ELECTRICAL INSTALLATION ENGINEER

NEWS LETTER

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

Dear Members and Friends,

Happy New Year Greetings !
" Pongal Nalvazhthukkal "!!

January is generally a month of prosperity, celebrations and gaiety, but this New Year is born with lot of challenges, particularly for Tamilnadu. Power Scarcity is affecting Industries, Agriculture and all other activities and water scarcity is scaring Food production and Rural Economy. With all the initiatives of the Government and with the help of the Almighty, it is the Hope and Prayer of every one that situation will return to normal soon. Added to these, there are happenings that disturb the Social Harmony and they need to be contained with strict implementation of Law and spreading of "Goodness" and Order.

It will be very appropriate to have a Relook at the Energy Scene, Energy Additions, Energy Efficiency, Energy Security and Energy Freedom and so on, as we are a country of large population, steady growth and galloping needs. We are certainly a Country blessed with lot of resources and potentially a strong Economy, but the problems are a plenty. The problems can be summed up into 2 aspects. The first one is very inadequate 'Oil' Resources resulting in 'Huge' Import Bill upsetting our Economy. The second one is Low Morality in every one and in all walks of life resulting in corruption and siphoning out of our 'Wealth'.

The first problem of Oil could be addressed with increased focus and application of technologies for Bio Crude, Bio Fuel and Bio Diesel, all from the various abundant Biomass resources. With the abundance of Sun Light, Rains and all other Natural Resources, we can certainly work more towards 'Renewable Energy' to set an example to the world as foreseen and told by Al Gore, former Vice President of U.S and an Environmentalist.

The second problem reminds us of a need for a Mahathma, whose martyrdom day falls this month, to unite and reform people and their attitude, as today we see shameless exhibition of selfishness by the States, Groups, Families and Individuals, without any concern or love for the Society or the Nation.

All concerns for Energy and its Generation, Distribution and Utilization clubbed with the issues of Efficiency and Safety increases our Role and Responsibilities. Let us take our pledge that we will excel in fulfilling our responsibilities.

We thank all those members who have helped us by participating in the advertisements appearing for the issue December 2012 – Hensel Electric India Pvt Ltd., Bracecorp Publications Pvt. Ltd., Prolite Autoglo Limited, Universal Earthing Systems Pvt. Ltd., Easun Reyrolle Limited, Intrans Electro Components Pvt. Ltd., Rowsons Marketing Pvt. Ltd., K-Lite Industries, Servomax India Ltd., Cape Electric Corporation, Power Links, Electrotherm (India) Ltd., OBO Bettermann India Pvt. Ltd., Galaxy Earthing Electrodes (P) Ltd., Ashlok Safe Earthing Electrode Ltd.

EDITOR

EVENTS

7th INDIA ELECTRICITY

Event Profile : India Electricity is one of the foremost Indian trade events, dedicated to the industrial power and electronics sector where the opportunities and challenges for the Indian power sector will be showcased

Date : 16th January 2013 to 18th January 2013

Venue : Pragati Maidan, NEW DELHI, INDIA

Website : www.biztradeshows.com/india-electricity

ELEKTROTEC

Exhibit Profile : Elektrotec creates a platform for healthy sharing of knowledge among industry professionals and gain latest technological innovational skills in both Electrical and Electronics industry

Date : 23 rd January 2013 to 26 th January 2013

Venue : Codissia Trade Fair Complex, COIMBATORE, INDIA

Website : **www.elektrotec**.codissia.com

1st INTERNATIONAL CONFERENCE ON BIOENERGY, ENVIRONMENT AND SUSTAINABLE TECHNOLOGIES

Exhibit Profile : BEST2013" aimed at creating an effective forum for exchanges of innovative ideas and research works in the areas of Energy, Environment and Sustainable Development for Cleaner Environment and to accomplish Eco-friendly future.

Date : 27-30, January 2013

Venue : **Arunai Engineering College, Tiruvannamalai, Tamilnadu, India**

Website : http://best.biotechpage.com/index.php#BEST2013

METERING INDIA - 2013

Event Profile : Seminar, entirely devoted to the utilization of technology for the benefit and betterment of Power and Metering eco-system

Date : 21st February 2013 to 22nd February 2013

Venue : Sovereign Hall, Hotel Le Meridien, Janpath, NEW DELHI - INDIA

Website : www.meteringindia.in

guangzhou electrical building technology 广州国际建筑电气技术展览会

Event Profile : Electrical Building Technology Guangzhou, Asia's leading show for the building and home automation and electrical engineering sectors

Date : 09-Jun-13 to 12-Jun-13

Venue : China Import and Export Fair Pazhou Complex, Guangzhou

Address: No.380, Yuejiang Zhong Road, Haizhu District, Guangzhou, China

Website: http://www.messefrankfurt.com.hk/fair_homepage.aspx?fair_id=16&exhibition_id=17

MEMBERS DETAILS

S.No.	Company Name	License No.	Place	Contact No.
176.	**Base Electrical and Electronic Solutions Private Limited** (Formerly Oswalds Engg. Co.)	ESA 375	Coimbatore	0422 4354655, 9842255004
177.	**Shiva Agency**	ESA 369	Coimbatore	0422–2434046, 9952422445
178.	**Airtex Electrical Services**	EA 2005	Coimbatore	9095493370, 9842481136
179.	**Power Electric Corporation**	EA 2544	Coimbatore	0422–2532530, 9843049001
180.	**Darshan Controlss Corporation**	EA 2445	Coimbatore	0422–2317091, 9843136616
181.	**Sri Vignesh Electricals**	EA 2562	Coimbatore	98941 37868, 8144910303
182.	**Sri Amman Control System**	EA 2668	Coimbatore	0422–2666750, 9894266694
183.	**Sri Srinivaasaa Electricals**	EA 1681	Coimbatore	0422–2511876, 9443044315
184.	**Power Systems**	EA 1595	Coimbatore	0422–4382996, 9842849385
185.	**MK Power Control Corporation**	EA 2811	Coimbatore	95855 44881, 9994435511
186.	**Highlands Engineering Co.**	EA 2007	Coonoor	0423–2230459, 9443356459
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188.	**Sudhan Power Tech**	ESA 218	Cuddalore	04142- 289386, 9942992606
189.	**A. Dhanapal**	EA 2390	Dharmapuri	04342–263443, 9443263443
190.	**Sarayu Contractors and Consultants**	EA 1554	Dindigul	0451–2461369, 9994457569

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CONTRIBUTION TO NEWSLETTER (Rs.1,000/- per year)

156. Al Ansari Power Technologies (I) Pvt Ltd., (2012-2013) ***New- member***
157. T.S.P Engineers & Consultants, (2012-2013) ***New-member***
158. Devee Enterprises Electricals P. Ltd, (2012-2013)
159. George Associates, (2012-2013)
160. Anand Electricals, Saidapet (2012-2013)
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181. DCW Ltd, (2012-2013)
182. Power Electric works, Trichy (2012-2013)
183. Adithya Mechatronics, (2012-2013)
184. R.S.Electric controls, (2012-2013)
185. Crompton Greaves Ltd, (2012-2013)
186. Bestech Electrical Engineering, (2012-2013)

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

(***Please help us to serve you better***).

KARNATAKA UNVEILS MULTI-CITY ROOFTOP SOLAR PROGRAMME

As solar programmes go, the one unveiled recently by Karnataka is a pretty small one — about 1.3 MW. But its spread is large.The State wants to create 0.5 kW and 1 kW household solar systems across some 1,943 houses in Bangalore, Mysore, Mangalore, Hubli and Gulbarga. From a reading of the tender notification, it appears that this is a pilot project.

These are grid-connected solar systems, which means that this programme is a rent-a-roof type of initiative. The solar developer puts up a plant on a rooftop and sells the electricity to the grid at prices arrived at by the tender process. The revenues will be shared with the roof owner.

Half kilowatt systems will come up on 1,297 roofs and 1 kW systems on 646. The equipment used should be those approved by the Karnataka Renewable Energy Development Ltd and the developers should guarantee a minimum of 450 units a year for half kilowatt systems and 900 units for 1 kW.

Success usually comes to those who are too busy to be looking for it - HENRY DAVID THOREAU

Let us move further.

4.3.1 We were dealing with the factors responsible for the deterioration/ageing of the Transformer Oil. Now let us understand some interesting phenomena connected with Transformer oil. *Significant among them is "Streaming Electrification of Oil."* It was noticed in the year 1978. It was related to large capacity EHV transformers. It is an *Electrostatic phenomenon* that normally occurs in large capacity transformers where forced air and forced oil cooling system is adopted. When the insulating oil flows fast the solid insulating structure of the transformer, charges separation and accumulation take place at Paper-Oil interface. When these accumulated charges assume greater proportions, streaming electrification with the consequential damages to the insulation structure of the Transformer occurs. It also produces partial discharges in the Transformer windings with the attendant loss of life of the Transformer (ageing process). Thus streaming electrification phenomenon demands a pointed attention from the view point of insulating oil ageing. It has a relationship with the

"Tan delta" and resistivity (ρ) of the oil and it is expressed by the equation:

$$\text{Tan } \delta = \frac{100}{\omega \varepsilon \varepsilon_o \rho}$$

Where ω = Angular frequency of the applied voltage (H_2), ε = Permittivity of the insulation,
ε_o = A Constant = 8.85×10^{-12} F/m and ρ = resistivity

Resistivity (ρ) is normally expressed in terms of the equation $\frac{1}{ne\mu}$

Where n = charge carrier density, e = electronic charge 'e' and μ = Carrier mobility.

