



# ELECTRICAL

INSTALLATION ENGINEER

## NEWS LETTER

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

Old No.82 / New No. 123, Lloyds Enclave, Avvai Shanmugam Road, Royapettah, Chennai - 600 014.

Phone : 2811 1300 Fax : 2811 1908 Email : tnagrade@gmail.com Website : www.teiea.com

ISSUE NO. 89

VOL : No. 8/2013

MONTHLY ISSUE NO. 7

PRIVATE CIRCULATION ONLY

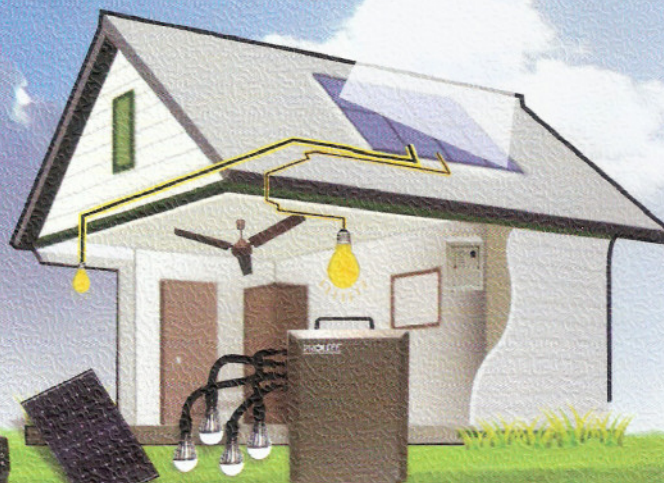
JULY 2013

## LED Solar Portable Lights

**PROLITE**<sup>®</sup>  
SOLAR LIGHTING SOLUTIONS

### Usages:

- Rural village
- Rescue
- Farm house
- Camping
- Trekking
- Fishing
- Shelter
- Any outdoor activities



Single LED Home Light

Four LED Home Light



Prolite Autoglo Limited

25, Singh Indl. Est. No.3, Ram Mandir Rd,  
Goregaon (W), Mumbai - 400 104, INDIA.

Tel: +91-22-6786 8100 / Fax: +91-22-6786 8107 E-mail: sales@prolite.in

www.prolite.in/solarhomelighting

www.prolite.in

Since 1984

*We do not take it lightly !!!*





# SEMINAR ON SAFETY WEEK - 25.05.2013 - MADURAI



Lighting the  
Kuthuvilakku by  
Er. S. APPAVOO, B.E.,  
Chief Electrical  
Inspector to  
Government



Releasing of  
the Souvenir



Participants gathering  
at the Meeting



## EDITORIAL

Dear Members, Fellow Professionals, Friends and Well wishers,  
SEASONS GREETINGS TO ONE AND ALL!

The Rains in many parts of the Country, and the inflows in many rivers and dams are encouraging signs, associated with improvements in Power situation, which all indicate better times of Growth and Economy. The excess of rains in some parts and the serious problems associated with it are very disturbing, but the reality is that it is almost an annual phenomenon happening in different locations each time. Our preparedness supported by Planning and Technology has to be improved vastly, which we are sure will happen as we go along as we are a capable nation, but we always learn our lessons from experience.

The month of July represents Cooperation and Cooperatives Internationally and in this connection it may be worth remembering about International Efforts and our involvement and role. In this context, the following quote will illustrate the essence. "As we reaffirm our development commitments, we realise that the world has changed profoundly since development cooperation began over 60 years ago. Economic, political, social and technological developments have revolutionised the world in which we live. Yet poverty, inequality and hunger persist. Eradicating poverty and tackling the global and regional challenges that have adverse effects on the citizens of developing countries are central to ensuring the achievement of the Millennium Development Goals and a more robust and resilient global economy for all. Our success depends on the results and impact of our joint efforts and investments as we address challenges such as climate change, economic downturns, food and fuel price crises, conflict, fragility and vulnerability to shocks and natural disasters. We also have a more complex architecture for development cooperation. G8 and recently G20 and BRICS are indispensable actors in global development."

BRICS is the acronym for an association of five major emerging national economies: Brazil, Russia, India, China and South Africa. The grouping was originally known as "BRIC" before the inclusion of South Africa in 2010. With the possible exception of Russia, the BRICS members are all developing or newly industrialised countries, but they are distinguished by their large, fast-growing economies and significant influence on regional and global affairs. As of 2013, the five BRICS countries represent almost 3 billion people, with a combined nominal GDP of US\$14.8 trillion, and an estimated US\$4 trillion in combined foreign reserves. Presently, South Africa holds the chair of the BRICS group.

Most of the materials necessary to our development have a geological origin: through this science we can identify and exploit sources of energy, from coal to natural gas and uranium, but also help identify alternative ones such as geothermal and hydropower, with a crucial role in the creation of a sustainable development model.

One of the important dimension of common interest among BRICS Nations is Energy as all these countries are Rich in Energy Resources including 'Renewables'. India can hope to benefit from the Cooperation in large measure to ensure Energy Security.

*We thank all those members who have helped us by participating in the advertisements appearing for the issue June 2013 – Galaxy Earthing Electrodes Pvt. Ltd., Electrotherm India Ltd., Prolite Autoglo Ltd., Power Links, Universal Earthing Systems Pvt. Ltd., Hensel Electric India Pvt. Ltd., Wilson Power and Distribution Technologies Pvt. Ltd., Pentagon Switchgear Pvt. Ltd., K-Lite Industries, Intrans Electro Components Pvt. Ltd., OBO Bettermann India Pvt. Ltd., Light India International 2013, Axess Seven, Universal Power Equipment Pvt. Ltd., Ashlok Safe Earthing Electrode Ltd.*

EDITOR

## CONTRIBUTION TO NEWSLETTER

(Rs.1,000/- per year)

256. M/s. Blue Sea Electrical Contractors (2013-2014)
257. M/s. KSB Electricals (2010-2014)
258. M/s. Philson Electric (P) Ltd (2013-2014)
259. M/s. Vinoth Electricals (2013-2014)
260. M/s. Karpaga Vinayagar Electricals (2009-2014)
261. M/s. Shree Sakthie Electrical & Engg (2013-2014)
262. M/s. S.S Electricals, Sriperumbudur (2012-2014)
263. M/s. MV Power Consultants & Engg (2013-2014), **New Member**
264. M/s. Transclean Electricals (2013-2014)
265. M/s. AN Power Engineering (2010-2014)
266. M/s. Chennai Engineering Services (2010-2014)
267. M/s. Vennila Electricals (2013-2014), **New Member**
268. M/s. Ganesh Electricals (2010-2014)
269. M/s. Bhabu Electricals (2013-2014), **New Member**
270. M/s. Vasu Electricals (2013-2014)

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

*(Please help us to serve you better)*

## OBITUARY



**D. SAMUEL**

(02-04-1940 – 18-06-2013)

On behalf of The Tamilnadu Electrical Installation Engineers Association 'A' Grade extends **Heartfelt Condolences** for the demise of Our Member **Mr. D. SAMUEL**, Proprietor, **Kumaran Engineering, 5/251-J, Samuel Building, (Opp. Abhirami Nagar), SPIC Nagar, Tuticorin – 628 005**. He is one of our active Senior Member.

*We pray the almighty to rest his Soul in Peace.*

**President : U. BASKARAN**

**Secretary : K. KANNAN**

**Treasurer : P. SUYAMBU**

**Editor :**

**G. VENKATESH**

**Printer :**

**M. VENKATARAMAN**

**Advisor :**

**S. MAHADEVAN**

No part of the material protected by this copyright notice may be reproduced or utilised in any form or by any means, the electronic or mechanical including photocopying, recording, or by any information storage and retrieval systems, without prior written permission from the copyright owner.

### YOUR CONTRIBUTION TOWARDS NEWS LETTER

#### (A) FOR BLACK & WHITE ONLY

1. Full Page (Per Issue)  
Rs. 2500

#### (B) FOR FOUR COLOUR PRINTING

1. Full Page only (Per Issue)  
Rs. 5000

Same Size Positives  
CD/Zip  
to be supplied  
by the Advertiser

*Demand Draft by drawn in favour of the  
"Tamilnadu Electrical Installation  
Engineers' Association 'A' Grade"  
payable at Chennai*

### PARTICULARS

### PAGE NO.

Seminar on Safety Week - 25.05.2013 - Madurai	6
Editorial	7
Contribution to Newsletter	7
Contents	8
Members Details	9
Know Thy Power Network – 70	10-11
Urgent Appeal for Uttarakhand Floods	11
Study on Estimation of Lifetime of Transformer Oil in Service	12-14
Samsung to Test 7 MW Offshore Wind Turbine at NAREC	15
Energy Management-Enabled LV Breaker by ABB	15
What is CE Marking?	16
Nanoparticles Promise to make LEDs Cheaper	16
Energy Utilization Efficiency and Harmonics	17-18
Product of the Month - Equipments by Installing Surge Protection of Sensitive Electrical & Electronic N Device	19
What is Power Factor?	20
Public can Approach TEDA approved agencies for Solar Panel Installation	20
Correcting Power Factor an Important Savings Factor	21-22
Consumers may get more time to meet Solar Purchase Obligations	22
IEEE Standards for Power Quality	23-24
Harnessing Ocean Current Energy - Promising New System Developed	25
Plasma Creation & Control	25
Help Line	26
Events	33
Chennai to Host India's Largest and Brightest Lighting Fair during September 13-16, 2013	35
Carbon Nanotubes Capture Electrical Signals between Neurons	35
Interview with Mr. Dilip Kumbhat on LII 2013	36-37
Premature failure of Transformers - Role of condenser bushings	38-39
UK Prime Minister Launches World's Largest Offshore Wind Farm	39
Energy Story - Energy Efficiency – The Fifth Fuel - Part 4	40-43
Abdullah Launches UT as 'Model Solar City'	43
Twisted Light Sends data through Optical Fiber for First Time	43
André-Marie Ampère	44-45
What is the Difference?	45
Mouse Inventor who Foresaw the Modern Internet	46
You are Never too old to Learn	46
Lakshmi Sahgal	47
How do I Protect Myself from UV Rays?	48-49
Managing Stress	50
Tirukkural And Management in a 'Nutshell' - 3	51
Home Festivals - 8	51
A Wonderful Experience?! ... Ha Ha Ha ..Enjoy	51
Dharma - 3	52
Power Your Mind - 3	52
Humour	53
Cutting-Edge Lighting Solution by Zumtobel for "Vorarlberg Museum"	54-55
Book Price List	56

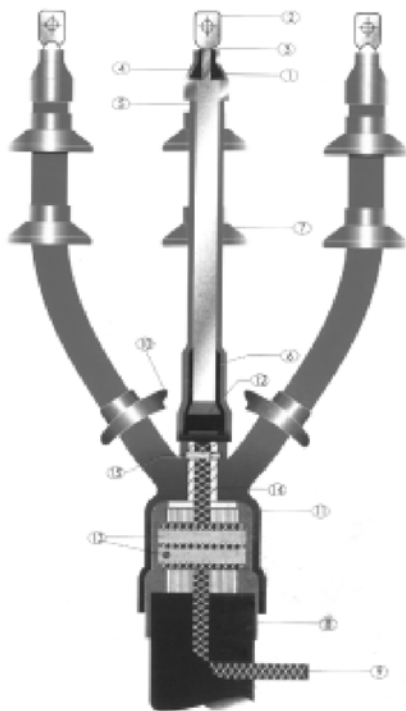
### ADVERTISEMENTS

### PAGE NO.

Ashlok Safe Earthing Electrode Ltd.	60
AXESS Seven	28
Cape Electric Pvt. Ltd.	30
Galaxy Earthing Electrodes Pvt. Ltd.	59
Hensel Electric India Pvt. Ltd.	2
Intrans Electro Components Pvt. Ltd.	3
K-Lite Industries	31
Light India International 2013	34
OBO Bettermann India P. Ltd.	5
Pentagon Switchgear P. Ltd.	4
Power Cable Corporation	32
Power Links	9
Prolite Autoglo Ltd.	1
RPG Cables	58
Universal Earthing Systems Pvt. Ltd.	27
Universal Power Equipment Pvt. Ltd.	29
Wilson Power and Distribution Technologies Pvt. Ltd.	57

## MEMBERS DETAILS

S.No.	Company Name	License No.	Place	Contact No.
251	Sun Power Engineers	EA 2259	Tirupur	0421-4350131, 98430 27586
252	JB. Electricals	EA 1785	Trichy	0431-483100, 94421 04300
253	L & K Electrical Enterprises	EA 1631	Trichy	94434 01640
254	Power Electrical Works	EA 2161	Trichy	0431-2531909, 94431 53290
255	Tech-up Engineering (P) Ltd.	ESA 251	Trichy	0431-2531925, 94433 46542
256	Thrisha Electricals & Engg	EA 2644	Trichy	98424 80044, 73739 68308
257	LMG Electricals (Formerly Universal Switchgear's)	EA 2693	Trichy	99409 12148, 98653 32658
258	TSP Engineers & Consultants	EA 2582	Trichy	0431-2782680, 9442120350
259	K. Swamy Electricals	EA 2486	Trichy	94423 60536, 94434 57810
260	Aarthy Electricals	ESA 172	Tuticorin	0461-4001152, 98657 58713
261	Kumaran Engineering	EA 1901	Tuticorin	04639-238275, 94897 49509
262	Nataraja Enterprises	ESA 182	Tuticorin	0461-234 1395, 98421 22397
263	SPIC Ltd.	ESA 259	Tuticorin	0461-2355401, 99944 88434
264	Vignesh Electricals	ESA 288	Tuticorin	0461-2392306, 98421 90136
265	Kutsun Enterprises	EA 2419	Tuticorin	0461-2324334, 94431 50291



## POWER LINKS

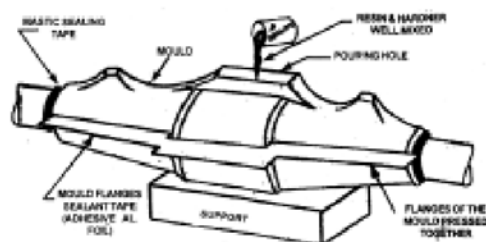
94/95, Triplicane High Road,  
Chennai - 600 005.

**Ph : 28420695, Mobile : 9282143549**

**● HEAT SHRINKABLE &  
● EPOXY COMPOUND TYPE  
CABLE JOINTING KITS**

From

**1. 1 KV (LT) to 33 KV (HT)  
FREE INSTALLATION SERVICE**



## Asset Management- An overview

**1.1** In my previous articles, an important topic, viz. “Residual Life Assessment of Electrical Equipment” has been dealt with in detail. We all know that this “Residual Life Assessment” is a part of the main subject, viz. “Asset management”. Hence it is desirable to learn more about this Asset Management. The backbone of this article is formed with the useful information gleaned from T&D World journal, May 2013. When I speak about Asset Management the first point that needs stress is that it is always preferable to keep the focus on “equipment” rather than make them out of the area of our concern.

**1.2** Every equipment has a specific/designed normal life span. It depends on the operating environment. If there is any abnormality in its operating conditions or any excess working beyond its assigned/designed parameters, its accelerated ageing will set in. This fast depletion of its normal lifeline or life forces will lead to its premature end/failure. We all are aware of this. After getting this awareness, is it not essential for us to learn more about “Asset Management” and its components like “Risk Management”? These topics have ‘great content’ in them. It will be of great interest and benefit, when we peep into this world, go through these topics, investigate their significance and structure.

**1.3** Every utility, industry, company is managing its assets; the important point is how effective/successful are in their attempts/methods. *Then you may pose the question what is “Asset”? Why does it assume greater significance?*

*Taking a broad view, it can be stated that “Asset” is anything that affects the value of the utility, industry or company when its use or functionality is not on the “right track”. Thus, assets include equipment, systems, intellectual property and people. This view helps us to understand that*

- *All these things are intact*
- *Equipment provide valuable service to the end users viz. the consumers*
- *People perform ‘Asset management’, operate, repair and replace equipment.*
- *Information systems collect data and help managers for decision making*
- *Intellectual property sets the techniques by which the asset management is performed.*

Thus Asset Management works if it is treated as an enterprise wide behaviour.

**1.4** All assets are constantly changing/deteriorating; they move towards their end of life. i.e. they will become obsolete or fail to serve their designed purpose in course of time. All these point to the need for “managing these assets” which is different from the “experiencing the life of an asset”. The latter is costly and expensive. Thus there exists a need for managing the assets, from their selection/erection to final disposal with the best practices available. “Cost cutting” is not a correct method. “Optimization” is one of the best options available. An asset management is nothing but “Optimizing Risks”. It is one of the methods of risk management.

**1.5** Among the risks normally faced by the utilities, industries and companies are,

- The external risks caused by normal operation, weather events, changes in customer demands, changes in government policies, economic conditions and many other risks caused by external influences/factors
- The internal risks caused by the deterioration of the equipment.
- Financial risks
- Risks of not setting any performance targets

**1.6** We should understand the existing risks and determine the levels of acceptable risks and also know the cost of not making a decision or adding further risks. In this regard, a comprehensive asset management system will play a significant role and of much use. An integrated system of asset management is always preferred. This method helps to identify

- the risks faced by the utilities, industries and companies and their consequences if not managed properly.
- the appropriate levels of risk tolerances
- the preferable/available risk mitigation methods
- whether maintenance programs are correctly carried out and skill forces are correctly put in place
- whether equipment life extension programmes or replacement of important assets are adopted
- the preferable step-by-step methods to track and measure risk, to manage risks and to achieve the set targets or goals.

The modern information and knowledge systems play an important role in this regard. There is a need for increased data, improved data management, performance analysis and data process automation tools. The next step that follows this methodology is called “Dynamic asset risk management”. In this method, the common tools mentioned above will be used along with various real time data streams so as to get effective, operational recommendations.



**2.1** Following viewpoints are generally adopted for achieving the goals in electrical utilities.

- Technical performance
- Financial Performance
- Compliance with various Regulatory Commissions
- Customer satisfaction

**2.2** Risks are measured in six to eight categories under each viewpoint. To cite examples

- under the head technical performance, risks can be measured in a reliability improvement project or an end of life asset replacement project,
- under customer satisfaction, it can be carried out for Billing system improvement;
- a project with a quick pay back (financial performance) is considered for a capital investment programme.

**2.3** The suggested areas where Dynamic Asset Risk Management principle can be applied in an electrical utility's operating business risks are as follows:

- Storage batteries in a substation are nearing their end of life
- Thunderstorms or cyclonic storms are on the way
- A feeder breaker does not reclose properly
- Highly loaded feeder circuits
- Protection relays which always cause problems

These issues relate to the programmes like maintenance, planning storm reliefs, capital spending and customer satisfaction.

I would like to sign off here. Kindly stay tuned.

*(To be continued...)*

*V. Sankaranarayanan B.E., FIE, Former Addl. Chief Engineer/TNEB  
e-mail: vsn\_4617@rediffmail.com; Mobile: 98402 07703*

## **URGENT APPEAL FOR UTTARAKHAND FLOODS**

As the magnitude of tragedy caused in Uttarakhand continues to unfold, **Prime Minister Dr. Manmohan Singh has issued an appeal to the public** for generous donations to support the victims who have suffered “**extensive devastation**”.

**“I appeal to all citizens to donate generously to the Prime Minister’s National Relief Fund,” he said.**

We request all our members to contribute to this noble cause.

Please send your contributions by way of Cheque or Demand Draft drawn in favour of  
**“The Chief Minister’s Relief Fund Uttarakhand”**

***Please send your Cheques to Association office before 20<sup>th</sup> August 2013.***

With the cheque or Demand Draft please enclose the following details.

1. Name :
2. PAN No. :
3. Address :
4. Mobile No. :
5. Tel No. :

We shall acknowledge your contributions in the Newsletter Issue.

*Please note that the receipt will be sent by Chief Minister’s Office  
to the Remitter directly to your address for claiming deduction  
u/s Section 80G of Income Tax Act, 1961.*

# STUDY ON ESTIMATION OF LIFETIME OF TRANSFORMER OIL IN SERVICE

*Lifetime of a transformer depends on the age of its electrical components, liquid and solid insulation. So study on ageing of oil is equally important as that of the solid insulation. The oil under service is subjected to thermal and electrical stress. Presence of oxygen and moisture and contaminants act as catalyst to accelerate the ageing process. Oil is regularly monitored to assess the extent of ageing. It is also desirable to establish the remaining life of the oil at various point of time during its service period. In order to do that it is required to know the rate of degradation of oil under operating conditions. It is well known that the operating conditions vary from one transformer to other and which is further influenced by the environmental factors. Due to these facts, the ageing of oil is considered to be a complex process. This suggests that the study to be conducted on large number of transformers in order to get a representative ageing characteristics. In the present study, a large number of oil samples drawn from power transformers of various age groups were analyzed. It is observed that deterioration of Interfacial tension and acidity is almost linear with service period and can find application in assessing lifetime of the oil.*

**Keywords:** Transformer oil, Mineral oil, Ageing, Degradation and Lifetime of oil.

## 1.0 INTRODUCTION

Mineral oil is used as insulating and cooling medium in transformers. It is reported that the oil plays very important role in the performance of a transformer [1]. Lifetime of a transformer depends on the status of its electrical components, solid insulation and oil condition. So study on transformer oil under varying operating conditions is a subject of investigation for many years. It is known from published literature that degradation of transformer oil is greatly influenced by large number of factors such as thermal and electrical stress, presence of oxygen, moisture and impurities [1-4].

Hydrocarbon based mineral oil is widely used as transformer oil. Ageing causes change in electronic configuration of the constituting hydrocarbon molecules and an electron valance is built up [2]. The ageing processes occurring during the service of a transformer may change the electric properties of the oil and may damage the insulation system [3]. Indicators of ageing process such as yellowing, oxidation, increased acidity and water content also reported [5]. Interfacial tension, a parameter used for qualitative characterization of oils, the value of 40 mN/m indicates the absence of undesirable polar components. Neutralization number (acidity) is a measure of the trace amount of acidic or alkaline contaminations in the oil [6]. Thus the ageing of oil is a complex process. There are at present various physicochemical theories upon ageing, which justify the degradation processes.

