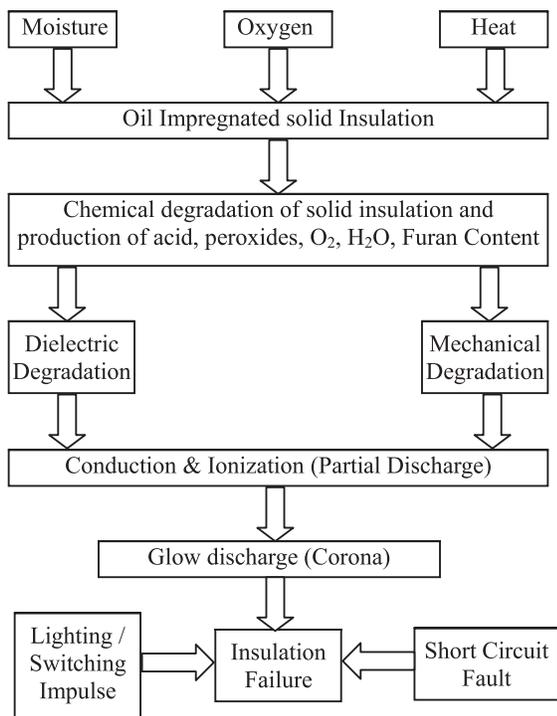


Table III: Aging process of solid insulation



Aging process of solid insulation

Moisture, oxygen and heat are the main three ingredients which initiates the degradation process of solid insulation (Table III). As a result of degradation process, acid, Oxygen, Moisture sludge etc. are formed which changes the chemical properties (acid Number), physical properties (IFT, Sludge content, moisture) electrical properties (BDV, Resistivity, Tanδ and aging status (Furan content) of the oil.

Aging status of Oil

Decomposition / oxidation of oil depends on the exposure of oil to heat, moisture and oxygen and it cause production of Acids. These organic acids are detrimental to the insulation system and can induce corrosion inside the transformer when water is present. An increase in the acidity is an indication of the rate of deterioration of the oil with sludge as the inevitable by- product of an acid situation. Hence acid number determines the presence of invisible sludge in the oil.

The presence of oil decay products and soluble polar contaminants from solid insulating materials also reduces the Interfacial Tension (IFT) value and therefore there is a definite relationship between Acid Number and IFT with the aging of transformer oil (Fig 1).

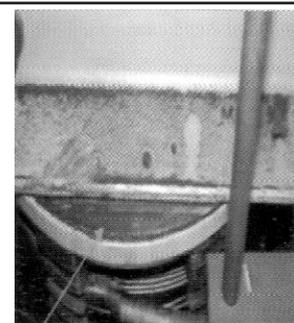
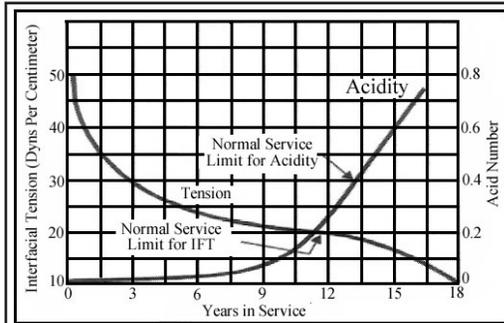


Fig 1: Relationship between the acid number, IFT, and the number of years in service as established by AIEE

Because of this relationship, it is possible to determine the quality of oil for acceptance (Table IV) on basis Colour, Acid Number, IFT and Oil Quality Index (OQIN).

Table IV: Oil Quality Index (OQIN)

COLOUR	ACID NUMBER (NN)	IFT	Oil QUALITY INDEX = (IFT/NN)	INFERENCE
Pale Yellow	0.03 - 0.10	30 - 45	600 - 1500	Very Good oil (Provides all required functions)
Yellow	0.05 - 0.10	27 - 29	270 - 600	Good oil (Provides all the required function, a drop in IFT may signal the beginning of sludge and sediments)
Bright Yellow	0.11 - 0.15	24 - 27	160 - 270	Acceptable oil (Not providing proper cooling and winding protection. Organic acids are beginning to coat winding insulation; sludge in insulation voids is highly probable).
Amber	0.16 - 0.40	18 - 24	45 - 160	Bad oil
Brown	0.41 - 0.65	14 - 18	22 - 44	Extremely Bad oil

Aging status of solid insulation

The degradation process of solid insulation gets accelerated with the increase of % moisture in the paper. The presence of moisture in the solid insulation can be determined indirectly through water ppm in oil with the help of graph shown in Fig 2 and the based on the condition of the paper (Table V) the decision for hot oil circulation or Drying up of transformer can be taken up.

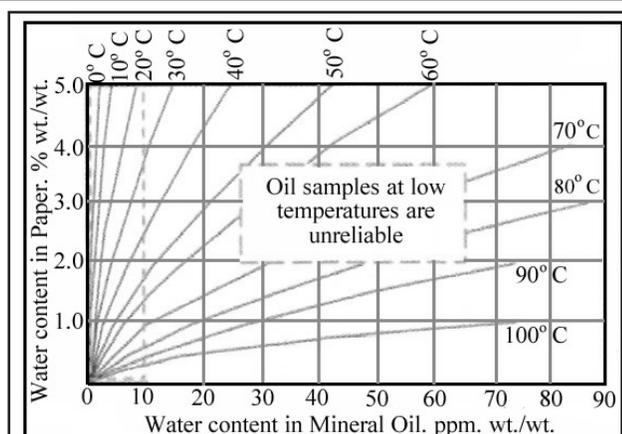


Fig 2: Griffin curve for water equilibrium in cellulose and mineral oil system

Table V: Inference of water content in paper

Water content in paper	Inference
0.5%	Well dried paper
1.5%	Minimum water content in paper
2%	Minimum water content in paper
3%	Paper fiber in oil
4.5%	Flash over at 90 Deg C
7%	Flash over at 50 Deg C
8%	Flash over at 20 Deg C

Due to chemical decomposition of paper, furan content consist of I) 5 Hydroxymethyl-2 furaldehyde II) Furfuryl Alcohol III) 2-Furfural (Furaldehyde) IV) 2-Acetyfuran (Furyl methyl ketone) V) 5-Methyl-2-furfural (furaldehyde) are produced in the oil. Each furan contents signify different condition as shown in the table VI.

Table VI: Significance of different furan Content

Furan Content In PPB	Significant
I) 5 Hydroxymethyl-2 furaldehyde	oxidation
II) Furfuryal Alcohol	High moisture
III) 2-Furfural (Furaldehyde)	Over heating
IV) 2-Acetyfuran (Furyl methyl ketone)	Lighting
V) 5-Methyl-2-furfural (furaldehyde)	Local, severe overheating

Since the total furan content (addition of all furan content) in the oil increases with the acceleration of decomposition process, the residual life of the paper insulation can be established indirectly by knowing the total furan content in the oil. The aging status of paper can also be determined directly by conducting Degree of Polymerization (DP) test on paper sample taken from the subjected transformer and the aging of the transformer can be established directly by knowing the DP value of the paper (Table VII). Hence based on the furan content in the oil decision like total replacement of oil, conducting DP test and RLA study; Refurbishing of solid insulation and disposal of transformer can be taken up.

Table VII: Residual life of solid insulation based on furan content and DP test

65°C Rise Transformer Total Furans (ppb)	Estimated Degree of Polymerization (DP)	Estimated Percentage of Remaining Life	Interpretation
51	800	100	Normal Aging Rate
100	700	90	
195	600	79	
381	500	66	Accelerated Aging Rate
745	400	50	
852	380	46	
974	360	42	
1,113	340	38	Excessive Aging Danger Zone
1,273	320	33	
1,455	300	29	
1,664	280	24	High Risk of Failure
1,902	260	19	
2,175	240	13	End of Expected Life of Paper Insulation and of the Transformer
2,487	220	7	
2,843	200	0	

Dielectric status of oil

Transformer oil acts as dielectric of the capacitors formed between windings to windings and windings to tank. Under the influence of high AC voltage, polar particles such as water, sludge, acid, resin, varnish etc present in the oil (dielectric) get ionized and cause the following effects.

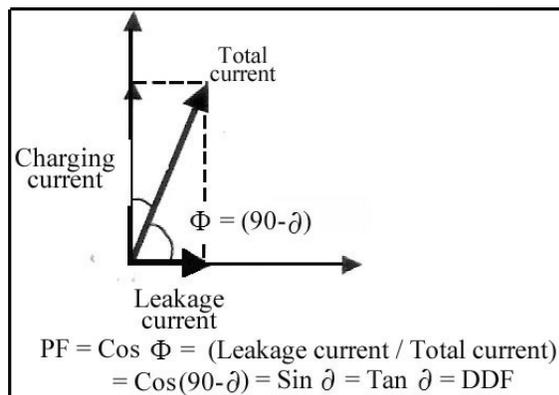
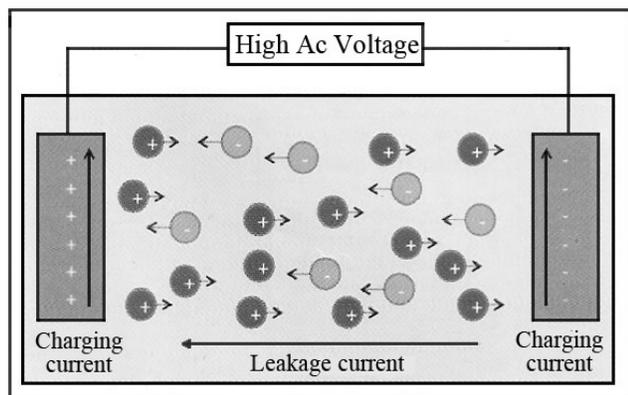


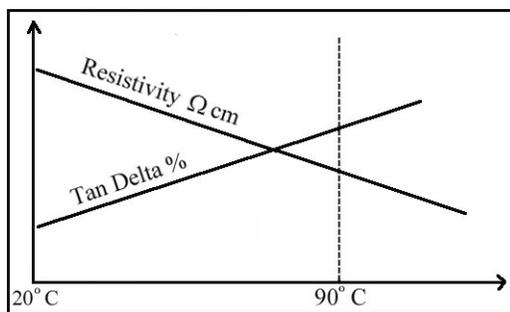
Fig 3

1. Flow of ionized particle initiates leakage current through the dielectric and the intensity of leakage current increases with the increase of ionized particles in oil. Since the value of $\tan \delta$ increases with the increase of leakage current, higher value of $\tan \delta$ indicates contamination of oil with water, sludge, acid, resin, varnish etc. Transformer with contaminated oil (Higher DDF) always runs with higher temperature because of continuous flow of leakage current through the dielectric with I^2R loss.
2. The resistivity of oil decreases with the increase of concentration of ionized particle in the oil. Hence lower resistivity also indicates the contamination of oil with water, sludge, acid, resin, varnish etc.
3. The voltage withstanding capacity of oil decreases with the increase of moisture concentration in the oil. The minimum voltage which transformer oil can withstand without any internal flash over is known as break down voltage. Hence BDV indicates the dryness of the oil.

Hence the oil test for BDV, $\tan \delta$ and Resistivity not only indicates the dielectric status of the oil but also indicates the reasons for lower dielectric properties. Therefore this analysis is used for improving the dielectric status of the oil by taking decision like hot oil circulation / vacuum drying out in case of low BDV of oil and total oil replacement in case of high $\tan \delta$ and low resistivity of oil.

Resistivity and tan delta

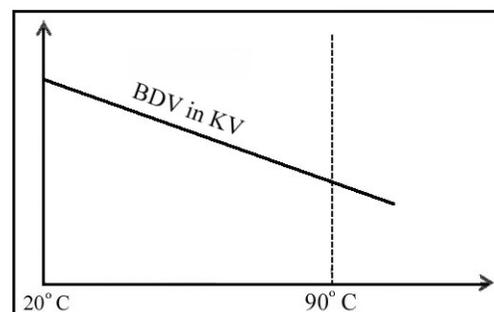
(indicates *deteriorating status* of the dielectric due to oxidation & contaminations of oil)



Presence of the Polar particles/Increase in temperature

Water ppm and BDV

(indicates *present status* of the dielectric due to contaminations of oil with water)



Presence of the Polar particles / Increase in temperature

Internal condition of the transformer

Thermal and electrical faults are the major faults which initiate the failure of any transformer. The reasons for various internal faults are shown in the Table VIII.

Due to thermal and electrical faults, oil and paper gets decomposed and formed gases (Table IX) known as key gases, which remains dissolved in the oil

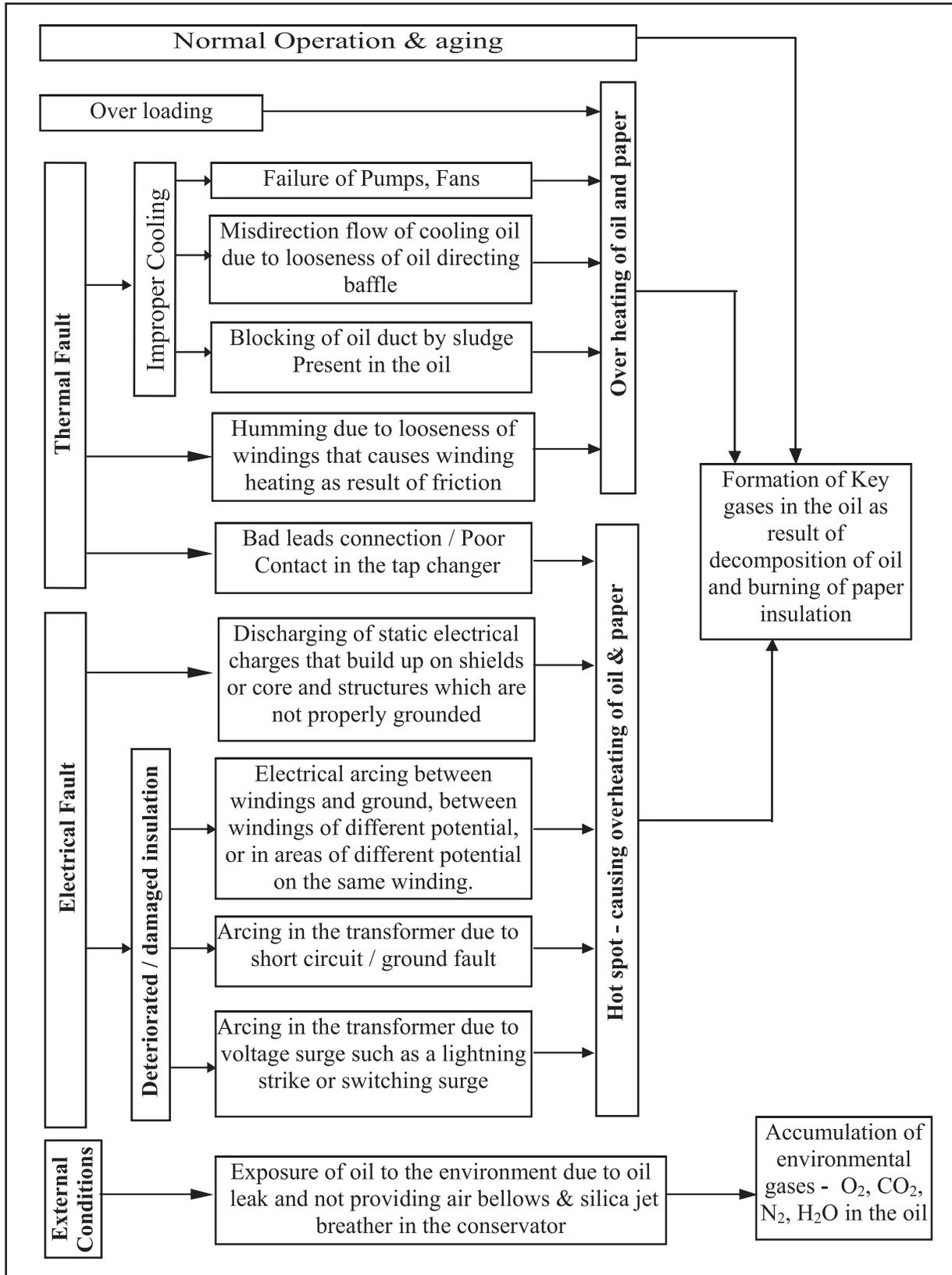
Since different gases are formed at different temperature (Table X), the internal condition of the transformer which may lead to the failure of transformer, can be predicted by tracing the amount key gases available in the oil. The method of tracing the amount of gases in the oil with the help of gas chromatography is known as DGA (Dissolved Gas Analysis)

Identification of the internal problem

Interpreting DGA for the identification of internal fault in transformer is a difficult task since the popular methods such as Key gas ratio, Roger Ratio, Duval triangle which are normally used for identifying the internal problem, have some limitation. Hence, for obtaining the better interpretation by applying the above methods, following points may be kept in mind before taking any decision such as internal inspection of transformer, tightness checking, changing defective parts etc.