Then we get $\text{Tan } \delta = \frac{100\ e\mu}{\omega \varepsilon \varepsilon_o}$

Generally changes in mobility has no bigger role in the ageing of the insulating oil; hence the changes in the carrier density "n", the electronic charge 'e' are considered. The change in the carrier density 'n' is found to be the main factor influencing the peak of "tan δ", when the oil is subjected to ageing process. Further the streaming Current "i" is proportional to the charge carrier density 'n' and the oil flow rate "v" as shown below.

$i = Anv$

where A is a material constant.

When the flow rate is constant, stream current "i" presents a trend similar to that of "tan δ" in ageing process. To reduce the effect of streaming electrification, high performance insulating oils with low charging tendency and high resistance to ageing are now used. Additives like Benzo triazole (BTA) are also added to these oils.

4.3.2 The Fig.1 helps the understanding of the ageing of oil, which directly reduces the useful operating life of a transformer.

4.4 AGEING OF INSULATING PAPER AND OTHER INSULATING MATERIALS

4.4.1 One of the main causes of the ageing of the transformer is the degradation of its insulating paper which is impregnated with oil. Such a paper while exposed to operating or service life gradually get deteriorated. As years passed, its mechanical strength tends to decrease while its electrical strength comparatively remain unaffected/ unchanged. During short circuits the transformer windings are subjected to large mechanical forces, which may break the windings mechanically or shear it or shift it from its present location. These occur when the insulating paper and press boards lost their resistance to mechanical forces/vibrations due to ageing. Thus we can see the life time of a transformer is mostly determined by the mechanical strength of its insulating materials like paper and pressboard which are affected by ageing or time caused gradual deterioration.

From the above it may be noted that the periodical measurement of the mechanical strength of the insulating paper and press board may provide a direct approach for the diagnosis of the operating life of oil-immersed transformers. The main problem or difficulty lies in the measurement of mechanical strength of an oil immersed transformer. Hence alternative methods are tried. *One of the significant methods is the determination of the degree of polymerization of the insulating paper.* This process involves the sampling of a small piece of insulating paper removed from the transformer for evaluation. IEC 450 publication prescribes the procedure for such evaluation.

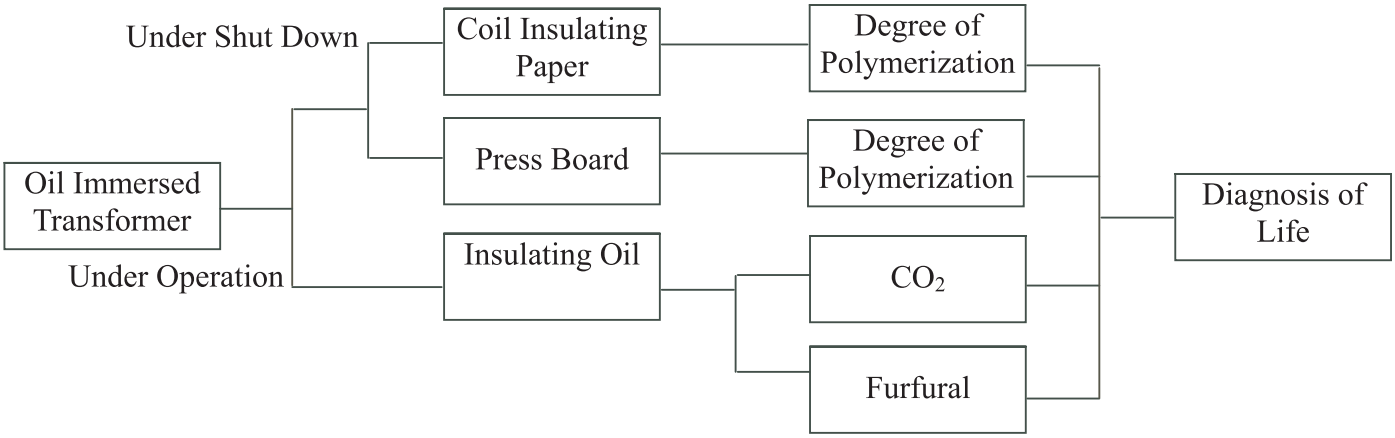

Fig.1: Diagnosis of oil Immersed Transformers

4.4.2 The insulating paper used in an oil-immersed transformer decomposes gradually due to heat dissipation. Some of the decomposition products formed from the cellulose paper are shown in Fig.2.

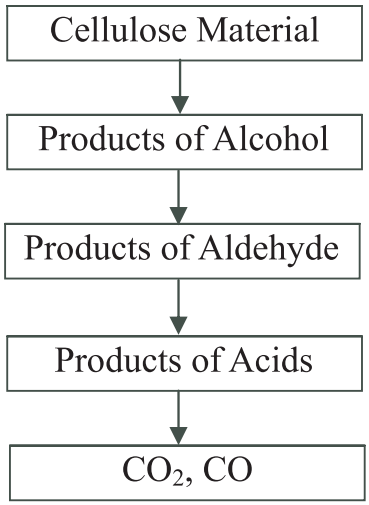

Fig.2: Decomposition Products of Cellulose Paper

The number of cellulose molecules at any time indicate the degree of polymerization. For example if the insulating paper is made out of Kraft pulp, the cellulose molecules will be around 1000 to 1100 at beginning of its service life. *Then it gradually goes down and finally reaches its end when it comes around 500 or less. Then the paper becomes brittle and cracks while it is bent.* The insulating paper located at the highest temperature zone or hot spot points should be evaluated. These points exist at the upper point of the winding inside the transformer. Then its lifetime can be predicted from Acker's equation viz. $D = Do\ (1\text{-}r)^{-p}$

Where D = Present degree of polymerization, Do = Initial degree of Polymerization, r = a constant and p = Operating period in years

4.4.3 The sampling of insulating paper from the windings for this test poses problems. It is difficult to remove a piece of insulating paper from the hotspot areas since it may lead to permanent problems. Pressboard or paper used in Power leads can be easily removed for evaluation but these are located at relatively low temperature regions and this demands the need for the consideration of such temperature differences on the final result. The temperature difference may be evaluated from the design data, heat-run test data before shipment and temperature history of the transformer in service. The first two data can be got from the manufacture and last one from the load factor of the transformer in service. Thus the lifetime of an oil-filled transformer can be determined from the change in the degree of polymerization of its insulating materials.

To conduct this test the transformer in point has to be removed from service. Then only the interval inspection with the subsequent removal of a piece of insulating paper can be carried out.

In my next article, how the lifetime assessment of an oil-immersed transformer can be carried out from the Carbon-dioxide and Furfural dissolved in its oil will be explained.

Till then, Kindly Stay Tuned.

(To be continued…)

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CORPORATION PLANS SOLAR BUS SHELTERS TO SAVE POWER

In a bid to reduce power consumption, Corporation of Chennai has proposed to build solar bus shelters on major arterial roads. Officials said the solar-powered bus shelters will also have charging points for mobile phones.

A senior corporation official said: "Some bus shelters in the city have at least 20 tubelights. These consume a lot of power. To cut back on power consumption, we are considering solar-powered bus shelters on arterial roads." Officials said they are yet to finalise locations for the proposed solar bus shelters. "The plan is only in its initial stage. We are also studying solar bus shelters which were introduced in Trichy."

Solar bus shelters were also introduced in New Delhi. However, the concept of solar bus shelters is yet to be common in the state. In Trichy, P Kumar, AIADMK MP had sanctioned Rs 99.70 lakh for 18 modern bus shelters and solar power lights from his Member of Parliament Local Area Development Fund. Each bus shelter was constructed at Rs 4.5 lakh. The fibre glasses on the roof of the bus shelters will produce about 200 watts power.

Commuters have welcomed the move. Ram Kumar, a commuters, said: "Many companies use extra tubelights to get a good display for their advertisements. The civic body's plan to come up with solar bus shelters will definitely reduce power consumption."Under the civic body's public private partnership plan for the modernised bus shelters, it allows advertising firms to build shelters and sell advertising space for 20 years. The selected firms, from the revenue earned through advertising, were supposed to pay the corporation an annual 1.5 lakh.

However, the corporation's plan to modernise 1,024 bus stops and create seating facilities, hand-rails and dustbin is stuck in litigation. The civic body had managed to get tenders to set up 490 shelters. But a few firms who were earlier managing the shelters, had approached the Madras high court and got a stay order.The civic body has also decided to install solar panels in corporation schools, hospitals and replace street tubelights in corporation's extended areas with energy-saving solar and LED lamps.

Source: TOI

Never stand begging for what you have the power to earn – PHYLLIS BOTTOME

FIRE & FIRE EXTINGUISHING

CLASSES OF FIRES	TYPES OF FIRES	PICTURE SYMBOL
A	Wood, paper, cloth, trash & other ordinary materials.	
B	Gasoline, oil, paint and other flammable liquids.	
C	May be used on fires involving live electrical equipment without danger to the operator.	
D	Combustible metals and combustible metal alloys.	
K	Cooking media (Vegetable or Animal Oils and Fats)	

CLASSIFICATION OF FIRE

CLASS A

Fires which are caused by ordinary combustible materials like wood, paper, cloth etc. are classified as Class A fires. As these materials are solid in nature, it is easier to contain this fire. Class A fires are slow in their Initial development and leaves an ash after the material is consumed.