In recent years, many analytical techniques and numerical computation systems have been developed to estimate ageing of oil [7]. Helerea *et al.* [8] have proposed a mathematical expression to evaluate lifetime of transformer oil:

$$L = -\ln P_{cr} \cdot \{1/K(S)\}$$

Where,  $P_{cr}$  is the critical index of the end of life and  $K(S)$  the ageing speed. It is reported that the lifetime duration is inversely proportional to the ageing speed.

There are standards on transformer oil indicating the permissible values of various parameters [9]. These limits can effectively be used to understand whether the oil is suitable for a transformer in service or not. Permissible limiting values for various parameters as per IS: 1866-2000 is shown in Table 1. It does not provide information on how long the oil can be used. To understand it and for a better prediction of ageing of oil, a data base is required on time dependent degradation behaviour of transformer oil. In the present paper, an attempt has been made to study the natural ageing of transformer oil in service by analyzing properties like Interfacial Tension, Neutralization Value, Dielectric Dissipation Factor (Tan  $\delta$ ) and Resistivity that may be useful to assess the remaining life of transformer oil.

## 2.0 EXPERIMENTAL TECHNIQUES

In the present study, naturally aged transformer oil samples collected from power transformers installed in same geographic zone with an age of 5-30 years were analyzed for Interfacial Tension, Neutralization Value, Dielectric Dissipation Factor (Tan Delta) and Resistivity. The samples are divided in six age groups, i.e., 5, 10, 15, 20, 25 and 30 years. In order to get representative values, about 10 samples in each age group are presented in this investigation.

***An Electrical shock victim might make you another victim - you can't touch that!***



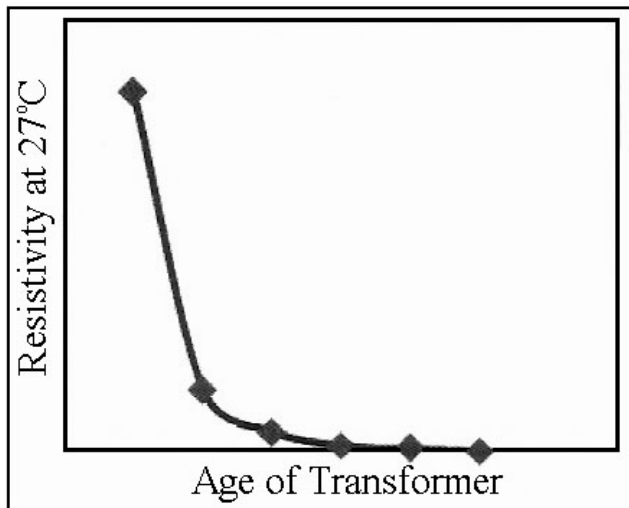
ELTEL make Automatic Tan Delta and Resistivity meter, Model ADTR 2 K was used for measuring Tan Delta and Resistivity of all the oil samples under this study. The measurements were carried out at 27°C and 90°C. Automatic Tensiometer Model DST 30 m, Surface Electro Optics, make, was employed for measurement of Interfacial Tension. Acidity of oil specimen was analyzed using Kyoto make Auto Titrator AT510.

**TABLE 1**

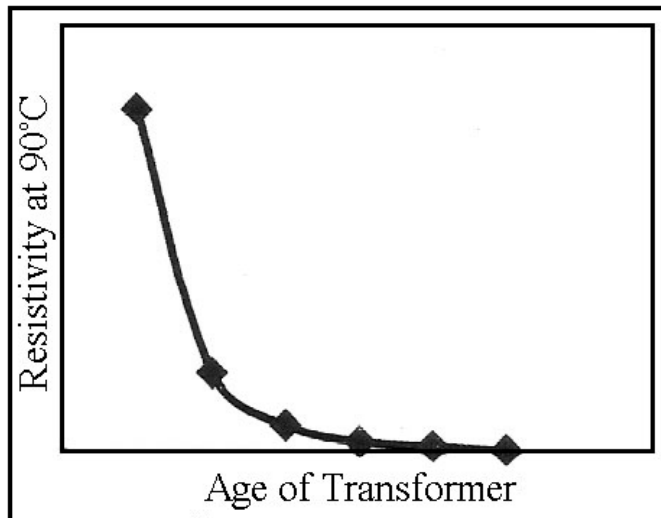
<b>RECOMMENDED LIMITS OF TRANSFORMER OIL IN NEW TRANSFORMER AND TRANSFORMER IN SERVICE</b>			
<b>Sl. No</b>	<b>Property</b>	<b>New</b>	<b>In service</b>
1	Resistivity, $\times 10^{12}$ Ohm-cm. at 27°C	6	0.10
2	Tan delta* at 90°C	0.015/0.01	1.0/0.2
3	Acidity, mg KOH/g	0.03	0.3
4	Interfacial Tension, at 27°C, mN/m	35	15
*Higher value is for transformer with >170 kV rating.			

### 3.0 RESULTS AND DISCUSSIONS

With the advancement of ageing, the colour of a new transformer oil changes from pale yellow to yellow and then finally to dark brown. So, colour of service oil is the simplest method to assess qualitatively the extent of its ageing. The transformer oil being functioned as an insulating material, its resistivity has to be very high. As per national and international standards, its minimum value should be  $1.0 \times 10^{12}$  and  $0.1 \times 10^{12} \Omega$ -cm at 27°C and 90°C respectively. Effect of service period on the resistivity of transformer oil at 27°C and 90°C is shown in Figures 1-2 respectively. The decrease in resistivity is very rapid during first 10-15 years of service. The trend is similar for both the temperature studied. It is noticed that the graph of resistivity of oil vs. age of transformer reached a very low value at a service period of about 20 years. The transformer oil is chemically a hydrocarbon compound having no polar or ionic group attached to it. High resistivity at the initial stage of service is the indication of purity of hydrocarbon. The rapid decrease in resistivity is due to the formation of large amount of polar and ionic compounds in transformer oil with increase in its service period.



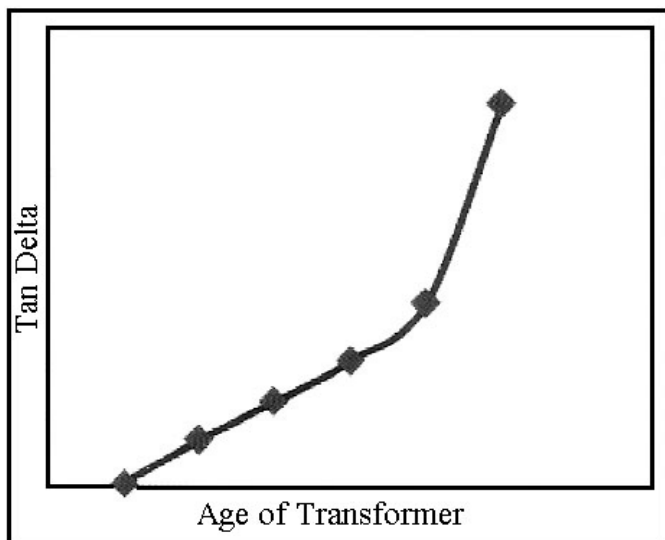
**Fig.1: Effect of Service Period on the resistivity of Transformer Oil at 27°C**



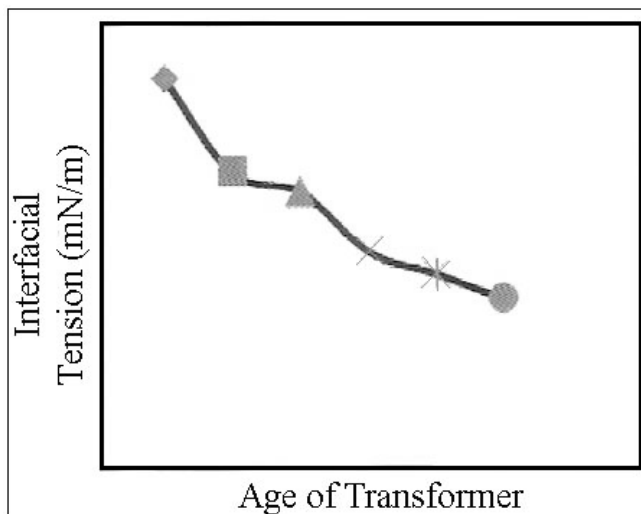
**Fig.2: Effect of Service Period on the Resistivity of Transformer Oil at 90°C**

The dielectric dissipation factor or tan delta of transformer oil is the tangent of the loss angle. In transformer oil, a high tan delta is an indication of significant power loss in the insulating oil, usually as a result of polar contaminants such as water, oxidized product of oil and cellulose paper. The increase in tan delta of transformer oil samples is shown in Figure 3. During initial period of service, a steady increase in tan delta was observed whereas the change was very rapid from the age of about 20 years.

**Men love to wonder, and that is the seed of science. – RALPH WALDO EMERSON**



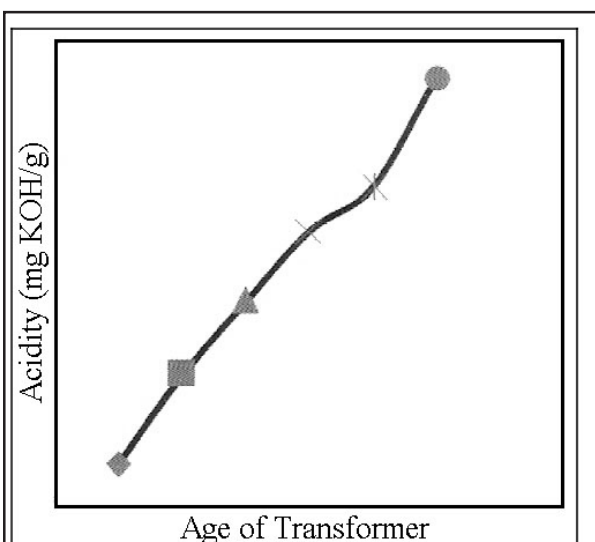
**Fig.3: The increase in Tan Delta of Transformer Oil Samples with Ageing**



**Fig.4: Effect of Age of Transformer Oil on its IFT**

The Interfacial Tension (IFT) measures the tension at the interface between two immiscible liquid (oil and water) and is expressed in mN/m. The test is sensitive to the presence of oil decay products and soluble polar contaminants from solid insulating materials. Figure 4 shows the effect of age of transformer oil on its IFT. The oil with an average age of 5 years is having an interfacial tension of about 40 mN/m. It is observed that the IFT decreased to about 16 mN/m at an average age of 30 years. The oil degradation components that affect interfacial tension are acids, aldehydes, ketones and esters. Oil oxidation products lower the interfacial tension and have an affinity for both water (hydrophilic) and oil. This affinity for both substances lowers the IFT. The greater the concentration of contaminants, the lower the IFT, with a badly deteriorated oil having an IFT of 18 mN/m or less.

The total acidity of transformer oil increases very slowly with service period and increases high when the transformer oil is ageing as shown in Figure 5. The total acidity of transformer oil depends on the amount of inorganic and organic acids present in it. Contamination of oil is the main cause of inorganic acidity. Hence, inorganic acidity is not expected to increase to a large extent with the increase in service period of transformer oil, if the transformer is maintained properly. Organic acids in the oil are originated as a result of oil oxidation. These organic acids are detrimental to the insulation system and can induce corrosion inside the transformer in presence of water. An increase in the acidity is an indication of the rate of deterioration of the oil with formation of sludge as the inevitable by-product.



**Fig.5: Change of Acidity of Transformer oil with its service period.**

#### 4.0 CONCLUSION

In the present study, ageing process of power transformer oil is tried to understand by estimating oil properties like interfacial tension, acidity, tan delta and resistivity.

- Resistivity of oil was found to decrease rapidly within a service period of 10-15 years, after which the change in slope of the curve was very low.
- Tan delta of oil was seen increasing proportionally with the age of oil till 15-20 years, after which the increase was very rapid.
- IFT of oil was observed to decrease almost linearly with year of service of oil and reached about 16 mN/m at an average 30 years.
- Acidity was found to increase again linearly with service period of oil.

It is evident from the experimental result that establishment co-relation of age of oil and expected remaining life can be worked out from the study of parameters like IFT and acidity.

*Courtesy: P.K. Maiti, Cpri Journal, December 2012*



## SAMSUNG TO TEST 7 MW OFFSHORE WIND TURBINE AT NAREC



Samsung Heavy Industries (SHI) will test the drive train for their seven megawatt (MW) offshore wind turbine at the National Renewable Energy Centre (Narec) in Northumberland, this summer.

Andrew Mill, Chief Executive at Narec, said: "This is fantastic recognition for the team involved in getting the first independent test facility of this scale ready for the new breed of multi-megawatt offshore wind turbines. We are delighted that SHI has chosen to undertake performance and endurance testing in the controlled onshore laboratory at Narec as part of their design validation process."

The SHI nacelle is being shipped to Narec where it will be used to commission the 15MW rated independent wind turbine nacelle test facility. This will be followed by a six month programme of testing where its performance will be monitored under simulated offshore operating conditions, including extreme wind events.

Business and Energy Minister, Michael Fallon, said: "Britain has a real chance to lead the world in the offshore wind sector and is being supported by Government. Samsung Heavy Industries decision to undertake the testing of its new multi-megawatt offshore wind turbine at Narec's pioneering test facility proves the benefits the facility can offer industry and demonstrates the opportunity for growth and jobs in the offshore sector."

The Energy Technologies Institute (ETI) is investing £25m in the Narec facility through the design, development, supplying and commissioning of the test rig by GE Energy-Power Conversion and MTS Systems Corporation.

David Clarke, CEO of the Energy Technologies Institute, said: "The confirmation of the Samsung Heavy Industries contract is a massive boost for both Narec and the UK Offshore Wind industry as a whole. It is evidence that the UK can create world leading engineering facilities for advancing technology innovation, which are attracting major industry operators and provide a welcome economic stimulus in a growing business sector."

### **About National Renewable Energy Centre (Narec):**

Narec has invested over £150 million of UK Government, private sector and European Union funding to create a unique integrated portfolio of research, testing and demonstration facilities for the offshore renewables industry, operated on an open-access, commercial basis in Blyth, Northumberland, England.

The 15 megawatt (MW) capacity Wind Turbine Drive Train Test Facility is an open access, onshore facility; open to all turbine developers on a commercial basis and can test turbines up to 10 MW at up to 50% over power.

### **About Energy Technologies Institute:**

The Energy Technologies Institute (ETI) is a public-private partnership between global industries – BP, Caterpillar, EDF, E.ON, Rolls-Royce and Shell – and the UK Government. Public sector representation is through the Department for Business, Innovation and Skills, with funding channelled through the Technology Strategy Board and the Engineering and Physical Sciences Research Council. The Department of Energy and Climate Change are observers on the Board.

The ETI's role is to bring together engineering projects that accelerate the development of affordable, secure and sustainable technologies that helps the UK address its long term emissions reductions targets as well as delivering nearer term benefits.

*More information:* [www.narec.co.uk](http://www.narec.co.uk) - [www.eti.co.uk](http://www.eti.co.uk)

## ENERGY MANAGEMENT-ENABLED LV BREAKER BY ABB



ABB recently launched Emax2, the first low-voltage circuit breaker with integrated energy management functions. Replacing existing traditional breakers with the Emax2 breaker has the potential to achieve annual savings of 5.8 million megawatt-hours, a release by ABB said.

Breakers like the Emax2 are used where protection and control of large amounts of energy are used in a low-voltage environment like industrial and commercial buildings, data centers or ships. Due to the energy savings, the Emax 2 breaker will typically pay for itself within a year, the release noted.

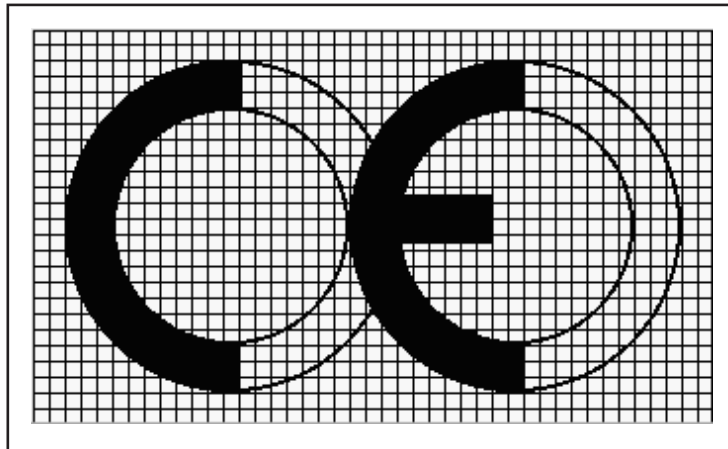
The breaker contains a protection trip relay with an integrated power controller that measures and evaluates energy consumption, then manages the loads to maintain or reduce the peak power usage as determined by the user. This will also help prevent blackouts since the root cause is often peak demand exceeding supply.

The breaker also has a communication module that allows it to share vital consumption and system reliability data directly with smart grid and other protocols.

The development of the new Emax 2 breaker took several years and was led by ABB's development center in Bergamo, Italy.

*Courtesy: Electrical Monitor, June 2013*

# WHAT IS CE MARKING?



The letters “CE” are the abbreviation of French phrase “Conformité Européene” which literally means “European Conformity”. The term initially used was “EC Mark” and it was officially replaced by “CE Marking” in the Directive 93/68/EEC in 1993. “CE Marking” is now used in all EU official documents.

The European Single Market was created at the beginning of 1992, with the objective of removing barriers to trade throughout the European Economic Area. In the period up to 1992, and subsequently, the European Parliament has enacted a series of measures intended to put the Single Market into practice. Some of these Directives, the “New Approach Directives”, specify controls on product design and documentation and include the requirement to affix the CE mark.

“CE marking” is a process that applies to a wide variety of products and one which manufacturers located in the EU or importers of goods into the EU must complete. The CE mark is affixed to the product as the final stage of this process and is effectively a statement from the manufacturer (or importer) that the process has been successfully completed and that the product meets the essential requirements of the relevant CE marking Directives.

## General principles of the CE marking

1. The CE marking shall be affixed only by the manufacturer or his authorised representative.
2. The CE marking shall be affixed only to products to which its affixing is provided for by specific Community harmonisation legislation, and shall not be affixed to any other product.
3. By affixing or having affixed the CE marking, the manufacturer indicates that he takes responsibility for the conformity of the product with all applicable requirements set out in the relevant Community harmonisation legislation providing for its affixing.
4. The CE marking shall be the only marking which attests the conformity of the product with the applicable requirements of the relevant Community harmonisation legislation providing for its affixing.
5. The affixing to a product of markings, signs or inscriptions which are likely to mislead third parties regarding the meaning or form of the CE marking shall be prohibited. Any other marking may be affixed to the product provided that the visibility, legibility and meaning of the CE marking is not thereby impaired.
6. Member States shall ensure the correct implementation of the regime governing the CE marking and take appropriate action in the event of improper use of the marking. Member States shall also provide for penalties for infringements, which may include criminal sanctions for serious infringements. Those penalties shall be proportionate to the seriousness of the offence and constitute an effective deterrent against improper use.

*Courtesy: <http://www.ce-marking.org/what-is-ce-marking.html>*

## NANOPARTICLES PROMISE TO MAKE LEDS CHEAPER

Light-emitting diode (LED) light sources have a lot going for them. They have longer life spans than their incandescent rivals and better luminous efficiency, and they’re environmentally friendlier. But those benefits come at a high cost—literally.

There are a number of points in the production of LEDs worthy of attack, such as the bases on which they’re grown. Another involves scarce rare-earth metals, a problem endemic to high-tech manufacturing. Now researchers at the University of Washington (UW) have come up with a nanoparticle that could replace the rare-earth-element phosphors currently used in LEDs to soften the harsh blue light they emit.

Chang-Ching Tu, a post-doctoral researcher at UW, has launched a new company, LumiSands, to market the nanoparticles. The technique for producing them involves etching off the material from wafers of silicon. While silicon does not typically emit light, when it is in crystalline form at dimensions below five nanometers it can begin to glow.

The silicon-based nanoparticles emit a red light that, when combined with part of the harsh blue light of the LEDs, produces greens, yellows, and reds that resemble sunlight.

“The beauty of our technology is to create a highly efficient fluorescent material by using silicon rather than rare-earth elements or other types of heavy-metal compound semiconductors,” Tu said in a UW press release. “The manufacturing process can be performed in a basic laboratory setting and is easy to scale up.”

The technology, though still evolving, is far enough along to launch a company, a prototype of the devices has been made, and Tu believes LumiSands could start manufacturing devices based on the technology within a year. He will continue to work on the red-light-emitting technology and then move on to other colors so that LEDs equipped with them will give off a white light with no rare-earth elements.

*Courtesy: IEEE Spectrum*



# ENERGY UTILIZATION EFFICIENCY AND HARMONICS

## **Introduction:**

All our alternating current electrical systems and equipments are designed to work from a power supply with Voltages of 50 Hz frequency having a sine wave form. Therefore the performance of the equipments and system elements to other frequencies with a distorted waveform and unbalanced loads has not been judged of any great importance.

But, with the advent of modern technology, system and equipments with special attention paid for energy efficiency, which make them essentially non-linear loads, these factors assume paramount importance as they affect the very performance of the electrical system and equipments.

## **Induction motors:**

Conductors associated with magnetic material will have pronounced skin effects than cables, wires, bus bars etc., The rotor is severely affected, as the conductors are subjected to magnetic field of varying frequencies i.e. from 1.5 Hz to 300 Hz created by the harmonic currents. During normal full load, with a slip of 3%, the currents flowing in the rotor bars will have a frequency of 1.5 Hz. Motors are designed to have the rotor reactance at this frequency nearly equal to the D.C. resistance, for obtaining optimum efficiency and torque.

If the induction motor is supplied with distorted wave form voltages containing harmonic frequencies of fifth, seventh etc., the rotor conductor resistance will be very high, due to skin effect i.e. the current is pushed to the periphery of the conductors as, due to high frequency flux, current in the rotor bars tend to crowd on the top side of the conductor and lead to rotor conductor failure near the end rings.