- DGA is unreliable if the transformer is de-energized and has cooled, if the transformer is new, or if it is less than 1 to 2 weeks of continuous service after oil processing.
- Dissolved Gas Analysis to be carried out after 1 month of service (Base line DGA) and thereafter twice in each year (Periodical DGA)
- A sudden increase in key gases and the rate of gas production is more important in evaluating a transformer than the amount of gas.
- Each DGA must be compared to prior DGAs so that trends can be recognized and rates of gas generation established.
- If any DGA indicates internal defects, repeat DGA is to be conducted for confirmation.

Table VIII



Significance of some dissolved gases

Acetylene (C₂H₂)

Generation of any amount of acetylene (C₂H₂) above a few ppm indicates high-energy arcing. Trace amounts (a few ppm) can be generated by a very hot thermal fault (500 degrees Celsius (EC) or higher). A onetime arc,

caused by a nearby lightning strike or a high voltage surge, can also generate a small amount of C_2H_2 . If C_2H_2 is found in the DGA, oil samples should be taken weekly or even daily to determine if additional C_2H_2 is being generated. If no additional acetylene is found and the level is below the limit value the transformer may continue in service. However, if acetylene continues to increase, the transformer has an active high-energy internal arc and should be taken out of service immediately for internal inspection.

Table IX

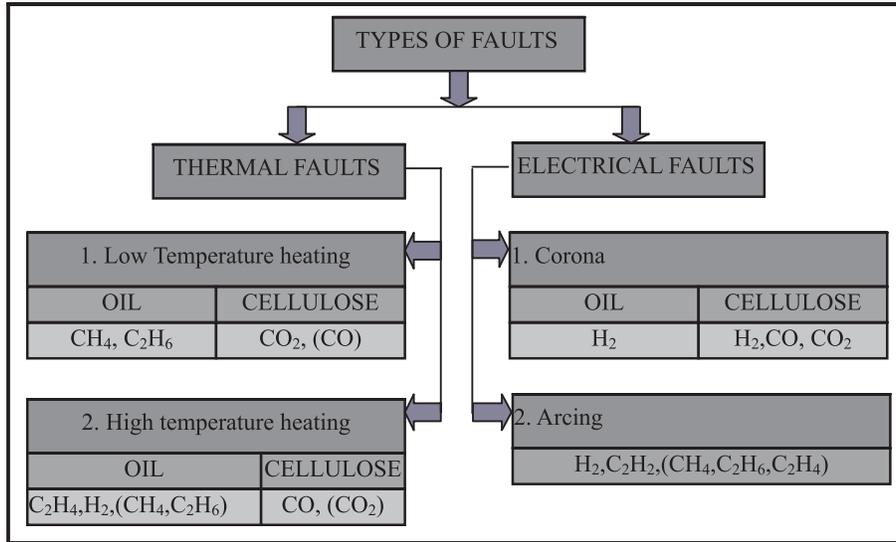
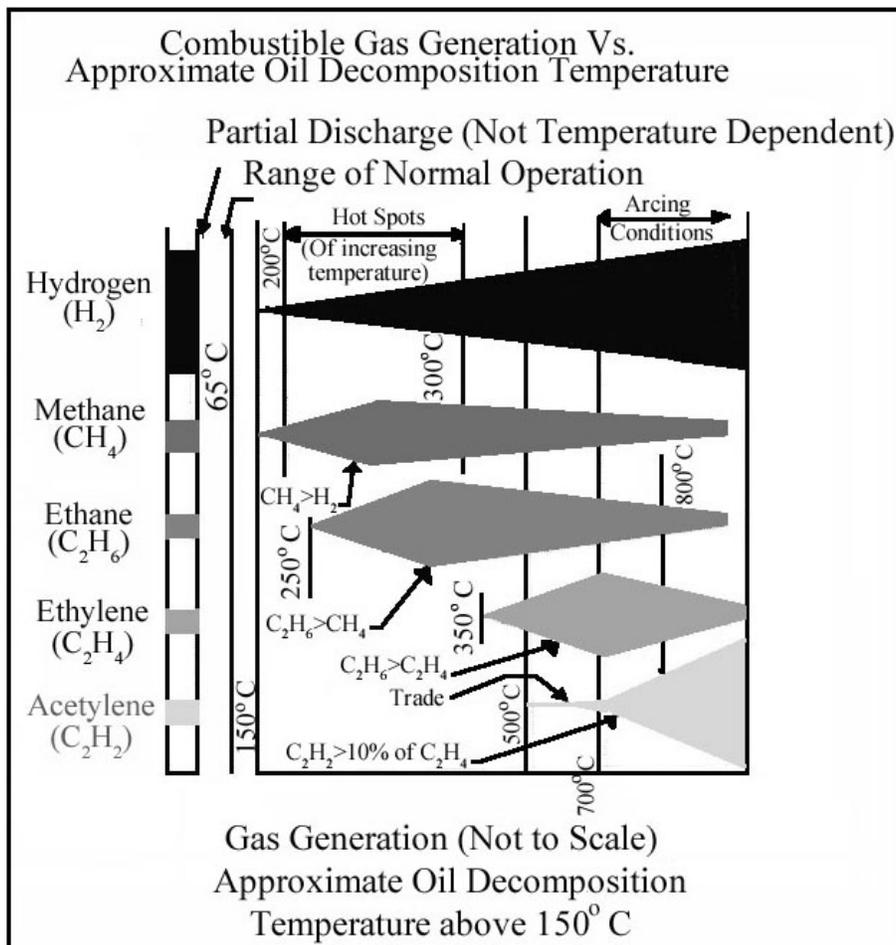


Table X



Ethane (C₂H₆) ethylene (C₂H₄)

Ethane and ethylene are sometimes called “hot metal gases.” When these gases are being generated and acetylene is not, the problem found inside the transformer normally involves hot metal. This may include I). Bad connection in leads, contacts on the tap changer. II). Stray flux impinging on the tank. III). Discharging of static electricity to ground. IV). An unintentional core ground with circulating currents.

Oxygen (O₂)

Oxygen (O₂) must be watched closely in DGA tests. Many experts and organizations, including EPRI, believe that above 2,000 ppm, oxygen in the oil greatly accelerates paper deterioration. This becomes even more critical with moisture above safe levels. Under the same temperature conditions, cellulose insulation in low oxygen oil will last 10 times longer than insulation in high oxygen oil. It is recommended that if oxygen reaches 10,000 ppm in the DGA, the oil should be de-gassed and new oxygen inhibitor installed. Excess amount of oxygen can be present in the oil due to rapid degradation process of paper insulation or direct exposure of oil to atmosphere through leaks, conservator without air bellows and silica gel breather.

CO₂/CO Ratio

This ratio is useful to determine if a fault is affecting the cellulose insulation. Experience has shown that with normal loading and temperatures, the rate of generation of CO₂ runs 7 to 20 times higher than CO. With a CO₂/CO ratio above 7, there is little concern. With CO₂/CO ratio less than 7 along with significant increase in H₂, CH₄, and C₂H₆ indicate overheating of paper. If a problem is suspected, take another DGA sample immediately to confirm the problem. Take the amount of CO₂ generated between the DGAs and divide it by the amount of CO generated in that same time to establish the ratio. An excellent indication of abnormally high temperatures and rapidly deteriorating cellulose insulation is a CO₂/CO under 5. If the ratio is 3 or under, severe and rapid deterioration of cellulose is certainly occurring. Extreme overheating from loss of cooling or plugged oil passages will produce a CO₂/CO ratio around 2 or 3 along with increasing Furans. In such case along with DGAs, Furans test is also to be conducted for accessing the residual life of the transformer.

Atmospheric gases (O₂, N₂ and CO₂)

In conservator-type transformers if nitrogen, oxygen, and CO₂ are found increasing in consecutive DGA, there is a good possibility of oil leak or the oil may have been poorly processed. There should be fairly low nitrogen and especially low oxygen in a conservator type transformer. However, if the transformer was shipped new with pressurized nitrogen inside and has not been degassed properly, there may be high nitrogen content in the DGA, but the nitrogen level should not be increasing after the transformer has been in service for a few years. When oil is being installed in a new transformer, a vacuum is placed on the tank which pulls out nitrogen and pulls in the oil. Oil is free to absorb nitrogen at the oil/gas interface, and some nitrogen may be trapped in the windings, paper insulation, and structure. In this case, nitrogen may be fairly high in the DGAs. However, oxygen should be very low, and nitrogen should not be increasing. It is important to take an oil sample early in the transformer's service life to establish a baseline DGA; then take samples at least annually. The nitrogen and oxygen can be compared with earlier DGAs; and if they increase, it is a good indication of a leak. If the transformer oil has ever been degassed, nitrogen and oxygen should be low in the DGA. It is extremely important to keep accurate records over a transformer's life; when a problem occurs, recorded information helps greatly in trouble shooting.

Popular methods used for diagnosing internal problem through DGA

Gas Ratio methods

There are three methods - Dornenburg, Rogers and IEC. In this method, the value of key gases ratio CH₄/H₂, C₂H₂/C₂H₄ and C₂H₄/C₂H₆ are used for interpreting the internal condition of any transformer. One drawback of the gas ratio methods is that some DGA results may fall outside the ratio codes and no diagnosis can be given (unresolved diagnosis does compare gas ratios). In such condition, value of CO₂/CO ratio, presence of O₂ along with the expert decision is required for conclusion.

Duval Triangle methods

In this method, relative proportions of 3 important gases i.e. CH₄, C₂H₄ and C₂H₂ are plotted in a triangular graph (Table XI) where different zone is allotted for different type of faults as shown in the Legend. The interpretation of fault is done on the basis of intersection point of the relative proportions of 3 important gases in which zone it falls.

Since, there is no area on the triangle for a transformer that does not have a problem. The triangle will show a fault for every transformer whether it has a fault or not. Therefore, this method cannot be used for all cases. It can be used in combination with gas ratio methods (Roger ratio) only when there is an increasing trend of these three principal gases.

Table XI: Duval triangle

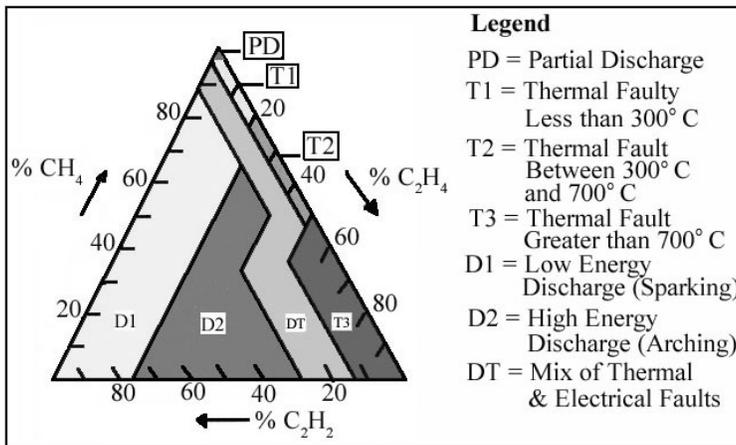


Table XI : Calculating methods for Duval Triangle

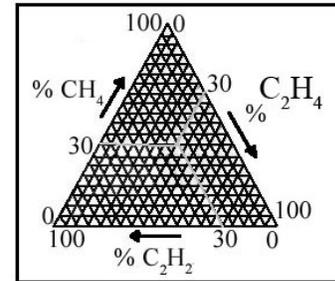
- In order to display a DGA result in the Triangle, one must start with the concentrations of the three gases. (CH_4) = A, (C_2H_4) = B and (C_2H_2) = C, in ppm.
- Calculate the sum of these three values: ($\text{CH}_4 + \text{C}_2\text{H}_4 + \text{C}_2\text{H}_2$) = S, in ppm,

- Calculate the relative proportion of the three gases, in %:

$$X = \% \text{CH}_4 = 100 (A/S),$$

$$Y = \% \text{C}_2\text{H}_4 = 100 (B/S),$$

$$Z = \% \text{C}_2\text{H}_2 = 100 (C/S)$$



- Plot X, Y and Z in the DUVAL Triangle
 - Point of intersection will be laying in a particular zone indicated in the triangle
 - Interpret the reason from the DUVAL table.
- This special graph for DUVAL triangle can be obtained by sending email to duvalm@ireg.ca.

Conclusion

Transformer is robust and static electrical equipment. Any Internal/external damage due to improper maintenance practice does not cause immediate failure of transformer, rather it takes longer time to translate this damages to failure, if it is unnoticed and corrective action is not taken in time. To avoid such consequence, maintenance schedule of periodical electrical test, oil testing and analysis and recordings these events in history register are followed up strictly so that required corrective action is initiated as and when deviation in test result is observed.

There are international standards - IEC (International Electro technical Commission / France), ANSI/ASTM (American National Standards Institute / American Society for Testing and Materials / USA), EPRI (Electric Power Research Institute / USA), CIGRE (Council International des Grand Reseaux Electricques / France), IEEE (Institute of Electrical and Electronic Engineers / USA) and national standards - IS (Indian Standard / India), ERDA (Electrical Research and Development Association / India), CBIP (Central Board for Irrigation and Power / India), CPRI (Central Power Research Institute / India) which have specified the limiting values for oil parameters and the guideline for transformer oil analysis according to transformers voltage grade, age, application and environmental condition.

Though the relevant standards specify the limiting values for oil parameters and the quantity (ppm) of dissolved gases, decision for corrective actions such as hot oil circulation, total oil replacement, internal inspection, RLA study etc are advised to take carefully on the basis of experience and history of the transformers.

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by M G Morshad, Neyveli Lignite Corporation Ltd
Courtesy: Ieema Journal, September 2013

DOCUMENTS REQUIRED WITH THE HT APPLICATION FORM TO TANGEDCO

Dear Members,

Many contractors among ourselves has confusion over the documents to be submitted with the HT Application form to TANGEDCO in respective distribution circles. To bring more clarity, as a first step, we would like to inform the set of documents required by TANGEDCO as per the Official website. In case your distribution circle needs extra set of documents we request you to share with our association, so that we shall compile all the extra set of documents and try to clarify the same from the central TANGEDCO office. As this exercise requires longer time, we request you to kindly bare with us for the time taken.

Thank You,

Editor

PROCEDURE FOR OBTAINING HT SERVICE CONNECTION

(As per TANGEDGO Official Website)

- ◆ Apply for HT service connection in the prescribed form (Form-4) obtainable free of cost from the Circle Office (SE's Office)
- ◆ Enter all the particulars required in the application form Produce proper documents/records as specified in the form (Form-4)
- ◆ Metering point of supply shall be 30 meters from the main gate easily accessible visible and satisfactory with regard to security aspects.

The following documents shall be accompanied with the application:

- (1) When the applicant is the owner of the premises:
Certified copy of the Sale deed for the premises executed in his favour (or) Property Tax receipt for the premises in the name of the applicant.
- (2) When the applicant is not the owner of the premises:
Consent letter from the owner of the premises (or) Proof of legal occupation (including lease deed) with the following:
 - (a) Indemnity Bond in Form 6
 - (b) Letter of acceptance to pay security deposit at twice the normal rate.
- (3) Partnership deed in case the applicant is a partnership firm or
- (4) Memorandum/Articles of Association in case of companies registered under Companies Act.
- (5) Letter/Resolution authorizing the signatory.
- (6) Site plan.
- (7) Compliance by the intending consumer of other laws of the State of Tamil Nadu relating to the obtaining of permit or approval or sanction or consent from the appropriate authorities as mentioned in such laws in regard to construction, alteration or repairs to buildings or establishment of new industries or factories or other establishments for which supply of electricity is required by such intending consumer.
- (8) As per Division Bench Order dated 23.8.2006, for all special/multistoried buildings in Chennai Metropolitan area, Planning permit from competent authority has to be submitted along with application and Completion Certificate from competent authority has to be submitted while effecting supply.
 - ◆ Submit the application to the Circle Office in person or by post and obtain proper acknowledgement.

NATIONAL ENERGY CONSERVATION DAY 2013

National energy conservation day 2013 would be celebrated on Saturday, at 14th of December.

What is the Energy Conservation?

National energy conservation day in India is celebrated to aware people about the importance of energy as well as saving or conserving the more energy by using less energy. The exact means of energy conservation is using less energy by avoiding the unnecessary uses of energy. Using energy efficiently is very necessary to save it for the future usage. Energy conservation should be rooted in the behavior of every human being to get more effect towards the plan of energy conservation.