If you are not big enough to lose, you are not big enough to win - WALTER REUTHER

CLASS B

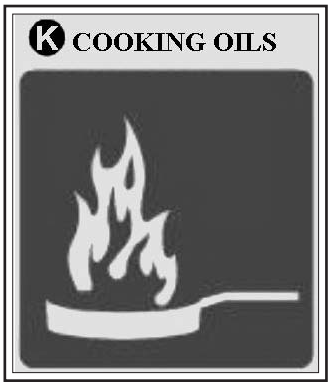
Fires which are caused by flammable and combustible liquids and gases like Gasoline, Fuel oil, Butane, Paint etc., These fires usually grow very rapidly. These are classified as Class B Fires. These fires do not leave any ash but dealing with these fire is very complex because of the fluidic nature of the materials which causes these fires.

CLASS C

Fires which are caused by electrical equipment like motors, machinery are classified as Class C fires. To generate fire, heat plays a vital role. Normally we require a fuel medium to generate heat. But in the case of Electricity, the very flow itself generates heat. Irrespective of the Burning materials present in it which may fall under Class A fire, class B Fire, these fires are classified as Class C Fires because originally it is caused by Electricity.

CLASS D

Class D fires are caused by combustible Metals. Eg. Potassium, Aluminium, Class Titanium etc. It is very difficult to ignite these Materials but once ignited causes intense fires and difficult to extinguish.



CLASS K

Class K fires are caused by Cooking oils, Vegetable & Animal fats etc.

Did you know on average a fire extinguisher contains only 10 seconds of extinguishing power?

What type of extinguishers are available?

It is vital to know what type of extinguisher you are using. Using the wrong type of extinguisher for the wrong type of fire can be life-threatening.

Water Fire Extinguishers

The most effective fire extinguishing agent is water. But it should be used only where it works best. Eg. Class A fires caused by ordinary combustible fires, usually class A fire extinguishers are painted in red.

How Water Fire Extinguishers Work

Water works in two ways, by both extinguishing the flames and soaking the materials in the fire, cooling them down and preventing them from burning any further

Why Use Water Extinguishers?

Water fire extinguishers are not harmful to people and are also environmental friendly.

Water and Electricity

Before using water fire extinguishers one must ensure that the Electricity supply to the premises is totally switched off.

Water Extinguishers and other Classes of Fires

Water is only suitable for Class A fires.

Dry Powder Fire Extinguishers

Powder fire extinguishers are an excellent all round fire extinguisher suitable for use on Class A, B & C fires. They are painted red with a blue panel.

How Dry Powder Fire Extinguishers Work

Dry powder fire extinguishers contain an extinguishing agent which is released by a compressed, non–flammable gas. The agent forms a blanket over the fire, thus preventing re-ignition. The residue must be cleaned and disposed of properly once the fire is extinguished.

There are Three Main Types of Dry Powder Extinguishers

1. ABC rated or multi-purpose powder, which contain ammonium phosphate
2. BC rated extinguishers, containing potassium bicarbonate or sodium bicarbonate (otherwise known as bicarbonate of soda or baking soda) Some BC rated powder fire extinguishers contain Monnex. The pressurising gas is usually nitrogen
3. A and D rated graphite powder fire extinguishers are usually used only in Class D fires

Both types of non-graphite dry powder extinguisher are potentially corrosive to soft metal such as aluminium, and can also be abrasive when sprayed.

Dry Powder Extinguishers and Water

The major drawback in using Dry Powder Extinguishers is the presence of Ammonium Phosphate which by reacting with any water present, forms phosphoric acid. This acid is corrosive and can seep into small cracks in equipment. So it is advised that dry chemical ABC rated fire extinguishers should not be used on Electrical equipments, if other fire extinguishing options are available. Utmost care must be taken while using dry chemical ABC rated fire extinguishers since there is the danger of inhaling toxic fumes, physical contact with harmful chemicals present in it causing injury to humans. So in case of any doubt, please call the fire brigade immediately.

Foam Fire Extinguishers

Aqueous Film forming foam fire extinguishers are very suitable for extinguishing class A & class B fires. These extinguishers are red in colour with a cream panel.

How Aqueous Film Forming Foam (AFFF) Fire Extinguishers Work

The AFFF foam extinguishers, when sprayed onto a fire, extinguishes and smothers the flames and thereby it seals any harmful vapours. This foam is effective on class A fires. When this is used on class B fires, the foam seals the liquid away from oxygen in the air and thereby it prevents re-ignition of the flammable liquids.

Foam Fire Extinguishers and Electricity

The foam spray nozzle that sprays the foam evenly, allowing you to coat the fire area quickly. Since the foam fire nozzle is non-conductive, you can use an AFFF fire extinguisher near (but not directly on) live electrical equipment. The quality models will have been tested to the BS EN3 35,000V dielectric test as defined by BSEN3-7:2004.

Foam Fire Extinguishers Containing PFOS

Perfluorooctane sulphonate (PFOS) which was used for many years in foam extinguishant has been proved to be toxic and risky to wildlife because of it's carcinogenic content.

Carbon Dioxide (CO_2) Fire Extinguishers

CO_2 extinguishers are useful for Class-B fires and also recommended for fires involving live electrical equipment. This CO_2 extinguishers are painted in bright red with black panel. It comes in two models viz. smaller model with 5 kgs and 9 kgs or higher model.

How Carbon Dioxide Fire Extinguishers Work

CO_2 Extinguishers stores CO_2 gas in liquid form (which becomes liquid under great pressure). When you operate the fire extinguisher, the liquid Co_2 expands as gas, in the process, rapidly cools the surrounding air.

This process is fast that it can make ice formation on the horn. So care must be taken not to hold the CO_2 extinguisher by the horn so that it does not freeze the skin.

CO_2 Fire Extinguishers and Electricity

The CO_2 fire extinguishers are safe to use on fires in or on electrical equipment and live cables. The advantage of CO_2 extinguisher is that the CO_2 gas is dry, so it does not leave any residue which might affect the performance of an electrical equipment in future. Factories and workplaces can have CO_2 extinguishers with a water additive or foam unit for maximum fire fighting ability.

Carbon Dioxide Fire Extinguishers and Other Fire Classes

The CO_2 extinguishers should not be used on Class A fires and Class D fires. This is because the CO_2 gas, if used on class D fires can blow the burning metal to spread over a wide area so that it becomes difficult to extinguish the fire.

Metal Fire, Fire Extinguishers

The Dry chemical extinguishers are filled with foam or powder (usually sodium bicarbonate or potassium bicarbonate & pressurized with Nitrogen). The dry chemical fire extinguishers work by interrupting the chemical reaction of fire by forming a thin layer of foam coating to the fuel so that the fuel is separated from the surrounding oxygen. Great care must be taken to choose the right type D fire extinguisher while dealing with various type of flammable Metals.

- Class D fires involve extremely high temperatures and highly reactive fuels. For example, burning magnesium metal breaks water down to hydrogen gas and excites the fire; breaks halon down to toxic phosgene and fluorophosgene and may cause a rapid phase transition explosion; and continues to burn even when completely smothered by nitrogen gas or carbon dioxide (in the latter case, also producing toxic carbon monoxide). Consequently, there is no one type of extinguisher agent that is approved for all class D fires; rather, there are several common types and a few rarer ones, and each must be compatibility approved for the particular hazard being guarded.
- As very poor last resort dry sand may be used to smother a metal fire if nothing else is available, applied with a long-handled shovel to avoid the operator receiving flash burns. Sand is, however, notorious for collecting moisture and even the smallest trace of moisture may result in a steam explosion, spattering burning molten metal around.
- Graphite based dry powders generally quite effective on fires involving high melting point metals such as, Zirconium, titanium and sodium potassium.

- Sodium bicarbonate-base dry chemical designed to suppress fires on most metal alkyls (pyrophoric liquids that ignite on contact with air) Such as triethylaluminium.
- Sodium chloride based dry powder is used on most class D fires involving metals such as magnesium.

Wet Chemical Fire Extinguishers

The wet chemical fire extinguishers are suitable for use on class F deep fat cooking fires. They are usually painted with Red with yellow panel.

How Wet Chemical Fire Extinguishers Work

In a wet chemical fire Extinguisher,potassium acetate is filled with added potassium citrate or potassium bicarbonate. This when operated, creates a fine mist which cools the flame and prevents flashing. Since the contents can be corrosive, it is advised to use a good quality extinguisher made from stainless steel.

Saponification

Saponification is the same process used to create soap from fats and oils as a result of a reaction with a metallic alkali, or base. The base acts on the oil to convert it into hydrolyzed acid and alcohol. Essentially, a wet chemical fire extinguisher converts the surface of the cooking oil or fat into a non-combustable soap.

An added benefit is that the soap-creation process is endothermic, meaning it absorbs heat energy from the oil, cooling the oil down in the process.

Using a Wet Chemical Fire Extinguisher

Like other specialist fire extinguishers, the wet chemical fire extinguisher has a long lance, allowing the user to stand well back from the fire and to spray the agent gently and evenly over the fire's surface. As with all specialist extinguishers, full training should be given in the proper and effective use of this extinguisher, a common sight in commercial kitchens and food manufacturing environments. Wet chemical fire extinguishers only work with animal fats and vegetable oils, so they cannot be used on Class B fires involving flammable liquids such as petrol or diesel.