Harmonic voltages or currents give rise to additional loss in the stator windings, rotor circuits, and stator and rotor laminations. The losses in these are much greater than the losses caused by the d.c. resistances; this is because of the increased eddy currents and skin effect associated with the high frequency components of the harmonic currents.

Leakage flux set up by harmonic currents in the stator and rotor end-windings add to these losses.

In the case of induction motors with skewed rotors the flux changes in both stator and rotor and high frequency can produce substantial iron loss. The magnitude of this loss depends upon the amount of skew, and the iron-loss characteristics of the laminations.

For instance, the effect of supply waveform distortion on the power loss in a 15 kW motor was studied; when operating at full output with 50Hz fundamental sinusoidal voltage supply the total loss was 1303 W, whereas with a quasi-square voltage supply the total loss was found to be 1600 W.

It can be seen that the additional power loss is the most serious effect of harmonics upon a.c. machines. The capability of a machine to cope with extra harmonic currents depends upon the total additional loss and its effect on the overall machine temperature rise and local overheating, especially in the rotor.

A six-pulse, three-phase converter produces additional rotating fields in the air gap. These rotate in space at many times the synchronous speed; the negative harmonic fields, e.g. the 5 and 11 rotating backwards at 5 and 11 times synchronous speed in space and at 6 and 12 times synchronous speed relative to the rotor. The positive harmonics rotate forwards in space, e.g. harmonic fields 7 and 13 rotating forwards at 6 and 12 times synchronous speed relative to the rotor. The rotor will therefore have currents at 6,12,18,24 etc. times stator frequency induced into cage windings, pole faces and field windings, and these produce extra rotor losses, with associated deep-bar skin effect.

Harmonic fields, which are seen to be rotating relative to each other, produce torque pulsations. Quite significant pulsating torques can be produced by interaction between a harmonic field and the fundamental flux. The resulting torque pulsations, at multiples of supply frequency, may need to be taken into account in designing the torsional characteristics of the complete shaft system.

## **Transformers:**

The presence of harmonic voltages increases the hysteresis and eddy current losses and stresses the insulation. The flow of harmonic currents increases the copper losses; this effect is more important in the case of converter transformers because they do not benefit from the presence of filters, which are normally connected on the a.c. system side. Apart from the extra rating required converter transformers often develop unexpected hot spots in the tanks.

An important effect particularly relevant to power transformers is the circulation of triplen zero sequence currents in the delta windings. The extra circulating currents can overheat the windings unless these are taken into account in the design.

Although the average current flow of sinusoidal AC is zero i.e. it is positive for as much time as it is negative, AC power can obviously perform useful work. AC energy, its ability to do work, is its effective value – a type of “average” called its “Root Mean Square” or “RMS” value.

The RMS value of AC is a measure of the heat it generates in a resistor, equivalent to that produced by DC current of the same value. The RMS value of a pure sine wave is  $0.707(1/\sqrt{2})$  times its peak value. For example, the RMS

of a 1.4 V peak sine wave is 1 V RMS. The RMS value of a distorted sine wave is not equal to this value, and the heat it produces is much higher and is not simple to derive by calculations; but has to be assessed by actual tests. Transformer energy losses in general are a combination of excitation (no-load) loss and load losses, which in turn consist of heat produced by eddy current loss and stray losses such as electromagnetic flux in windings, cores and shields. Excessive harmonics have a particularly pronounced effect on Eddy current losses, since these increase as the square of the frequency. All losses, however, including skin effect losses, increase with harmonic distortion, and losses mean wasted energy, often in the form of increased heating which can raise the transformer temperature above its rating.

It can be seen that a system where the harmonic loads are small relative to the supply capacity is least adversely affected.

Typical Eddy current loss factors for oil-filled transformers

Transformer Size Oil filled transformers	Eddy current loss factor
up to 1 MVA	1 %
1 MVA to 5 MVA	1 to 5 %
Greater than 5 MVA	9 to 15 %

#### Bus bar, cables and conductors:

More lines of flux than its surface encompass the center of the conductor; hence the inductive reactance of the center is greater than that of the surface, which results in lesser flow of A.C. currents in the center. This unequal current distribution is reflected in the apparent larger A.C. resistance and large  $I^2R$  loss. This is called “skin effect”. Since the inductive reactance is directly proportional to the frequency ( $X_L = 2\pi f l$ ), the A.C. resistance of the conductor also increases; for larger conductors the A.C. resistance increases more rapidly with frequency as shown in the table below.

A.C./D.C. resistance ratio	Frequency	Harmonics of 50 Hz
1.01	50	1
1.21	250	5
1.35	350	7
1.65	550	11

For closely placed conductors, another factor comes in to play, called “proximity effect”, which is of same nature as of skin effect.

At certain harmonics, the combined effect may even result in twice  $I^2R$  loss.

Apart from the conductor copper loss, in the case of long cables, the dielectric loss of the insulation becomes a

matter of concern. The dielectric loss in watts per kilometer per phase is given by the equation:

$$D = 2\pi f C U_0^2 \tan \delta 10^{-6} \text{ (watt/km per phase)}$$

It will be seen from this equation that, for a specified design of cable in which values of  $C$  and  $U_0$  are fixed, the dielectric loss becomes proportional to the frequency and does not depend upon the current passing through the cable. Hence, higher the harmonics higher the dielectric losses will be.

#### Conclusion:

If increasing the number of phases employed does not give an appropriate reduction in the offending frequencies, resort has to be made to filters.

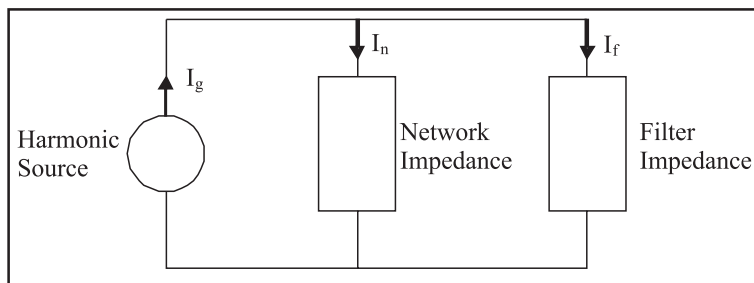
The equivalent circuit for calculations & designing the harmonic filter:

Harmonic filter – typical arrangement

The factors that affect this filter current and thus the filter component ratings are:

1. System Voltage Variation
2. System Frequency Variation
3. System Fault Level Variation
4. Variation in Harmonic Generation
5. Variation in Capacitance due to manufacturing tolerance, element failure etc.
6. Variation in Inductance due to manufacturing tolerance, temperature, magnetic linkage with metallic parts etc.

These usually take the form of a tuned circuit or circuits designed to present low impedance to the unwanted frequency and thus conduct the offending harmonic current away from the line. Wherever possible harmonic filters are avoided as their design is complex and the precise frequency to which they are tuned is usually a compromise. Additionally the diverted current has to be absorbed in the filter and thus filters are wasteful of energy and contribute to the loss of efficiency.



*Courtesy :K.R. Govindan, Kavoori Consultants*

**One machine can do the work of fifty ordinary men. No machine can do the work of one extraordinary man. - ELBERT HUBBARD, The Roycroft Dictionary and Book of Epigrams, 1923**



## PRODUCT OF THE MONTH

### EQUIPMENTS BY INSTALLING SURGE PROTECTION OF SENSITIVE ELECTRICAL & ELECTRONIC N DEVICE

With the present day sophistication in Electrical and Electronic equipments, every household, office, factory, commercial complex, multiplex where electrically operated equipments like Computers, TV, Servers, Escalators, and Motors are electronically controlled and needs to be protected with special care as they are very sensitive to transient over voltages.

With the present day power cut, which necessitates switching on and switching off frequently, tremendous switching surges are generated during this operation, which could cause failure or malfunction.

**It is very important to note that the latest NATIONAL ELECTRIC CODE (2011) and IS 3043 specifically recommends the use of surge protection systems to protect the sensitive equipments against Over Voltages induced by Lightning and switching surges.**

The latest IS code for transient voltage protection is in the final stage of approval and expected to be released any time during the next three months. We also understand it is generally based on IEC standards.

Transient over voltages or Surges are generated:

- Whenever a lightning strikes directly / in the near vicinity.
- As a consequence of different faults in the power system
- Switching on and off of different loads etc.

**JEF CPT PSC4 : A DIN Rail mount type, combined Type I & II (Lightning & switching Surges) Class B & C suitable for installation at SSB / DB**

#### **SALIENT PARAMETERS OF JEF CPT PSC 4**

Maximum Continuous Operating Voltage ( $U_c$ )	: 275 / 480V Three phase
Lightning Impulse current (10/350) ( $I_{imp}$ )	: 12.5 kA (L-N) / 50 kA (N- PE)
Maximum discharge current (8/20) ( $I_{max}$ )	: 65 kA (L-N & N-PE)
Nominal discharge current (8/20) ( $I_n$ )	: 20 kA (L-N) / 50 kA (N-PE)
Voltage protection level ( $U_p$ )	: $\leq 1.3$ kV (L-N) / $\leq 1.5$ kV (N-PE)
Maximum back-up fuse (gL)	: 125 A
Short circuit withstand ( $I_{cc}$ )	: 25 kA
Response time ( $t_A$ )	: 25 (L-N)/100 (N-PE) nano seconds

#### **SALIENT FEATURES :**

- ◆ Combined Class I and II protection ◆ Pluggable elements Ease of Maintenance
- ◆ Local Status Indication and remote indication with potential free contacts ◆ Compact-4 pole
- ◆ High Lightning surge handling capability



The surge protection device shown above is intended to be installed either at the SSB or DB or near the end equipment on the LT side. It is a combined class I & II (B+C) type i.e. it is capable of handling lightning as well as switching surges.

The surge protection system is housed in a DIN Rail Mount. The SPDs should comply with the performance requirements of the IEC 61643 – 1 and IEC 61643-11

When the surge element reaches its' end of life, the respective status indicator flag turns red indicating that the element is out of service. In addition, potential free contacts are provided for remote indication.

Following care shall be taken while connecting the Surge Protection Device:

- The connections shall be of 'V' type.
- The leads from bus bar shall be as short as possible and the length shall be restricted to less than 500 mm.
- The earth lead can be connected to the general earthing system, the value of which shall be preferably less than 5 ohms.
- For very sensitive installations, it is suggested to get the guidance from the manufacturer as the standards recommend graded protection.

The above surge protection device is connected parallel to the system and hence is not dependant on the line current. Ideally, this is recommended to be installed wherever sensitive electrical and electronic equipments are operational to ensure a trouble free 24x7 operation.

**For more details contact Mr. K. KANESAN,  
JEF Techno Solutions Pvt. Ltd., Chennai. Phone No. 044-2499 6022**

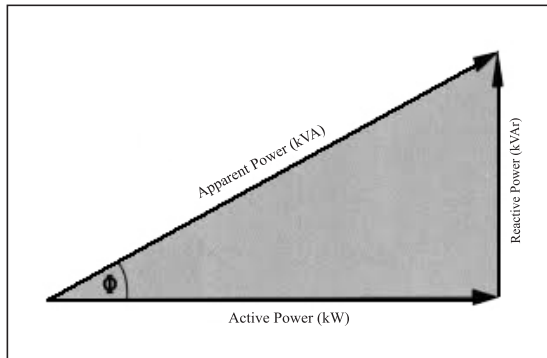
# WHAT IS POWER FACTOR?

Power Factor is a measure of how efficiently electrical power is consumed. In the ideal world Power Factor would be unity (or 1). Unfortunately in the real world Power Factor is reduced by highly inductive loads to 0.7 or less. This induction is caused by equipment such as lightly loaded electric motors, luminaire transformers and fluorescent lighting ballasts, welding sets, etc.

## WHAT DOES IT DO TO MY ELECTRICITY BILL?

In a 3-phase supply, kW consumed is (volts x amps x 1.73 x Power Factor)/1,000. The electricity company supplies you VOLTS x AMPS and they have to supply extra to make up for the loss caused by poor Power Factor. When the power factor falls below a set figure, the electricity supply companies charge a premium on the kW being consumed or charge for the whole supply as kVA.

## WHAT CAUSES POWER FACTOR TO CHANGE?



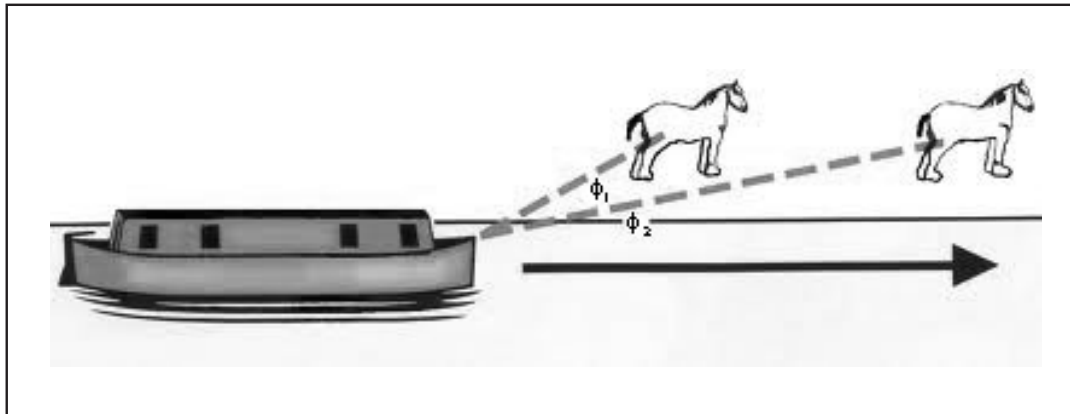
Inductive loads cause the amps to lag behind the volts. The wave forms of volts and amps are then “out of phase” with each other. The more out of phase they become then the lower the Power Factor. Power Factor is usually expressed as  $\cos\phi$ .

In 3 phase power supplies the “power” can be measured as a triangle. ACTIVE Power is the base line and is the real usable power measured in KW.

REACTIVE power is the vertical or that part of the supply which causes the inductive load. The reactive power in is measured in kVAR (kilo volt-amperes reactive)

APPARENT Power is the hypotenuse. This is the resultant of the other two components and is measured in kVA

## THE EFFECTS OF POWER FACTOR



Consider a canal boat being pulled by a horse. If the horse could walk on water then the angle (Phi)  $\phi$  would be zero and  $\cosine\phi = 1$ . Meaning all the horse power is being used to pull the load.

However the relative position of the horse influences the power. As the horse gets closer to the barge, angle  $\phi_1$  increases

and power is wasted, but as the horse is positioned further away, then angle  $\phi_2$  gets closer to zero and less power is wasted.

## WHY DO I NEED POWER FACTOR CORRECTION?

Capacitive Power Factor correction (PFC) is applied to electric circuits as a means of minimizing the inductive component of the current and thereby reducing the losses in the supply.

The introduction of PFC capacitors is a widely recognized method of reducing an electrical load, thus minimizing wasted energy and hence improving the efficiency of a plant and reducing the electricity bill.

It is not usually necessary to reach unity, (i.e. Power Factor 1) since most supply companies are happy with a PF of 0.95 to 0.98

## HOW DOES IT WORK?

By installing suitably sized switched capacitors into the circuit, the PF is improved and the value becomes nearer to 1, thus minimizing wasted energy and improving the efficiency of a plant.

*Courtesy: [www.energy-in-motion.com](http://www.energy-in-motion.com)*

## PUBLIC CAN APPROACH TEDA APPROVED AGENCIES FOR SOLAR PANEL INSTALLATION

Tamil Nadu Energy Development Agency (TEDA), which is the nodal agency for solar power production and panel installation, has approved six agencies in Madurai, which can be approached for the solar power panel installation. Both the central and state governments have been providing support and subsidy for solar panel installations in residential as well as commercial institutions. These agencies would install the panels on receipt of payment from the customers. ***The customers need to pay only the remaining amount from the original price after 30% subsidy from the Central government and Rs 20,000 subsidy from the state government,*** said R Anand, director of Ren Solar Energy Solutions Private Limited.

*Courtesy: Times of India*

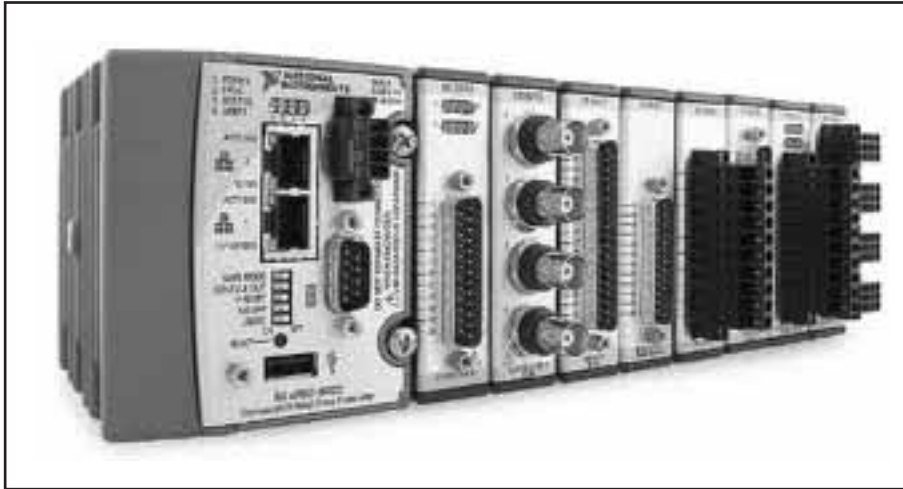


# CORRECTING POWER FACTOR

## AN IMPORTANT SAVINGS FACTOR

These days, harmonic capacitors or “power savers” are very popular devices sold on teleshopping channels. They are being projected as the Holy Grail discovery to trim down your home electric bills. Unfortunately, the promises they make of 60 percent reduction in residential power consumption are not true. One way to ensure that the household users don’t fall prey to these is to understand a term called power factor correction and how it impacts their bill. Power factor correction systems bring huge value to industrial power users and this is mainly due to the difference in the way industrial users and residential users are billed. To understand this, it is important to figure out how AC power works.

### POWER



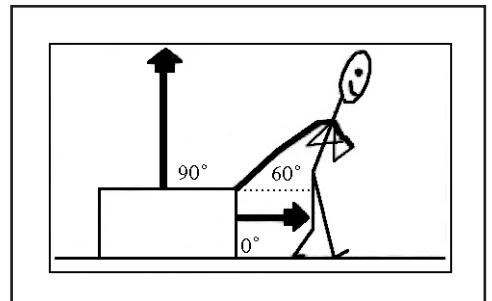
Power is the rate of flow of energy through a given point in the circuit. In AC circuits, the load can be resistive (e.g. bulb, electric iron) or reactive (e.g. air-conditioner, motor pumps, welding machines). The voltage and current are perfectly synchronized through a purely resistive load ensuring a unidirectional and positive power (product of voltage and current). This is called as real power (W). In a purely reactive load the voltage and current are perfectly 90 degrees out of phase. Thus their product reverses in direction over half cycle and the net power transferred is zero over a complete power cycle. This is reactive

power (VAR). It doesn’t have a magnitude and thus it is scaled only in the imaginary axis in the power triangle. The power which completes this Pythagoras theorem is the apparent power (VA) which is the product of root mean square value of voltage and current. Thus apparent power is a combination of the real power that gets transferred through the load and the reactive power which gets pushed back to the source from the capacitor and the inductor in the load. The power circuit in our house and industries are never purely resistive or reactive and thus apparent power provides the real picture of the power consumed by the load. An ideal power circuit will keep the apparent power as close as possible to the real power but this is never the case and thus the true power consumed is always more than the ideal value. It is this factor which provides a very good indication of this deviation and is called the power factor.

### POWER FACTOR



Power factor is the ratio of real power to apparent power. It fluctuates between -1 and 1 with the ideal value as 1 (Real power = Apparent power). It is also equal to the cosine value of the phase difference between voltage and current. Thus you will also see it being referred to  $\cos \phi$  in various electrical equipment.



When the phase angle difference between voltage and current is 25° then 90 percent power is transferred efficiently, with 60° the work done by power is only 50 percent and as we saw earlier at 90° the work done by the power on the load is zero (imaginary). A good analogy to this is a man pulling a big log of wood using a rope. If he pulls the log with the rope parallel to the ground, maximum work is done in moving the log ahead. But as he starts to create an angle between the rope and the ground, the harder will it be to pull the log. When the rope is horizontal to the ground (90°) no matter how much energy he puts in he won’t be able to move the log ahead i.e. work = 0. Hence, the best way to use power in the most efficient way is to reduce reactive power in the circuit, thus bringing



the apparent power to as close the real power. This is done by power factor correction systems.

### **POWER FACTOR CORRECTION SYSTEMS**

The way to correct power factor is to reduce the reactive power in the circuit. Most of the industrial loads have extensive inductive load giving rise to a lagging current, reducing the power factor. Inductive current and capacitive current have an inverse relationship as capacitors discharge current when inductors conduct it. So the best way to correct the lagging current due to inductive load is to add capacitor banks to the circuit. But at times the reactive elements starts resonating with each other causing voltage fluctuations and hence leaving the system unstable. Thus it is very important to conduct a complete engineering survey by an expert before PFC systems are installed specially on non-linear loads. For non-linear loads a passive PFC systems alone doesn't solve the problem. Active PFC systems which can re-shape the current waveform through a load provide better power factor correction capabilities for circuits with non-linear loads. They also work in multiple stages providing automatic power factor correction and continuously targeting an optimum PF value. They perform high end online data processing to provide real-time PF correction.

Advanced embedded systems like National Instruments CompactRIO platform are used to make Smart Active Power Factor Correction systems. The versatility, modularity and flexibility of NI CompactRIO allow it to directly acquire voltage and current signals from multiple power lines simultaneously. The availability of FPGA on these systems allow it to perform high-end number crunching to calculate the derived values, compute complex analysis and provide control output signals to take corrective actions on a real-time basis for e.g. controlling a thyristor-switched capacitor banks on PF correction on fast changing dynamic load circuits. The ruggedness and reliability of this hardware allows it to be used in hazardous condition continuously for years together. National Instruments LabVIEW electrical power suite software provides advanced analytics tools which help to program these PFC systems as per IEC standards.