One can save the energy by deeply taking care of it such as turning off the unnecessarily running fans, lights, submersible, heater, combining car trips or other electric things of daily usage. These are the more easier and efficient way to save extra uses of energy thus playing the great role towards the campaign of national energy conservation.

Fossil fuels, Crude oil, Coal, natural gas etc generate sufficient energy for the use in daily life but increasing the demands of it day by day creates the fear of reducing or diminishing the natural resources. Energy conservation is the only way which helps in replacing the non-renewable resources of energy with the renewable energy.

How National Energy Conservation Day is Celebrated

To make the campaign of national energy conservation more effective and special all over the India, variety of energy conservation competitions are organized by the government or other organizations around the living areas of normal people as they are the main target of the campaign. At many places the various painting competitions on energy conservation day is held by the student or member of the organizations at school, state, regional or national level.

The campaign of the national energy conservation is the national awareness campaign launched by the Ministry of Power to facilitate the process of energy conservation in India. Painting competitions organized for the students at many levels is one of the main activities of this campaign which helps in increasing the awareness of children about the importance of conserving energy as well as educating and involving their parents in the campaign. This competition helps the people of domestic sectors to be aware.

Every participant is provided a theme Topic such as the "More stars, more savings", "Today's energy wastage is tomorrow's energy shortage", "Energy saved is future save" and many more. Participants can make their painting more effective by using the Pencil Color,

Our Member Mr. G. M. VISHNURAM, Emaar Electricals, Chennai has given an excellent suggestion - all our members who shall not be able to participate in Energy Conservation Day Directly, can make a special request to their clients, to increase the AC temperature by atleast 1 Degree from 7.12.2013 to 14.12.2013, to bring an awareness on Energy Conservation.

We request you to write to our association the efforts taken by you for Energy Conservation. We shall be too happy to publish in our next NEWSLETTER issue, to share your experiences and to motivate the others in Energy Conservation.

Editor

Crayons, Water Color and etc.

Students, who take part in the competition and win, get participation certificate, merit certificate or cash prizes which worth Rs 33,000 per State. This amount is distributed among all the winners of a state and awarded by the Ministry of Power at 14th of December at the celebration event of National Energy Conservation day.

Objectives of National Energy Conservation Day

National energy conservation day is celebrated every year using particular theme of the year by keeping in mind some goals and objectives to make more effective all over the country among people. Some of the important goals are:

- ◆ It is celebrated to send the message of importance of conserving energy in the every walk of life among people.
- ◆ Promoting the way of process of energy conservation by organizing a lot of events such as discussions, conferences, debates, workshops, competitions and etc all through the country.
- ◆ Promote people for less energy usage by neglecting the excessive and wasteful uses.
- ◆ Encourage people for efficient energy use in order to decrease the energy consumption and prevent the energy loss.

Prepare and prevent, don't repair and repent.

Significant Roles of Indian Citizens in Energy Security

Each and every citizens of the India must aware about how to use efficient energy, how to save the energy for their own future safety and many more ways. They should follow all the rules, regulations and policies implemented by the Government of India in order to support the energy efficiency. Citizens of India can pay their direct contribution to the campaign of reduce energy use throughout the 11th Five Year Plan period. Children are the big expectation and hope for the country to bring positive changes as well as to enhance the economic condition of the country.

NSA DATA CENTRE OPENING DELAYED AFTER SERIES OF ELECTRICAL SURGES IN UTAH

1.5 billion-dollar one million square-foot Bluffdale / Camp Williams LEED Silver facility houses a 100,000 sq-ft mission critical Tier III data center. The remaining 900,000 SF is used for technical support and administrative space. Our massive twenty building complex also includes water treatment facilities, chiller plants, electric substation, fire pump house, warehouse, vehicle inspection facility, visitor control center, and sixty diesel-fueled emergency standby generators and fuel facility for a 3-day 100% power backup capability. Ten meltdowns in 13 months cause damage worth hundreds of thousands of dollars and baffle investigators at Utah facility



Electrical surges at a huge new National Security Agency data centre have reportedly fried equipment, melted metal and caused fiery explosions, delaying its opening for a year.

Ten meltdowns over the past 13 months have caused hundreds of thousands of dollars' worth of damage to machinery and baffled investigators at the agency's data storage complex in Utah, the Wall Street Journal reported on Tuesday.

The surges have apparently prevented the NSA from using computers at its biggest data centre, a key element in its ability to store and process information from electronic snooping.

A spokesperson, Vanee Vines, suggested in a statement that the 247-acre site, which encompasses 1.2m sq ft of enclosed space, was getting back on track. "The failures that occurred during testing have been mitigated. A project of this magnitude requires stringent management, oversight, and testing, before the government accepts any building."

However, the cause of eight of the 10 surges, known as arc fault failures, remain disputed, and investigators have not ruled out further meltdowns, which were compared to flashes of lightning inside a 2ft box.

The \$1.7bn facility, two years in the making, was due to host supercomputers to store gargantuan quantities of data from emails, phone calls, Google searches and other sources.

William Binney, a mathematician who worked at the NSA for almost 40 years and helped automate its worldwide eavesdropping, said Utah's computers could store data at the rate of 20 terabytes – the equivalent of the Library of Congress – per minute.

The NSA chose Bluffdale largely because of cheap electricity. The centre uses 65 MW to run computers and keep them cool, racking up more than \$1m in costs per month. The first electrical surge was on August 2012. The most recent occurred last month.

The US army corps of engineers, which is overseeing construction of the facility, said the cause of the problems had been identified and that a contractor was now correcting it. The centre would be "completely reliable" before being handed over to the NSA, said Norbert Suter, the corps' chief of construction operations.

Other testimony cast doubt on that, saying 30 independent experts had conducted 160 tests over 50,000 hours, and still did not agree on what caused eight of the 10 surges, nor on ways to prevent future surges.

The Journal report, citing documents and interviews, said builders cut corners, back-up generators failed tests, a cooling system remained untested and some technicians questioned the adequacy of the electrical control system.

HELP LINE

Query: What are the accuracy class specs available for CTs & PTs?

Mr. T.N. THINAKARAN, Power Engineering Co., Nagercoil

Explanation:

Accuracy Class of Metering CT:

Metering Class CT

Class	Applications
0.1 To 0.2	Precision measurements
0.5	High grade kilowatt hour meters for commercial grade kilowatt hour meters
3	General industrial measurements
3 OR 5	Approximate measurements

Accuracy Class Letter of CT:

Metering Class CT

Accuracy Class	Applications
B	Metering Purpose

Protection Class CT

C	CT has low leakage flux.
T	CT can have significant leakage flux.
H	CT accuracy is applicable within the entire range of secondary currents from 5 to 20 times the nominal CT rating. (Typically wound CTs.)
L	CT accuracy applies at the maximum rated secondary burden at 20 times rated only. The ratio accuracy can be up to four times greater than the listed value, depending on connected burden and fault current. (Typically window, busing, or bar-type CTs.)

Accuracy Class of Protection CT:

Class	Applications
10P5	Instantaneous over current relays & trip coils: 2.5VA
10P10	Thermal inverse time relays: 7.5VA
10P10	Low consumption Relay: 2.5VA
10P10/5	Inverse definite min. time relays (IDMT) over current
10P10	IDMT Earth fault relays with approximate time grading: 15VA
5P10	IDMT Earth fault relays with phase fault stability or accurate time grading: 15VA

HELPLINE

This Helpline shall provide you guidelines for your Electrical Related queries.

We shall try to provide solutions for your queries from replies sought from Experts in respective fields.

Since most of the queries shall be location specific. We request you to clarify the replies published, with Local Authorities.

We request you to treat these replies only as guidelines. We look forward to serve you better.

Please send your queries to our mail id: tnagrade@gmail.com

PRODUCT OF THE MONTH

UPRATING OF TRANSFORMERS

With the increase in Demand, Awareness of conservation and lesser availability of space it has become essential to upgrade the 20/30 years old electrical equipment's to a high output by using upgraded technology, hybrid material, innovative design & refined processes. It becomes more prudent to up-rate the whole of a system rather than up-rating a single equipment.

With the availability of new insulating material & improved design technology the generating machine either hydro or thermal can be up-rated for higher output. However, the up-rating of transformer has not been reviewed by giant manufacturers due to complex retrofitting work on transformer.

Generally speaking, it is possible to up-rate the capacity of Transformers due to absence of any rotating part. The same can be achieved in following way.

- a. Core, Tank OLTC, Radiators and Bushings are retained and used & this almost covers 60% of the cost of a transformer.
- b. The winding configuration will be changed with higher cross section & by using better winding technology so as to reduce the hot / spot temperature and losses.
- c. Addition of few cooling radiators for the extra heat generated by up-rating the capacity.
- d. By providing extra insulation & extra clamping arrangement to increase the impulse & short circuit strength compared to previous design.
- e. By conversion of 3 winding transformers to 2 windings.
- f. By redesigning for higher rating by using nomex paper etc.
- g. By removing tertiary winding & change of vector group

Considerable time is saved as repaired & refurbished transformer is available for use within 3 to 4 months as compare to manufacturing cycle of more than 12 months & more for the same transformers.

Repairs & Refurbishment is economical as the cost of repairs is restricted to 40 to 45% of the cost of a new Power Transformer as good credit of old copper is available. High Volt Electricals Pvt. Ltd. has completed the following projects for various rating in this aspect and few cases are depicted here.

I. FOR MSEB

1. One 50 MVA, 240/115.5/34.5 KV G.E. Canadian make Auto Transformer was uprated and converted to 75 MVA, 220/110 KV Transformer and working in Oglewadi S/s. of MSEB.
2. One 21 MVA, 220/22 KV MARELI make Transformer was converted to 28 MVA 110/22 KV and is working at TALAGAON S/s. of MSEB.

II. FOR PRIVATE CUSTOMERS

- a. A 30 MVA, 110/11KV ENGLISH ELECTRIC make GENERATOR TRANSFORMER was converted to 30 MVA, 66/11 KV Transformer by using new OLTC for **DCM Jaghadia**.
- b. A 25 MVA, 132/11 KV NGEF make Transformer with 7.8% Impedance converted to same rating with 11.5%. Before increase in impedance Transformer failed 3 times in 4 year. Now working satisfactorily for the last two years for **RAIPUR ALLOYS LTD.**
- c. 16800 KVA GE make Rectifier transformer of 60 c/s altered for 50 c/s operation for **M/s. SIEL.**

For further information please contact

ROWSONS MARKETING PVT. LTD., CHENNAI.

E-Mail: rmpl@rowsons.com/re@rowsons.com; offers@rowsons.com

REPAIRS / REHABILITATION / UPRATING OF TRANSFORMER

The power demand in India by the 2020 is estimated to be 385000 MW, requiring some US\$ 760 billion (approx.) to be invested. Faced with acute financial limitations, **private power participation** has been actively sought to rescue the situation in addition to new plants by **revamping and refurbishing of old plants.**

Present installed Power Generator capacity is 15000 MW and for 12th plan 25000 MW is being aided and funds allocation for 11th & 12th plan is Rs. 151896 Crores. Repair business is available for 15000 MW per annum if

10% failure rate is consider. Power has emerged as the fourth basic necessity, after food, clothing and shelter. The **shortage of electrical** power in India is expected to **worsen** in years to come, despite the plans for stepping up its generation. The consequences of this potential shortfall of power may be very serious.

After independence, India achieved a remarkable annual growth rate of about 10% to meet the growing needs of electricity consumption. However, power shortage of varying degrees have continued despite large capacity addition in earlier plans. India needs to add 1,50,000 MW of power capacity in the next 10 years to meet the demand of fast growing economy. **The average deficit in power supply for the last five years is more than 10%.** This incongruous demand supply gap is bound to adversely affect industrial growth. One of the cost effective options available for narrowing down the gap is **improving performance of the existing power plants.**

Rehabilitation of Power Plants: With the ever increasing demand for power competing with price, many countries are looking to supply extra power at reduced rates, and many among them are examining ways of increasing power capacity in the cheapest possible ways. Among them, building an entirely new power plant for meeting increasing demand is an attractive proposition. However in large number of cases, it is not practical due to paucity of funds , insufficient space or absence of ideal site. Thus there can be many options, but the one of them that is becoming increasingly popular is that of **rehabilitation / life extension of power plants through re-furbishment / retrofitting and up-gradation.** It involves retrofitting, refurbishing and upgrading of all plant equipment i.e. boiler, turbines, generators, **transformers**, etc. **This help achieve number of goals: life extension of plants, outage reduction, increased efficiency, increased output, etc.**

In units approaching the end of service life, it may be necessary to take up large scale replacement of high temperature / pressure parts after duly assessing their remnant life, to extend their service life. The cost of such life extension would be **about 40%** of the cost of the new installation of equivalent capacity. Even after regeneration, the cost / kwh will be much cheaper than the **cost / kwh** for a new power plant.

Manufacturing power plant equipment is monopolised by big players; for new comers entry is made difficult. However, these players are not in a position to cope up with the increase in the work load and the possibility is that power plants and substations would be led to paralysing situation. Therefore these big players, and also the power plants, are keen to enlist assistance of new comers as well. **The corporates which are into manufacturing and refurbishing generators, turbines, boilers and transformer** have good opportunity to share in rejuvenation of transformers. There are companies specialising in aforesaid areas, which foresee tremendous business opportunities in joining hands with big players and looks for a bigger share in the areas of its specialisation.

Thinking in India: While inauguration of ABB Plant at Baroda; the **Finance Minister Mr. P. Chidambaram** stated that an increase of **1%** in the average “national plant load factor” (PLF), by retrofitting and upgrading power plants, would lead to generation of additional 500 MW power at cost much lower than the Rs.4,000 crore needed to set up a new thermal power plant of similar capacity. Since 70% of the total generation in the country is contributed by thermal power plants, in 1984 **Govt. of India launched a scheme for renovation and modernisation of power plants**, and set aside some budget amount for retrofitting some old power plants where residual life, and consequently even efficiency had reduced. On the basis of this, NLC resorted to retrofitting of their Thermal Power plants installed in 1962-64. Encouraged with the results, the second phase of renovation and modernisation scheme aims at removing the bottlenecks and improving the performance of identified thermal power plants.

*by Dr.G.V. Rao, Life Senior Member-IEEE,
Chairman, Rowsons Group*

OUTSTANDING COINCIDENCES OF WORDS.....

Hate has 4 letters so does Love.....
 Enemies has 7 letters so does Friends.....
 Lying has 5 letters so does Truth.....
 Negative has 8 letters so does Positive.....
 Under has 5 letters so does Above.....

Cry has 3 letters so does Joy.....
 Anger has 5 letters so does Happy.....
 Right has 5 letters so does Wrong.....
 Are they by Coincidences?? !!
 It means Life is like a Double edged Sword,

*We should choose the **BETTER SIDE**.....!!*

I will express my love for my Creator by caring for His creations in all the possible ways.

CENTER FOR STUDY OF SCIENCE, TECHNOLOGY AND POLICY (CSTEP)

Center for Study of Science, Technology and Policy (CSTEP) is a not for profit research organisation incorporated in 2005 u/s 25 of The Companies Act, 1956. Its vision is to enrich the nation with technology-enabled policy options for equitable growth. CSTEP has grown to become a multi-disciplinary policy research organisation in the areas of Energy, Infrastructure, Materials and Security Studies. Its research team is inter-disciplinary and has over 6 members with specialisation in science, engineering, management, economics, policy and social sciences. CSTEP is recognised as a Scientific and Industrial Research Organisation by the Ministry of Science and Technology, Government of India. The Center is supported by the grants from domestic and international foundations, industry trusts and governments. Grants and donations made to CSTEP are eligible for exemptions u/s 80(G) of the Income Tax Act, 1961. CSTEP is also registered under the Foreign Contribution (Regulation) Act, 2010.

CSTEP has on its Board people from various back grounds and with relevant and rich experience. The board members represent reputed organisations to include, government, corporate, academics, philanthropists and from administrative services. In addition to this, CSTEP has built a multi-disciplinary research capacity to include economists, policy specialists and social scientists, IT experts, etc to ensure that the research conducted have a long-term impact and have meaningful outcomes by incorporating social and economic perspectives to a scientific solution. CSTEP constantly aims at science and technology enabled policy options for an inclusive and equitable economic growth.

CSTEP has to its credit several publications and research reports which are published in reputed journals, both at the national and the international levels.

What we DO

Science and technology are key enablers to address the various challenges faced by the country. Newly emerging science and technologies provide leapfrogging options for India. However, the success of science and technology and relevance to society depend on the social, economic and political environment. In that sense, CSTEP aims at science and technology enabled policy options for an inclusive and equitable economic growth.

Thus an interdisciplinary approach is required to adequately address the pressing problems facing the country.