They have usually been tested to a 13A Class A rating but should not be specified for anything other than a kitchen.

Other Fire Extinguishers in the Commercial Kitchen

Wet chemical fire extinguishers have a very specific function, and are not suitable for other fire types except Class A fires if no other extinguisher is available.

Most Fire Risk Assessments would recommend that wet chemical extinguishers are kept in proximity with other fire safety items such as a CO_2 extinguisher for electrical items, and a substantial fire blanket such as a 1.8m x 1.2m size. Fire blankets should be used to smother small pan fires, not to deal with commercial fryer fires.

A small fire blanket is a useful fire safety device for any kitchen, commercial or domestic. Simple to use, yet effective, it should be used to smother a fire and then LEFT ALONE for a considerable length of time to ensure the fire is completely extinguished. If in doubt, smother, get out, stay out and call the Fire Brigade.

How to inspect your Fire Extinguisher

1. You should read the operators manual that comes with your extinguisher to learn how to properly inspect and maintain your extinguisher. Extinguishers require routine maintenance.
2. Look at your fire extinguisher and see if it is a rechargeable or disposable. A rechargeable extinguisher can be refilled so you can use it over. A disposable must be thrown away after use.
3. Look over your fire extinguisher well, looking for dents, rust or any other damage. Make sure the extinguisher looks in good condition.
4. Check the seal that holds the pin in the extinguisher handle. Look carefully making sure there is no evidence of it being tampered with. Make sure there are no broken or missing seals or pins.
5. If your extinguisher has a gauge make sure you check the pressure, the needle should be in the "green". Also make note of the weight. Is the extinguisher full? Does it need recharged.

6. Look at the pin, nozzle and name plate to make sure they are all intact. Most fire extinguishers are stamped with the last service date.
7. Check the inspection tag on your extinguisher. Make sure it has been serviced.

How to use the Fire Extinguisher?

Follow the "PASS" acronym and you will easily figure it out.

PASS

***P*ull the Pin** at the top of the extinguisher. The pin releases a locking mechanism and will allow you to discharge the extinguisher.

***A*im at the base of the fire,** not the flames. This is important – in order to put out the fire, you must extinguish the fuel.

***S*queeze the lever slowly.** This will release the extinguishing agent in the extinguisher. If the handle is released, the discharge will stop.

***S*weep from side to side.** Using a sweeping motion, move the fire extinguisher back and forth until the fire is completely out. Operate the extinguisher from a safe distance, several feet away, and then move towards the fire once it starts to diminish. Be sure to read the instructions on your fire extinguisher – different fire extinguishers recommend operating them from different distances. Remember: Aim at the base of the fire, not at the flames!!!!

Before deciding to fight a fire, be certain that:

- The fire is small and not spreading. A fire can double in size within two or three minutes.
- You have the **proper fire extinguisher** for what is burning.
- The fire won't block your exit if you can't control it. A good way to ensure this is to keep the exit at your back.
- You know your fire extinguisher works. Inspect extinguishers once a month for dents, leaks or other signs of damage. Assure the pressure is at the recommended level. On extinguishers equipped with a gauge, the needle should be in the green zone - not too high and not too low.
- You know **how to use your fire extinguisher**. There's not enough time to read instructions when a fire occurs.

How to Fight a Fire Safely:

- Always stand with an exit at your back.
- Stand several feet away from the fire, moving closer once the fire starts to diminish.
- Use a sweeping motion and aim at the base of the fire.
- If possible, use a "buddy system" to have someone back you up or call for help if something goes wrong.
- Be sure to watch the area for awhile to ensure it doesn't re-ignite.

Never Fight A Fire If:

- The fire is spreading rapidly. Only use a fire extinguisher when the fire is in its early stages. If the fire is already spreading quickly, evacuate and call the fire department.
- You don't know what is burning. Unless you know what is burning, you won't know what type of fire extinguisher to use. Even if you have an ABC extinguisher, there could be something that will explode or produce highly toxic smoke.
- You don't have the proper fire extinguisher. The wrong **type of extinguisher** can be dangerous or life-threatening.
- There is too much smoke or you are at risk of inhaling smoke. Seven out of ten fire-related deaths occur from breathing poisonous gases produced by the fire.

Any sort of fire will produce some amount of **carbon monoxide**, the most deadly gas produced by a fire. Materials such as wool, silk, nylon and some plastics can produce other highly toxic gases such as carbon dioxide, hydrogen cyanide, or hydrogen chloride. Beware - all of these can be fatal.

Smoke inhallation or exposure to fire itself can be life threatening so get educated about the basics in **CPR** and **burn treatment**.

Great Fires in History

World history is rife with stories and lore that blame great fires for the destruction of vast areas or entire cities. From the great fire that sacked Rome in 64 B.C. to the fires that raged through the Australian landscape in 2002, fire remains one of man's most difficult battles.

Here are some of the most famous fires that occurred in the last few centuries:

The Great Chicago Fire

The Great Chicago fire is probably the most famous fire that occurred within the past hundred years or so. This fire occurred on the evening of October 8, 1871. The summer of 1871 was unusually dry in Chicago. With all its wooden buildings, Chicago was kindling waiting to burn. Incidentally, the city of Chicago had finished building all of the downtown's sidewalks out of wood right before the fire.

This fire killed 300 people and destroyed more than 17,000 structures - over 2000 acres in 27 hours. The origin of the fire is uncertain, though popular legend attributes its origin to a woman named Mrs. O'Leary. Mrs. O'Leary was milking her cow at the start of the fire.

Legend has it that a farm animal kicked over her lamp, setting the barn on fire and starting the spread of one of the biggest fires in history. The fire destroyed the entire downtown core of Chicago and most of its North side.

The history of National Fire Prevention Week has it roots in the Great Chicago Fire. On the fire's 40th anniversary, the Fire Marshals Association of North America decided to commemorate it with something that would keep the public aware of the dangers of fire and the importance of fire prevention.

The Great Fire of London

Next to the Great Chicago Fire, London's historical fire is probably the second most-famous. This fire began in a baker's shop on September 2, 1666 and lasted for several days. Surprisingly, the Great London Fire has no reported death toll. It destroyed more than 13,000 structures.

London was also a city largely built of wood, another kindling waiting to burn. When the city was rebuilt, builders used brick and stone to prevent a disaster of such proportions from ever happening again.

San Francisco Earthquake Fire

San Francisco's great fire occurred as a result of a tremendous earthquake that took place in the morning of April 18, 1906. Fires began from stoves and lamps that were overturned from the earthquake. The earthquake destroyed the city's water mains, making it nearly impossible for firefighters to fight the blaze. As a result, the fire lasted for three days until firefighters decided to dynamite entire blocks to prevent the spread of the fire. This disaster took its toll, killing 3,000 people and destroying close to 300,000 structures.

ELECTRICAL FIRE CAUSES

The three main groups of fire causes are accidental, natural and incendiary. Of the accidental fire causes, electricity often plays a major part. Electricity can also be involved in incendiary and natural causes. Fire investigators are faced with difficulty in determining the cause of a fire, they have often relied on the phrase "the fire was electrically caused" as a "catch all" to avoid the more appropriate phrase "the fire cause was undetermined". In fact, it is actually quite difficult to start a fire with electricity. This article discusses the various ways in which electricity can be involved in the cause of fires and recent developments in investigation techniques.

Three elements must be present in order for a fire to initiate. These are oxygen, fuel and heat. Not only do these elements have to be present together at the same time, but the fuel must be conditioned in a way that the heat

source can initiate an exothermic oxidation reaction. Electricity can play an important role in this process by providing the heat source.

Short Circuits

One example of an electrical heat source is a short circuit. There exists two main types of short circuits; a dead short circuit and a limited short circuit.

A dead short occurs when a live wire comes in contact with a common or ground wire (or the positive and negative wires are connected in a DC circuit) and the circuit is subsequently energized. In properly fused circuits this will cause the fuse to blow and the circuit to de-energize. This type of situation does not create sufficient heat to ignite combustibles. However, it is possible that the circuit is not fused properly. If this occurs, the current can continue to pass through the wires causing them to significantly overheat. This type of situation can ignite surrounding combustibles causing a fire.

Limited Short Circuit

The other type of short circuit is a limited short circuit. In this case, wires come in contact such that the volume of material through which the current flows is smaller than the fusible link. This will create a spark or flash and result in melting of the copper of the wiring. This situation can also cause ignition of combustibles provided the mass of the combustibles contacting the heat source is small enough that the heat source can cause it to reach ignition temperatures and initiate a self-sustaining exothermic oxidation reaction or fire. It is difficult to ignite concentrated, solid combustibles such as wood, plastic and even paper with this type of heat source. However, cotton products, sawdust, wood chips and combustible gases can be ignited.

Overloaded Circuits

Another electrical heat source can be created when a circuit is over fused. Over fusing of a circuit can result in high current flow through the wires overloading the circuit. Although electrical wiring is designed to carry current at much higher than its rated capacity, increasing current above this rated capacity causes the wire to generate excess heat. This is not a problem as long as the heat can be dissipated from the wire. However, if the wire is enclosed within a small insulated space, such as the holes through which wires run through floor joists in a home, the heat in these areas may not be able to dissipate as quickly as it is being generated. As a result, the surrounding combustibles can pyrolize and eventually ignite, causing a fire.