Built on such advanced technology there are various types of smart PFC systems supplied to global market which can perform automatic and static power factor correction. As these systems are modular and flexible, they can be added with additional I/O's to perform other power quality measurements like frequency variations, flickering, voltage dips, swells, unbalances and harmonics. This helps to identify and correct the power circuits of various potential faults which can cause a reduction in the PF value. For example they are used in heavy harmonic infused power distribution systems to detect and prevent harmonic amplifications providing advanced and fast detuned power factor correction.

Such advanced PFC systems are very important these days as most of the utilities around the world impose huge penalties for industrial consumers with very low power factor. This is because the utilities have to provide the additional reactive power while they charge only for the real power. Also apart from the average energy consumption measured in kWh, industries are also charged for maximum demand consumption which is calculated in kVA (apparent power). Thus power factor correction is very effective and helpful in reducing the electric bill for industrial users compared to residential users where the savings are minimalistic to the cost of the equipment.

In addition to these benefits, PFC also helps to curb line losses, voltage fluctuations and meet contractual and regulatory agreements. So if you operate a factory and haven't still implemented a power factor correction system, it will be worth spending some time evaluating your options because correcting power factor is a very important savings factor for your business.

*Pradeep Nair, Business Development Manager - Energy, National Instruments  
Courtesy: Electrical Monitor June 2013*

## **CONSUMERS MAY GET MORE TIME TO MEET SOLAR PURCHASE OBLIGATIONS**

High tension and a section of low tension electricity consumers in the State are likely to get more time to meet solar purchase obligations (SPO).

As per the Tamil Nadu Solar Energy Policy 2012, the SPO prescribed for HT and LT commercial establishments is three per cent by December this year and six per cent from 2014.

For instance, by December, 3 % of energy of these categories of consumers should be solar power. The Tamil Nadu Electricity Consumers' Association (TECA) went to the Appellate Tribunal for Electricity in June 2013, saying that consumers will not be able to meet the obligation of three per cent to six per cent as the State did not have the required solar energy capacity and that the obligation on open access customers who are already under Renewable Purchase Obligation fixed by the Regulatory Commission is not correct.

*Courtesy: The Hindu-Web, 07/06/2013*

***DON'T EVER CLIMB THE FENCE AROUND AN ELECTRICAL SUBSTATION. If a ball or pet gets inside the fence, ask a grown-up to call the electric company - they'll come and get it out for you.***



# IEEE STANDARDS FOR POWER QUALITY

India is amid a revolutionary effort to achieve a National Smart Grid Mission of “Quality Power on Demand for All by 2027,” and the global standards-development community has already laid substantial groundwork to ensure that the first half of that goal is not sacrificed in the rush to achieve the second.

In the drive to rollout electricity to more and more residential and business users, the quality of that power must not be overlooked. Many global standards are either in place or in development to help utilities, the power industry serving them and consumers of power better deal with the issues that frequently threaten power quality.

## ADDRESSING HARMONICS AND POWER FACTOR

“Dirty” voltage is a widely shared power-quality concern among the utilities worldwide. Without implementation of mechanisms for monitoring and controlling how dirty the voltage quality is, issues such as the harmonics produced by equipment using semiconductors can prove damaging to not only sensitive utility infrastructure but also the devices that are being powered in homes and businesses.

IEEE 519™-1992 “Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems” is commonly leveraged by the power industry to offset the issue of harmonic distortion. The guide addresses problems involved in the harmonic control and reactive power compensation of the full gamut of static power converters in use in commercial and industrial power systems. Focusing on the interface between power sources and loads-the “point of common coupling”. IEEE519 recommends limits of total harmonic distortion, as well as the limits of individual harmonics within that total.

In the decades of IEEE 519’s usage in the field, market deployment of static power converters using semi conductors has intensified in order to improve power factor. In turn, then, utilities, their users and suppliers have gained substantially greater experience with harmonics, their effects on power equipment and how those effects should be limited. Adding those worldwide lessons learned is the purpose of an ongoing project to revise the standard, IEEE P519. Additionally, a “sister” document, IEEE P519.1™ “Draft Guide for Applying Harmonic Limits on Power Systems,” is being developed to provide example applications of the procedures and limits presented in the base standard.

## A GROWING ARRAY OF GLOBAL POWER-QUALITY STANDARDS

In addition to IEEE 519, there is an array of global standards designed to improve power quality. Included among those are the following IEEE standards:

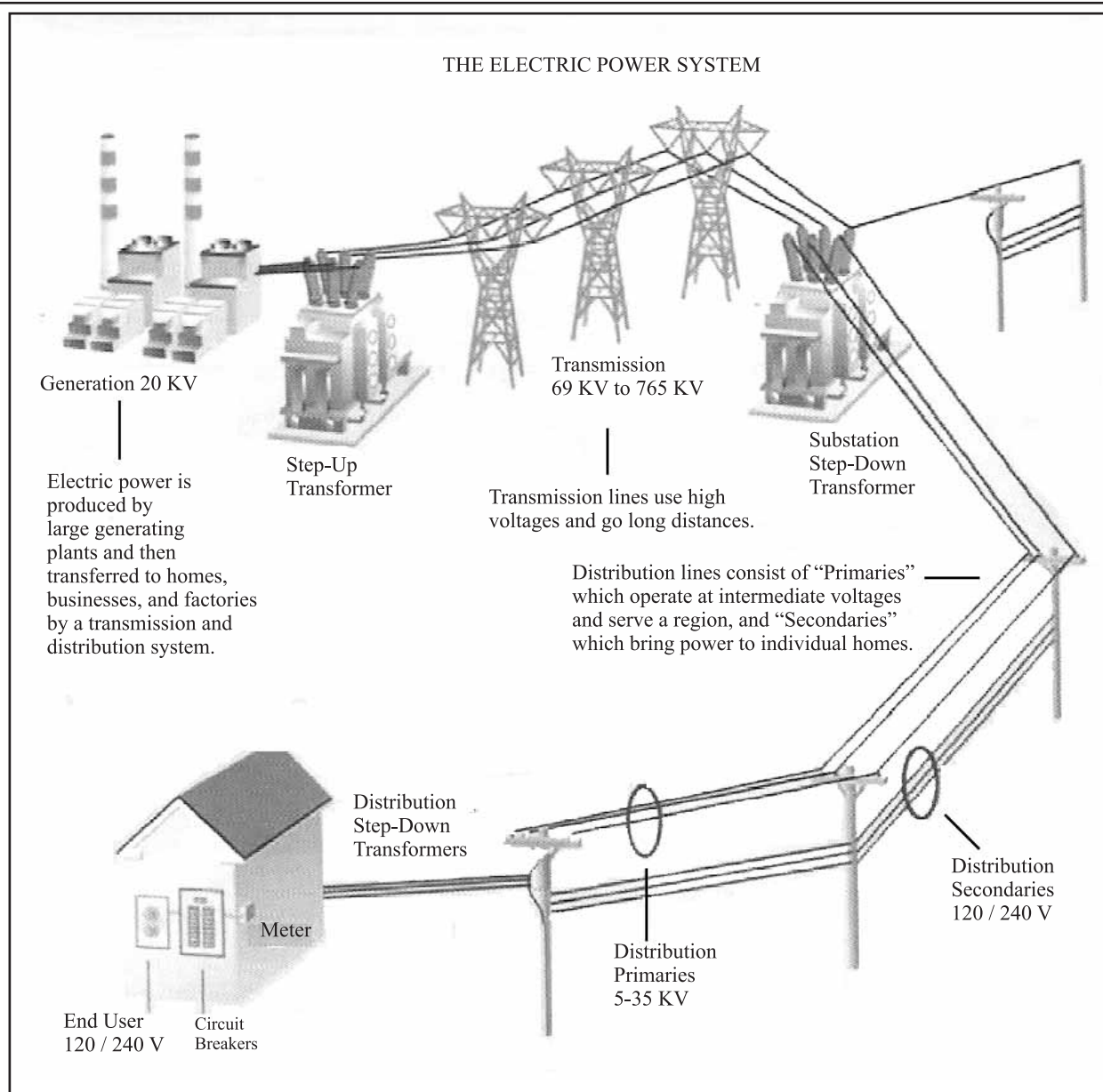
IEEE 1250™-2011 “Guide for Identifying and Improving Voltage Quality in Power Systems”-considered a “gateway” document for power quality, in that it references other sources relevant to the technology space, this guide explores voltage quality levels from benchmarking studies, factors that affect power-system performance and mitigation measures to improve performance. Some equipment, for example, is not designed to withstand the surges, faults, distortion and other issues typical of utility distribution systems; voltage fluctuation can impact steady-state voltage level and light flicker. IEEE 1250 is intended to assist system designers, operators and users in ensuring compatibility between the quality of voltage provided and needs of electrical equipment.

IEEE 1159™-2009 “Recommended Practice for Monitoring Electric Power Quality” – This document is intended to assist users and equipment and software manufacturers and vendors by describing techniques for defining, measuring, quantifying and interpreting electromagnetic disturbances on the power system. IEEE 1159 defines a consistent set of terms and descriptions for conducted electromagnetic phenomena that occur on both single-phase and poly phase AC power systems, and it discusses power-quality monitoring devices, application techniques and the interpretation of monitoring results.

IEEE 1159.3™-2003 “Recommended Practice for the Transfer of Power Quality Data” – Designed to cover all of the power-quality phenomena identified in IEEE 1159, as well as other power-related measurement and simulation data and other data types, IEEE 1159.3 defines a file format that is suitable for exchanging such data in a vendor-independent manner and without the need for a central registration authority. Also, the recommended practice utilizes a highly compressed storage scheme to minimize both the required disk space and transmission times in data exchange.

IEEE 1409™-2012 “Guide for Application of Power Electronics for Power Quality Improvement on Distribution Systems Rated 1 kV Through 38 kV”- Detailing custom power devices as options in solving power-quality problems, IEEE 1409 is designed as a resource for electric utility providers seeking to implement electronic-based equipment in distribution systems in order to improve power quality. Guidelines and performance expectations are provided for these “custom power” devices, an emerging technology space in the power-quality domain. The guide draws on the power-assessment techniques specified in IEEE 1250-1005 and IEEE 1159.

IEEE C37.232™ -2011 “Standard for Common Format for Naming Time Sequence Data Files (COMNAME)”- Adopted by major utilities, independent system operators and manufacturers, the standard defines a procedure for naming the diverse time sequence data (TSD) files produced by equipment such as digital-fault and power-swing recorders and power-quality monitors.



**Fig.1: The Electric power System, as Depicted in IEEE 1250™**  
**"Guide for identifying and improving voltage Quality in Power Systems"**

## CONCLUSION

India's challenges with power quality are already significant; in fact, the India Smart Grid Task Force (ISGTF) and India Smart Grid Forum (ISGF) have identified improving power quality as one of the primary drivers of smart-grid rollout among India's power customers. Unless addressed, India's issues with power quality stand to be magnified as the nation works to rollout electricity to the estimated one third of its population that today has no access to power. The global standards-development community has made significant strides to ensure that power quality does not have to be a casualty of the drive to deliver electricity to more and more users, and innovation in the area continues. As India's effort to modernize its power grid continues, its role in the global standards-development effort around power quality, smart-grid capabilities and other related spaces will grow increasingly important. Through consensus-building activities toward, global standards, grid planners and engineers in India will have unique expertise and experiences to offer the rest of the world, and they will be able to tap into the lessons learned from colleagues outside their own country.

*Courtesy: By William Ash, Strategic Program Manager,  
 IEEE Standards Association, is currently leading the smart grid strategy and implementation for the IEEE-SA  
 Electrical Monitor, June 2013*

Please refer our following NEWSLETTERS for further information on Power Factor

2008 – July (Pg no.18); 2009 – Aug (Pg nos. 10, 24 & 32); 2010 – Mar (Pg no. 10), Sep (Pg no. 33);  
 2011 – Jan (Pg no. 28), 2012 – Oct (Pg no. 53), Nov (Pg no. 44); 2013 – June (Pg no. 19).



## HARNESSING OCEAN CURRENT ENERGY - PROMISING NEW SYSTEM DEVELOPED

Ocean currents are a very promising-looking source of renewable energy, but the technology for capturing ocean current energy and using it to create electricity hasn't matured yet. However, that may soon change — a new ocean current harnessing system capable of working in deep waters has been developed by researchers at the Universidad Politécnica de Madrid, and a prototype has already been successfully tested.

The new experimental prototype — created within the framework of the PROCODAC-GESMEY project — has successfully met the goals of the researchers: it's cheaper to construct, install, and maintain than current designs; it can produce the expected amount of energy; it can be maneuvered by remote control; it can operate in relatively deep waters; and it's affordable enough for "a medium sized shipyard" to purchase, as the researchers put it.

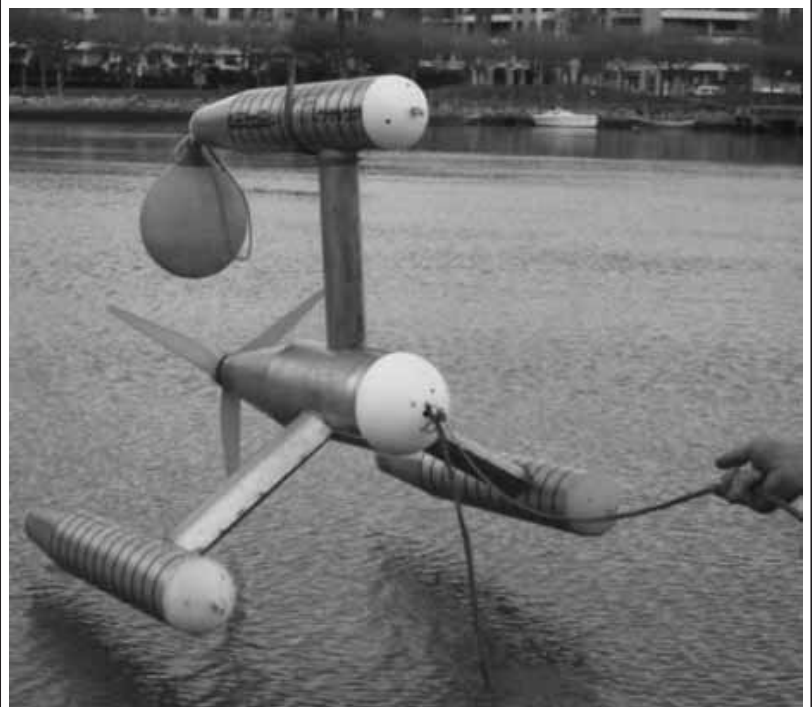
The prototype — created in collaboration with the Astilleros Balenciaga company and the Fundación Centro Tecnológico Soermar — is one-tenth the size that a potential "industrial size" 1MW unit would be. The prototype is also accompanied by a newly designed underwater buoy capable of operating in areas of 40 meters of depth.

The researchers will next be working on the creation of a larger prototype with potential performance improvements.

While this new prototype/research is focused entirely upon harnessing the energy of ocean currents, there are actually quite a few ways to harness the incredible and renewable power of the ocean - waves, tides, salinity, temperatures, etc. It's been estimated that as an energy resource, the world's oceans could easily supply all of the energy currently used by humans many times over. Just something to keep in mind....

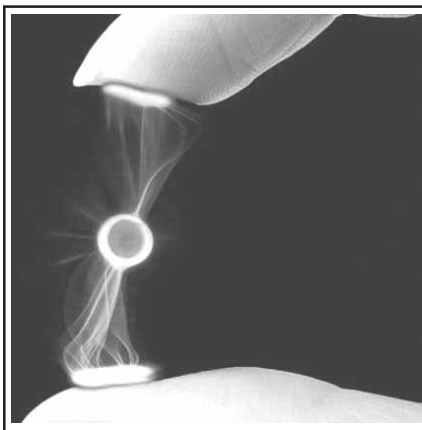
The new design is patented/patent pending, and the co-owner is the Universidad Politécnica de Madrid within a Framework Agreement signed between UPM and Soermar.

*Courtesy: Clean Technica <http://cleantechnica.com/2013/07/04/ocean-current-energy/>*



*The new prototype of the PROCODAC project.  
Image Credit: Universidad Politécnica de Madrid*

## PLASMA CREATION & CONTROL



Scientists at the University of Missouri have devised a new way to create and control plasma that could transform American energy generation and storage.

Randy Curry, professor of electrical and computer engineering at the University of Missouri's College of Engineering, and his team developed a

device that launches a ring of plasma at distances of up to two feet. Although the plasma reaches a temperature hotter than the surface of the sun, it doesn't emit radiation and is completely safe in proximity to humans. While most of us are familiar with three states of matter — liquid, gas and solid — there is also a fourth state known as plasma, which includes things such as fire and lightning. Life on Earth

depends on the energy emitted by plasma produced during fusion reactions within the sun.

The secret to Curry's success was developing a way to make plasma form its own self-magnetic field, which holds it together as it travels through the air.

"Launching plasma in open air is the 'Holy Grail' in the field of physics," said Curry.

"Creating plasma in a vacuum tube surrounded by powerful electromagnets is no big deal; dozens of labs can do that. Our innovation allows the plasma to hold itself together while it travels through regular air without any need for containment." The plasma device could also be enlarged to handle much larger amounts of energy, he said.

For the current work, Curry and his team used older technologies to build their prototype of a plasma-generating machine. But a considerably smaller device using newer, miniaturized parts could also be built within three to five years with sufficient funding, Curry said.

"We have a world-class team at MU's Center for Physical & Power Electronics, but that team will evaporate without funding."

*Source: RedOrbit Staff & Wire Reports - Your Universe Online*

# HELP LINE

**Query:** *Is there is any IEC standards regarding Internal Separation in Switch Gear Panels?*

**Mr. Ganesan, DGS Electricals**

**Explanation:** IEC 61439 'Low-voltage switchgear and controlgear assemblies', specifies standard arrangements of switchboard (call forms of internal separation).

The are labelled as Form 1, Form 2, Form 3 and Form 4. Forms 2, 3 and 4 are further broken down into Form 2a, 2b, 3a, 3b, 4a and 4b.

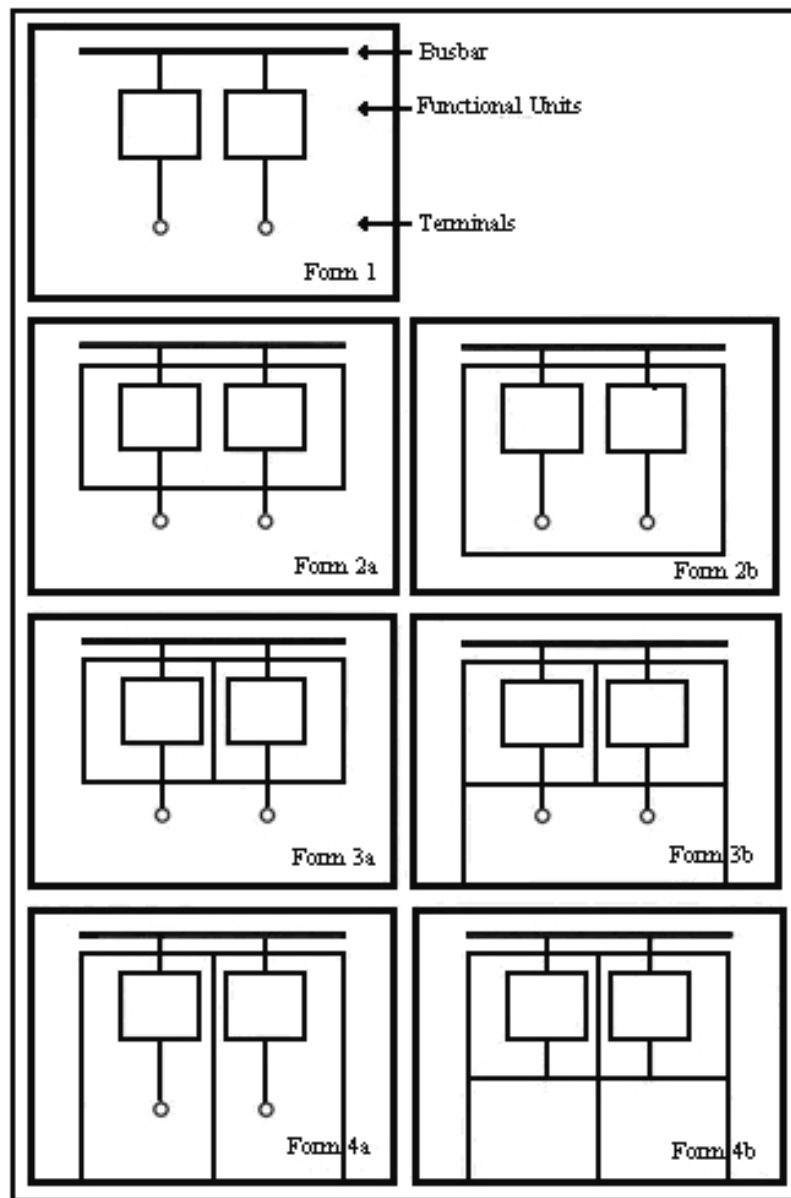
Each Form relates to the internal separation of the busbars, functional units and terminals, each being defined as:

**Busbar** - low impedance conductor to which several electric circuits can be connected

**Main busbar** - busbar to which one or more distribution busbar, incoming unit or outgoing unit can be connected

**Distribution busbar** - busbar in one section which is connected to the main busbar from which incoming or outgoing units can be connected

**Functional Unit** - part of the assembly comprising the electrical and mechanical elements that contribute to the fulfilment of the same function



**Incoming unit** - functional unit which feeds energy into the assembly

**Outgoing unit** - functional unit supplying energy to the outgoing circuits

**Terminals** - part of the assembly which provide for connection of incoming and outgoing cable and busbar

Internal separation is achieved by the use of barriers or partitions (including metallic or non-metallic), insulation of live parts or an integral housing (i.e. moulded case circuit breaker). The internal barriers should provide protection against contact to IP XXB and against the ingress of foreign bodies to at least IP 2X.