CSTEP endeavours to develop such an expertise and provide an objective assessment to enable policymakers to take appropriate decisions. Our approach to policy research is built on three pillars: theory, computation and experimentation. Recent advances in computing technologies have enabled modeling of socio-technical systems to explore a large number of policy options and enrich public debate. We develop scientific tools and models needed for policy research and analysis. Our present research is in the areas of energy, infrastructure, materials and national security. A brief description of our activities is given below.

ENERGY EFFICIENCY AND SUSTAINABILITY

National Mission for Enhanced Energy Efficiency (NMEEE) is one of the eight missions under Prime Minister's National Action Plan for Climate Change. The objective is to improve the energy efficiency of industrial systems and lower carbon emission. CSTEP is pursuing these studies covering industrial processes, such as the manufacturing of cement, and iron and steel. CSTEP is also working on a methodology for determining an accepted specific energy consumption of industrial systems.

SOLAR THERMAL

CSTEP's work involves developing engineering-economic-policy assessment of large-scale deployment of solar thermal power technologies in India taking into account the constraints in technology, resource availability (land & water), scale-up etc. The research focuses on four main concentrated solar technology options – parabolic trough, linear fresnel, dish sterling and solar tower- and evaluates their performance and economic viability. The options of hybridisation and energy storage are being analysed. We hope that these studies will suggest innovations that are necessary to make these options economically viable and sustainable.

WIND POWER

The wind power potential in India has recently been raised to 1,00,000 MW. This estimate is based on the possibility of installing larger turbines at greater heights and utilising land for wind farming more effectively. There are many issues that invite detailed study including economic viability, access to roads, electricity network and the grid's ability to absorb and compensate for intermittent power. CSTEP researchers are presently estimating the potential for Karnataka and Andhra Pradesh. The approach involves the calculation of wind power at higher heights, overlaying Geographical Information Systems (GIS) that enable land use analysis. We are examining the

cost effectiveness of various electricity storage options such as batteries to enable a sustainable integration of large-scale wind power in the electricity grid.

NUCLEAR POWER

Our studies focus on technical, economic, regulatory and strategic aspects of nuclear power and its potential to meet India's aspirations for energy security. We have examined the viability of the India's fast breeder program and desirability of nuclear power in India's future energy mix. A recently concluded study examined the desirability of the international nuclear agreement and concluded that global cooperation is necessary for the rapid growth of nuclear power.

SMART GRIDS

The electricity grid faces challenges ranging from lack of robustness and flexibility for incorporating intermittent renewable energy options and sudden bursts of consumption. Smart technologies using digital communications and control may make it secure and renewable-friendly. However, the success of grid depends on policies that incorporate new models for access, pricing and stability options. Infact these policies combined with a strict consumption protocol will determine the smooth functioning of the modern grid. CSTEP is working to develop a state-of-the-art smart grid that will integrate the renewable energy systems that are intermittent in nature and also provide fail-safe options.

Security

Management of disasters, both natural and man-made, is vital to minimise the loss of life, livelihood and property. We are presently developing models and simulation tools to assess and develop emergency management and mitigation methodologies. These tools will also assist in responding to emergencies, especially in urban areas.

Decision Theatre

How do we decide to decide? In the past, decisions were made based on experience, wise counsels and defaults. Today computers with a prodigious memory and speed of processing enable us to examine nearly all options for decision making in real time. The computing speed also allows us to visualise the possible consequences. This is the basis for building DARPAN. We develop methodologies combining system-dynamics, GIS, data mining and statistical analysis. Each model is constructed in close collaboration with stakeholders to identify the variables of importance to decision-makers with visual depictions of their possible consequence. A feature of the system is multiple screens that display detailed visual representation of decisions, policies and their impact. We are working to seek funds for building DARPAN that can address problems in civil society.

\$800 MILLION TRANSMISSION LINE FOR RAJASTHAN

The Asian Development Bank will supply \$500 million towards the cost of a transmission line to carry solar power to state and national grids. The government of Rajasthan and Indian grid utilities will supply the remaining \$300 million.

The Asian Development Bank (ADB) will provide US\$500 million of the funding for an \$800 million renewable energy transmission system in north west India.

With the sun-drenched state of Rajasthan playing a pivotal role in the country's ambition of generating 20 GW of solar power by 2022, plans are in place for 1,850 km of transmission lines in the west of the state to supply solar energy to state and national grids.

The government of Rajasthan and India's transmission utilities are expected to supply the remaining \$300 million for the scheme which will upgrade capacity at seven sub stations as well as providing three new 400 kV stations and nine new 220 kV facilities.

The initial \$150 million of ADB funds will be supplemented 'later in 2014' by a further \$220 million and a final \$128 million in 2015, according to a statement published by the bank on its website on Friday.

The article states the ADB funding will come from the bank's clean technology fund and will include \$2 million for technical assistance and infrastructure planning for the new state-funded PV and solar thermal park at Bhadla as well as transmission system studies and a community development plan to step up solar electricity and clean water equipment for small communities.

Work has started on the initial 75 MW of PV power at the Bhadla park being developed by the state's Rajasthan Renewable Energy Corp in the west of the region, with 20 MW set to be added annually from next year onwards. Rajasthan supplied 80% of the first phase of India's national Jawaharlal Nehru National Solar Mission (JNNSM) and is targeting 8 GW of solar and wind generation by 2018, mostly from the private sector.

Read more: http://www.pv-magazine.com/news/details/beitrag/800-million-transmission-line-for-rajasthan_100012879/#ixzz2iW7doMzu

SOLAR CELLS COULD SOON ADD POWER TO YOUR SMARTPHONES AND TABLETS

Power efficiency can make or break a mobile device. If we weren't constrained with the power supply, then our mobile devices would probably be even faster and more powerful than they are now. But even as mobile CPUs and GPUs are increasingly becoming power efficient, we still find ourselves finding the need to plug in at the end of the day (or even at the middle of the day). If all goes well with a new technology being developed by Alta Devices, we might be able to rely on the sun or other light sources to augment our batteries or even power our devices altogether.

As it stands, solar cells are currently very inefficient at absorbing energy from the sun, especially if the surface area were only to cover, say, the back end of a mobile phone or tablet. The highest-efficiency solar cell chemical could, theoretically, power a mobile phone, but in its current form, it would be very impractical to incorporate in a mobile device.

Gallium arsenide is better-able to capture light than traditional solar cells, and is currently used in space-bound craft such as satellites. The problem is that gallium arsenide is usually synthesized in a crystalline form — quite cumbersome to add onto a mobile device. Alta Devices, a Silicon Valley startup, has found a way to synthesize the material onto a thin film, and the resulting solar cells can convert up to 30.8% of the energy from light into electricity.

The resulting film is about 1 micron thin — about a fourth of the width of human hair. The solar cells have two layers, one of which consists of indium gallium phosphide, which converts light with lower wavelengths into electricity.

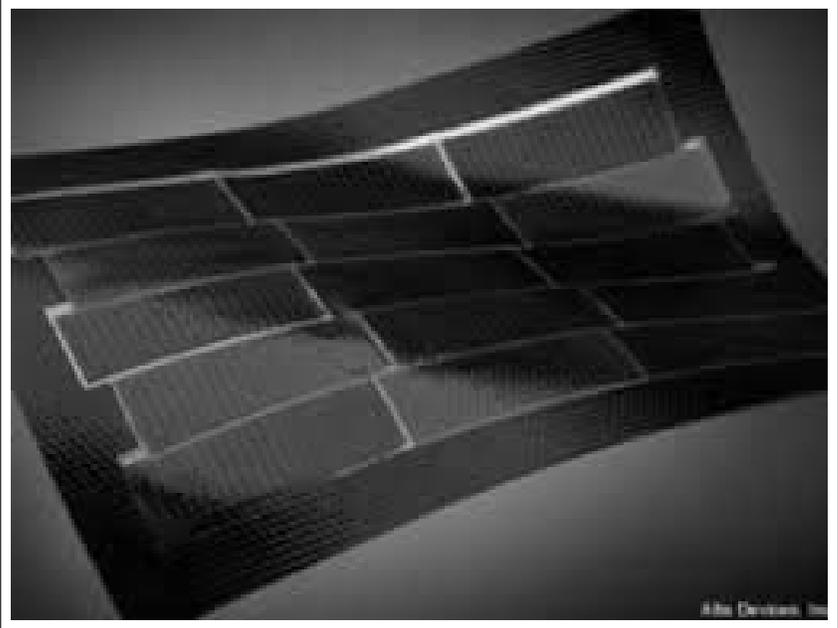
The end result: a smartphone battery cover that can output about 1.5 watts of electricity at peak, such as when exposed to sunlight. Alta Devices has actually developed a prototype for a Samsung galaxy smartphone (model unspecified). CEO Christopher S. Norris says this can charge a mobile phone in about three times the time it would take to charge from a wall outlet. But while that's still less than ideal, the point here is to reduce dependency on the grid. "If you're in full sun, a watt and a half for 10 minutes will give you an hour of talk time."

At this point, the main benefit would not necessarily be taking out the need to plug in altogether, but to augment power from the grid and to extend usage while unplugged. If you're curious, you can check out Alta Devices' battery life extension calculator, to determine how much you can extend your battery life. If you're mostly outdoors and if you carry your phone on your belt, this could be as much as an 83% extension. Students with time spent outdoors get about 54% extension of their battery life.

While this would be a great addition to smartphones in the developed world, the real benefit would be in emerging markets, where mobile devices have proliferated faster than the electricity grid, reports the New York Times. But going beyond mobile phones, Alta Devices' technology can also be applied to cars. While Alta Devices solar cells mounted onto a car's surface area would not necessarily be able to power the entire vehicle, it can help reduce the load on the internal combustion engine by, say, delivering power to the electronics. This is something that certain hybrid vehicles currently do with their gas-powered engine, plus battery technology.

Would you be willing to carry your smartphone on your belt, in order to absorb as much energy from the sun possible?

Featured image credits: Shutterstock / Solar cell film image credit: Alta Devices



Watch out for power lines when using a ladder, chainsaw or other outdoor equipment.

SOLAR-POWERED UNMANNED AIRCRAFT TAKING OFF

AeroVironment's Puma AE™ small unmanned aircraft system (UAS) recently completed a 9 hour, 11 minute endurance test that further shows the promise of solar-powered aircraft.

A recent outdoor test flight of a solar-powered prototype version of the AeroVironment's proven Puma AE™ small unmanned aircraft system (UAS), operating with the company's newest long-endurance battery, lasted 9 hours, 11 minutes – significantly longer than the flight endurance of small UAS being used in the field today.

Fig. 1 shows the Puma AE.



The Puma AE unmanned aircraft

AeroVironment is working with Alta Devices, a Sunnyvale, Calif. company that provides flexible, portable power that can be embedded into any other material, in the development of the solar Puma AE.

“This is a critical milestone with far-reaching implications for the many ways small UAS can benefit military, public safety and commercial customers,” said Roy Minson, AeroVironment senior vice president and general manager, Unmanned Aircraft Systems (UAS). “The solar Puma AE is the latest example of AeroVironment’s longstanding commitment to deliver important, innovative solutions that meet our customers’ needs.

“Our integration of this cutting-edge technology dramatically increases Puma’s current flight endurance using a clean, renewable power source,” Minson added, “this development can give Puma AE customers significantly increased capabilities that approach those of the next class of UAS at a much lower acquisition and operating cost, and with much greater operational flexibility.” AeroVironment’s new long endurance battery extends Puma AE’s non-solar endurance to more than three hours. This means small UAS could be used for longer missions over greater distances than previously possible.

Minson added that past solar solutions for powering small UAS were either too heavy or did not produce enough power for long-range flight – or both. “However,” he said, “the solar Puma AE technology can produce enough power, while adding negligible weight, so that endurance is no longer an issue for most customer missions.”

Using a proprietary and highly differentiated technology, Alta Devices manufactures the world’s thinnest and highest efficiency solar cells using Gallium Arsenide. This technology significantly extends the battery life of any application, in many cases eliminating the need to recharge from the grid because it converts more light into electricity. Solar material like that used in the development of the solar Puma AE incorporates a thin, mobile power technology on a flexible substrate that has been independently certified by the National Renewable Energy Laboratory (NREL) as world-records for both single (28.8%) and dual (30.8%) junction solar cells.

Puma AE is a flexible, efficient and rugged hand-launched workhorse for intelligence, surveillance and reconnaissance (ISR). This solar-power enhancement makes it even more indispensable for U.S. and allied military, as well as for domestic public safety applications, such as firefighting, law enforcement, search and rescue, oil and gas field monitoring, and other commercial needs.

The solar Puma AE configuration currently is in the research and development phase. A production version is planned for early 2014.

The 13-pound Puma AE is fully waterproof, man-portable and can be assembled in minutes, hand-launched, operated and recovered on sea or land by a team of two people. It requires no infrastructure, such as runways, launching pads or recovery devices. In addition, the system is quiet and operates autonomously, providing persistent observation data.

In July, AeroVironment received a “Restricted Category” rating for its Puma AE small UAS from the Federal Aviation Administration. The first-of-its-kind certificate permits operators to fly Puma AE for commercial missions in regions of the Arctic.

We never know the worth of water till the well is dry. – THOMAS FULLER

HUGE NEW SOLAR THERMAL PLANT CAN KEEP RUNNING FOR SIX HOURS AFTER SUN GOES DOWN



The Ivanpah plant in the Mojave may have recently snatched away the title of “world’s largest,” but Abengoa Solar’s Solana plant in the desert near Gila Bend, Arizona, still has its share of superlatives. At 280 megawatts, Solana is one of the largest plant using parabolic mirrors in the world, and it is undoubtedly the largest to use substantial thermal storage to keep the juice flowing for hours after the sun goes down. Intermittency is still among the most common complaints about industrial-scale renewable energy, so proving that this storage tech can work is a huge step for the solar industry.

Abengoa announced on Wednesday that the Solana plant “passed commercial operation tests.” The first of these involved running the plant’s generator at full power while also ramping up the

thermal storage system. Next, after letting the solar part of the plant stop once the sun was down, operators fired up the generator and produced electricity for six full hours using only the thermal storage system. Intermittency, you matter not here.

Solana is composed of about 3 200 parabolic trough mirrors spread out over 7.8 square kilometers (3 square miles), with 280 megawatts of total generating capacity. The mirrors concentrate the sun’s rays onto a tube filled with a “heat transfer fluid” usually involving oil, which eventually heats water to create steam and turn a turbine. The plant generates enough electricity at its peak to power around 70 000 homes. It’s located in a nice sunny spot about 70 miles southwest of Phoenix, an area as good as any when it comes to sunny days. In fact, Gila Bend, Arizona, is turning into a sort of solar power wonderland in recent days: there are now four solar plants approved in the area, though the other three range between only 17 and 32 megawatts. The town even has the “Gila Bend Transmission Initiative” up and running to try and make solar development in the region even more attractive than it already is.

The storage part of Solana is what makes it really interesting. Ivanpah, the 377-megawatt behemoth currently holding the mark as the largest solar thermal plant in the world (and currently ramping up toward full production in the Mojave Desert in California), doesn’t have a way to store its generated energy, and most other plants built so far also lack that ability.

But it has become increasingly clear that storing solar power is a worthwhile endeavor; in one recent paper, researchers calculated that the energy return on investment—that is, the amount you get out based on how much energy you put in—is positive for *any* storage technology paired with solar photovoltaics. Battery storage tends to be the worst form of storage we can use, while pumped hydro and compressed air storage are the best.

Abengoa uses thermal storage, and variations that use steam, molten salts (used at Solana), or other materials, are also now under investigation in a number of places. Of course, the *energy* return isn’t the same as the *cost* return, and price is what has kept storage from going mainstream with most renewable projects. A huge focus of the industry right now is to bring those costs down, with help from places like the Department of Energy’s Advanced Research Projects Agency—Energy. In Solana’s case, Abengoa has been testing out storage tech in Spain (notably at the Solucar platform near Seville, home to a number of pilot projects), and seems to be a bit ahead of some other major solar developers. The \$1.45 billion loan from the DOE for Solana likely didn’t hurt, however.

Solana will start full commercial operation soon. A power purchase agreement with Arizona’s biggest utility, Arizona Public Service, is already in place covering the entirety of the solar plant’s output.

Teachers open the door but you must enter by yourself. - www.wisdomquotesandstories.com

GE TO MUSCLE INTO FUEL CELLS WITH HYBRID SYSTEM

General Electric is working on an efficient distributed power system that combines proprietary fuel cell technology with its existing gas engines [like the one in the photo].

The company's research organization is developing a novel fuel cell that operates on natural gas, according to Mark Little, the director of GE Global Research and chief technology officer. When combined with an engine generator, the system can convert 70 percent of the fuel to electricity, which is more efficient than the combined cycle natural gas power plants powering the grid.