Leakage Current

Fires can also be caused electrically through what is called leakage current. Leakage current occurs when water is in the presence of electricity. Exposed wiring, which exists primarily at connectors and switches, can come in contact with water. Since water conducts electricity, a current will flow through the water between contacts or from the live to ground or common. Over time, the water will accumulate salts which increases its ability to conduct a current. This current can eventually develop to a point where it generates a significant quantity of heat which begins to pyrolize and carbonize the combustibles in the area. This can eventually result in a situation where a carbon bridge is formed, creating a continuous arc or significant generation of heat. Ignition of surrounding combustibles can result in a fire.

Electrical Contacts

Electrical contacts can also fail resulting in uncontrolled heating. Each time a contact is opened or closed, a small spark is generated. This causes degradation of the surface of the contact. Contacts can fail "open" in which case the circuit simply becomes inoperable. However, they can also fail "closed" and weld together resulting in uncontrolled heating.

A Tribute to Firefighters **: The men and women, who risk their lives daily to keep our homes and communities safe from the damaging and potentially fatal effects of fire, deserve a special tribute. Firefighters are often overworked and underappreciated, yet instead of complaining, more often than not, they tell you how much they love their job. Do we realize how conscientious and dedicated these public servants are to their communities?**

***UL** is a global independent safety science company with more than a century of expertise innovating safety solutions from the public adoption of electricity to new breakthroughs in sustainability, renewable energy and nanotechnology. Dedicated to promoting safe living and working environments, UL helps safeguard people, products and places in important ways, facilitating trade and providing peace of mind.*

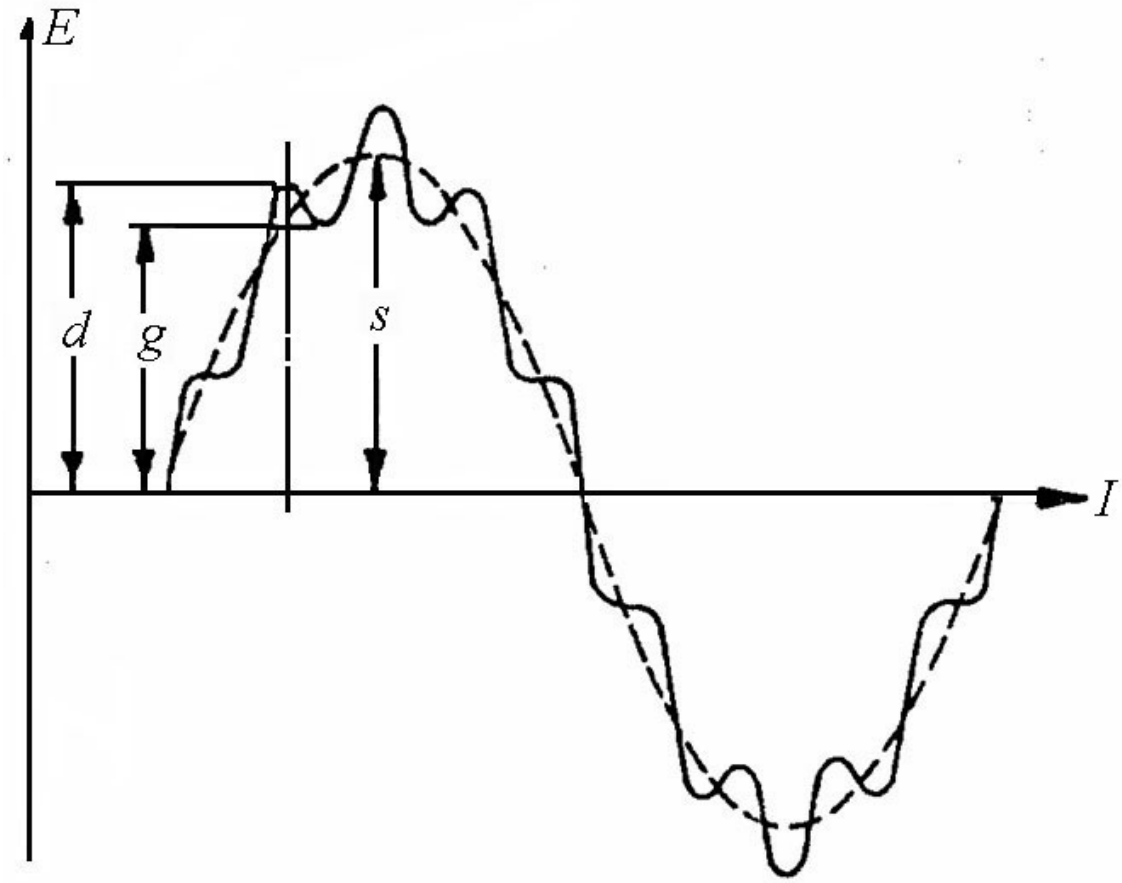
Our five businesses, Product Safety, Verification Services, Life & Health, Knowledge Services and Environment, demonstrate our expanding breadth of expertise and growing range of services to offer solutions needed in a constantly evolving world.

- In 1894 Mr. William Henry Merrill founded Under Writers Electrical Bureau, The Electrical Bureau of the National Board of Fire Underwriters. The Bureau's first test Conducted on March 24, 1894, on non Combustible insulation materials.
- In 1899, UL publishes index to 1000 laboratory test reports that includes Arc lamps, Cleats, Conduits, Flexible Cords, Heaters, Fuses, Junction Boxes etc.
- In 1903 UL Publishes its first Standard for safety titled "Tin Clad Fire Doors".
- In 1905 UL certifies first Fire extinguisher.
- In 1916 UL establishes first International office in London to inspect British Products exported to the United States.
- In 1921 UL certifies the 1st Refrigerator. Today 28 special requirements and 51 separate tests consider everything from Shock Hazards associated with cleaning up food spills to injuries that could be caused by collapsing or broken shelves or the ability of a small child to open the door from inside.
- In 1923 UL certifies the first vault door for burglary & resistance.
- In 1928 UL publishes first UL Standard for Radios & certifies the first player Piano.
- In 1930 UL certifies the first Automatic dishwasher.
- In 1933 UL Tested explosion proof motor for US Bureau of Mines.
- In 1937 UL certifies first washing machine.
- In 1939 UL certifies Black & White TV.
- In 1940 UL certifies First Vending Machine.
- In 1966 UL certifies Automatic seat belt.
- In 1969 Introduces classification service with the word 'classified' on UL labels.
- In 1971 UL certifies First Life Vest Certified.
- In 1975 UL investigated 10,000 incidents of TV tube fire, UL developed the federal television standard adopted by Consumer Product Safety Commission as federal regulation for Television.
- In 1977 UL certifies the first microwave oven
- In 1978 UL certifies First Personal Computer Tested
- In 1980 UL certifies its first Solar Collector.
- In 1985 UL issues its 500th standard UL 1459 for Telephone equipment. UL mark appear on 2.5 billion products manufactured in more than 40000 Plants Worldwide.
- In 1988 UL certifies first Bullet Resistant Vest for Police body armor.
- In 1990 UL receives a Stratospheric Ozone Protection award from the US environmental Protection Agency. It issues the first standard for safety for recycling systems that clean & save refrigerants used in automotive aircondition system.

THE UBIQUITOUS HARMONICS IN POWER SYSTEM AND ITS MANAGEMENT

A pure sinusoidal voltage is a conceptual quantity produced by an ideal AC generator built with finely distributed stator and field windings that operate in a uniform magnetic field. Since neither the winding distribution nor the magnetic field are uniform in a working AC machines, voltage waveform distortions are created, and the voltage-time relationship deviates from the pure sine function. The distortion at the point of generation is very small (about 1% to 2%), but nonetheless it exists. Because this is a deviation from a pure sine wave, the deviation is in the form of a periodic function, and by definition, the voltage distortion contains harmonics.

ACTUAL VOLTAGE WAVE FORM AS GENERATED



When a sinusoidal voltage is applied to a certain type of load, the current drawn by the load is determined by the voltage and impedance and follows the voltage waveform. These loads are referred to as linear loads; examples of linear loads are resistive heaters, incandescent lamps and constant speed induction and synchronous motors.

In contrast, some loads cause the current to vary disproportionately with the voltage during each cyclic period. These are classified as nonlinear loads and the current taken by them has a nonsinusoidal waveform.

Power system harmonics are integer multiples of the fundamental power system frequency. Power system harmonics are created by non-linear devices connected to the power system. High levels of power system harmonics can create voltage distortion and power quality problems and result in increased heating in the equipment and conductors, misfiring in variable speed drives and torque pulsations in motors.

Harmonics have existed for many years in the power system of industries, but only over the last few years have they turned into a major problem to normal operations. This is largely due to the proliferation of harmonic producing equipment and the increased sensitivity of certain types of equipment to harmonics. The effects of harmonics can often be serious – computer systems may fail to operate properly, capacitor banks, such as those used for power factor correction, can become overloaded and fail and interference may occur on communication lines.