**Form 1** has no internal separation between , while Form 4b has the greatest with busbars, functional units and terminals all being separated (see illustration):

**Forms of separation Form 1** - no internal separation of the busbars, functional units and terminals from each other.

**Form 2a** - separation of the busbars from the functional units. Terminals are not separated from the busbars.

**Form 2b** - as for 2a, but with the terminals are not separated from the functional units.

**Form 3a** - separation of the busbars from the functional units and each functional unit from the other units. Terminals of each functional unit are not separated from each other. Terminals are not separate from the busbars.

**Form 3b** - as per 3a, but with the terminals separated from the busbar (and functional units)

**Form 4a** - separation of the busbars from the functional units and each functional unit from the other units. Separation of the terminals for a

functional unit from the busbars and those of any other unit. Terminals enclosed in the same compartment as the functional unit.

**Form 4b** - as per 4a, but with the terminals for each functional unit enclosed in their own space.

See more at: <http://myelectrical.com/notes/entryid/120/switchboard-forms-of-internal-separation#sthash.VN1dF7EQ.dpuf> by By Steven



# CHENNAI TO HOST INDIA'S LARGEST AND BRIGHTEST LIGHTING FAIR DURING SEPTEMBER 13-16, 2013

India's largest and brightest lighting fair titled Lii 2013, Light India International 2013, has been organized by Indian Society of Lighting Engineers in Chennai Trade Centre during 13-16 September 2013. Chennai has been chosen for the second time as the venue for this prestigious event keeping in view vibrant economic pace of activity in the city as well as the growth potential.

Lii2013 is expected to be participated by more than 250 manufacturers including 100 from overseas mainly from China, Taiwan, Korea, Italy, Germany, USA. Concurrent show on Solar Lighting Systems and a technical seminar with international experts on the emerging trends in green concepts are expected to draw a larger participation and visitors

Light India International 2013 will publicize the developments taking place in the lighting industry and provide excellent marketing opportunities for all the products and services under the lighting industry. The exhibition will showcase a wide range of products over 16500 sqm exhibition area in Chennai Trade Centre, covering Residential, commercial and retail lighting; Industrial lighting; Street lighting; Security lighting; Environmental / Landscape lighting; City beautification lighting; Architectural lighting; Railway / Metro lighting; Airport & Runway lighting; Refineries / Mines lighting; LED lighting; Intelligent lighting; Lighting with non-conventional energy; Speciality lighting; Lighting accessories and controls; Power saving solutions; and Testing and measuring instruments. IT, Publications and Consultancy services relating to lighting industry will also take part in the event.

Mainly a B2B event, open to business visitors from 10 am to 3 pm, the fair will provide the exhibitors with opportunity to explore investment opportunities and locate partners for joint ventures and tie-ups. The fair will be open to public in evenings from 3.00 PM to 7.00 PM.

The fair **website: [www.lii.co.in](http://www.lii.co.in)** gives more information on the event.....for registration of exhibitors and visitors. Limited sponsorship opportunities are also available.

The previous edition of this event titled Lii2011 held in March 2011 had 220 participants including 80 from overseas. More than 15,000 business visitors visited the event and on the spot business worth Rs.200 million were reported to have been transacted.

## About ISLE

ISLE is a professional registered body in the field of illumination engineering with a broad-based membership of scientists, engineers, architects, academicians, researchers and designers. ISLE is affiliated to the CIE, the International Commission on Illumination. It is closely associated with the Bureau of Indian Standards, the Department of Science and Technology, the Ministry of Power and the Ministry of Non-Conventional Energy Sources.

Lii2013 Secretariat can be contacted on **Email : [info@Lii.co.in](mailto:info@Lii.co.in)** and **Cell phones 98402 73833 & 98402 74355** for details.

## FOR FURTHER DETAILS CONTACT:

**Mr. S. Raghavan, Advisor - Lii2013 (Mobile : +91-9790974048) E-mail : [sraghavan@Lii.co.in](mailto:sraghavan@Lii.co.in)**

**Mr. R. Balasubramanian, Secretary - Lii2013 (Mobile : +91-9840055645) E-mail : [balu@Lii.co.in](mailto:balu@Lii.co.in)**

## CARBON NANOTUBES CAPTURE ELECTRICAL SIGNALS BETWEEN NEURONS

President Obama's BRAIN initiative, which was launched back in April, may already have a new tool for mapping the human brain in its arsenal. Researchers at Duke University have used a carbon nanotube to capture electrical signals from individual neurons.

With a complete 3-D digital map of the human brain now available as part of the European Human Brain Project, brain research is gaining a lot of momentum. The carbon nanotube probe developed by the Duke team, which acts like a sort of harpoon, first spearing the neurons and then collecting the electrical signals they send to communicate with other neurons, is expected to provide a new level of insight into the human brain.

"To our knowledge, this is the first time scientists have used carbon nanotubes to record signals from individual neurons, what we call intracellular recordings, in brain slices or intact brains of vertebrates," said Bruce Donald, a professor of computer science and biochemistry at Duke University, in a press release.

The research ("Intracellular Neural Recording with Pure Carbon Nanotube Probes"), which was published in the journal *PLoS ONE*, overcame the shortcomings (literally) of other attempts to use carbon nanotubes (CNTs) as neuron probes. Previously, CNTs have proven to be too short or too thick for the job. But the Duke team was able to make their CNT probe one millimeter long (quite long for CNTs) and capable of monitoring the electrical signals between neurons more precisely than the glass or metallic electrodes that are typically used.

The researchers were able to achieve these unique CNT characteristics with a specially devised technique. They accumulated carbon nanotubes at the tip of a tungsten wire until the tubes took the shape of a needle-like probe. Next, they coated the probe with an insulating material and then removed the insulating material with a focused ion beam. This process of applying, then removing the insulating material gave the probe an extremely fine point.

"The results are a good proof of principle that carbon nanotubes could be used for studying signals from individual nerve cells," said Duke neurobiologist Richard Mooney, a study co-author, in press release. "If the technology continues to develop, it could be quite helpful for studying the brain."

While the researchers concede that more research needs to be done to improve the electrical recording capabilities of the probes—even as improvements are made to their geometry and the insulating layers—the Duke team has applied for a patent on the probe. The researchers expect that the technology could not only prove useful for mapping the brain but for creating brain-computer interfaces.

*Courtesy: IEEE Spectrum*

## INTERVIEW WITH Mr. DILIP KUMBHAT ON LII 2013



### **Can you tell about the organizers?**

*India's largest and brightest lighting fair titled Lii 2013, Light India International, will be organized by Indian Society of Lighting Engineers (ISLE) in Chennai Trade Centre during 13-16 September 2013. ISLE is a professional registered body in the field of illumination engineering with a broad-based membership of scientists, engineers, architects, academicians, researchers and designers. ISLE is affiliated to the CIE, the International Commission on Illumination. It is closely associated with the Bureau of Indian Standards, the Department of Science and Technology, the Ministry of Power and the Ministry of Non-Conventional Energy Sources.*

### **What is role of ISLE in future towards developing new technologies in the field of lighting?**

*ISLE provides only the enabling environment and provisions for technology development. Technology updation through invited speakers from abroad, introduction of state of art short term and regular courses in Indian Universities drafting international faculty. As an example, a recent study suggests that by the end of next decade more than 50% of lighting use will move from conventional lights to LED based lighting systems because of its energy efficient performance, and hassle free maintenance. In order to meet this kind of growth in demand the lighting industry in all sectors will need a large number of professionals trained in lighting to back up the industry in the domain of R&D, QC, Production, and Design and technology adaptation. At the same time, there is a growing demand by specifiers such as architects, consultants, and city planners for lighting professionals. Responding to this urgent need, ISLE has initiated the process of establishing an internationally recognised education course in Lighting across India as an integral part of its mandate, by signing an MOU with the Lighting Education Trust (LET) UK to promote lighting education in India. To start with, this course has been implemented in Mewar University, a UGC approved engineering education establishment in Chittorgarh, Rajasthan.*

### **What type of visitors do you think shall find this event useful ?**

*The main stakeholders to benefit are manufacturers, importers of lighting equipments, dealers, R&D institutions, Builders , Electrical consultants, Electrical Contractors, Architects, Lighting Designers, Interior Designers, Hospitality Industry Engineers and knowledgeable general public.*

*Light India International 2013 will publicize the developments taking place in the lighting industry and provide excellent marketing opportunities for all the products and services under the lighting industry. The exhibition will showcase a wide range of products over 16500 sqm exhibition area in Chennai Trade Centre, covering Residential, commercial and retail lighting; Industrial lighting; Street lighting; Security lighting;*



*Environmental/Landscape lighting; City beautification lighting; Architectural lighting; Railway / Metro lighting; Airport & Runway lighting; Refineries / Mines lighting; LED lighting; Intelligent lighting; Lighting with non-conventional energy; Specialty lighting; Lighting accessories and controls; Power saving solutions; and Testing and measuring instruments. IT, Publications and Consultancy services relating to lighting industry will also take part in the event. Seminars and technical sessions; Theme pavilion and Special outdoor lighting will be the other salient features of the fair.*

**How do you think , effects of these types of events shall percolate to common citizens?**

*In fact, the exposure of the emerging trends in any area for the general public is mainly through such platforms only. The purpose of allocating timings for general public is to encourage them to have a hands on feel of the various and latest products in the specialized areas . Practically every participant company will introduce new products in such international events to enhance their image and publicize.*

**In your view, who and why ( exhibitors) should they participate in this event?**

*All manufacturers involved in lamps, LED, luminaires and its accessories including the control gear and allied items should participate in the event. Publications and Consultancy services, lighting design software companies relating to lighting industry will also take part in the event. It is a proven fact that, the small industries supplying accessories involved in lighting, benefitted more than the leaders during the last Lii2011. They had opened up many new clients and they are the first to come forward to register now also for Lii2013. This is an opportunity to open up new avenues and interact with all the interconnected people.*

**What are the concurrent events planned?**

*Technical seminar on the emerging trends in green lighting concepts for a greener world with international faculties , student seminar on Green Lighting Concepts by engineering students and awards, product presentation by select companies , group meetings of A grade electrical contractor's association, wireman association and cultural meets are planned*

**What type of new technologies you think shall be displayed this year?**

*Solar and LED lighting concepts and the recent developments on energy saving equipments in lighting*

**What are the amenities you are providing for the exhibitors?**

*All the amenities normally provided in the International Exhibitions*

**To participate, whom and how to contact ?**

*Lii2013 Secretariat can be contacted on Email : [info@Lii.co.in](mailto:info@Lii.co.in) and Cell phones 98402 73833 & 98402 74355 for details. FOR FURTHER DETAILS CONTACT :Mr. S. Raghavan, Advisor - Lii2013 (Mobile : +91-9790974048) E-mail : [sraghavan@Lii.co.in](mailto:sraghavan@Lii.co.in) ( or ) Mr. R. Balasubramanian, Secretary - Lii2013 (Mobile : +91-9840055645) E-mail : [balu@Lii.co.in](mailto:balu@Lii.co.in)*

**As a CEO of K-Lite Industries, what is your view about the future of lighting and how K-Lite is going to face the future?**

*Yes, the whole lighting concepts are undergoing a total change with the advent of LED and the green concepts . It is a very good development that the Government is taking a very big lead to popularize the solar and LED in a very big way. Over and above, the mind set of the general public has now been fully tuned to the energy saving and LED concepts. As the demand grows, the scaling up will bring down the cost and LED is going to be the future and we have no choice but to go with it. The advantage of LED is that small entrepreneurs are now becoming a major source for supply of luminaries and accessories. Even though the beginning of the new era with LED was dominated by Chinese products at the cheapest prices, the market is now stabilizing with Indian made ones. K-Lite is equally striving at its best to cope up with the emerging trends and have already introduced state of art LED luminaires and solar street light systems at economical prices.*

# PREMATURE FAILURE OF TRANSFORMERS

## ROLE OF CONDENSER BUSHINGS

Failure of new transformers during monsoon or just after monsoon is a common incident in India. Inspection of three such transformers revealed few similarities, as given below.

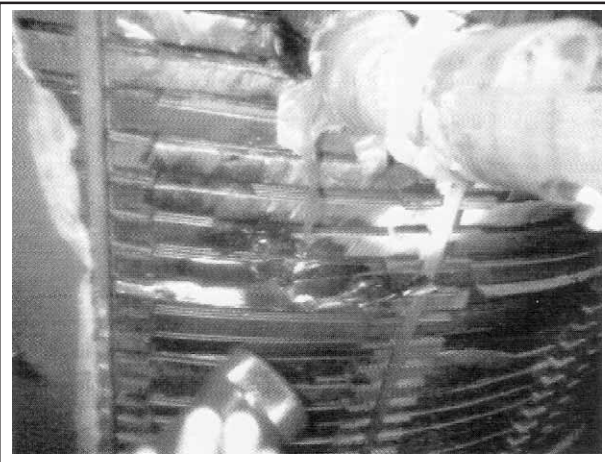
- Main leads of failed windings are soaked in water.
- Failure points are just below the main leads.
- Water soaked insulation and water particles are found inside the transformer.
- Top terminals of bushings are not tightened fully.

The similarities in constructional features of transformers are as follows.

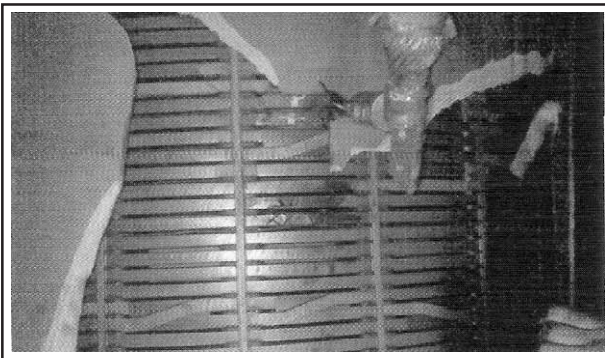
- Winding terminals are connected to Condenser bushings.
- Oil level in conservator is below bushings' top.

These transformers are erected by customers or by contractors engaged by them.

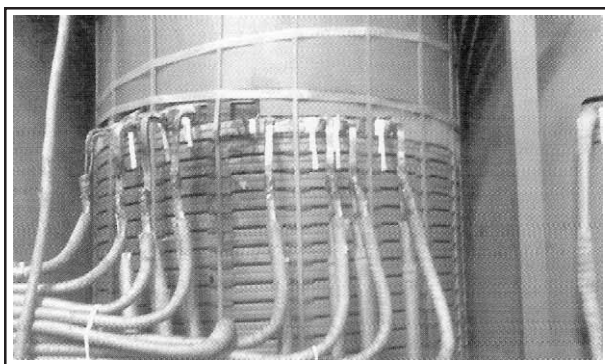
Detailed investigation and brain storming sessions concluded that, entry of water through top terminal is the cause of failure.



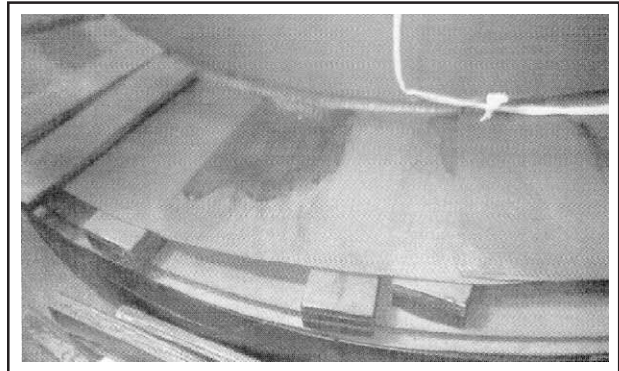
**Fig.1: Failed discs 100 MVA, 220/132 kV auto transformer**



**Fig.2: Failed discs 100 MVA 220/132 kV transformer**



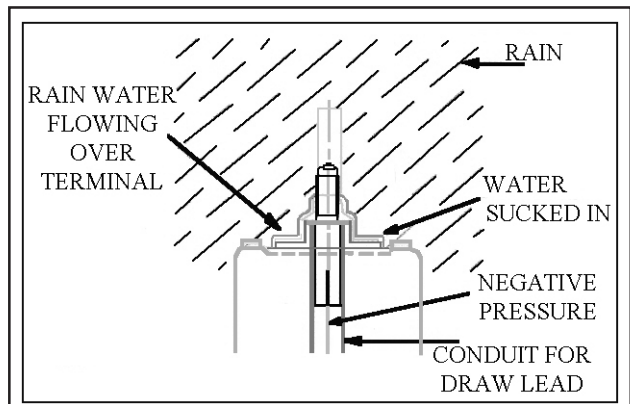
**Fig.3: Failed discs 50 MVA 132 kV transformer**



**Fig.4: Marks of water collection on insulation of 100 MVA**

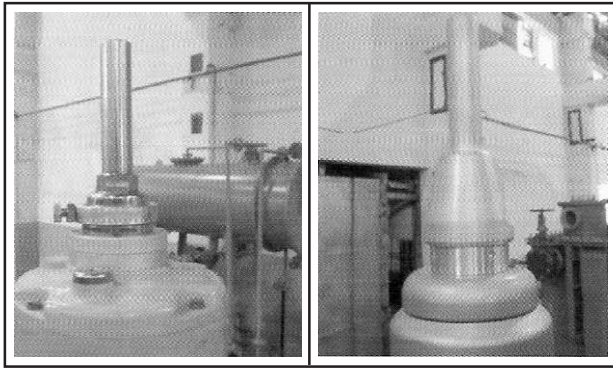
### Mechanism of water entering into transformer

When rain falls on a hot transformer which is loaded, it gets cooled quickly. Quick cooling reduces volume of oil inside the transformer rapidly. Substantial quantity of air is required to replace the reduced volume of oil. Rock type silica gel filled breathers offer high resistance to air flow. Due to this a negative pressure is created inside the transformer. To neutralize this negative pressure air is breathed in through the joints which are not tightened properly. As the joint of bushing terminal is located above conservator and water is flowing over the joints, water is sucked in along with air. Once flow is started the flow will continue through capillary action.



**Fig.5: Water entering through terminal**





**Fig.6&7: Bushing terminals which are prone to allow water entry**

### **Cause of improper tightening of terminal**

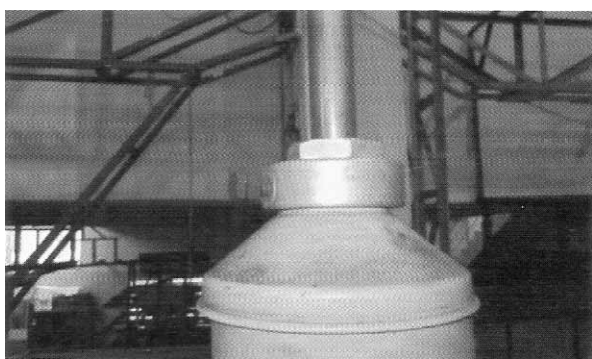
In India, most of the substations, where transformers are erected, do not have modern equipments like hydraulic ramps, lifts etc. Therefore the work of connecting the bushing terminals is entrusted to a daring person who can climb the bushing without any safety harness, instead of a skilled person. The work is also not supervised by competent authorities because of the same reason. As some of the bushings do not have a locking arrangement, there are chances that tightness may get disturbed during connecting bushings to overhead line through flexible conductors.

### **Solutions**

Tightening of the bushings top terminals properly is the only solution to this problem. But manufacturers of bushings need to address the problem by designing terminals to a fool proof one. Using ball type silica gel will reduce the resistance to breathing. Providing a rain shield will ensure water does not enter the transformer even if terminals are not tightened fully. Thus many costly failures can be avoided.

### **Bushings**

There are almost half a dozen bushing manufacturers in India. The firm where the author is associated is procuring bushings mainly from 3 firms. Let us designate them as A, B and C. The terminals of bushings made by company is perfect and such a failure with this make is not yet reported. Bushings up to 145kV of Make B and whole range of bushings made by C are prone to this type of failure. Earlier firm C used to provide rain sheds to their bushings later they discontinued the practice.



**Fig.8: Bushings with rain shed**

### **Conclusion**

In earlier years connection to bushings were made at bottom. Later this gave way to draw lead construction in which windings are terminated to a long cable. This cable is drawn to top of bushing and terminals are connected. For sealing rubber "O" rings are used. Only advantage of this arrangement is easiness in replacing the bushing at site. This design is prone to water ingress in design, thereby increasing the risk of failure. Though the failures are due to carelessness from the part of customer during erection and defective design of bushings, manufacturer of transformers are tasked to rectify the transformer free of cost.

*By T Vijayan, Transformers & Rectifiers(I) Ltd, Ahmedabad,  
Courtesy: IEEMA Journal, June 2013*

## **UK PRIME MINISTER LAUNCHES WORLD'S LARGEST OFFSHORE WIND FARM**

It's been a long time in the making - 12 years to be precise - but the London Array, the world's largest offshore wind farm, is officially up and running. At a launch event today in Margate, Kent, UK Prime Minister David Cameron called the project "A win for Kent... a win for renewable energy... and most of all, a very big win for Britain."

"We are making this country incredibly attractive to investment," Prime Minister Cameron added.

Although the UK is far and above the world leader in offshore wind capacity, with 74 per cent of global market share, London Array is the first major renewable energy project to be inaugurated by Cameron since he took office in 2010.

"Projects like London Array demonstrate the economic opportunity of large-scale renewable energy projects - from the direct investment they attract to the industries they strengthen," said Dr. Sultan Ahmed Al Jaber, CEO of Abu Dhabi-based renewable energy company Masdar, one of the companies behind the development of the project, along with DONG Energy and E.ON.

"London Array also exemplifies what can be achieved through smart policies and strong partnerships," added Dr. Al Jaber.

London Array's 175 Siemens 3.6 MW turbines have a combined capacity of 630MW and are expected to produce enough electricity to power over half a million UK homes each year.

"Wind offshore is going primetime," said Peter Loescher, President and CEO of Siemens, who also spoke at the event.