The fuel cell will generate electricity from reformed natural gas, or gas that's treated with steam and heat to make hydrogen and oxygen, he says. Residual gases from the fuel cell process—a

“synthesis gas” that contains carbon monoxide and hydrogen—would then be burned in a piston engine to generate more electricity. The waste gas that comes from the fuel cell needs to be specially treated but “we know we can burn these things. They're well within the fuel specs of our current engine,” Little says.

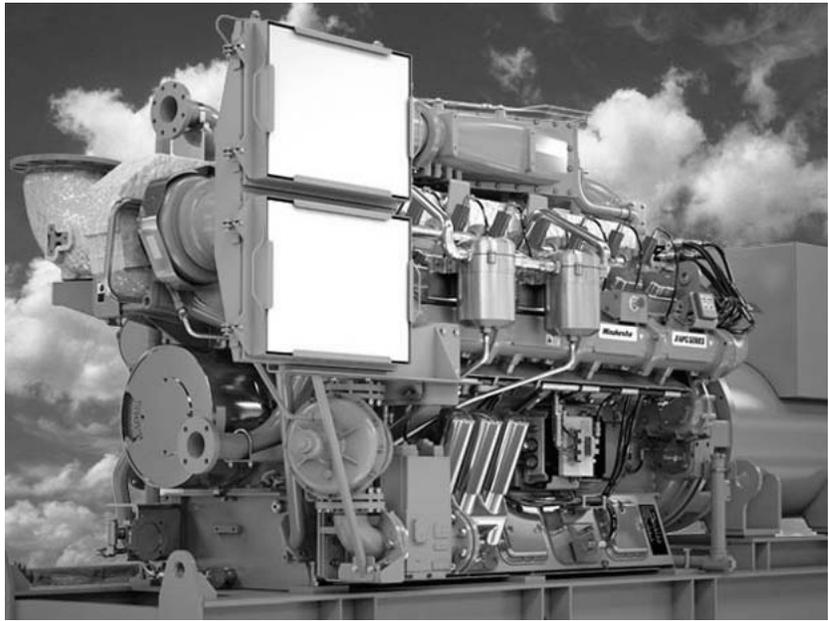
This distributed power system could provide electricity to a small industrial site or a data center, for example. It would replace diesel generators that are often used to power remote locations or bring electricity to places without a central grid.

GE sells engines from two companies it acquired, Austria-based Jenbacher and Wisconsin-based Waukesha. It has done its own research on solid oxide fuel cells, and in 2011, it invested in Plug Power, which makes fuel cells for homes and small businesses. But Little indicated that this distributed power system will use new fuel cell technology invented by GE and configured to work in tandem with GE's engines. “We have a real breakthrough in fuel cell technology that we think can enable the system to be distributed and yet work at a very high efficiency level,” he says.

Commercial customers are showing more interest in stationary fuel cells and natural gas generators because they can provide back-up power and potentially lower energy costs. GE's system, which is still a few years away from commercial availability, will be aimed at customers outside of the United States, Little says. Because the United States has relatively cheap natural gas, the combined power generation unit is unlikely to be cost competitive with grid power there. However, the price for natural gas in many other countries is more than double that in the United States and the hybrid power generation unit will “compete beautifully,” Little says.

GE's hybrid fuel system is just one of many research efforts the conglomerate has underway to take advantage of unconventional oil and natural gas drilling. Among the projects now being considered at a planned research center in Oklahoma is a way to use liquid carbon dioxide as the fluid to fracture, or frack, wells, rather than a mixture of water and chemicals. The company is developing a hybrid locomotive engine that can run on both diesel and natural gas. And it is working on small-scale liquid natural gas fueling stations that could be placed along railroad lines.

In another effort, GE is developing sensors and software to make oil and gas wells smarter. Researchers are working on different types of photonic sensors that are able to withstand very high heat and pressure. These would be better than electronic sensors for gathering flow and fluid composition data within wells, according to GE researchers.



Courtesy : IEEE SPECTRUM; Image credit: GE

CONSERVATION: It doesn't cost. It saves.

RUST BOOSTS ARTIFICIAL PHOTOSYNTHESIS, RESEARCH FINDS — BRINGS ECONOMICAL ARTIFICIAL PHOTOSYNTHESIS ONE STEP CLOSER

An important breakthrough has been made in the development of an economical means of harnessing artificial photosynthesis, according to researchers at Boston College — the voltage gap between the two core processes of oxidation and reduction has been reduced significantly via utilization of the common, and relatively cheap, material known as rust (iron oxide).

The researchers have apparently come within only “two-tenths of the photovoltage required to mimic oxidation and reduction, respectively, using unique photoanodes and photocathodes developed using novel nanowire components and coatings.” With this significant narrowing of the gap — while using only very economical materials — the day when artificial photosynthesis proves useful/practical for energy gathering/storing uses isn’t far off, according to the researchers.

“Many researchers have been trying to harvest solar energy and directly store it in chemical bonds,” stated lead author Dunwei Wang, an associate professor of chemistry at Boston College. “Solar panels can harvest energy, but economical storage has remained elusive. We are trying to borrow a page from Mother Nature whereby photosynthesis produces energy from the sun and stores it.”

But “copying” highly complex natural reactions certainly isn’t always an easy thing to do, and in this case it “requires materials that can absorb sunlight broadly, transfer the energy to excited charges at high efficiencies and catalyze specific reduction and oxidation reactions,” as the researchers note — quite a list of demands.

The press release from **Boston College** explains:

Natural photosynthesis consists of two important processes. Oxidation produces oxygen gas. Reduction produces organic molecules. Artificial photosynthesis, also known as water splitting, tries to copy these two reactions using a photoanode to oxidize water and a photocathode to either reduce water for hydrogen production or to reduce carbon dioxide for organic molecules.

But in an artificial environment, a gap has persisted in the voltage required on either side of the reaction in order to achieve these results. In essence, oxidation and reduction require 1.2 to 1.3 volts combined to achieve the charge required to power artificial photosynthesis. Previously, only rare materials allowed researchers to bridge the gap, but those efforts are prohibitively expensive for widespread application.

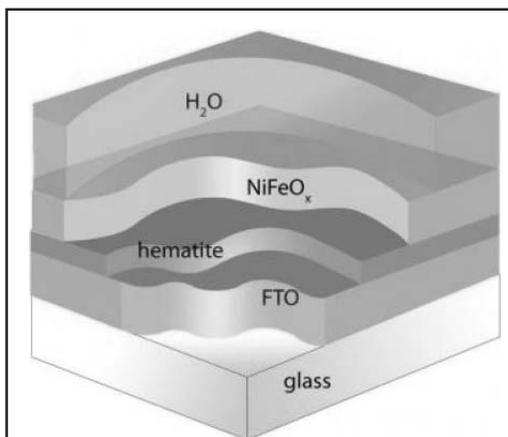
The researchers had already developed a new cathode preparation technique to improve hydrogen production — which means that there’s nothing really in the way of a highly efficient photocathode being constructed. And now, with these recent advances in photoanode development, there’s not much left that needs to be overcome before (relatively) economical artificial photosynthesis is within reach.

The recent research, the Boston College note, “produced advances in photoanode development, where their engineered nanowire structures enabled the team to achieve a photovoltage of .6 volts using an iron oxide material. The voltage represents a 50% increase above the best prior results, which were reported last year. The team achieved the gains by coating hematite, an iron oxide similar to rust, with nickel iron oxide.”

“Already, the team has yielded more than 1 volt of power when combined with the photocathode they developed earlier this year,” Wang added. “Our system, made of oxygen, silicon and iron — three of the four most abundant elements on earth — can now provide more than 1 volt of power together. Now we are just two-tenths of a volt short on the photoanode. That’s a significant narrowing of the gap.”

A gap which now can be completely closed with only “minor” improvements.

Read more at <http://cleantechnica.com/2013/10/18/rust-boosts-artificial-photosynthesis-research-finds-brings-economical-artificial-photosynthesis-one-step-closer/#O3kcVdsKifqJyOva.99>



Taking Mother Nature’s lead, researchers have sought new methods and materials capable of mimicking photosynthesis. Researchers at Boston College report that modifying the surface of hematite with a nickel iron oxide coating produces an increase in cathode photovoltage of nearly four-tenths of a volt. That’s nearly enough energy to put an economical method of artificial photosynthesis within reach.

Image Credit: Angewandte Chemie

STRENGTHENING POWER TRANSMISSION IN COIMBATORE

Industries here will extend their support to the Tamil Nadu Generation and Distribution Corporation (Tangedco) to remove the bottlenecks and strengthen the power transmission infrastructure in this region.

Representatives of some of the industrial associations had a meeting with the Tangedco officials here recently in this regard.

Power generation in the State is expected to increase by 2,000 MW soon. More sub-stations and transmission lines are needed in this region to avoid load shedding. In Coimbatore city, almost all the feeders and transformers are over loaded, an official of Tangedco told *The Hindu*.

The Tangedco has proposed 110 KV sub-station at Race Course, another 230 KV sub-station in the city, 110 KV sub-station at Somayampalayam, and 400 KV sub-station at Edayarpalayam. It needs clearance from the Forest Department for the Somayampalayam sub-station. For the Edayarpalayam project, 60 acres of land is required. While 40 acres of government land is available, another 20 acres of private land is needed. With regard to the Coimbatore 230 KV sub-station and 110 KV sub-station, 11 tower lines need to be erected in Valankulam and four at Selvampathy tank.

It is not possible to take the cables underground instead of installing the towers in the water bodies as the cost will be higher. The towers cannot be constructed on the bunds as more space is needed. Some of the non-Governmental organisations are opposing the proposal to construction of the towers in the water bodies.

President of the Indian Chamber of Commerce and Industry, Coimbatore, R. R. Balasundharam said that the meeting was organised by the Southern India Mills' Association.

The industries have supported the Tangedco in several locations by providing land for the infrastructure.

They can talk to the units and help remove the bottlenecks, wherever possible, in the city too. Even if power is available, transmission infrastructure should be strengthened to improve the supply, he said.

Courtesy: Hindu, M. Soundariya Preetha

SUNTECH ANNOUNCES 1500V FRAMELESS PV MODULE

Suntech Power Holdings Co., Ltd. (NYSE: STP), ("Suntech" or the "Company"), one of the world's largest solar companies, will showcase its 1,500V frameless photovoltaic module at the Solar Power International (SPI) Exhibition in Chicago, Illinois. This higher voltage module, engineered for utility-scale and commercial applications, lowers balance of system costs. Suntech's 1,500V frameless PV module will be on display at booth #243.

The 60-cell IEC-rated 1,500Vdc module achieves lower balance of system costs by allowing longer cable runs and longer strings, fewer combiner boxes and smaller wire sizes. Because there is no frame around the modules, equipment grounding is not required. Labour and materials are reduced, saving money for the installer and for the customer.

The frameless construction is a "glass-on-glass" structure which replaces the backsheet with heat-strengthened glass. Its IP67-rated junction box greatly reduces the possibility of water or dirt ingress. Eliminating the frame removes a key mechanism for Potential Induced Degradation (PID). The new module is backed by the Company's 25-year linear power warranty.

Aesthetically, the glass-only module presents a clean look. Its low profile is only 6mm thick. Effective wire management with no grounding lugs contributes to the sleek aesthetics as well.

"Suntech continues its commitment to develop solutions to better meet the requirements of our customers throughout the value chain," said Mick McDaniel, Managing Director of Suntech America. "This new higher voltage module incorporates the most recent advances in solar technology to enable our partners to install ever more efficient and durable utility and commercial power plants."

The introduction of this new module extends the Suntech portfolio of photovoltaic products. The new 1500V frameless 255W (STP255-20/Wdj) and 250W (STP250-20/Wdj) modules will be available for installation beginning in the first quarter of 2014.

"Though force can protect in emergency, only justice, fairness, consideration and cooperation can finally lead men to the dawn of eternal peace."

CHENNAI DOCTORS TURN TO ANIMAL WASTE TO HEAL

CHENNAI: What do leather waste and fish scales do in a hospital? Well, heal injuries faster. Animal bones, fur and horns thrown away at slaughter houses are now turning into bone grafts and wound-dressing materials.

Medicare and tanning may be miles apart, but CLRI scientists have found a way to bring them together. The waste from leather industry has been transformed into products such as corneal implants, bandages and dog chews. Every time leather is processed in a tannery or used in an industry, around 30% of it goes waste, most of it in a non-biodegradable form. "Not only are we bringing down waste, but also working to bring out several products from it through our 'Waste to wealth' project," said T P Sastry, head of the bio-products lab.

For instance, when animal skin is made into leather by tanning with chemicals, especially chromium sulphate, some amount of skin goes waste. It is detoxified, and collagen is later extracted from this. The collagen is made into sponges or films, which can be used to dress wounds.

Collagen sheets made using extracts from animal intestines, wasted skin and fish scales are being used by some hospitals.

TS Uma, a scientist at the Central Leather Research Institute (CLRI) was more than just amused when she watched a television show last year on how puffer fish become a big ball by drinking water to avoid being eaten by a predator. It showed the elasticity of its skin due to the presence of collagen. That kept her thinking on why they can't be used for medical purposes that need collagen support. The result today is a wound dressing material. Uma kept travelling to Nagapattinam to procure puffer fish, which is considered inedible. Found in the deep sea, puffer fish get into fishing nets, and are thrown away. "From the skin of puffer fish, I could develop a collagen film and sponge for dressing wounds. The film has the quality to absorb medicine and it can be used on burn wounds to clean and heal them," she said.

With the collagen film, the wound has to be dressed only once in three days, unlike the conventional method that involves daily dressing. "The amount of collagen present in the film can assist the skin to grow faster," said Uma, who has also developed keratin sponges and films, used for dressing, from fur and horn of bovines. The products will soon be registered for patent.

Leather research contributing to medicare may sound unusual, but the lab has been churning out several healthcare products from animal waste. Like corneal implants from fish scales. "We are working with Sankara Nethralaya to make products that can be used for corneal repair and correction," said T P Sastry, head of the bioproducts lab at CLRI.

Some of their products such as bone grafts, collagen sheets from fish scales and chrome waste were awarded patents in May. Collagen extracted from animal bones waste in slaughter houses was developed into grafts. "This graft can be used to repair and rebuild bones in the spine and has application as dental implants," said Sastry. Usually, grafts are taken from the patient's own body.

The collagen sheets, one of the first innovations, made using the extract from animal intestines, were used to treat school children who were injured in the Kumbakonam fire accident.

The lab has also been making shoes, wallets and bags using regenerated leather. On being made into a shoe or a bag, the leather that does not fit into the shape of the product is wasted. "We have been using the remaining leather to make puppets, visiting cards, key-holder pouches and lamp shades," he said.

The chandelier that beautifies the reception hall of CLRI was also made using regenerated leather.

HIDE TO HEAL

Leather research is contributing to medical care by helping develop new products



<p>1 BONE GRAFT</p> <p>Made from Bone waste in slaughter house</p> <p>How Bone is demineralised leaving behind collagen powder, which is mixed with polymers to improve strength and made into grafts</p> <p>Uses Dental implant; repair bone loss caused by fractures; rebuild bones in hips, spine, joints</p>	<p>2 COLLAGEN SPONGE</p> <p>Made from Chrome shavings waste</p> <p>How Leather from animal skin is tanned with chemicals. The waste obtained during the process - chrome shavings - is de-chromed to remove toxins. Collagen is extracted and moulded into sponges</p> <p>Uses Wound-dressing material</p>
<p>3 COLLAGEN FILM</p> <p>Made from Skin of puffer fish</p> <p>How Skin of puffer fish (rich in</p>	<p>4 KERATIN FILM</p> <p>Made from Hair and horn waste in slaughterhouses</p> <p>How Keratin extracted from hair and horn is made into films or sponges.</p> <p>Uses Wound-dressing. Keratin has skin-regenerative properties</p>
<p>5 CORNEAL IMPLANT</p> <p>Made from Fish scales</p> <p>How Collagen extracted from fish scales. Density reduced to make thin films</p> <p>Uses Corneal repair and regeneration</p>	<p>collagen) used to make films or sponges</p> <p>Uses Wound-dressing, skin regeneration</p>

ENERGY STORY

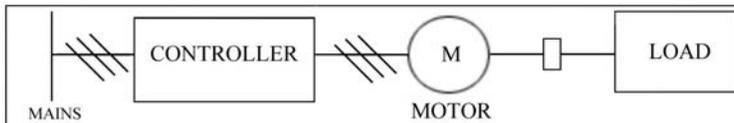
ENERGY EFFICIENCY – THE FIFTH FUEL – PART 8

EFFICIENT ELECTRICAL ENERGY UTILIZATION

Electrical Energy Utilization and Motor Driven Systems:

It is worth repeating and remembering that Motor Driven Systems form the bulk of use of Energy in general and the End Use Efficiency improvements will have to address the Motor Driven Systems with elements as below.