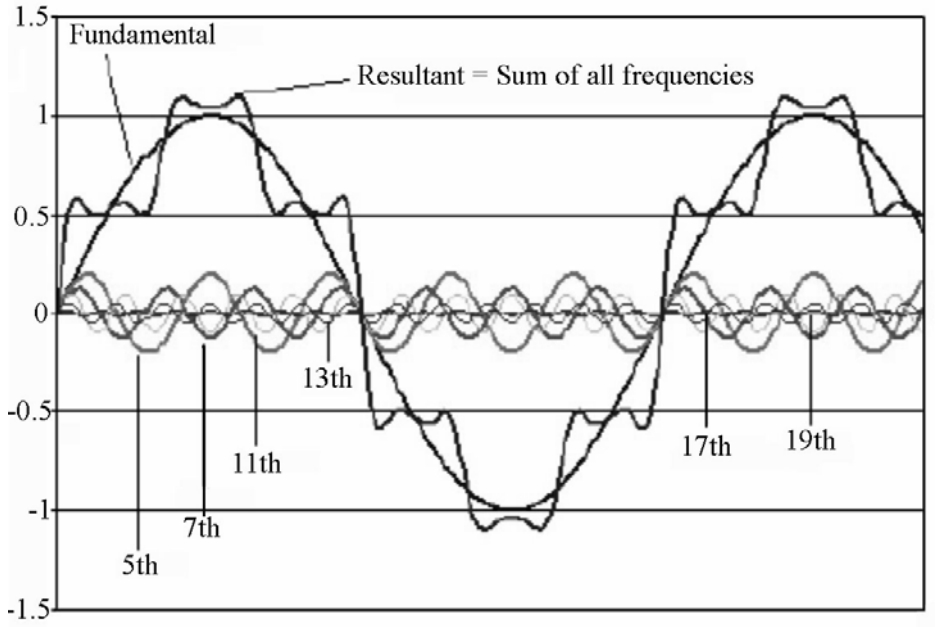
Harmonics are distortions to the voltage and current waveforms from their normal sinusoidal shape. An important feature of harmonics is that the magnitude of the harmonics normally decreases with increasing frequency. Thus, only the first few orders usually need to be considered in examining the effects of harmonics on power system components or equipment.

Harmonics are present to some degree in all plant operations and will not normally create any problems, but nevertheless, depending on the system characteristics and the severity of the harmonics, they can produce disastrous effects.

Harmonics in Plant Distribution Systems

Linear and Non-Linear Loads

A linear load is one in which the current is proportional to the voltage. In general, the current waveform will have the same shape as the voltage waveform. Some examples of linear loads are induction motors, resistance heaters and incandescent lights.



The common sources of Harmonic Currents or non linear loads in Plant Distribution System are

- Electronic Chokes in Fluorescent Lamps
- Single Phase Uninterrupted Power Supplies of various ratings
- Three Phase Uninterrupted Power Supplies of various ratings
- Computer Load, Printers etc.
- Electronic Equipment with SMPS
- Battery Chargers
- Thyristorized DC Drives
- Variable Frequency Drives (Adjustable Speed Drives)
- SCR Controlled Industrial Heaters

- Variable Frequency Drives (VFDs)
- Welding Controls
- Rectifiers
- Saturated Transformers and Motors
- Arc Furnaces
- DC motor drives

Magnitude of Harmonics - Source Impedance and Short Circuit Ratio

The source impedance plays a major role in the magnitude and effects of harmonics

The short circuit ratio can be used as a rule of thumb in determining if the harmonics produced by a non linear load will be significant or not.

Short Circuit Ratio (SCR) = source short Circuit Power Rating (MVA)/Power Rating of non linear load (MW)

An SCR value above 20, combined with a resonant harmonic order greater than 8.5, will usually rule out the possibility of harmonic problems in the circuit. The source short circuit MVA is the volt-amperes which would result if the supply is short circuited.

The impedance used in the short circuit MVA calculations is actually the total of all impedances between the point of the short circuit and the source. In many cases, the other impedances (transmission line and the impedances on any loads) are small relative to the impedance of the transformer and are not significant to the calculation

Ex: an industry in Tamilnadu has a 110 kV/7 kV 10 MVA transformer installed on the incoming from the grid; the transformer impedance is 8.35%; the plant receives power from two sub stations of the TNEB grid. The source impedance of the grid for 10 MVA base is just 0.16%

Effect of harmonics in limited power generation:

The author was conducting energy audit in a huge paper mill in Uttar Pradesh in 1993. The captive plant generation was by a turbo generator of 13 MVA rating. Most of the paper mills have their own electrolytic caustic soda plant powered by DC from converters. This plant too had a caustic soda plant powered by an 8 MW converter unit. When the plant was running on the captive power plant, the converter was switched on and a huge voltage dip with many equipments mal operating resulted. The harmonic load was estimated around 1.2 MVA. The generator was oscillating momentarily. This is because of the high source impedance of the power plant compared to that of the grid.

MANAGING HARMONICS:

Controlling harmonics at the source itself:

Captive generating plants: Choosing coil pitch in the armature winding to minimize harmonic content in the generated voltage

By selecting an appropriate pitch factor following specific harmonic frequencies in the generated voltage wave form can be reduced or eliminated.

- Full Pitch: A full pitch will have no damping effect on any harmonic frequency.
- A 2/3 pitch will eliminate the third harmonic and subsequent triplen i.e.: 9th, 15th, 21st, 27th, etc.
- A 4/5 pitch will eliminate the 5th harmonic.
- A 6/7 pitch will eliminate the 7th harmonic.
- A 5/6 pitch will:
    1. Minimize the 5th harmonic, but not eliminate it as will a 4/5 pitch.
    2. Minimize the 7th harmonic, but not eliminate it as will a 6/7 pitch.

Harmonic Content of Semiconductor Converters

A rectifier can be described by the number of pulses or ripples which are present in the

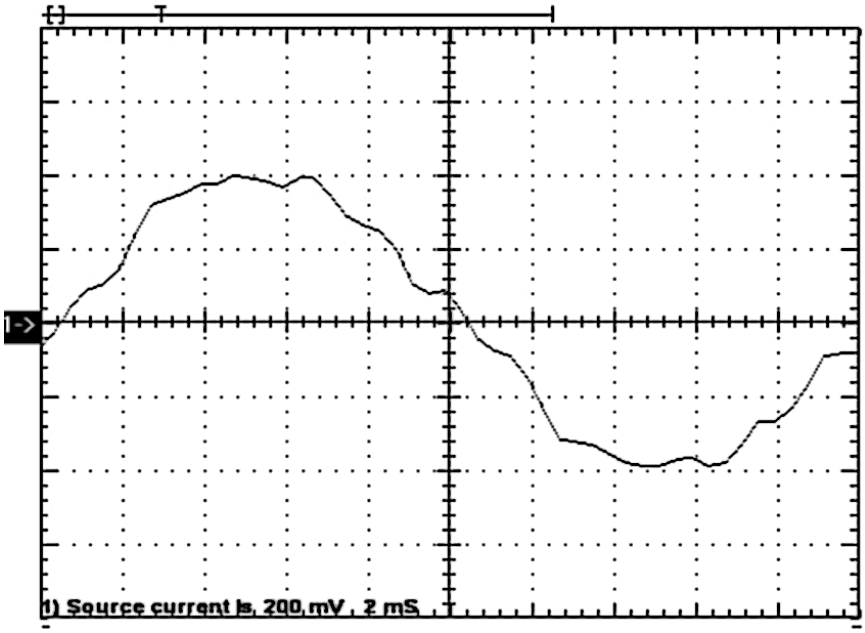
DC output over one cycle of the supply voltage. This number can be used to determine the frequencies of the characteristic harmonics which are present in the AC wave-form namely (50Hz x N x number of pulses) +/- 1, where N is an integer. The multiple of 50Hz is known as the order of the harmonics. For example, a single phase full-wave rectifier produces two pulses and will contain all of the odd harmonics. A three phase, six pulse rectifier generates harmonics of the 5th, 7th, 11th, 13th, 17th, 19th, 23rd, 25th etc., orders. Two six pulse rectifiers can be combined to produce 12 pulse rectification and will generate harmonics of the 11th, 13th, 23rd, 25th etc., orders.

In the simple case of a non-phase controlled rectifier, the magnitude of the harmonics in the current waveform decreases with increasing frequency and can be related to the fundamental as follows:

The waveform of the rectifiers input contains many harmonics. Even number harmonics, such as the 6th cannot exist in any waveform that is symmetrical in its positive and negative half cycles. The predominant harmonic is the 5th and the 7th. Following is a table showing the theoretical amplitudes of various harmonics.

From IEEE C57.18.10 - Table 11

Harmonic Number	6-pulse	12-pulse	18-pulse	24-pulse
5	.200			
7	.143			
11	.091	.091		
13	.077	.077		
17	.059		.059	
19	.053		.053	
23	.043	.043		.043
25	.040	.040		.040



Source current is waveform in 12-pulse converter

The more the pulses, the lesser the harmonics.

The author has carried out energy audit in aluminum processing plants. Generally these plants need very high D.C. current for their smelters, in the range of hundreds of kilo ampere, which means employing huge rectifying units. They use a 36 pulse rectifier unit which produces negligible distortion in the wave form and hence the harmonics

It can be seen that the wave form distortion is almost negligible and the harmonics are insignificant.