The UK has set a goal of generating 18 gigawatts of offshore wind energy capacity by 2020. With several gigawatts in various stages of the development pipeline, that lofty goal seems plausible, especially if the country moves forward on incentivizing the kind of large-scale renewable energy projects that brought London Array to life. And while the project was first proposed in 2000, the actual construction process took less than two years to complete.

It's amazing how fast things can move once the key political, regulatory, and financial pieces of the puzzle are in place.

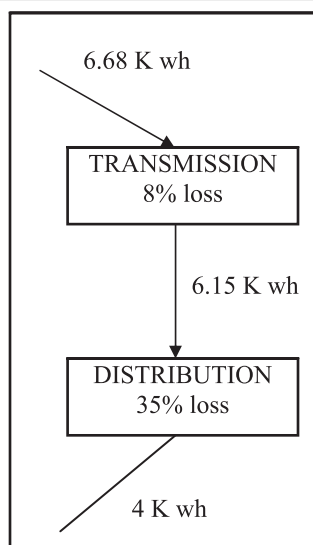
*Tim Hurst now works with Masdar in Abu Dhabi.*

*By Timothy B Hurst on 5 July 2013; Courtesy : RenewEconomy.com; <http://reneweconomy.com.au/2013/uk-prime-minister-launches-worlds-largest-offshore-wind-farm-40851>*



# ENERGY STORY

## ENERGY EFFICIENCY – THE FIFTH FUEL - PART 4



### EFFICIENT ELECTRICAL ENERGY TRANSMISSION AND DISTRIBUTION

We saw in the First part about the losses at different stages of Electricity Generation to end use.

As seen in the earlier parts of the article and as per illustration below, substantial Transmission and Distribution losses at present open up tremendous scope and challenges to tap the “Fifth Fuel”

Extracts from IEC given below, with regard to Transmission and Distribution areas and issues, Findings and suggestions and Comments about achieving Energy Efficiency in Transmission and Distribution would be very useful.



Growing populations and industrializing countries create huge needs for electrical energy. Unfortunately, electricity is not always used in the same place that it is produced, meaning long-distance transmission lines and distribution systems are necessary. But transmitting electricity over distance and via networks involves energy loss. So, with growing demand comes the need to minimize this loss to achieve two main goals: reduce resource consumption while delivering more power to users.

Reducing consumption can be done by change of consumer habits.

Transmission and distribution of electrical energy require cables and power transformers, which create three types of energy loss:

The Joule effect, where energy is lost as heat in the conductor (a copper wire, for example);

Magnetic losses, where energy dissipates into a magnetic field

The dielectric effect, where energy is absorbed in the insulating material.

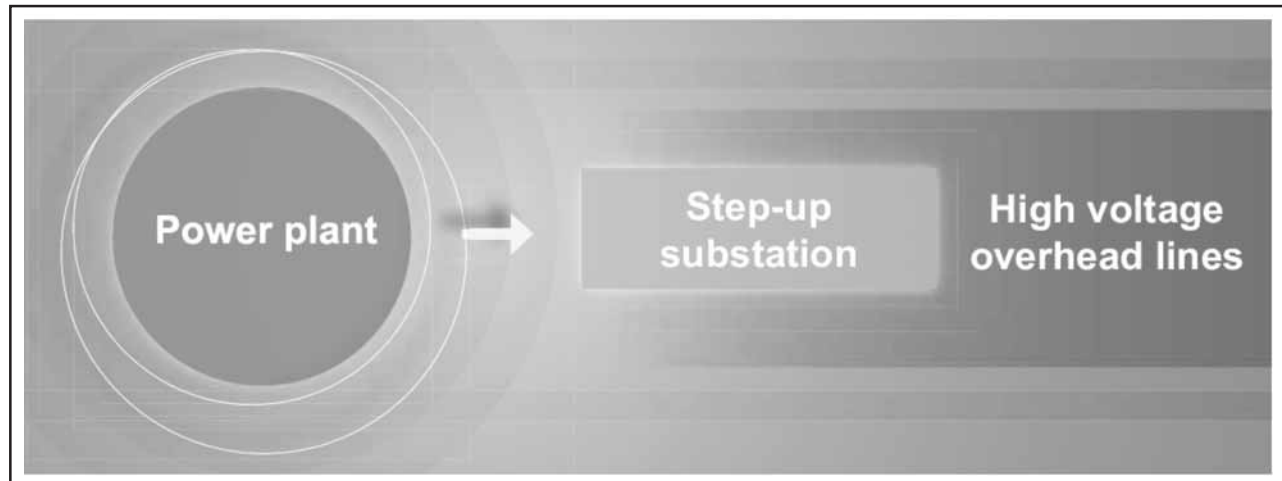
The Joule effect in transmission cables accounts for losses of about 2.5 % while the losses in transformers range between 1 % and 2 % (depending on the type and ratings of the transformer). So, saving just 1 % on the electrical energy produced by a power plant of 1 000 megawatts means transmitting 10 MW more to consumers, which is far from negligible: with the same energy we can supply 1 000 - 2 000 more homes. Changing consumer habits involves awareness-raising programs, often undertaken by governments or activist groups. Simple things, such as turning off lights in unoccupied rooms, or switching off the television at night (not just putting it into standby mode), or setting tasks such as laundry for non-peak hours are but a few examples among the myriad of possibilities.

On the Energy Production side, building more efficient transmission and distribution systems is another way to go about it.

### High Efficiency Transformers:

Superconducting transformers and High temperature superconductors are new technologies which promise much in terms of Electrical Energy Efficiency and at the same time, new techniques are being studied. These include direct current and ultra high voltage transmission in both alternating current and direct current modes.

## OUTLINE OF AN ELECTRICAL TRANSMISSION/DISTRIBUTION SYSTEM

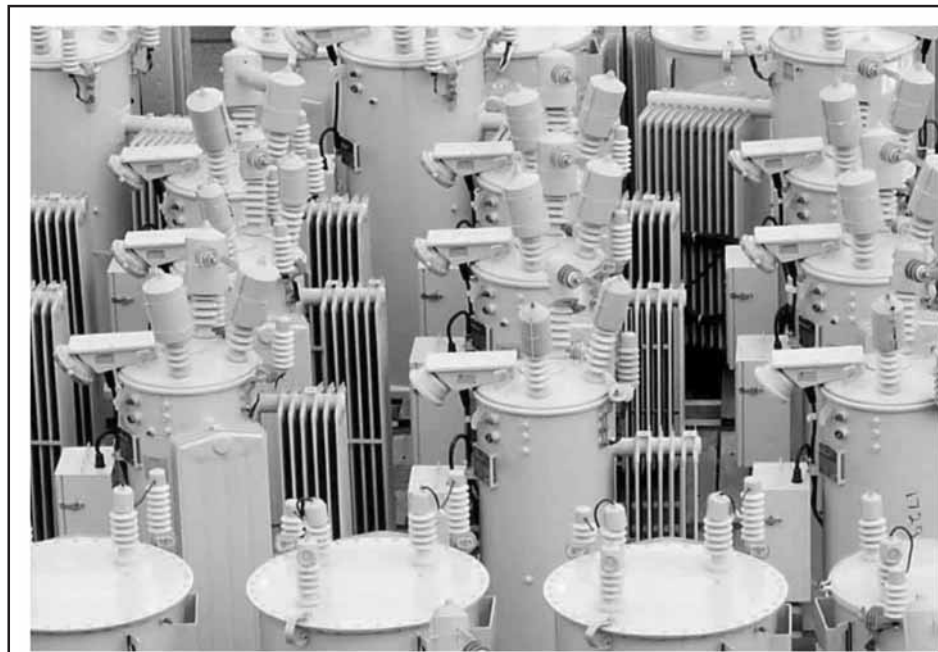


Note only the main elements are on the Schematic Diagram since control gear and switch gear do not create significant losses.



### ELECTRICAL LOSSES AND OVERALL EFFICIENCY

A power plant produces electrical energy in medium (20 000 V) or low (1 000 V) voltage which is then elevated to high voltage (up to 400 kV) by a step-up substation. Electrical power is then transmitted across long distances by high-tension power lines, and the higher the voltage, the more power can be transmitted.



A step-down substation converts the high voltage back down to medium voltage and electrical power can then be transported by medium voltage lines to feed medium and low voltage transformers using overhead lines or underground cables. Most of the users are fed in low voltage, but bigger ones, such as factories, commercial buildings, hospitals and so forth, can be directly fed in medium voltage. The length of cables between a power plant and a step-up substation is short since they are usually installed in the same place, so the energy losses there are quite low. The situation is not the same between the step-down substation and users where kilometers of medium and low voltage cables must be erected or buried to reach them.

Energy losses essentially come about in transformers and cables. The Efficiency of large Power Transformers in step-up and step-down substations is quite high and may reach 99 %, but this depends mostly on the real power delivered, compared with the maximum power it could in principle deliver. A transformer operating at power close to the assigned value has the best efficiency. Medium and low voltage transformers are of different types and their efficiency may range between 90% and 98%, again depending on the power delivered.

For cables it's the contrary. Those carrying high current sustain more heating and therefore endure more energy loss because of the Joule effect, which is an increase in heat resulting from current flowing through a conductor. Essentially, electrical current passing through a conductor raises its temperature and this heat bleeds away as lost energy. This raises design considerations for overhead lines for long distance transmission cables and underground ones which deliver energy from the step-down substation to the user.

Electricity supply companies generally try to limit energy losses in overhead lines to about 2.5 %. So, between the power plant and the step-down substation the total losses range between 3 % and 5 %. Between the step-down substation and users the losses can be about the same or even greater. Therefore the overall losses between the power plant and the users can easily be between 8% and 15 %, which suggests that there is still some room to improve efficiency in the Transmission and Distribution System and hence reduce CO2 emissions.

### **TECHNOLOGIES WITH POTENTIAL**

High Efficiency Transformers and Super conducting Transformers and high temperature superconductors are technologies that promise much in terms of electrical Energy Efficiency.

High Efficiency Transformers:

According to the Leonardo ENERGY website, which is the global community for sustainable energy professionals: "The worldwide electricity savings' potential of switching to High Efficiency Transformers is estimated to be 200 TWh. This savings potential is not only technically advantageous, but also brings economic and Environmental benefits. Taking the full life cycle cost into account, selecting High Efficiency Transformers is often an economically sound investment decision despite their higher purchase price."

High Efficiency Transformers have been around for Decades. But because their prices are greater than for ordinary transformers, buyers should estimate the energy savings which can be made during the life cycle of a transformer and then choose the most appropriate one. These transformers differ from ordinary ones in that they use high quality magnetic material and selected insulating substances and are designed in such a way that they can be cooled down better.

Regulators may also require using certain kinds of transformers within the context of the Kyoto Protocol.

### **Superconductivity**

Most conductors have some degree of resistance, which prevents Electricity from flowing effortlessly.

Superconductors are materials that have no resistance to the flow of Electricity and this occurs mostly at extremely Cold temperatures. The first occurrence in 1911, was in a material which became superconducting at 4 degrees Kelvin (-269 Celcius/ -452 Farenheat). By the 1950s, with the discovery of new materials this had risen to 17.5 Deg.K and in 1980s 92Deg K which is warmer than liquid nitrogen – a commonly available coolant. Today, Super conductivity is happening -135° C (or -211° F). Despite the apparent coldness, this is known as high temperature superconducting, or HTS, and it holds a lot of potential for being Energy Efficient in the future.

### **Superconducting transformers**

When a transformer is under a loaded condition, Joule heating of the copper coil adds considerably to the amount of lost energy. Although today's utility power transformers lose less than 1 % of their total rating in wasted energy, any energy saved within this 1 % represents tremendous potential savings over the expected lifetime of the transformer as they can be in service for decades.

We are all used to seeing copper and aluminium electrical wires and cables, which conduct electricity at ambient temperatures but lose energy due to the Joule effect. With superconductors, losses due to the Joule effect become essentially zero, thereby creating the potential for dramatic reduction in overall losses. Even with the added cost of making them cold enough for superconducting, transformers in the 10 MW and higher range are projected to be substantially more efficient and less expensive than their conventional counterparts.

### **High temperature superconducting cables**

Superconducting cables offer the advantage of lower loss, lighter weight, and more compact dimensions, as compared to conventional cables. In addition to better Energy Efficiency of the Utility Grid, this can lead to easier and faster installation of the cable system, fewer linking parts, and reduced use of land. The high performance of superconducting materials leads to reduced materials use and lighter and more compact cable technology. In this way, energy and cost are saved in the whole chain of manufacturing, transport, installation, use and end-of life disposal. In the shorter term, these HTS cables offer energy.



***Ups and downs in life are very important to keep us going,  
because a straight line even in an E.C.G. means we are not alive – RATAN TATA***



Efficiency, cheaper installation and lower system cost. The long-term perspectives include low-loss backbone structures that transmit electric power over long distances. The driving factors for such backbone structures are: uninhibited exchange of electricity in interconnected networks.

HTS cable backbones, which do not yet exist, would be designed as DC systems with power ratings in multiples of gigawatts. They can be created as “virtual backbones” joining and reinforcing existing networks, or as actual lines traversing continents. HTS backbones will be an alternative or complement to gas and oil pipelines, oil tankers and overland transport of hydrogen or other energy types. The determining factors for them, apart from cost, are political stability within the connected regions, ownership and tariff structures.

The IEC committees where these technologies are being considered are TC 14, *Power transformers*, TC 20, *Electric cables*, and TC 90, *Superconductivity*.

Other transmission techniques are also being studied, such as direct current and ultra high voltage in both alternating current and direct current modes.

(To be continued)

*S. Mahadevan, B.E., F.I.E., M.B.A., Consultant, Energy and Energy Efficiency, Mobile: 98401 55209*

## ABDULLAH LAUNCHES UT AS ‘MODEL SOLAR CITY’



Chandigarh as a ‘Model Solar City’ was formally launched by Dr. Farooq Abdullah, Hon’ble Minister for New and Renewable Energy, Govt. of India here today. The Minister first inaugurated 50 KWp grid interactive rooftop Solar Photovoltaic Power Plant at Paryavaran Bhawan, Sector 19B. The cost of the Power Plant is Rs.90.40 lac (50% contribution from MNRE, Govt. of India) with 10 years Operation and Maintenance. The executing agency is M/s Sova Power Ltd., Kolkata. The plant will be able to generate 65,000 units of electricity per year.

Next, Hon’ble Minister inaugurated 100 KWp Grid interactive Rooftop based Solar Photovoltaic Power Plant at Model Jail, Burail. With this, Model Jail, Chandigarh became the first Jail of the country having grid interactive Solar Power plant on its rooftop. The cost of the Power Plant is Rs.143 lac (50% contribution from MNRE, Govt. of India) with 10 years Operation and

Maintenance. The executing agency is M/s DDS Solar Power, 23, India Pvt. Ltd., New Delhi. The plant will be able to generate 1,30,000 units of electricity per year.

On this occasion, Dr. Farooq Abdullah, Hon’ble Minister appreciated the efforts taken by Chandigarh Administration in making Chandigarh as a ‘Model Solar City’. He desired that Model Solar City concept shall be successful only when we are able to attract all the private agencies and public to install Solar Photovoltaic Power Plant on their rooftops for which he stressed the need for wider publicity. He informed the media present that Ministry of New & Renewable Energy, Govt. of India is taking lot of efforts under National Solar Mission for use of more & more Solar Energy for day-to-day needs. Earlier in the day, Dr Farooq Abdullah met H.E., the Governor of Punjab & Administrator, UT Chandigarh in Punjab Raj Bhawan and discussed various issues concerning Solar City Projects.

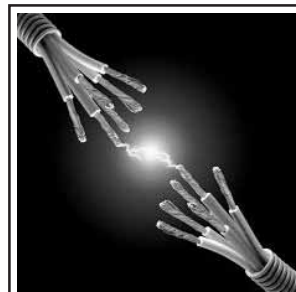
The inaugural function was attended by Shri K.K.Sharma, IAS, Advisor to the Administrator, UT, Chandigarh, Shri V.K. Singh, Finance Secretary, Shri D.K.Tiwari, Secretary (Science & Tech.), Shri Santosh Kumar, Director (Science & Technology) and other Senior Officers of Chandigarh Administration. From Ministry of New & Renewable Energy, Shri Tarun Kapoor, IAS, Joint Secretary and Shri A. K. Tripathy, Director were also present.

The Solar Photovoltaic Power Plant Projects are being executed by CREST [Chandigarh Renewal Energy, Science & Technology Promotion Society] and at present 1860 KWp Solar Photovoltaic Systems at 12 different Government buildings are under installation stage and likely to be completed within 2-3 months.

*Source : Punjab Newline Network*

*See more at: <http://www.punjabnewsline.com/news/abdullah-launches-ut-as-model-solar-city/82071#sthash.owqaxNKc.dpuf>*

## TWISTED LIGHT SENDS DATA THROUGH OPTICAL FIBER FOR FIRST TIME



For the first time beams of “twisted” light have been used to transfer data through optical fiber. A team of researchers from Boston University and University of Southern California succeeded in transmitting 1.6 terabits per second using one kilometer of optical fiber. Last June, a team of researchers transmitted data through the air at 2.56 Tb/s using twisted light, but this is the first time the method has been used to send data through optical fiber.

Twisting light means photons have a quantum characteristic called orbital angular momentum (OAM). Photons with OAM have electric and magnetic fields that corkscrew rather than oscillate in a plane. There are a theoretically infinite number of OAM values, and multiple beams having different orbital angular momentums can occupy the same fiber, allowing more data to be transferred.

Before this breakthrough, using twisted light technology in optical fiber was impossible. But with a new optical fiber developed by Siddharth Ramachandran, a professor of engineering at Boston University, twisted light beams can now safely reach their destinations.

“For several decades since optical fibers were deployed, the conventional assumption has been that OAM-carrying beams are inherently unstable in fibers,” said Ramachandran. “Our discovery, of design classes in which they are stable, has profound implications for a variety of scientific and technological fields that have exploited the unique properties of OAM-carrying light, including the use of such beams for enhancing data capacity in fibers.”

With data high in demand, the number of wavelengths we can use to increase bandwidth has started to reach its limits. Researchers hope that OAM will allow bandwidth to expand even further.

Twisted light technology isn’t only for optical wavelengths. Researchers in Italy and Sweden were successful in applying OAM to radio waves. They were able to transmit two “twisted” radio beams a distance of 442 meters by bending a dish antenna. But some radio communication scientists aren’t convinced that this will actually increase capacity. Some argue that OAM radio frequencies mimic existing multiple input multiple output (MIMO) technologies.

*Courtesy : IEEE Spectrum*

# ANDRÉ-MARIE AMPÈRE



**André-Marie Ampère** (20<sup>th</sup> January 1775 – 10<sup>th</sup> June 1836) was a French physicist and mathematician who is generally regarded as one of the main founders of the science of classical electromagnetism, which he referred to as “electrodynamics”. The SI unit of measurement of electric current, the ampere, is named after him.

## Biography

Ampère was born on 20<sup>th</sup> January 1775 to Jean-Jacques Ampère, a prosperous businessman, and Jeanne Antoinette Desutières-Sarcey Ampère during the height of the French Enlightenment. He spent his childhood and adolescence at the family property at Poleymieux-au-Mont-d’Or near Lyon. Jean-Jacques Ampère, a successful merchant, was an admirer of the philosophy of Jean-Jacques Rousseau, whose theories of education (as outlined in his treatise *Émile*) were the basis of Ampère’s education. Rousseau believed that young boys should avoid formal schooling and pursue instead an “education direct from nature.” Ampère’s father actualized this ideal by allowing his son to educate himself within the walls of his well-stocked library. French Enlightenment masterpieces such as Georges-Louis Leclerc, comte de Buffon’s *Histoire naturelle, générale et particulière* (begun in 1749) and Denis Diderot and Jean le Rond d’Alembert’s *Encyclopédie* (volumes added between 1751 and 1772) thus became Ampère’s schoolmasters. The young Ampère, however, soon resumed his Latin lessons, which enabled him to master the works of Leonhard Euler and Daniel Bernoulli.

## French Revolution

In addition, Ampère used his access to the latest mathematical books to begin teaching himself advanced mathematics at age 12. In later life Ampère claimed that he knew as much about mathematics and science when he was eighteen as ever he knew; but, apolymath, his reading embraced history, travels, poetry, philosophy, and

the natural sciences. His mother was a devout woman, so Ampère was also initiated into the Catholic faith along with Enlightenment science. The French Revolution (1789–99) that began during his youth was also influential: Ampère’s father was called into public service by the new revolutionary government, becoming a justice of the peace in a small town near Lyon. When the Jacobin faction seized control of the Revolutionary government in 1792, his father Jean-Jacques Ampère resisted the new political tides, and he was guillotined on 24 November 1793, as part of the Jacobin purges of the period. In 1796 Ampère met Julie Carron. André-Marie Ampère took his first regular job in 1799 as a mathematics teacher, which gave him the financial security to marry Carron and father his first child, Jean-Jacques (named after his father), the next year. (Jean-Jacques Ampère eventually achieved his own fame as a scholar of languages.) Ampère’s maturation corresponded with the transition to the Napoleonic regime in France, and the young father and teacher found new opportunities for success within the technocratic structures favoured by the new French emperor. In 1802 Ampère was appointed a professor of physics and chemistry at the École Centrale in Bourg-en-Bresse, leaving his ailing wife and infant son in Lyon. He used his time in Bourg to research mathematics, producing *Considérations sur la théorie mathématique de jeu* (1802; “Considerations on the Mathematical Theory of Games”), a treatise on mathematical probability that he sent to the Paris Academy of Sciences in 1803.

## Teaching career

After the death of his wife in July 1803, Ampère moved to Paris, where he began a tutoring post at the new École Polytechnique in 1804. Despite his lack of formal qualifications, Ampère was appointed a professor of mathematics at the school in 1809. As well as holding positions at this school until 1828, in 1819 and 1820 Ampère offered courses in philosophy and astronomy, respectively, at the University of Paris, and in 1824 he was elected to the prestigious chair in experimental physics at the Collège de France. In 1814 Ampère was invited to join the class of mathematicians in the new Institut Impériale, the umbrella under which the reformed state Academy of Sciences would sit.