Electrical Energy gets converted to Mechanical Energy through Motors and the Mechanical Energy is available in the form of 'Rotary Energy'. The Speed of Rotation and the Torque Developed are critical which decide on the loading and Power Consumption.



Motor Speed: Some of the basics as detailed below are simple and are important to understand.

$$\text{Synchronous Speed (RPM)} = \frac{120 \times \text{Frequency}}{\text{Poles}}$$

The actual speed, which the motor operates, will be less than the synchronous speed. The difference between synchronous and full load speed is called slip and is measured in percent. It is calculated using this equation:

$$\text{Slip (\%)} = \frac{\text{Synchronous Speed} - \text{Full Load Speed}}{\text{Synchronous Speed}} \times 100$$

'SLIP' is decided by the Rotor Design, Losses, Efficiency.....

'SLIP' or the Running Speeds decide the Actual Load and the Loading.

Speeds decide the 'OUT PUT' which has to tune with requirements.

Varying the Speed of Motor for getting the accurate output: As seen above, the speed needs to be varied depending on the actual requirements and some of the common Methods are illustrated in the Diagram below:

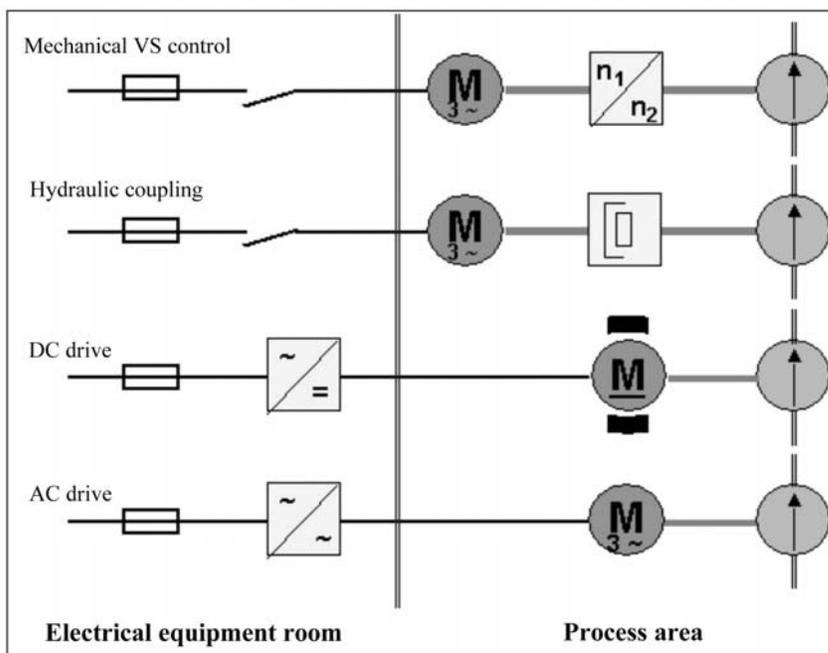
As shown in the fig, top 2 variations are effected after the Motor and before the Load, and the bottom 2 refer to Speed Control of Motors.

There are very many applications where there are no Speed Controls at all, but Out Puts are controlled through Throttling or Braking like in the cases of Pumps and Conveyors. In case of Compressors, the common practice is to allow the Loading and Un-Loading Cycles of Motors and Compressors to meet the Load Requirements.

Application of ASD (Adjustable Speed Drives) for regulating the Speed and the Out Put:

Every standard AC motor can be fitted with a variable speed drive using a frequency inverter. Frequency and voltage of the single - phase or three - phase mains are varied by the frequency inverter, such that the motor can be operated with varying speeds over large range settings.

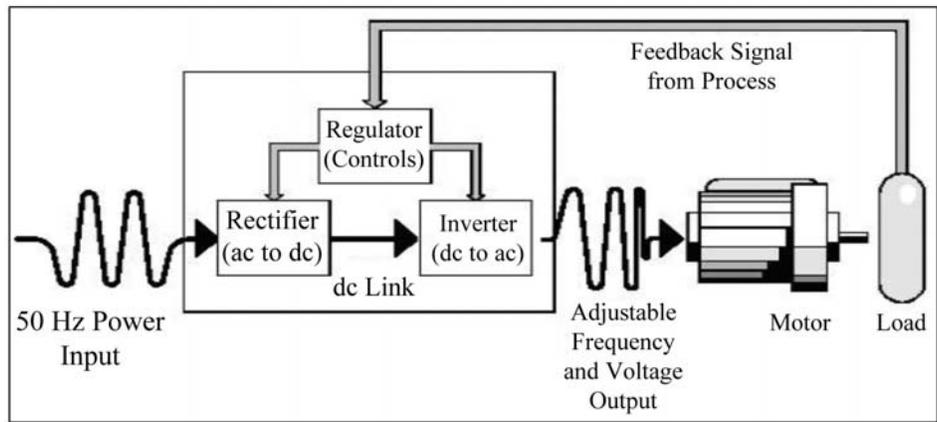
The primary functions of a variable speed AC drive, is to convert electrical power to the usable form for controlling speed, torque and direction of rotation of AC motor.



The AC drive system basically splits into two sections:

Power electronics: In the power circuit the three phase incoming AC power is rectified to DC and then inverted to AC of desired frequency & voltage. This consists of surge suppresser circuit, line communicated converter (controlled or uncontrolled rectifier), pre-charging unit, DC link capacitor unit with bleeder resistor inverter, etc.

Control circuitry: The control circuitry monitors & controls the whole working of the drive. It regulates the output voltage, process the feedback, the fault and interlocks the inverter by tripping it in case of any fault.



The Diagram shows the basic advantage the Variable Speed Drives provide by regulating the input power to tune with the outputs, which can also help Energy Conservation.

VFD Operation Basics

Many motion applications — particularly pumps, fans, conveyors, and mixers — require nothing more than an inexpensive drive with simple speed control. Here, a V/Hz drive is usually the best bet.

V/Hz drives are increasingly replacing older forms of motor control, including mechanical variable-speed drives, solid-state starters and conventional motor starters.

With centrifugal loads, variable frequency drives also save energy. To illustrate, consider the “affinity laws” that govern centrifugal loads. If Q is flow, n is speed, and hp is horsepower:

$$Q \text{ is proportional to } n \quad P \text{ is proportional to } n^2 \quad hp \text{ is proportional to } n^3$$

These relationships highlight the benefit of using V/Hz drives to control flow, for example, instead of dampers, inlet vanes, or throttling valves. Unlike on-off mechanisms, V/Hz drives allow power consumption to fall with flow — and a small drop in flow results in a large drop in power consumption. For example, a fan operating at 80%, consumes only 51% of the energy required at 100%.

Understanding ASD or VSD Applications for different kinds of Loads:

Loads ideal for ASD application: Variable Torque (centrifugal pumps, fans etc.)

Liquids and gases when moved require a pressure proportional to the square of the velocity (i.e. volume moved). The horsepower requirement varies as the cube of the speed change. These applications usually have the greatest opportunities for energy savings as well as improved control.

Loads requiring careful ASD application: Constant Torque loads (Positive displacement air compressors, conveyors, crushers etc.)

Constant-torque loads require the same torque regardless of speed. The ASD must be carefully sized to ensure adequate starting torque. Power is proportional to speed.

Loads difficult for ASD application: Constant power loads (Machine Tools)

In this group, the load torque decreases with increasing speed. This application usually applies to processes that are changing diameters, such as lathes, winders, unwinders and metal-cutting tools operating over wide speed ranges.

(To be continued)

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BLAISE PASCAL (1623 - 1662)



Blaise Pascal (19 June 1623 – 19 August 1662) was a French mathematician, physicist, inventor, writer and Christian philosopher. He was a child prodigy who was educated by his father, a tax collector in Rouen. Pascal's earliest work was in the natural and applied

sciences where he made important contributions to the study of fluids, and clarified the concepts of pressure and vacuum by generalizing the work of Evangelista Torricelli. Pascal also wrote in defense of the scientific method. In 1642, while still a teenager, he started some pioneering work on calculating machines. After three years of effort and fifty prototypes, he invented the mechanical calculator. He built 20 of these machines (called Pascal's calculators and later Pascalines) in the following ten years. Pascal was an important mathematician, helping create two major new areas of research: he wrote a significant treatise on the subject of projective geometry at the age of 16, and later corresponded with Pierre de Fermat on probability theory, strongly influencing the development of modern economics and social science. Following Galileo and Torricelli, in 1646 he refuted Aristotle's followers who insisted that nature abhors a vacuum. Pascal's results caused many disputes before being accepted.

In 1646, he and his sister Jacqueline identified with the religious movement within Catholicism known by its detractors as Jansenism. His father died in 1651. Following a mystical experience in late 1654, he had his "second conversion", abandoned his scientific work, and devoted himself to philosophy and theology. His two most famous works date from this period: the *Lettres provinciales* and the *Pensées*, the former set in the conflict between Jansenists and Jesuits. In this year, he also wrote an important treatise on the arithmetical triangle. Between 1658 and 1659 he wrote on the cycloid and its use in calculating the volume of solids. Pascal had poor health especially after his 18th year and his death came just two months after his 39th birthday.

Early life and education

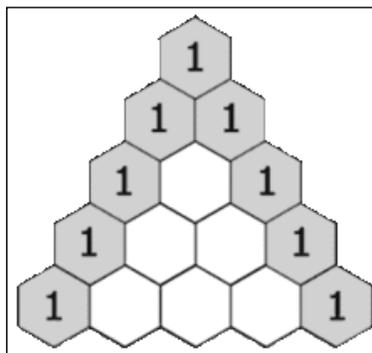
Pascal was born in Clermont-Ferrand; he lost his mother, Antoinette Begon, at the age of three. His father, Étienne Pascal (1588–1651), who also had an interest in science and mathematics, was a local judge and member of the

"Noblesse de Robe. The young Pascal showed an amazing aptitude for mathematics and science.

Particularly of interest to Pascal was a work of Desargues on conic sections. Following Desargues' thinking, the 16-year-old Pascal produced, as a means of proof, a short treatise on what was called the "Mystic Hexagram", *Essai pour les coniques* ("Essay on Conics") and sent it—his first serious work of mathematics—to Père Mersenne in Paris; it is known still today as Pascal's theorem. It states that if a hexagon is inscribed in a circle (or conic) then the three intersection points of opposite sides lie on a line (called the Pascal line). Pascal's work was so precocious that Descartes was convinced that Pascal's father had written it. When assured by Mersenne that it was, indeed, the product of the son not the father, Descartes dismissed it with a sniff: "I do not find it strange that he has offered demonstrations about conics more appropriate than those of the ancients," adding, "but other matters related to this subject can be proposed that would scarcely occur to a 16-year-old child."

In 1642, in an effort to ease his father's endless, exhausting calculations, and recalculations, of taxes owed and paid, Pascal, not yet 19, constructed a mechanical calculator capable of addition and subtraction, called Pascal's calculator or the Pascaline. The Musée des Arts et Métiers in Paris and the Zwinger museum in Dresden, Germany, exhibit two of his original mechanical calculators. Though these machines are early forerunners to computer engineering, the calculator failed to be a great commercial success. Because it was extraordinarily expensive the Pascaline became little more than a toy, and status symbol, for the very rich both in France and throughout Europe. However, Pascal continued to make improvements to his design through the next decade and built 20 machines in total.

Contributions to mathematics



Pascal's triangle. Each number is the sum of the two directly above it. The triangle demonstrates many mathematical properties in addition to showing binomial coefficients.

Pascal continued to influence mathematics throughout his life. His *Traité du triangle arithmétique* ("Treatise on the Arithmetical Triangle") of 1653 described a convenient tabular presentation for binomial coefficients, now called Pascal's triangle. The triangle can also be represented:

	0	1	2	3	4	5	6
0	1	1	1	1	1	1	1
1	1	2	3	4	5	6	
2	1	3	6	10	15		
3	1	4	10	20			
4	1	5	15				
5	1	6					
6	1						

He defines the numbers in the triangle by recursion: Call the number in the $(m + 1)$ th row and $(n + 1)$ th column t_{mn} . Then $t_{mn} = t_{m-1,n} + t_{m,n-1}$, for $m = 0, 1, 2, \dots$ and $n = 0, 1, 2, \dots$. The boundary conditions are $t_{m,0} = 0$, $t_{0,n} = 0$ for $m = 1, 2, 3, \dots$ and $n = 1, 2, 3, \dots$. The generator $t_{00} = 1$. Pascal concludes with the proof,

$$t_{mn} = \frac{(m+n)(m+n-1)\dots(m+1)}{n(n-1)\dots 1}$$

In 1654, prompted by a friend interested in gambling problems, he corresponded with Fermat on the subject, and from that collaboration was born the mathematical theory of probabilities. The friend was the Chevalier de Méré, and the specific problem was that of two players who want to finish a game early and, given the current circumstances of the game, want to divide the stakes fairly, based on the chance each has of winning the game from that point. From this discussion, the notion of expected value was introduced. Pascal later (in the *Pensées*) used a probabilistic argument, Pascal's Wager, to justify belief in God and a virtuous life. The work done by Fermat and Pascal into the calculus of probabilities laid important groundwork for Leibniz' formulation of the infinitesimal calculus.

After a religious experience in 1654, Pascal mostly gave up work in mathematics.

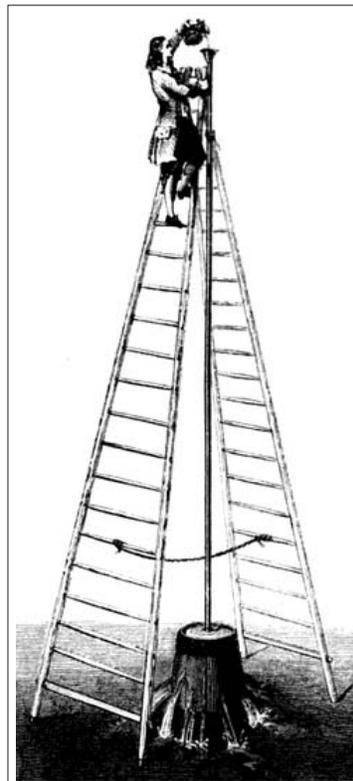
Philosophy of mathematics



Pascal's major contribution to the philosophy of mathematics came with his *De l'Esprit géométrique* ("of the Geometrical Spirit"), originally written as a preface to a geometry textbook for one of the famous "Petites-Ecoles de Port-Royal" ("Little Schools of Port-Royal"). The work was unpublished until over a century after his death. Here, Pascal looked into the

issue of discovering truths, arguing that the ideal of such a method would be to found all propositions on already established truths. At the same time, however, he claimed this was impossible because such established truths would require other truths to back them up—first principles, therefore, cannot be reached. Based on this, Pascal argued that the procedure used in geometry was as perfect as possible, with certain principles assumed and other propositions developed from them. Nevertheless, there was no way to know the assumed principles to be true. Pascal also used *De l'Esprit géométrique* to develop a theory of definition. He distinguished between definitions which are conventional labels defined by the writer and definitions which are within the language and understood by everyone because they naturally designate their referent. The second type would be characteristic of the philosophy of essentialism. Pascal claimed that only definitions of the first type were important to science and mathematics, arguing that those fields should adopt the philosophy of formalism as formulated by Descartes. In *De l'Art de persuader* ("On the Art of Persuasion"), Pascal looked deeper into geometry's axiomatic method, specifically the question of how people come to be convinced of the axioms upon which later conclusions are based. Pascal agreed with Montaigne that achieving certainty in these axioms and conclusions through human methods is impossible. He asserted that these principles can be grasped only through intuition, and that this fact underscored the necessity for submission to God in searching out truths.

Contributions to the physical sciences



Pascal's work in the fields of the study of hydrodynamics and hydrostatics centered on the principles of hydraulic fluids. His inventions include the hydraulic press (using hydraulic pressure to multiply force) and the syringe. He proved that hydrostatic pressure depends not on the weight of the fluid but on the elevation difference. He demonstrated this principle by attaching a thin tube to a barrel full of water and filling the tube with water up to the level of the third floor of a building. This caused the barrel to leak, in what became

known as Pascal's barrel experiment. By 1646, Pascal had learned of Evangelista Torricelli's experimentation with barometers. Having replicated an experiment that involved placing a tube filled with mercury upside down in a bowl of mercury, Pascal questioned what force kept some mercury in the tube and what filled the space above the mercury in the tube. At the time, most scientists contended that, rather than a vacuum, some invisible matter was present. This was based on the Aristotelian notion that creation was a thing of substance, whether visible or invisible; and that this substance was forever in motion. Furthermore, "Everything that is in motion must be moved by something," Aristotle declared. Therefore, to the Aristotelian trained scientists of Pascal's time, a vacuum was an impossibility. How so? As proof it was pointed out:

Light passed through the so-called "vacuum" in the glass tube.

Aristotle wrote how everything moved, and must be moved by something.

Therefore, since there had to be an invisible "something" to move the light through the glass tube, there was no vacuum in the tube. Not in the glass tube or anywhere else. Vacuums – the absence of any and everything – were simply an impossibility. Following more experimentation in this vein, in 1647 Pascal produced *Experiences nouvelles touchant le vide* ("New Experiments with the Vacuum"), which detailed basic rules describing to what degree various liquids could be supported by air pressure. It also provided reasons why it was indeed a vacuum above the column of liquid in a barometer tube.

On 19 September 1648, after many months of Pascal's friendly but insistent prodding, Florin Périer, husband of Pascal's elder sister Gilberte, was finally able to carry out the fact-finding mission vital to Pascal's theory. The account, written by Périer, reads:

"The weather was chancy last Saturday...[but] around five o'clock that morning...the Puy-de-Dôme was visible...so I decided to give it a try. Several important people of the city of Clermont had asked me to let them know when I would make the ascent...I was delighted to have them with me in this great work... "...at eight o'clock we met in the gardens of the Minim Fathers, which has the lowest elevation in town....First I poured 16 pounds of quicksilver...into a vessel...then took several glass tubes...each four feet long and hermetically sealed at one end and opened at the other...then placed them in the vessel [of quicksilver]...I found the quick silver stood at 26" and 3½ lines above the quicksilver in the vessel...I repeated the experiment two more times while standing in the same spot...[they] produced the same result each time... "I attached one of the tubes to the vessel and marked the height of the quicksilver

and...asked Father Chastin, one of the Minim Brothers...to watch if any changes should occur through the day...Taking the other tube and a portion of the quick silver...I walked to the top of Puy-de-Dôme, about 500 fathoms higher than the monastery, where upon experiment...found that the quicksilver reached a height of only 23" and 2 lines...I repeated the experiment five times with care...each at different points on the summit...found the same height of quicksilver...in each case..."

Pascal replicated the experiment in Paris by carrying a barometer up to the top of the bell tower at the church of Saint-Jacques-de-la-Boucherie, a height of about fifty meters. The mercury dropped two lines. In the face of criticism that some invisible matter must exist in Pascal's empty space, Pascal, in his reply to Estienne Noel, gave one of the 17th century's major statements on the scientific method, which is a striking anticipation of the idea popularised by Karl Popper that scientific theories are characterised by their falsifiability: "In order to show that a hypothesis is evident, it does not suffice that all the phenomena follow from it; instead, if it leads to something contrary to a single one of the phenomena, that suffices to establish its falsity." His insistence on the existence of the vacuum also led to conflict with other prominent scientists, including Descartes. Pascal introduced a primitive form of roulette and the roulette wheel in the 17th century in his search for a perpetual motion machine.

Adult life, religion, philosophy, and literature

For after all what is man in nature? A nothing in relation to infinity, all in relation to nothing, a central point between nothing and all and infinitely far from understanding either. The ends of things and their beginnings are impregnably concealed from him in an impenetrable secret. He is equally incapable of seeing the nothingness out of which he was drawn and the infinite in which he is engulfed.

Religious Conversion

On 23 November 1654, between 10:30 and 12:30 at night, Pascal had an intense religious vision and immediately recorded the experience in a brief note to himself which began: "Fire. God of Abraham, God of Isaac, God of Jacob, not of the philosophers and the scholars..." and concluded by quoting Psalm 119:16: "I will not forget thy word. Amen." He seems to have carefully sewn this document into his coat and always transferred it when he changed clothes; a servant discovered it only by chance after his death. This piece is now known as the *Memorial*. The story of the carriage accident as having led to the experience described in the *Memorial* is disputed by some scholars. His belief and religious commitment revitalized, Pascal visited the older of two convents at Port-Royal for a two-week retreat in

Men never commit evil so fully and joyfully as when they do it for religious convictions

– BLAISE PASCAL

January 1655. For the next four years, he regularly travelled between Port-Royal and Paris. It was at this point immediately after his conversion when he began writing his first major literary work on religion, the *Provincial Letters*. Pascal's most influential theological work, referred to posthumously as the *Pensées* ("Thoughts"), was not completed before his death. It was to have been a sustained and coherent examination and defense of the Christian faith, with the original title *Apologie de la religion Chrétienne* ("Defense of the Christian Religion").

Last works and death

Pascal's epitaph in Saint-Étienne-du-Mont, where he was buried. T. S. Eliot described him during this phase of his life as "a man of the world among ascetics, and an ascetic among men of the world." Pascal's ascetic lifestyle derived from a belief that it was natural and necessary for a person to suffer. In 1659, Pascal fell seriously ill. During his last years, he frequently tried to reject the ministrations of his doctors, saying, "Sickness is the natural state of Christians." Louis XIV suppressed the Jansenist movement at Port-Royal in 1661. In response, Pascal wrote one of his final works, *Écrit sur la signature du formulaire* ("Writ on the Signing of the Form"), exhorting the Jansenists not to give in. Later that year, his sister Jacqueline died, which convinced Pascal to cease his polemics on Jansenism. Pascal's last major achievement, returning to his mechanical genius, was inaugurating perhaps the first bus line, moving passengers within Paris in a carriage with many seats. An autopsy performed after his death revealed grave problems with his stomach and other organs of his abdomen, along with damage to his brain. Despite the autopsy, the cause of his poor health was never precisely determined, though speculation focuses on tuberculosis, stomach cancer, or a combination of the two. The headaches which afflicted Pascal are generally attributed to his brain lesion.

Legacy



In honor of his scientific contributions, the name **Pascal** has been given to the SI unit of pressure, to a programming language, and Pascal's law (an important principle of hydrostatics), and as mentioned above, Pascal's triangle and Pascal's wager still bear his name. Pascal's development of probability theory was his most influential contribution to mathematics. Originally applied to gambling, today it is extremely important in economics,



especially in actuarial science. John Ross writes, "Probability theory and the discoveries following it changed the way we regard uncertainty, risk, decision-making, and an individual's and society's ability to influence the course of future events." However, it should be noted that Pascal and Fermat, though doing important early work in probability theory, did not

develop the field very far. Christiaan Huygens, learning of the subject from the correspondence of Pascal and Fermat, wrote the first book on the subject. Later figures who continued the development of the theory include Abraham de Moivre and Pierre-Simon Laplace.

In literature, Pascal is regarded as one of the most important authors of the French Classical Period and is read today as one of the greatest masters of French prose. His use of satire and wit influenced later polemicists. The content of his literary work is best remembered for its strong opposition to the rationalism of René Descartes and simultaneous assertion that the main countervailing philosophy, empiricism, was also insufficient for determining major truths.

In France, prestigious annual awards, Blaise Pascal Chairs are given to outstanding international scientists to conduct their research in the Ile de France region. One of the Universities of Clermont-Ferrand, France – Université Blaise Pascal – is named after him. The University of Waterloo, Ontario, Canada, holds an annual math contest named in his honour. Roberto Rossellini directed a filmed biopic (entitled *Blaise Pascal*) which originally aired on Italian television in 1971. Pascal was a subject of the first edition of the 1984 BBC Two documentary, *Sea of Faith*, presented by Don Cupitt.

Courtesy: www.wikipedia.org

The power of a Man's virtue should not be measured by his special efforts, but by his ordinary doing – BLAISE PASCAL

Amish – The Kind Hearted People

The living philosophy of Amish is simple — back to the basics and nature. They even forgave the killer of their own children.

There are communities who voluntarily shun the modern way of life and opt for a simple, old-fashioned traditional way even though living amid an affluent society. The Amish people came from Germany to New England, in the U.S., to escape persecution. They speak a dialect of German-English. Their customs, traditions and culture have undergone minor changes during the last 250 years of their existence as a separate community with little interaction with the outside world other than unavoidable. Their living philosophy is simple - back to the basics and nature. Living in harmony with nature is what they preach and practise.

It was a revelation to visit one of their villages in Lancaster County of Pennsylvania. The Amish are about 250,000 in population residing in about 25 States of the U.S., Ohio and Pennsylvania being the most populated. These villages do not have electricity, hence no TV or fridge or any electrical device, do not have automobiles but only horse-drawn buggies and agriculture and raising farm animals are their main occupation. Women excel in making quilts, which are in great demand. Men grow beards, wear hats and jackets. Women are distinguished by their jackets and skirts and they also wear caps. They are not expected to have make-up but lead a simple unostentatious life.

Elected bishops are supreme — not only in religious matters but in settling civil disputes and giving rulings. Litigation is rare. Crime is non-existent in these villages. Children study in Amish villages up to the eighth grade and give up studies to take up farming and other vocational jobs within the community. Those who work outside the community return to their villages after work. It is rare to find anyone leaving the community to settle down to a 'normal' life outside.

Marriages are strictly within the community. Any one daring to marry a person from outside is "shunned", that means the villagers do not socialise with such renegades. Every week a church service is held in one of the homes led by the local bishop. The family is expected to provide space for the service and make arrangements to feed the congregation after service. Since every one has to

take turns in having the congregation once a week, the burden of such meetings is shared by everyone at his/her turn. Slow but small modifications, without any drastic change in the basic tenets, are seen in the villages. The Amish are a secluded lot and they do not mix with the mainstream people. So taking pictures of any Amish is taboo as well as a visit to any Amish household.

A tragic incident in October 2006 illustrates how the Amish community reacts. A deranged man, not Amish, barged into a small school in a village in Lancaster County. He was armed to the teeth. He shackled eight small girls aged between seven and 12. He was prepared to molest them but an alarm was raised and it upset him. He shot the girls spraying bullets that killed seven of them on the spot, while the eighth died in hospital. Knowing that his game was up he shot himself to death. This shook the peaceful community and the village was the centre of attention in the entire U.S. for a week. After autopsy, the little girls were buried amid mourning and prayer by a shocked community that had not witnessed any violence. This was a traumatic event for the entire community.

However, village elders met and decided to forgive the killer. They met the man's wife and his children and consoled them. They promised all support for the family and they wished her to stay in the same village nearby. There was not one bit of hatred but only compassion for the family of the assassin. In an extraordinary gesture, a few Amish men and women attended the funeral of the killer just to tell every one that the community harboured no ill will towards a dastardly killer who snuffed out young lives.

Noting that the village and the school where the killing took place had become a visitors' attraction, the Amish elders had the building razed to ground overnight. All that was visible the next morning was a plain field with grass spread over the land, indistinguishable from the surroundings with no trace of the building. It was a wonderful gesture that showed how the elders and the community reacted so maturely and philosophically to a cataclysmic event that had shattered their peaceful lives.

(D.B.N. Murthy, email: dbnvimi@gmail.com)

Courtesy: The Hindu, dt:04.08.2013

During my second year of nursing school our professor gave us a quiz. I breezed through the questions until I read the last one: "What is the first name of the woman who cleans the school?" Surely this was a joke. I had seen the cleaning woman several times, but how would I know her name? I handed in my paper, leaving the last question blank. Before the class ended, one student asked if the last question would count toward our grade.

"Absolutely," the professor said "In your careers, you will meet many people. All are significant. They deserve your attention and care, even if all you do is smile and say hello." I've never forgotten that lesson. I also learned her name was Dorothy. - JOANN C. JONES

P. S. SIVASWAMI IYER (1864 - 1946)

Sir Pazhamaneri Sundaram Sivaswami Iyer, KCSI, CIE (Tamil: பழமநேரி சுந்தரம் சிவசுவாமி அய்யர்) (b. February 7, 1864 - d. November 5, 1946) was a prominent lawyer, administrator and statesman who served as the Advocate General of Madras from 1907 to 1911.



Sivaswami Iyer was born on February 7, 1864 in the village of Palamaneri. He had his schooling in Palamaneri and graduated from Presidency College, Madras. Sivaswami Iyer studied law and practised as a lawyer serving as the Advocate-general of Madras Presidency from 1907 to 1911. He also served as a member of the executive council of the Governor of Madras and as a member of the Council of State. Sivaswami Iyer died on November 5, 1946 at the age of 82. Sivaswami Iyer was also active in the Indian independence movement and presented India's case before the League of Nations. He was a keen connoisseur of arts and library science.

Early life

Sivaswami Iyer was born to Sundaram Iyer in the village of Palamaneri on February 7, 1864. He

belonged to the Palamaneri Brahacharanams who traced their descent from Krishnan Raman Brahmarayar, the commander-in-chief of the Chola army under Rajendra Chola.

Sivaswami Iyer had his schooling in Palamaneri and graduated from Presidency College, Madras in January 1882, with a first class in Sanskrit and History. He studied law from Madras Law College and set up practice as a lawyer in 1885.

As lawyer

Sivaswami Iyer set up a successful practice as lawyer and on May 12, 1904, was nominated to the Governor's Executive Council as Additional member in charge of making rules and regulations. Sivaswami Iyer served as member of the Madras Legislative Council from 1904 to October 25, 1907, when he was appointed Advocate-General of Madras Presidency. Sivaswami Iyer was elected to the senate of the Madras University in 1898 and served as Vice Chancellor of the Madras University from 1916 to 1918. From 13 April 1918 to 8 May 1919, he served as the Vice Chancellor of Banaras Hindu University.

Politics

Sivaswami Iyer entered politics in 1912 when he was appointed member of the Executive Council of the Governor of Madras as per the Minto-Morley scheme and served from 1912 to 1917. During the First World War, he was instrumental in raising support for the Indian Volunteer Movement in order to provide support to the United Kingdom. His moderate views and weak opposition to Government policies including the widely condemned internment of Annie Besant during his tenure as member of the executive council earned him the displeasure of Indian nationalists. However, in 1919, Sivaswami Iyer expressed strong condemnation of the Jallianwala Bagh massacre.

Sivaswami Iyer was the Indian delegate to the third session of the League of Nations in 1922 in which, he condemned the mandate policy of General Smuts of the Republic of South Africa. Sivaswami Iyer served as a member of the Council of State from 1922 to 1923. He also opposed the Simon Commission on its arrival in India. Sivaswami Iyer served as a member of the Imperial Legislative Assembly, in which he spoke often on military matters.

Later life and death

In 1931, he was appointed member of the new Indian Military College Committee. During his later years, he expressed strong disapproval of any attempt to partition the subcontinent. Sivaswami Iyer died in his Madras home on November 5, 1946 at the age of 82. On his death, the Lady Sivaswami Iyer girls school was named after him in his memory.

Legacy and criticism

Sivaswami Iyer was an avid reader and a connoisseur of arts. He was a strong advocate of women's education and supported sweeping reforms to this regard. He took a special interest in military matters and served as a member of the Indian Military College Committee set up to establish an indigenous military academy on the model of Sandhurst.

Sivaswami Iyer was known for his mastery over Sanskrit and his love for the language. He is also known for his vehement attacks on Tamil extremists whom he once mocked as the "rabble in the towns".

Honours

Sivaswami Iyer was made a Companion of the Order of the Indian Empire in 1908 and a Companion of the Order of the Star of India in 1912. He was promoted to a Knight Commander of the Order of the Star of India in 1915.

DOCTOR'S VERDICT ON SALT - STRESS RELIEF IS SALT BAD FOR HYPERTENSIVE?

What is bad for hypertension is iodized salt, which is a fake salt. It's made up of only 3 synthetic chemicals, sodium, chloride, iodine. It does not melt in water (glistens like diamonds), does NOT melt in the body, does not melt in the kidneys, gives kidney stones, and raises blood pressure. However, it is the salt favoured by the drug-based doctors who say it is very clean and sanitary, pointing to how white it is and how it glistens like diamonds. The fake salt is man-made in a factory. The true salt, which comes from the sea and dried under the sun and commonly called rock salt, has 72 natural minerals including natural sodium, chloride, iodine. It melts in water, melts in your body, melts in the kidneys, does not give kidney stones, and best of all, brings down blood pressure and stops/prevents muscle cramps, numbness, tingling.

If you get muscle cramps in the lower legs at night, just take a half teaspoon of rock salt and a glass of water, and the cramps with its horrific pain will be gone in 5 minutes.

The highest BP that came my way was in a woman who had a BP of 240/140 and came to my house at 10:30 pm on what she said was a matter of "life and death" because the high BP was already giving her a crushing headache, especially the back of her head. She could not walk up the 6 shallow steps to my porch. Two men had to help her, one on each side, in addition to the cane that she needed to prop herself up.