Ampère engaged in a diverse array of scientific inquiries during the years leading up to his election to the academy—writing papers and engaging in topics from mathematics and philosophy to chemistry and astronomy. Such breadth was customary among the leading scientific intellectuals of the day. Ampère claimed that “at eighteen years he found three culminating points in his life, his First Communion, the reading of Antoine Leonard Thomas’s “Eulogy of Descartes”, and the Taking of the Bastille. On the day of his wife’s death he wrote two verses from the Psalms, and the prayer, ‘O Lord, God of Mercy, unite me in Heaven with those whom you have permitted me to love on earth.’ Serious doubts harassed him at times,



and made him very unhappy. Then he would take refuge in the reading of the Bible and the Fathers of the Church.” For a time he took into his family the young student Antoine-Frédéric Ozanam (1813–1853), one of the founders of the Conference of Charity, later known as the Society of Saint Vincent de Paul. Through Ampère, Ozanam had contact with leaders of the neo-Catholic movement, such as François-René de Chateaubriand, Jean-Baptiste Henri Lacordaire, and Charles Forbes René de Montalembert. Ozanam was beatified by Pope John Paul II in 1997.

### Work in electromagnetism

In September 1820, Ampère’s friend and eventual eulogist François Arago showed the members of the French Academy of Sciences the surprising discovery of Danish physicist Hans Christian Ørsted that a magnetic needle is deflected by an adjacent electric current. Ampère began developing a mathematical and physical theory to understand the relationship between electricity and magnetism. Furthering Ørsted’s experimental work, Ampère showed that two parallel wires carrying electric currents attract or repel each other, depending on whether the currents flow in the same or opposite directions, respectively - this laid the foundation of electrodynamics. He also applied mathematics in generalizing physical laws from these experimental results. The most important of these was the principle that came to be called Ampère’s law, which states that the mutual action of two lengths of current-carrying wire is proportional to their lengths and to the intensities of their currents. Ampère also applied this same principle to magnetism, showing the harmony between his law and French physicist Charles Augustin de Coulomb’s law of magnetic action. Ampère’s devotion to, and skill with, experimental techniques anchored his science within the emerging fields of experimental physics. Ampère also provided a physical understanding of the electromagnetic relationship, theorizing the existence of an “electrodynamic molecule” (the forerunner of the idea of the electron) that served as the component element of both electricity and magnetism. Using this physical explanation of electromagnetic motion, Ampère developed a physical account of electromagnetic phenomena that was both empirically demonstrable and mathematically predictive. In 1827 Ampère published his magnum opus, *Mémoire sur la théorie mathématique des phénomènes électrodynamiques uniquement déduite de l’expérience* (Memoir on the Mathematical Theory of Electrodynamic Phenomena, Uniquely Deduced from Experience), the work that coined the name of his new science, *electrodynamics*, and became known ever after as its founding treatise. In 1827 he was elected a Foreign Member of the Royal Society and in 1828, a foreign member of the Royal Swedish Academy of Science. In recognition of his contribution to the creation of modern electrical science, an international convention signed in 1881 established the ampere as a standard unit of electrical measurement, along with the coulomb, volt, ohm, and watt, which are named, respectively, after Ampère’s contemporaries Charles-Augustin de Coulomb of France, Alessandro Volta of Italy, Georg Ohm of Germany, and James Watt of Scotland.

Courtesy: [www.wikipedia.org](http://www.wikipedia.org)

## WHAT IS THE DIFFERENCE?

### Between REWARD and AWARD

Awards are tokens of appreciation, which are given to individuals for their achievements. It can be called as symbol of recognition to an individual for their personal achievements. Rewards on the other hand are also recognition but it is a kind of acknowledgment to an individuals contributions. Rewards can also be said to be an encouragement to an individual.

Awards can also be called as a prize that is given away to individuals for their noteworthy activities. By getting an award, people approve that you have done something great. Awards can come in form of commemorative

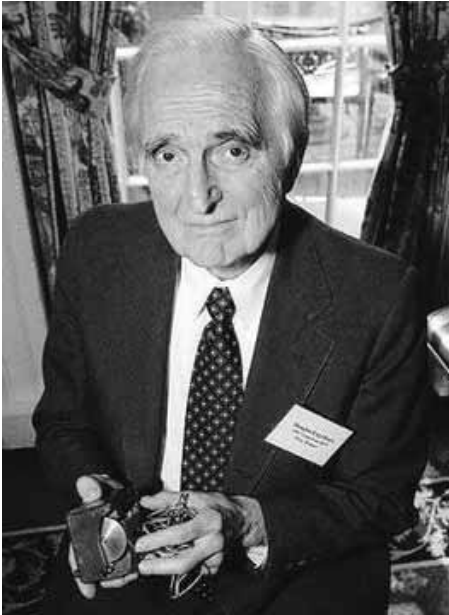
plaques, medals, trophies, certificates, titles, badges, pins and cash. Rewards most of time is associated with money or a promotion or like that.

You may be rewarded for finding and returning some one’s valuable things. The police normally give away rewards on valuable information. Rewards can be termed as a compensation that you get for helping others. But you only get award and not reward for writing a novel. Well, the award can be called as a reward for an individual’s effort

Awards are publicly presented. Rewards, on the other hand, are only private or personal affairs.



# MOUSE INVENTOR WHO FORESAW THE MODERN INTERNET



The first computer mouse was a wooden shell with metal wheels. The man behind it, tech visionary Doug Engelbart, has died at 88 after transforming the way people work, play and communicate.

The mild-mannered Engelbart had audacious ideas. Long before Apple founder Steve Jobs became famous for his dramatic presentations, Engelbart dazzled the industry at a San Francisco computer conference in 1968.

Working from his house with a homemade modem, he used his lab's elaborate new online system to illustrate his ideas to the audience, while his staff linked in from the lab. It was the first public demonstration of the mouse and video teleconferencing, and it prompted a standing ovation.

*"We will miss his genius, warmth and charm," said Curtis R. Carlson, the CEO of SRI International, where Engelbart used to work. "Doug's legacy is immense. Anyone in the world who uses a mouse or enjoys the productive benefits of a personal computer is indebted to him."*

Back in the 1950s and 1960s, when mainframe computers took up entire rooms and were fed data on punch cards, Engelbart already was envisioning a day when computers were far more intuitive to use.

One of the biggest advances was the mouse, which he developed in the 1960s and patented in 1970. The idea was way ahead of its time.

The mouse didn't become commercially available until 1984, with the release of Apple's then—revolutionary Macintosh computer. Engelbart conceived the mouse so early in the evolution of computers that he and his colleagues didn't profit much from it. The technology passed into the public domain in 1987, preventing him from collecting royalties on the mouse when it was in its widest use. At least 1 billion have been sold since the mid-1980s. Now, their usage is waning as people merely swipe their finger across a display screen.

"There are only a handful of people who were as influential," said Marc Weber, founder and curator of the Internet history programme at the Computer History Museum, where Engelbart had been a fellow since 2005. "He had a complete vision of what computers could become at a very early stage."

Among Engelbart's other key developments in computing, along with his colleagues at SRI International and his own lab, the Augmentation Research Center, was the use of multiple windows. His lab also helped develop ARPANet, the government research network that led to the Internet. Engelbart played down the importance of his inventions, stressing instead his vision of using collaboration over computers to solve the world's problems. "Many of those firsts came right out of the staff's innovations even had to be explained to me before I could understand them," he said in a biography written by his daughter.



Engelbart is survived by his wife, Karen O'Leary Engelbart; his four children, Diana, Christina, Norman and Greda, and nine grandchildren.

*Courtesy: The Hindu, dt: 05.07.2013*

## YOU ARE NEVER TOO OLD TO LEARN

My grandfather has recently started a course called 'Computers for the Terrified.' He's nearly eighty and, although used to be an engineer within the British Royal Airforce, he is completely stuck when it comes to computers.

He came back from his first evening at this course. When asked how it had gone, he replied, 'Yes, it was really good. I really enjoyed it, but I really couldn't get to grips with my mole.'

I stopped for a second, completely puzzled, until I realised he was talking about the mouse.

# LAKSHMI SAHGAL



**Lakshmi Sahgal** pronunciation (or **Sehgal**); (24 October 1914 – 23 July 2012) was a revolutionist of the Indian independence movement, an officer of the Indian National Army, and the Minister of Women's Affairs in the Azad Hind government. Sahgal is commonly referred to in India

as Captain Lakshmi, a reference to her rank when taken prisoner in Burma.

## Early life

Sahgal was born as Lakshmi Swaminathan in Madras (now known as Chennai) on 24 October 1914 to S. Swaminathan, a lawyer who practiced criminal law at Madras High Court and A.V. Ammukutty, better known as Ammu Swaminathan, a social worker and independence activist from the prominent Vadakkath family of Anakkara in Palghat, Kerala. Sahgal chose to study medicine and received an MBBS degree from Madras Medical College in 1938. A year later, she received her diploma in gynaecology and obstetrics. She worked as a doctor in the Government Kasturba Gandhi Hospital located at Triplicane Chennai.

In 1940, she left for Singapore after the failure of her marriage with pilot P.K.N. Rao. During her stay at Singapore, she met the members of Netaji's Indian National Army. She established a clinic for the poor, most of whom were migrant laborers from India. It was at this time that she began to play an active role in the India Independence League.



## The Azad Hind Fauj

In 1942, during the surrender of Singapore by the British to the Japanese, Sahgal aided wounded prisoners of war, many of whom who were interested in forming an Indian liberation army. Singapore at this time had several

nationalist Indians working there including K. P. Kesava Menon, S. C. Guha and N. Raghavan who formed a Council of Action. Their Indian National Army or *Azad Hind Fauj* however received no firm commitments or approval from the occupying Japanese forces regarding their participation in the war. It was against this backdrop that Subhas Chandra Bose arrived in Singapore on 2 July 1943. In the next few days, at all his public meetings, "Netaji" spoke of his determination to raise a women's regiment which would "fight for Indian Independence and make it complete". Lakshmi had heard that Bose was keen to draft women into the organisation and requested a meeting with him from which she emerged with a

mandate to set up a women's regiment, to be called the Rani of Jhansi regiment. Women responded enthusiastically to join the all-women brigade and Dr. Lakshmi Swaminathan became Captain Lakshmi, a name and identity that would stay with her for life.

The INA marched to Burma with the Japanese army in December 1944 but by March 1945, with the tide of war turning against them, the INA leadership decided to beat a retreat before they could enter Imphal. Captain Lakshmi was arrested by the British army in May 1945, remaining in Burma until March 1946, when she was sent to India – at a time when the INA trials in Delhi heightened popular discontent with and hastened the end of colonial rule.



## Later years

In 1971, Sahgal joined the Communist Party of India (Marxist) and represented the party in the Rajya Sabha. During the Bangladesh crisis, she organized relief camps and medical aid in Calcutta for refugees who streamed into India from Bangladesh. She was one

of the founding members of AIDWA in 1981 and led many of its activities and campaigns. She led a medical team to Bhopal after the gas tragedy in December 1984, worked towards restoring peace in Kanpur following the anti-Sikh riots of 1984 and was arrested for her participation in a campaign against the Miss World competition in Bangalore in 1996. She was still seeing patients regularly at her clinic in Kanpur in 2006, at the age of 92. In 2002, four leftist parties – the Communist Party of India, the Communist Party of India (Marxist), the Revolutionary Socialist Party, and the All India Forward Bloc – nominated Sahgal as a candidate in the presidential elections. She was the sole opponent of A.P.J. Abdul Kalam, who emerged victorious.

## Personal life

Sahgal married Colonel Prem Kumar Sahgal in March 1947 in Lahore. After their marriage, they settled in Kanpur, where she continued with her medical practice and aided the refugees who were arriving in large numbers following the Partition of India. They had two daughters Subhashini Ali and Anisa Puri The Sahgals' daughter, Subhashini Ali, is a prominent Communist politician and labor activist. According to Ali, Sahgal was an atheist. The filmmaker Shaad Ali is her grandson.

## Death

On 19 Jul 2012, Sehgal suffered a cardiac arrest and died on 23 July 2012 at 11:20 A.M. at the age of 97 at Kanpur. Her body was donated to Kanpur Medical college for medical research.

## Awards

In 1998, Sahgal was awarded the Padma Vibhushan by Indian president K. R. Narayanan.

*Earth laughs in flowers – RALPH WALDO EMERSON*

# HOW DO I PROTECT MYSELF FROM UV RAYS?

UV light is found in **sunlight** (where it constitutes about 10% of the energy in vacuum) and is emitted by **electric arcs** and specialized lights such as mercury lamps and **black lights**. It can cause **chemical reactions**, and causes many substances to glow or **fluoresce**.

You don't have to avoid sunlight completely, and it would be unwise to reduce your level of activity by avoiding the outdoors, because physical activity is important for good health. There are some steps you can take to limit your exposure to UV rays. Some people think about sun protection only when they spend a day at the lake, beach, or pool. But sun exposure adds up day after day, and it happens every time you are in the sun. If you are going to be in the sun, "Slip! Slop! Slap! and Wrap" is a catch phrase that can help you remember some of the key steps you can take to protect yourself from UV rays: *Slip on a shirt; Slop on sunscreen; Slap on a hat; Wrap on sunglasses to protect the eyes and sensitive skin around them; Seek shade*

An obvious but very important way to limit your exposure to UV light is to avoid being outdoors in direct sunlight too long. This is particularly important between the hours of 10 am and 4 pm, when UV light is strongest. If you are unsure about the strength of the sun's rays, use the shadow test: if your shadow is shorter than you are, the sun's rays are the strongest, and it is important to protect yourself. UV rays reach the ground all year, even on hazy days, but the strength of UV rays can be different based on the time of year and other factors. The UV rays become more intense in the spring, even before temperatures get warmer. People in some areas may get sunburned when the weather is still cool because they may not think about protecting themselves if it's not hot out. Be especially careful on the beach or in areas with snow because sand, water, and snow reflect sunlight, increasing the amount of UV radiation you receive. UV rays can also reach below the water's surface, so you can still get a burn even if you're in the water and feeling cool.

Some UV rays can also pass through windows. Typical car, home, and office windows block most of the UVB rays but a smaller portion of UVA rays, so even if you don't feel you're getting burned your skin may still get some damage. Tinted windows help block more UVA rays, but this depends on the type of tinting. UV radiation that comes through windows probably doesn't pose a great risk to most people unless they spend long periods of time close to a window that receives direct sunlight.

If you plan to be outdoors, you may want to check the UV Index for your area first. The UV Index usually can be found in local newspaper, TV, radio, and online forecasts. It is also available on the EPA's web site at [www.epa.gov/sunwise/uvindex.html](http://www.epa.gov/sunwise/uvindex.html) and in a variety of smartphone apps.

## **Protect your skin with clothing**

When you are out in the sun, wear clothing to protect as much skin as possible. Clothes provide different levels of UV protection, depending on many factors. Long-sleeved

shirts, long pants, or long skirts cover the most skin and are the most protective. Dark colors generally provide more protection than light colors. A tightly woven fabric protects better than loosely woven clothing. Dry fabric is generally more protective than wet fabric.

Be aware that covering up doesn't block out all UV rays. If you can see light through a fabric, UV rays can get through, too. Some companies now make clothing that is lightweight, comfortable, and protects against UV exposure even when wet. It tends to be more tightly woven, and some have special coatings to help absorb UV rays. These sun-protective clothes may have a label listing the UV protection factor (UPF) value – the level of protection the garment provides from the sun's UV rays (on a scale from 15 to 50+). The higher the UPF, the higher the protection from UV rays. Some children's swimsuits are now made from sun-protective fabric and are designed to cover the child from the neck to the knees.

Newer products, which are used in the washing machine like laundry detergents, can increase the UPF value of clothes you already own. They add a layer of UV protection to your clothes without changing the color or texture. This can be useful, but it's not exactly clear how much it adds to protecting you from UV rays, so it is still important to follow the other steps listed here.

## **Use sunscreen**

A sunscreen is a product that you apply to your skin for protection against the sun's UV rays. But it's important to know that sunscreen does not provide total protection against all UV rays. Even with proper sunscreen use, some rays get through, which is why using other forms of sun protection is also important. Sunscreens are available in many forms – lotions, creams, ointments, gels, sprays, wipes, and lip balms, to name a few. Some cosmetics, such as lipsticks and foundations, also are considered sunscreen products if they contain sunscreen. Some makeup contains sunscreen, but only the label can tell you. Makeup, including lipstick, without sunscreen does not provide sun protection. Check the labels to find out. Always follow the label directions. Most recommend applying sunscreen generously. When putting it on, pay close attention to your face, ears, neck, arms, and any other areas not covered by clothing. If you're going to wear insect repellent or makeup, put on the sunscreen first.

## **Read the labels**

When choosing a sunscreen product, be sure to read the label before you buy. Many groups, including the American Academy of Dermatology, recommend using broad-spectrum products (which help protect against both UVA and UVB rays) with a sun protection factor (SPF) of at least 30. The SPF number is the level of protection the sunscreen provides against UVB rays "a higher number means more protection.

When using an SPF 30 sunscreen and applying it thickly, you get the equivalent of 1 minute of UVB rays for each 30 minutes you spend in the sun. So, 1 hour in the sun wearing SPF 30 sunscreen is the same as spending 2



minutes totally unprotected. People often do not apply enough sunscreen, so the actual protection they get is less. Sunscreens labeled with SPFs as high as 100+ are now available. Higher numbers do mean more protection, but many people do not understand the SPF scale. SPF 15 sunscreens filter out about 93% of UVB rays, while SPF 30 sunscreens filter out about 97%, SPF 50 sunscreens about 98%, and SPF 100 about 99%. The higher you go, the smaller the difference becomes. No sunscreen protects you completely. Regardless of the SPF, sunscreen should be reapplied often for maximal protection.

The SPF number indicates protection against UVB rays only. Sunscreen products labeled “broad-spectrum” provide some protection against both UVA and UVB rays, but at this time there is no standard system for measuring protection from UVA rays. Products that contain avobenzone (Parsol 1789), ecamsule, zinc oxide, or titanium dioxide can provide some protection from UVB and most UVA rays.

Check the expiration date on the sunscreen container to be sure it is still effective. Most sunscreen products are effective for at least 2 to 3 years, but after a long time in storage you may need to shake the bottle to remix the sunscreen ingredients. Some sunscreen products can irritate your skin. Many products claim to be hypoallergenic or dermatologist tested, but the only way to know for sure if a product will irritate your skin is to try it. One common recommendation is to apply a small amount to the soft skin on the inside of your elbow every day for 3 days. If your skin does not turn red or become itchy, the product is probably OK for you.

#### **Be generous**

Ideally, about 1 ounce of sunscreen (about a palmful) should be used to cover the arms, legs, neck, and face of the average adult. For best results, most sunscreens must be reapplied at least every 2 hours and even more often if you are swimming or sweating. Products labeled “waterproof” may provide protection for at least 80 minutes even when you are swimming or sweating. Products that are “water resistant” may protect for only 40 minutes. Remember that sunscreen usually rubs off when you towel yourself dry, so you will need to put more on. Sunless tanning products, such as bronzers and extenders give skin a tan or golden color. But unlike sunscreens, these products provide very little protection from UV damage.

#### **Wear a hat**

A hat with at least a 2- to 3-inch brim all around is ideal because it protects areas such as the ears, eyes, forehead, nose, and scalp that are often exposed to intense sun, such as the ears, eyes, forehead, nose, and scalp. A dark, non-reflective underside to the brim can also help lower the amount of UV rays reaching the face from reflective surfaces such as water. A shade cap (which looks like a baseball cap with about 7 inches of fabric draping down the sides and back) also is good, and will provide more protection for the neck. These are often sold in sports and outdoor supply stores. A baseball cap protects the front and top of the head but not the neck or the ears, where skin cancers commonly develop.

#### **Wear sunglasses that block UV rays**

UV-blocking sunglasses are important for protecting the delicate skin around the eyes, as well as the eyes themselves. Research has shown that long hours in the sun without protecting your eyes increase your chances of developing some eye diseases. The ideal sunglasses should block 99% to 100% of UVA and UVB radiation. Before you buy, check the label to make sure they do. Labels that say “UV absorption up to 400 nm” or “Meets ANSI UV Requirements” mean the glasses block at least 99% of UV rays. Those labeled “cosmetic” block about 70% of UV rays. If there is no label, don’t assume the sunglasses provide any UV protection. Darker glasses are not necessarily better because UV protection comes from an invisible chemical applied to the lenses, not from the color or darkness of the lenses. Look for an ANSI label.

Large-framed and wraparound sunglasses are more likely to protect your eyes from light coming in from different angles. Children need smaller versions of real, protective adult sunglasses – not toy sunglasses. Ideally, all types of eyewear, including prescription glasses and contact lenses, should absorb the entire UV spectrum. Some contact lenses are now made to block most UV rays. But because they don’t cover the whole eye and surrounding areas, they are not sufficient eye protection when used alone.

#### **Avoid tanning beds and sunlamps**

Many people believe the UV rays of tanning beds are harmless. This is not true. Tanning lamps give out UVA and usually UVB rays as well. Both UVA and UVB rays can cause long-term skin damage, and can contribute to skin cancer. Tanning bed use has been linked with an increased risk of melanoma, especially if it is started before the age of 30. Most skin doctors and health organizations recommend not using tanning beds and sun lamps. If you want a tan, one option is to use a sunless tanning lotion, which can provide a darker look without the danger

#### **Protect children from the sun**

Children need special attention, since they tend to spend more time outdoors, can burn more easily, and may not be aware of the dangers. You should develop the habit of using sunscreen on exposed skin for yourself and your children whenever you go outdoors and may be exposed to large amounts of sunlight. If you or your child burns easily, be extra careful to cover up, limit exposure, and apply sunscreen. Babies younger than 6 months should be kept out of direct sunlight and protected from the sun using hats and protective clothing. Sunscreen may be used on small areas of exposed skin only if adequate clothing and shade are not available.

#### **A word about sun exposure and vitamin D**

Doctors are learning that vitamin D has many health benefits. It might even help lower the risk for some cancers. Your skin makes vitamin D naturally when you are in the sun. How much vitamin D you make depends on many things, including how old you are, how dark your skin is, and how strong the sunlight is where you live.

*Courtesy: <http://www.cancer.org>*

# MANAGING STRESS

## 1. What is Stress?

Stress in Individuals is defined as any interference that disturbs a person's healthy mental & physical wellbeing. It occurs when the body is required to perform beyond its normal range of capabilities. Stress is produced by high demands in life combined with high constraints & little support from colleagues & family. The results of stress are harmful to individuals, families & the society.

## 2. Effect of Stress on the Body

When the human body is placed under stress, it increases the production of certain hormones, such as adrenaline and cortisol. These hormones produce a marked change in heart rate, blood pressure levels, metabolism & physical activity. Although this physical reaction will help you to function more effectively when you are under pressure for short periods of time, it can be extremely damaging to the body in the long term.

Long-term stress has been identified as one of the most prevalent causes of high blood pressure and heart disease. Prolonged stress can increase the incidence of psychological disorders. Worries can reach such a level that they surface as a frightening, painful physical sensation, which can be mistaken for a heart attack.

People under prolonged stress are more prone to irrational fears, mood phobias and may experience fits of depression, anger & irritability.

## 3. Effect of Stress on Decisions

Suffering from any level of stress can rapidly cause individuals to lose their ability to make sound decision, especially if their self confidence fails. Faulty decisions made in the workplace and at home may lead to accidents or arguments or financial loss.

## 4. Recognizing Symptoms of Stress

There is no single symptom that can identify stress. Some physical symptoms of stress can be life-threatening such as blood pressure and heart disease. Less life-threatening physical signs include insomnia, a feeling of constant fatigue, headaches, skin rashes, digestive disorders, weers, colitis, loss of appetite, overeating & cramps. Many of these symptoms occur at some point after a stressful event. Other symptoms of stress are more immediate for example, feeling of nausea, breathlessness or a dry mouth. All these symptoms, of course, may be caused by factors other than stress.

The emotional symptoms of stress can be general irritability, acute anxiety attacks, depression, lack of libido, the loss of a sense of humour, and an inability to concentrate on the simplest of routine tasks. Some of the most common indications of stress are:

- Becoming unnecessarily over-emotional or aggressive in conflict situations.
- Loss of interest in personal appearance, social events or previously liked activities or sports.
- Poor concentration, difficulty in remembering and an inability to make decisions.

- Sadness, guilt, fatigue, apathy and a pronounced feeling of helplessness or failure.
- Loss of confidence in personal ability, often coupled with a lack of self-worth.
- As a temporary relief from stress, many people indulge in excessive eating, smoking, drinking or spending.

## 5. Reducing Stress

There is no formula guaranteeing a stress-free life, but there are techniques for minimizing stress.

- Take a stroll when you are stressed. It can help restore your perspective.
- Avoid the habit of taking work home with you every night.
- Next time you feel you have too much to do, delegate at least one task.
- Learn from those who do not suffer from stress.
- Avoid routinely working late & at weekends.
- Try to anticipate corporate change by constantly uploading your skills. Take advantage of training schemes.
- Adopt new management ideas only if they are useful-never adopt what is merely fashionable.
- When learning new technology, start slowly & build confidence.
- It is never too late to learn a new skill such as computing.
- Assess the stress factors of any new job before you accept it.
- Always be flexible in your attitudes – you may not know the full story.
- Do not make major decisions too quickly.
- Arrange to have lunch with your partner or a close friends once a week.
- Learn to talk openly about your emotions and feelings with close friends & confidants.
- Relieve pressure by discussing work problems openly.
- Spend an hour or two alone week, away from work & family.
- Try to take a five-minute break from your work every hour or so.
- Do not ignore your problems-acknowledge them as they arise.
- Learn to say 'no'. You have the right to refuse other people's excessive demands on your time.
- Practise yoga or a similar exercise routine to help you relax.
- Plan activities for each weekend. Try not to let the days just drift past.
- Join an evening class every year, and start to learn something new.

# TIRUKKURAL AND MANAGEMENT IN A 'NUTSHELL' - 3



The Essence of Management is Decision Making and its Implementation with all other concerns associated with it like the speed, costs, men and materials and so on. The 'Speed' has become very critical more than ever before at present times due to competition and fast changes in anything and everything. The 2 Kurals of Tiruvalluvar taken up for analysis

here bring out the essence of decision making and the speed and the caution.

Decision making is the purpose of all deliberations and once the decision is made there should be no delay in its execution. As the implementation is on, the situation around could either be favorable or with some obstacles, foreseen or developed due to fast changing situations. These Kurals and the others in the Chapter of "Vinaichcheyal Vagai"

or "The Conduct of Affairs" address these concerns very well.

"Soozhchchi Mudivu Thuniveidal Aththunivu Thazhchchyl Thanguthal Theethu" **Kural 671**

சூழ்ச்சி முடிவு துணிவுஎய்தல் அத்துணிவு தாழ்ச்சியுள் தங்குதல் தீது. குறள் - 671

"The end of all deliberations is to arrive at a decision; and when a decision is come to, it is wrong to delay the execution there of"

"Ollumvai Ellam Vinai Nandre Ollakkal Sellumvai Nokkichcheyal" **Kural 673**

ஒல்லும்வாய் எல்லாம் வினைநன்றே; ஒல்லாக்கால் செல்லும்வாய் நோக்கிச் செயல். குறள் - 673

"Go straight for the Goal whenever circumstances permit; but whenever circumstances are against, follow along the path that offereth the least resistance"

## HOME FESTIVALS

### AVANI (August/September)



This is a busy month, with two major festivals celebrated both at home and at the temple. Krishna Jayanthi, the birth of Lord Krishna, comes first. In the painting at right is the rescue of the baby Krishna, who was born in a prison. His father carries him across a swollen stream while the seven-headed serpent, AdiSeshan, protects the incarnation of Lord Vishnu from the storm. In the Home, offerings of butter and yoghurt are made to Krishna's image, and footprints made with red powder reveal his path

from the home's front door to the shrine room, suggesting that Krishna has come to participate. Ganesha Chaturthi is a mammoth festival across all of India, ten days in celebration of His manifestation. Shown in the center of the painting is a statue of Lord Ganesha and a devotee offering obeisance by pulling his ears and bobbing up and down, a practice called *thopukarnam* in Tamil, done only for Ganesha – one explanation being that it is to make the Baby Ganesha laugh. The icon of Ganesha is made by the devotees from river clay and painted and decorated. At festival's end is the Visarjana or departure, when the clay icon is placed into the river the Deity is bid farewell. In North India Visarjana is celebrated by millions of people. At far right in the art is depicted the story of Ganesha consuming so many sweet offerings that He had to tie a snake around his belly to keep it from bursting. Ganesha chastised the Moon for laughing at His predicament, and as penance the Moon has ever since waxed and waned through the month instead of remaining constantly bright.

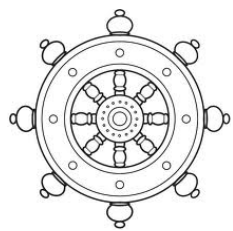
(To be continued)

## A WONDERFUL EXPERIENCE?! ... HA HA HA ..ENJOY

**WARM MILK:** In a convent in Ireland, the 98-year-old Mother Superior lay dying. The nuns gathered around her bed trying to make her last journey comfortable. They tried giving her warm milk to drink but she refused it. One of the nuns took the glass back to the kitchen. Then, remembering a bottle of Irish Whiskey that had been received as a gift the previous Christmas, she opened it and poured a generous amount into the warm milk. Back at Mother Superior's bed, they held the glass to her lips. The frail nun drank a little, then a little more and before they knew it, she had finished the whole glass down to the last drop. As her eyes brightened, the nuns thought it would be a good opportunity to have one last talk with their spiritual leader... "Mother," the nuns asked earnestly, "Please give us some of your wisdom before you leave us." She raised herself up in bed on one elbow, looked at them and said: "DON'T SELL THAT COW."



## DHARMA - 3



### Sanatana Dharma

Sanatana Dharma means the Eternal religion, the Ancient Law. This is based on the Vedas. This is the oldest of living religions. Hinduism is known by the name

Sanatana Dharma. What the Vedas alone declare to be the means of attaining the summum bonum or the final emancipation, is the Sanatana Dharma or Hindu Dharma. The foundation of Sanatana Dharma is Sruti (Vedas); Smritis are the walls; the Itihasas and the Puranas are the buttresses or supports. In ancient times, the Srutis were learnt by heart. The teacher sang them to his pupils and the pupils sang them after him. They were not written in book form. All the sects, all the philosophical systems, appeal to (look upon) the Sruti as the final authority. The Smriti stands next in authority to the Sruti.

Hinduism stands unrivalled in the depth and grandeur of its philosophy. Its ethical teachings are lofty, unique and sublime. It is highly flexible and adapted to every human need. It is a perfect religion by itself. It is not in need of anything from any other religion. No other religion has produced so many great saints, great patriots, great warriors and great Pativratas. The more you know of it, the more you will honour and love it. The more you study it, the more it will enlighten you and satisfy your heart.

### India – The Home Of Religions

The religious history of the world tells us that from time immemorial, India has been the home of great sages, seers and Rishis. All the great religious ideals that have moulded the character of men, the loftiest tenets of ethics and morality that have raised human beings to magnanimous heights of divine splendour and all the sublime truths of spirituality that have made men divine and have moulded the spiritual ideals of nations and saviours of mankind, first arose in India. The spiritual horizon of India has always been illumined with the glory of the self-effulgent sun of wisdom of the Upanishads. Whenever there was any upheaval in any part of the world, the origin of this could be traced to the wave of spirituality caused by the birth of a great soul- a special manifestation of Divinity in some part of India.

Hindus have had a culture, civilisation and religion millennia older than those of any other country or people.

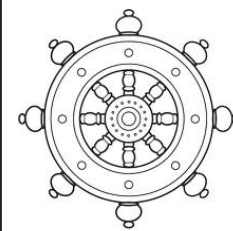
God did speak to the world through India's Rishis, Yogis, Mahatmas, Alvars, prophets, Acharyas, Sannyasins and saints. Their teachings are really inspired. God is the one Light and Truth from

whom emanate the teachings of all faiths. India is the home and abode of religions. It occupies the proud first place in religious devotion and godliness. It is famous for its Yogis and saints. The goal of India is Self-realisation or attainment of God-consciousness, through renunciation. The history of India is a history of religion. Its social code and regulations are founded upon religion. Minus its Yoga, religion and its regulations, and India will not be what it has been for millennia. Some Hindus are still not aware of the distinguishing features of Sanatana Dharma. If every Hindu knew and understood what Hinduism is, the Hindus of today would all be gods on this earth. May you all be endowed with the knowledge of Sanatana Dharma! May you all endeavour to protect the Eternal Dharma! May the secrets of Sanatana Dharma be revealed unto you all, like a fruit in the palm of your hand, through the grace of the Lord! May the blessings of Rishis be upon you all! Glory to the Vedas and Sanatana Dharma! Glory to Brahman (Supreme Reality), the source of all Vedas and Sanatana Dharma.

### Samanya Dharma

Every religion has a generic form or Samanya Rupa and a specific form or Vishesha-Rupa. The general form remains eternally the same. It is never changed by any circumstance whatever. It is not affected at all by changes of time, place, surroundings and individual differences. This aspect of religion is called Sanatana or Eternal. That which changes according to the change of time, place and surrounding circumstances is the external aspect or ritual, of Dharma.

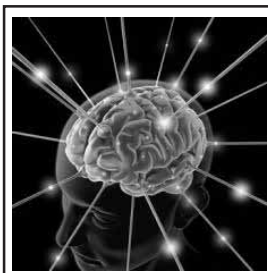
Samanya Dharma is the general Dharma or law for all men. Varnasrama Dharma are special Dharmas which are to be practised by particular castes and by men in particular stages of life. The Samanya Dharma must be practised by all, irrespective of distinctions of Varna and Asrama, creed or colour. Goodness is not the property of any one class, creed, sect or community. Every man possesses this virtue.



## POWER YOUR MIND

### WHAT IS DEPRESSION?

Depression is not a disease  
But it is only a fallen wave  
In the ocean of consciousness  
Only to rise again with great  
Force to lift us up and up  
Till we reach the shore safely.



*Courtesy: Swami Srikantananda*

### BE FEARLESS

Fear is only a thunder cloud  
Making an empty sound  
The force of wind  
Moves it round and round  
And frightens only those  
Who are not sound.

# HUMOUR

## LOWEST POSSIBLE

A student burst into his professor's office and says; "Professor Stigler, I don't believe I deserve this F you've given me."

To which Stigler replied, "I agree, but unfortunately it is the lowest grade the University will allow me to award."

## COME BACK

A couple was making their first doctors visit prior to the birth of their first child. After the exam, the doctor took a small stamp and stamped the wife's stomach with indelible ink. The man and his wife were curious about what the stamp was for, so when they got home, the man took out his magnifying glass to try to see what it was. In very small letters, the stamp said, "When you can read this, come back and see me."

## How did you do that?

Three visitors to London climb up the tower that houses Big Ben and decide to have a contest. They're going to throw their watches off the top, run down the stairs and try to catch the watches before they hit the ground.

The first tourist throws his watch, takes three steps and hears his watch crash. The second throws his watch and takes only two steps when he hears his watch shatter.

The third tosses his watch off the tower, jogs down the stairs, goes to a candy store, buys a snack, walks back to Big Ben and catches his watch. "How did you do that?" asks one of his friends.

"My watch is 30 minutes slow."

## Memory...

An elderly couple had been experiencing declining memories, so they decided to take a power memory class where one is taught to remember things by association. A few days after the class, the old man was outside talking with his neighbor about how much the class helped him.

"What was the name of the Instructor?" asked the neighbor. "Oh, ummmm, let's see," the old man pondered. "You know that flower, you know, the one that smells really nice but has those prickly thorns, what's that flower's name?"

"A rose?" asked the neighbor. "Yes, that's it," replied the old man. He then turned toward his house and shouted, "Hey, Rose, what's the name of the Instructor we took the memory class from?"

## When?...

Q. When do you stop at green and go at red?

A. When you're eating a watermelon!

## Paint me...

A woman decided to have her portrait painted. She told the artist, "Paint me with diamond rings, a diamond necklace, emerald bracelets, a ruby broach, and gold Rolex."

"But you are not wearing any of those things," he replied. "I know," she said. "It's in case I should die before my husband. I'm sure he will remarry right away, and I want his new wife to go crazy looking for the jewelry."

## RESPECT THE HOBBIES

A woman went shopping, at cash counter she opened her purse to pay.

The cashier noticed a TV remote in her purse.

He couldn't control his curiosity and asked, "Do you always carry your TV remote with you?"

She replied, "No, not always, but my husband refused to accompany me for shopping today, so..."

The shopkeeper smiles and takes back all the items that the lady had purchased.

Shocked at this act, she asks the shopkeeper, "What are you doing?"

He said, "Your husband has blocked your credit card."

**MORAL: Respect the hobbies of your Husband!**

1) The best principle to be Successful, each and every time : either CONVIENCE or CONFUSE.

2) There is only one Mathematical Figure which value is equal to the number of Alphabets in that word.

Guess !? One need not require Forethought for this ... not yet got ? ... It is Number 4 (four) and no more.

3) Out of 12 months in the year, only the First and the Second month's name ends with "WORRY"!

Is it not? If so why? Generally, FEBRUARY - Worry on account of new Taxes as the Central/State Governments announces BUDGET!

Then JANUARY - Generally a Big Question Mark as to the all coming days throughout the current year, for all JANAsamuh / JANAngal (every citizen).

4) What do you understand about "CREDIT WORTHINESS"? Think deeply....

That person who knows the Technics and have Capacities to obtain CREDITS / LOANS of every kind, even from the most stingy Fellow, is hailed to have more "CREDIT WORTHINESS"....!

5) Every Organisation will have a Prime place where CASH is dealt and that person, who handles is called, "CASHIER".

Do you know the secret behind the phrase "Cashier"?

Think casually... It is to say... "Cash is here" ... "Cash here"... finally, that becomes..... "CASHIER"

6) "SENIOR CITIZEN"...! Think sincerely.....

Do you know what is the Real Sense of SENIOR ?

Even the Government has given various amenities. But, what actually required is, one should go Nearer to the Senior Citizen, see them with sympathy and attend to their needs. The Age old people, may also can see only the nearer things! Hence it is said, "See - Near", and that became "SENIOR"

7) An "INTIAL" - is invariable to us. Can you tell, as to what could be the Initial for GOD? Atleast one Initial?

Think Devotionally...

Commonly people say - "O GOD" !

Hence, "O", is the Initial for GOD !

(Incidentally "O" - represent "OMNIPRESENT".)

By M. Sri Rama Prasad

# CUTTING-EDGE LIGHTING SOLUTION BY ZUMTOBEL FOR “VORARLBERG MUSEUM”

Dornbirn, Austria – Following a four-year conversion period, the “vorarlberg museum” in Bregenz will open its doors again on 21 June 2013. The museum designed by the Bregenz-based architectural studio Cukrowicz Nachbaur has now become one of the highlights of the city's cultural landscape. In order to meet the demanding lighting requirements of the various areas of the museum, the designers opted for a project-specific lighting solution by Zumtobel. The new “vorarlberg museum” is an architectural and cultural gem situated on a prominent location right at the heart of the city of Bregenz. For as long as 150 years, it has been preserving cultural and artistic testimonials from the region of Vorarlberg. This time-honoured art collection has now been turned into a contemporary museum that arouses the visitor's interest already from the outside. Inside the building, various exhibition areas form the heart of the museum; they posed the greatest challenge in terms of selecting the right lighting system. Therefore, the designers and architects relied on Zumtobel's expertise when it came to presenting some 150 years of history of Vorarlberg.

## **90 percent custom solutions to achieve perfect illumination**

An important aspect in the building's redesign was to find a perfect lighting system for the various areas of the museum that can also be adjusted flexibly and quickly. In collaboration with lighting designer Manfred Draxl and with structural and technical requirements in mind, Zumtobel developed a customised lighting concept for the museum that combines efficient and gentle lighting with high lighting quality and perfect colour rendering. Moreover, all areas of the museum are uniformly lit with a warm white colour temperature of 3000 kelvin – this creates perfect lighting conditions for the exhibits as well as a pleasant atmosphere for both visitors and staff members.

About 90 percent of the lighting solution are custom solutions, including more than 1400 special luminaires. Furthermore, Zumtobel developed so-called multi-functional mono-points (MMP) for the exhibition areas and the foyer, which allowed unobtrusive homogeneous installation despite the building's slightly conical layout. MMPs are concrete casting boxes with a diameter of 90 millimetres. Recessed into the ceiling along a grid, they allow flexible integration of luminaires, loudspeakers or heavy-duty elements. The MMP automatically detects when a luminaire is installed and connects it to the central Luxmate Litenet lighting management system. Using Luxmate, the museum's entire lighting solution can easily be controlled with high precision. The system combines complex qualities to form a central unit that can be operated and configured thanks to especially developed graphic user interfaces via smartphones and tablets. In addition, Zumtobel has developed a special addressing concept for the illumination of exhibition spaces which allows for luminaires installed in retrospect to be integrated into the existing lighting solution immediately.

## **Innovative luminaires for demanding tasks**

For uniform vertical illumination of walls, with the light centre at eye level, Zumtobel used wallwashers as suspended pendant luminaires with a length of 470 millimetres. Moreover, two pivoting LED luminaires – a simple recessed spotlight and a suspended version with five integrated spots – enable accent lighting of the exhibits. Above all, they boast very high colour rendering ( $R_a > 90$ ) and excellent lighting quality. Their UV- and IR-free light is also particularly gentle on the exhibits. This combination is also used in the show depot where special objects are presented behind glass panels. Here, the luminaires are mounted on Tecton trunking. Tecton is a continuous-row lighting system which, thanks to its built-in 11-pole current conducting section, connects the luminaires with all functions such as power supply or lighting control. This allows absolutely flexible mounting positions and reduces costs for both installation and maintenance. Thus, additional luminaires can be added to the Tecton trunking for special exhibitions. For perfect illumination of the foyer, Zumtobel relies on a combination of custom-made LED downlights, LED spotlights, HIT downlights and halogen spotlights. In the next room, the light-flooded atrium, daylight is enhanced by soft indirect lighting provided by minimalist Arcos spotlights.

In the museum café, Zumtobel added a decorative lighting installation consisting of some 30 halogen luminaires with fabric shades providing cosy light that entices guests to stay for a while. In the administrative area, mainly luminaires with fluorescent lamps are used. Thus, the Freeline luminaire as pendant luminaire achieves perfect lighting conditions in the offices, thanks to its uniform light distribution. In the rooms where events are to be held, special lighting systems fitted with fluorescent lamps and halogen lamps provide both pinpoint and linear lighting. For the staircase of the new building, Zumtobel has developed another LED downlight, taking into account the sloped ceiling. In the staircase of the old building, the challenge was to follow the contours of the historic window arches and produce an appropriate light distribution.

*Courtesy : ZUMTOBEL*

*Link : [http://www.zumtobelgroup.com/en/Historical\\_exhibits\\_presented\\_in\\_a\\_new\\_light.asp](http://www.zumtobelgroup.com/en/Historical_exhibits_presented_in_a_new_light.asp)*



# PICTURES OF VORARLBERG MUSEUM





Safe Earthing Electrodes | Back Fill Compounds | Lightning Arresters



# ASHLOK

Your Ultimate Solution for Earthing

India | U.A.E

[www.ashlok.in](http://www.ashlok.in) | +91 94440 87356 | [earthing@ashlok.in](mailto:earthing@ashlok.in)

# 13

*Glorious Years of Earthing*

Printed and Published by 'Tamilnadu Electrical Installation Engineers' Association  
"A" Grade, Chennai -14. Editor : G. Venkatesh Advisor : S. Mahadevan