I muscle tested her and found that she had her BP of 240/140 and the crushing pain in the head, her body's water content was only 6% (normal is 75%), salt content was zero, potassium was 96% deficient, and cardiac output (blood flow from the heart) was only 40% (normal is 100%). So the blood supply to the head was 60% deficient.

I gave her one 6" long green chili (hot pepper), 1 raw ripe saba banana, 1/2 teaspoon of rock salt and 3 8-oz glasses of tap water. The chili was to normalize cardiac

output and shoot blood to the head, the saba banana was for the potassium deficiency and to have food in the stomach because pepper will give a stomach ache if the stomach is empty, and the rock salt and the water were the first aid for her severe dehydration which was causing her arteries to be dry and stiff and her blood to be thick and sticky, because they were dehydrated.

After 5 minutes, she said, "The pain in my head is gone." We took her BP, it was 115/75, and cardiac output was up to 100%.

She walked out of the house to her car without the men helping her and without the cane.

She has been taking 2.5 teaspoons of rock salt, 15 glasses of water, 6 Saba bananas and 3 of the long pepper daily since then (beginning September 2009), and her BP and cardiac output have been normal since then.

Two months later, in November, at a PCAM round table forum on hypertension in Club Filipino, she gave her testimony, followed by her brother who said that she grew 2", because the salt and the water had refilled her compressed disc spaces in her vertebral column. The disc paces had become compressed because they had become dehydrated since the fluid filling up these discs are 95% water.

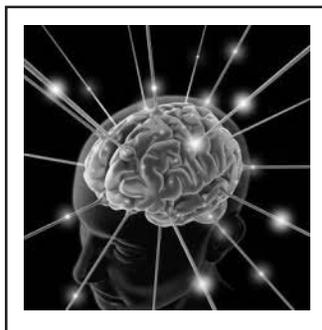
Why salt? Because without salt the body cannot retain water no matter how much water is drunk. You will still be dehydrated because you will just keep urinating and sweating the water out.

This is not an isolated case. When BP is rising high but there is little or no headache but there is stiffness of shoulder and neck muscles, all you need to normalize the BP and remove the stiffness and the pain in 5 minutes is 1/2 teaspoon of rock salt and 3 glasses of water. If there is crushing pain in the head, it means blood supply to the head is lacking, and you will need the chili to normalize it and shoot blood to the head and remove the extreme pain.

POWER YOUR MIND

PROOF OF GOD

Why do you ask for proof of God?
 In spite of terrible calamities,
 Dangers, accidents and diseases
 You are still alive. Is it not
 Enough proof that
 He is protecting
 You without your knowledge?
 He does not care whether you

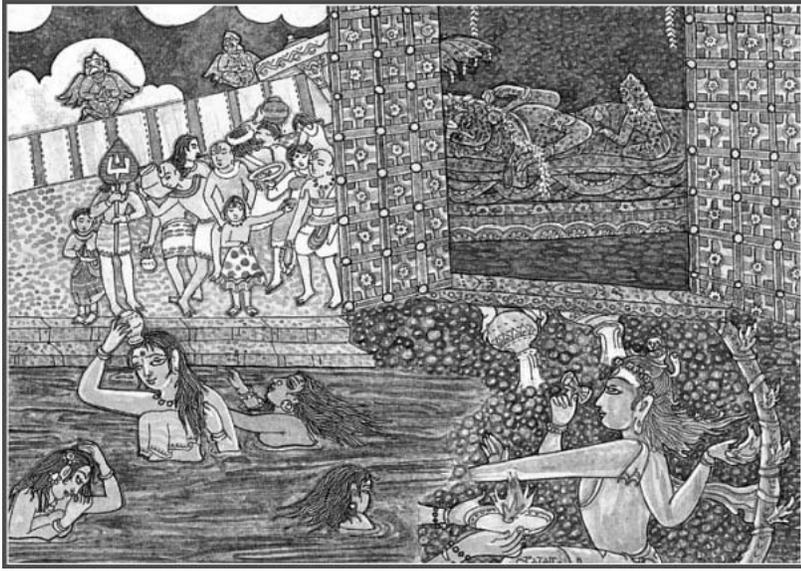


Believe or not.
 When you search for proof
 He just smiles and says
 Children! Be Happy.
 Religion is not the imagination
 Of lunatics but an experience
 Of the wise those
 Who walked with God.

Courtesy: Swami Srikantananda

HOME FESTIVALS

Markali(December/January)



During Tirupuval (below, in upper left of painting), people bathe (lower left) and gather in the early morning to go on procession singing devotional Vaishnava songs (upper left). Especially popular are those of the 9th

century lady saint Andal, venerated as one of South India's greatest devotional poets. On Vaikunth Ekadasi, the 11th day of the lunar month, the doors of the huge temple of Srirangam are opened to devotees from morning to night for darshan of Rangam, an aspect of Lord Vishnu, sleeping on Adishani, the serpent king (upper right). Another famed festival is Ardra Darshana, when Siva Nataraja is decorated and taken from the temple in procession throughout the community (lower right). Especially the ill and those of old age seek to have a glimpse of Nataraj. A renowned sweet, aurudra kalli, is made with vegetables on this day.

“All of these festivals are earnestly conducted. People wait for the day with their mind on God. The purpose is to gather in the home and worship for the prosperity of the family and of all mankind.”

MEMORIES OF A GOOD TEACHER

Do you think it's possible to like a person so much that you can't see a single flaw in them? Is it possible to admire a person to such an extent that whatever they do, it just seems perfect? Why yes, without doubt, one can say that she knows a person who is perfect in everything they do, say or think. I too knew someone who made an impact on me. A few years back... to be exact, 12 years ago, I knew a young lady who is still dear to me. She was quite short and had a very pretty face with eyes that looked like almonds, and the most striking feature was her smile! A smile that could brighten your day. She was exactly the kind of person whom children would love to see on their first day in class at a new school. I'm talking about my teacher. She knew how to make people feel special. We were in Kenya at that time. New school, new people, an altogether new life. I was feeling lost amidst all the happy chattering children. That's when Rose Ma'am came and talked to me. But the problem was I didn't know to speak in English properly. That was the most embarrassing moment on the first day at a new school. I somehow managed to stutter and stammer and talk to her. I was sure I made a bad impression on her. But she found it rather amusing. She just smiled and said, "I hope you have a fun year in my class. I know you are feeling a bit low at the moment. But don't worry; you'll make friends in two days. Just be happy with how things are going on. Keep that sweet smile of yours on and

everyone would want to talk to you." And yes, she was right! By the end of the first day, two girls came up to me and asked me if I wanted to be their friend. And I obviously agreed. This was just one of the many instances that made me like Rose Ma'am.

Days passed. Classes were going on fine. Since I used to reach early to class, I used to talk to her. We bonded fast. There was not a single day that I would go home without saying 'bye' to her. She helped improve my English. We used have a creative writing period. She was impressed with my writing and encouraged me to write more. And little by little she built up my English and made me confident.

Whatever I'm today, I owe it all to her. I really miss her. I tried to get in touch with her a couple of years ago only to learn that she had been suffering from cancer and had passed away. I was shocked. How I wish I could spend more days with her, just to let her know how she changed my life, how she influenced me. I'm sure I'm not only one whose heart she touched. She must've touched hundreds of children's hearts. She's that one teacher who can be best described with the quote: "The mediocre teacher tells. The good teacher explains. The superior teacher demonstrates. The great teacher inspires." - William Arthur Ward.

*by S. APOORVA, XII D, Chinmaya Vidyalaya, Tripunithura
Courtesy: The Hindu, dt:03.09.2013*

HUMOUR

Bank Robbery

During a robbery in Guangzhou, China, the bank robber shouted to everyone in the bank, "Don't move. The money belongs to the State. Your life belongs to you." Everyone in the bank lay down quietly. This is called "**Mind Changing Concept**". Changing the conventional way of thinking.

When a lady lay on the table provocatively, the robber shouted at her, "Please be civilized! This is a robbery and not a rape!"

This is called "**Being Professional**". Focus only on what you are trained to do!

When the bank robbers returned home, the younger robber (MBA-trained) told the older robber (who has only completed Year 6 in primary school), "Big brother, let's count how much we got."

The older robber rebutted and said, "You are very stupid. There is so much money it will take us a long time to count. Tonight, the TV news will tell us how much we robbed from the bank!"

This is called "**Experience**". Nowadays, experience is more important than paper qualifications!

After the robbers had left, the bank manager told the bank supervisor to call the police quickly. But the

supervisor said to him: "Wait! Let us take out \$10 million from the bank for ourselves and add it to the \$70 million that we have previously embezzled from the bank".

This is called "**Swim with the tide**". Converting an unfavorable situation to your advantage!

The supervisor says, "It will be good if there is a robbery every month."

This is called "**Killing Boredom**". Personal Happiness is more important than your job.

The next day, the TV news reported that \$100 million was taken from the bank. The robbers counted and counted, but they could only count \$20 million. The robbers were very angry and complained, "We risked our lives and only took \$20 million. The bank manager took \$80 million with a snap of his fingers. It looks like it is better to be educated than to be a thief!"

This is called "**Knowledge is worth as much as gold!**"

The bank manager was smiling and happy because his losses in the share market are now covered by this robbery.

This is called "**Seizing the opportunity**". Daring to take risks!

So who are the real robbers here?

By R.G. Keswani; Courtesy: Ieema Journal October 2013

TIRUKKURAL AND MANAGEMENT IN A 'NUTSHELL' 7



"Focus" and "Perseverance" are two important dimensions of Management Planning and Action to help justify Proper Application of Resources and Success. Tiruvalluvar addresses this as **Öökkamudaimai** in his Kurals. Öökkamudaimai is translated as Energy by some of the commentators. He brings out clearly the

Message that Resources may get wiped out in the absence of Öökkamudaimai.

Aakkam Izhandemendru Allavar Öökkam Oruvantham Kaithuudai yar Kural 593

ஆக்கம் இழந்தேம் என்று அல்லாவார் ஊக்கம் இருவந்தம் கைத்துஉடையார் குறள் 593

"Behold the men that hold in their hands the resource called unremitting Energy; they will never despair saying 'Alas we are ruined'

Udaiyar Enappaduvathu Öökkamakththu Illar Udaiyathu Udaiyaro Matru? Kural 591

உடையர் எனப்படுவது ஊக்கம் அஃது இல்லார் உடையது உடையரோ மற்று? குறள் 591

"Those that possess Energy are alone to be called High; as those that possess it not, do they really possess what they own?"

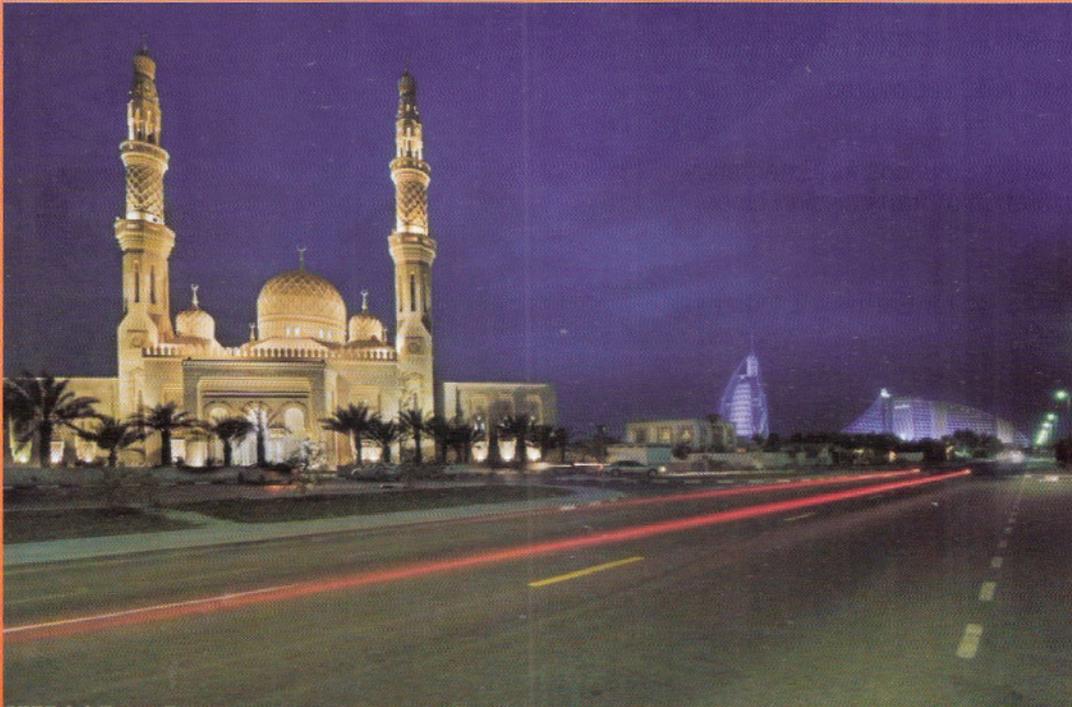
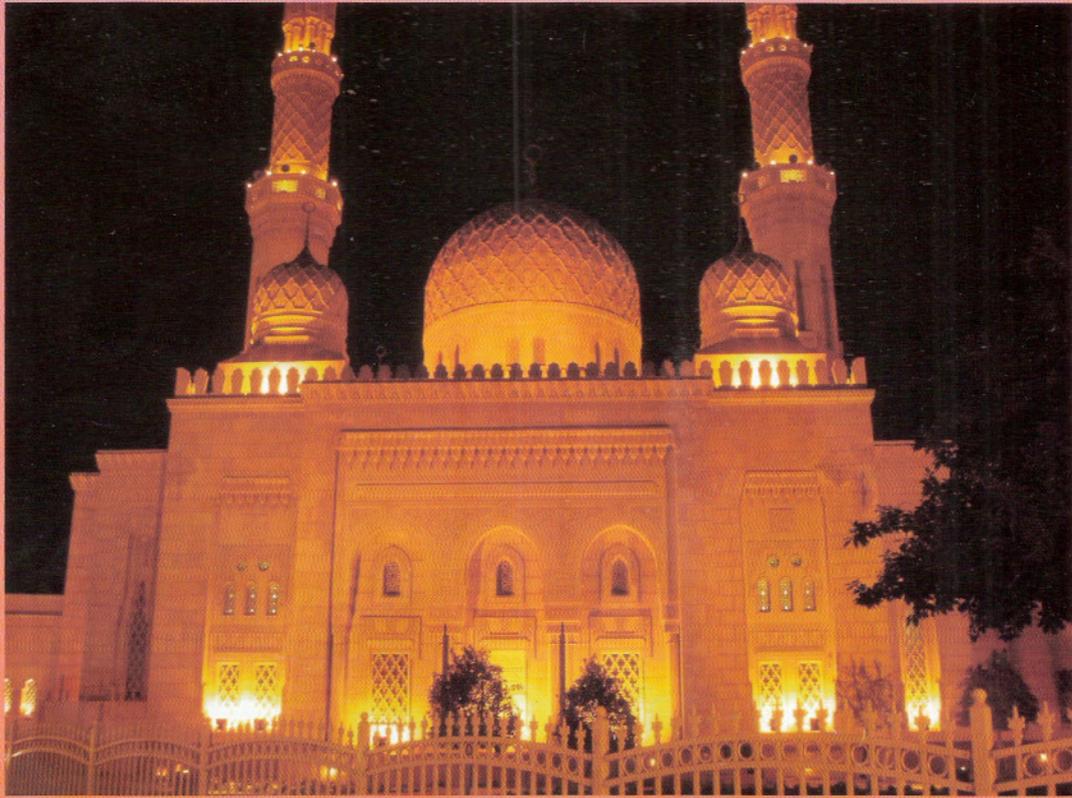
TODAY'S REALITY

*Big house but small family.
More Education but less Common sense.
Advanced Medicine but poor Health.
Touched Moon but Neighbours unknown.
High Income but less Peace of Mind.
High IQ but less Emotions.*

*Good knowledge but less Wisdom.
And finally Lots of human beings but less Humanity.*

*Some one asked Buddha. What is Poison?
He gave a Great Answer.
Everything Excess in Life is Poison.*

THE JUMEIRAH MOSQUE



The Jumeirah Mosque is located in beachside area in Dubai, Jumeirah Mosque is the only Mosque in Dubai which is opened for the non Muslims. There is another Mosque named as Sheik Zayed Grand Mosque in Abu Dhabi is also opened for non Muslim tourists.

Jumeirah Mosque is built in 1978 with beautiful white stone structure with towering twin minarets framing a large central dome.

Non-Muslims visitors can visit Jumeirah Mosque at every Saturday, Sunday, Tuesday and Thursday.

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