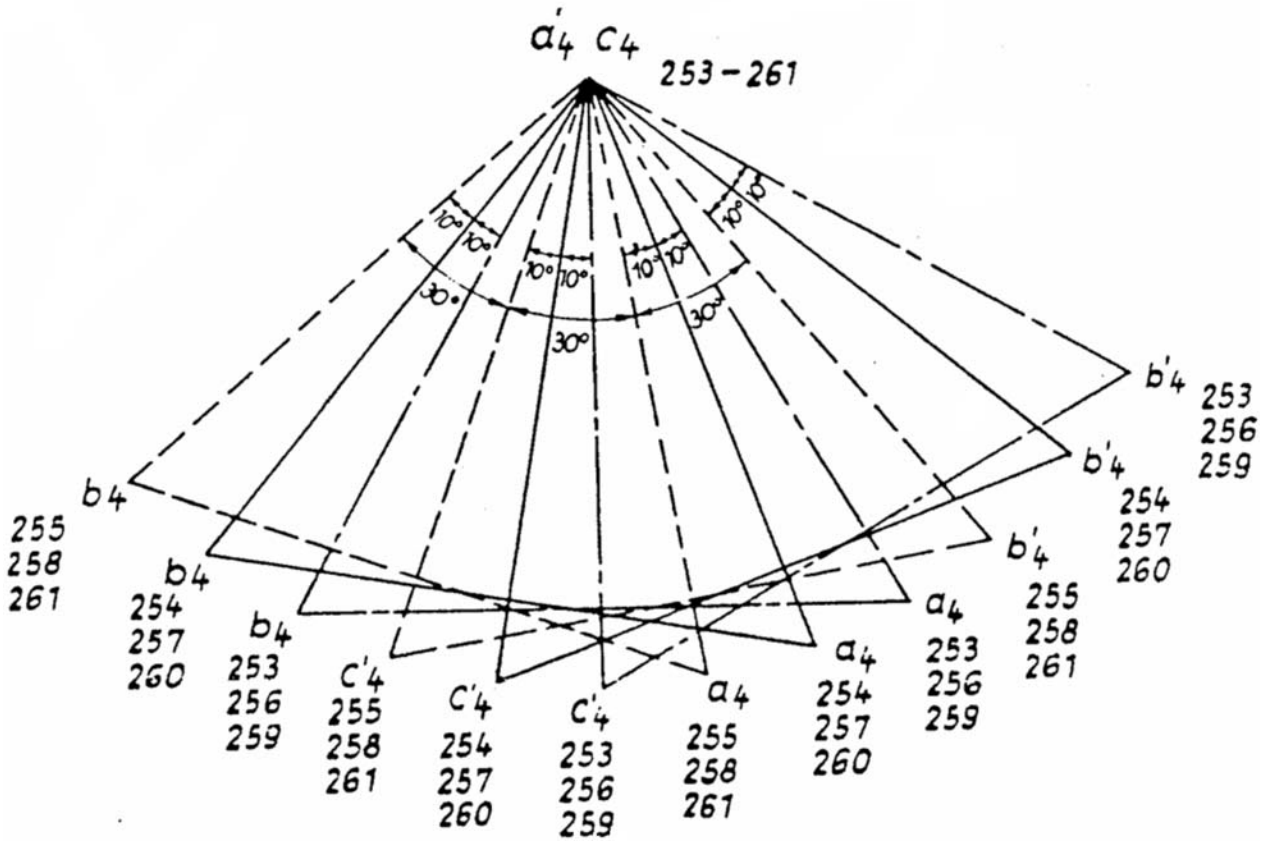
There are many ways to reduce harmonics, ranging from variable frequency drive designs to the addition of auxiliary equipment. The primary methods used today to reduce harmonics are:

Power System Design:

Harmonics can be reduced by limiting the non-linear load to 30% of the maximum transformer's capacity. However, with power factor correction capacitors installed, resonating conditions can occur that could potentially limit the percentage of non-linear loads to 15% of the transformer's capacity.

Harmonics at the common bus:

For cancellation to occur, the non-linear loads must be operated simultaneously and have similar characteristics. One cost-effective implementation of this concept uses delta-wye isolation transformers on a few large VFDs, while using smaller and less costly line reactors on smaller VFDs.



12 phases per primary phase, each at 30° away

ISOLATION TRANSFORMERS:

Isolation transformer provides several advantages. First and foremost, it provides impedance to the drive, which reduces current distortion. It obviously resolves voltage mismatch between the supply and the load. If the secondary is grounded, it isolates ground faults and reduces common mode noise.

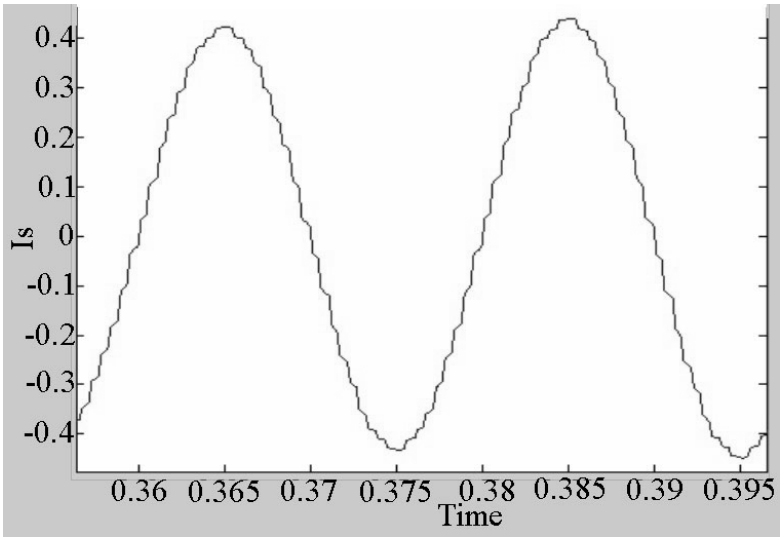
Line Reactors:

A line reactor provides the impedance to reduce harmonic current, similar to an isolation transformer, but with a smaller size and cost. Line reactors (also referred to as inductors) are available in standard impedance ranges from 1.5%, 3%,

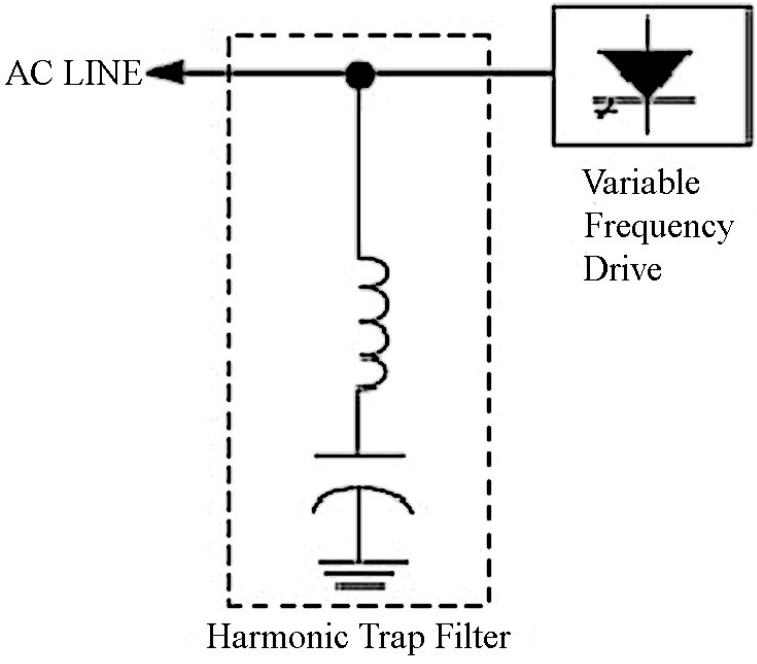
5% and 7.5% of the load impedance. Where system voltage is on the lower end of nominal, the greater impedance values should be avoided.

Passive Filters:

Passive or 'trap' filters employ 'passive' elements (capacitors and inductors) to 'trap' or absorb harmonics. An inherent benefit of all passive filters is power factor correction. Passive filters are generally configured to remove only one or two specific harmonics. Passive filters are generally regarded as unsuitable for filtering 3rd harmonics. For this reason, they are best suited for applications in which 3rd harmonics are not an issue, power factor correction is required and specific harmonics such as 5^{th} or 7^{th} are creating the problem. Passive filters are ideal for systems that have a high percentage of 6 pulse drives and other linear loads. However, the filters may need to be returned for changes in the power system. Filters can be designed for several non-linear loads or for an individual load, as shown in the figure below:



Simulated Is for 36-pulse converter



Typical Harmonic Trap Filter Configurations

Broadband Filters:

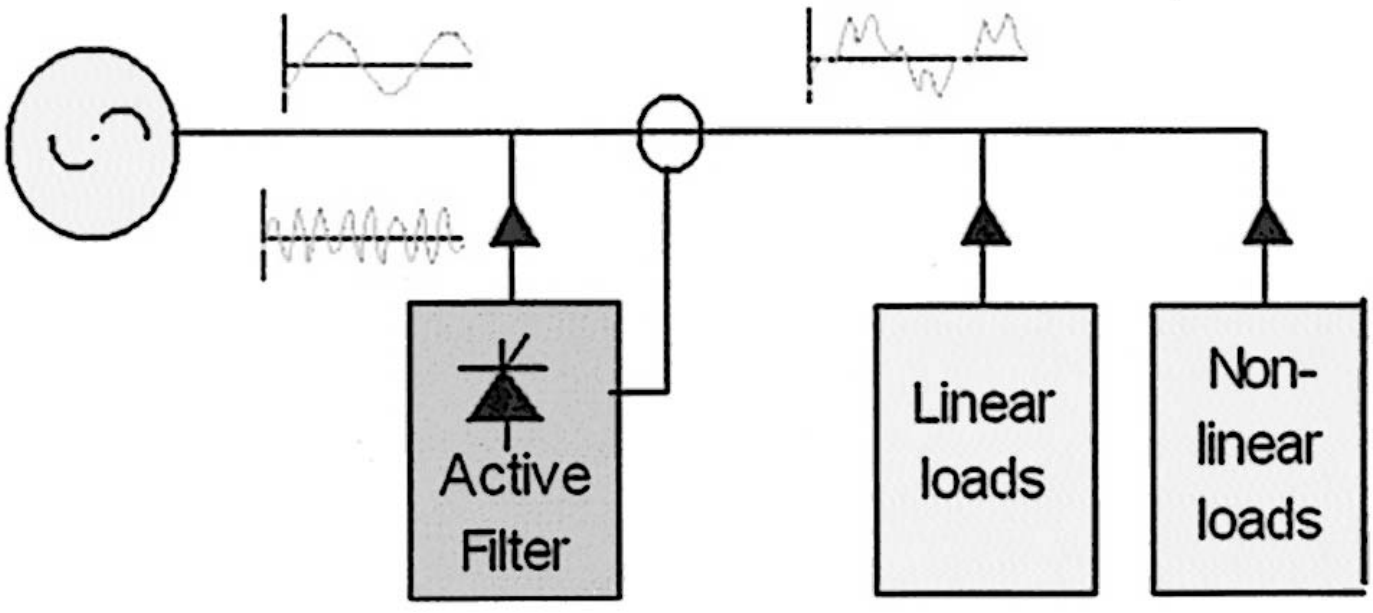
By treating a wider spectrum of harmonics, broadband or high pass filters can be more effective than tuned filters but can also be more expensive. Shunt connected high pass filters are frequently tuned above the seventh harmonic and used in conjunction with single-tuned filters to target the lower frequencies. They usually include resistors, which can be an operating problem. A series broadband filter improves upon former broadband harmonic filtering techniques and broadens the range of suitable applications. This is a conventional low pass filter created with an inductor and capacitor. Series broadband filters are applied to individual loads or groups of loads in a system. They can be applied on SCR rectifiers, including phase control and pre-charge front ends, as well as six-pulse rectifiers using AC line reactors or DC chokes. The latest design accomplishes broadband harmonic filtering with about half the capacitance of previous designs. This minimizes leading current under light load conditions and improves compatibility with standby power generators.

Active Filters:

In contrast to passive filters, active filters monitor the load current and inject a harmonic current of equal magnitude but opposite polarity to dynamically cancel harmonic load currents. The active harmonic filter can be an economical solution for applications where the harmonic load is either 30% of the total transformer capacity or several hundred kVA. They provide a cost-effective alternative to 18-pulse technology when several drives are installed in one location. Unlike passive filters, active filters cannot be overloaded if the level of harmonics increases. Often times, active filter units can be paralleled to accommodate increases in non-linear load. An illustration of how an active filter is applied is shown in Figure below:

Conclusion:

Harmonic is, so to say, a necessary evil and the industries have to put up with it. As discussed above there are many methods to control it and if unavoidable, has to be mitigated; there are many ways available as seen above; the harmonic problems have to be understood and suitable action has to be taken to avoid equipment failures, mal operation of controls and proliferation.



Typical Active Filter Application

Courtesy: K.R. Govindan, Kavoori Consultants

ENERGY PERFORMANCE STANDARDS FOR AIR CONDITIONERS COMPREHENSIVELY UPGRADED IN INDIA

- *Standards now at 8% higher efficiency for star-rating on split 1.5 ton ACs and higher*
- *Mobile-based application launched to help consumers calculate energy consumption*
- *Technological improvements driving higher energy efficiency in the HVAC industry*

NEW DELHI, May 2, 2012: The Bureau of Energy Efficiency (BEE), a statutory body under the Union Ministry of Power, has upgraded the requirements for star rating of split type room air-conditioners. This legislation came into effect in January this year and raised the energy efficiency standards by about 8% for split air-conditioners for the same rating band. The change is intended to help raise consumer awareness on saving energy and creating more energy efficient appliances across the spectrum for this industry. The star rating scheme, under the BEE's standards and labeling programme is especially relevant in view of the upcoming freeze on Hydro-chlorofloro-carbons (HCFC) under the Montreal Compact on Environment (Montreal Protocol) in 2013 and the effort of getting prepared for future GWP (Global Warming Potential) legislation without any energy penalty. For the Indian industry, this marks a substantive step forward in not only averring to the rising awareness and readiness on the policy side to taking control of the most pertinent energy efficiency issues, but also marks a firm movement towards a healthy public-private partnership in the area of energy reforms.

Consumer awareness is the single most important factor in the success of energy efficiency movement thus far. To further empower consumers, a mobile-phone based application called "AC Power Saver" has been developed that enables consumers to calculate energy consumption and savings right on their mobile devices. This application will be available for Android, Blackberry and iPhone users free of charge. BEE is also planning to provide touch screen kiosks replicating the "AC Power Saver" calculations, at a few designated showrooms across India. These tools will help consumers calculate the expected annual electricity bills and the potential savings. Users can get an idea about their savings on their electricity bills if they buy higher star rating air conditioners. For a wider reach, a dedicated web site – www.SaveEnergy.co.in – has been created with all necessary information including the energy calculator.

The campaign to educate consumers comprises several strategic initiatives. Air conditioner showroom salesmen are being trained and oriented on the star labeling criterion so that they can explain to consumers the tangible benefits of using energy efficient air conditioners. BEE has already trained 1,544 salesmen in India across 6 cities and plans to continue with this effort. These trained salesmen help consumers make an informed choice with respect to energy efficiency while buying home air conditioners.

Emerson Climate Technologies and International Copper Promotion Council (India) continue to support BEE's national education program on star labeling for air conditioners that educate consumers to use higher energy efficient products.

Speaking on the occasion, Dr. Ajay Mathur, Director General, BEE said, "Energy is critical for India, and the demand for clean and efficient energy devices is growing rapidly. We are happy that our initial steps in introducing star labeling for air-conditioners has borne such good results. It is our resolve to further augment this initiative by including as wide a section of consumers as possible and to do this we have embarked on a variety on new measures to educate and engage the public at large as well as the manufacturers and retailers."

Emerson Climate Technologies, an engineering technology innovator, has been actively collaborating with BEE to build awareness of the star rating program. According to Mr. Deepak Takkar, Sr. Vice President – Sales & General Manager – Cold Chain, Emerson Climate Technologies (India) Pvt. Ltd., "Research shows that every watt of energy saved at consumption results in four watts less energy produced, factoring in the generation and T&D losses. The adoption of star rating in air-conditioners significantly supports energy conservation and improvement of power efficiencies in India". He added, "The industry plays a key role in augmenting the success of Government's thrust on environmental protection. In the air-conditioning industry, on the manufacturers' side, we have introduced Copeland Scroll™ compressors in the Indian residential AC market for the first time to provide

optimum energy savings and comply with the higher star rating. Copeland Scroll™ technology has been extremely successful in the commercial AC segment around the world for many years. We believe that with the focus on empowering consumers with efficient and reliable technologies like Copeland Scroll™, and awareness tools like the 'AC Power Saver' mobile app, India stands to greatly improve the energy situation and bridging the supply-and-demand gap."

According to Mr. Sanjeev Ranjan, CEO, International Copper Promotion Council (India), "ICPCI has been actively engaged since 2007 with the Air Conditioner Industry by promoting the life cycle cost as the main attribute to drive consumer purchase decisions. Copper's better thermal and electrical properties do help in improving energy efficiency performance of air conditioners, which in turn helps achieve higher star rating more cost effectively. ICPCI as a part of Copper Alliance, led by International Copper Association is working for technology advancement by focusing on reducing the material cost of energy efficient air conditioners through the introduction of smaller diameter copper tubes for heat exchanger. Today, with the launch of the upgraded star-rating labeling program, Indian consumers can now buy air conditioners that save energy and money. We do appreciate the admirable work done by BEE and will continue to support it in its endeavor to promote and implement the star labeling program across the country."

The star labeling program for air-conditioners, frost free refrigerators, tubular florescent lights, and distribution transformers began in May 2006 in a voluntary phase. In the air conditioner segment, 70% of the organized players adopted it in the voluntary stage, which prompted BEE to make it mandatory from January 2010. Since star labeling was a new concept for appliance showrooms and end users, BEE partnered with Emerson Climate Technologies and International Copper Promotion Council (India) in 2008 to start several initiatives to educate the market on the benefits of star labeling. Training sessions were conducted for store salesmen throughout India. After the education program, a survey was conducted across 19 cities covering over 1,200 salesmen and 400 users to understand their perception on star labeling. The survey results showed that end users cared about energy efficiency, price and brand. The survey also indicated that salesmen needed more education and sales tools to explain to the end user the concept of payback period.

About BEE: The Government of India set up Bureau of Energy Efficiency (BEE) on March 1, 2002 under the provisions of the Energy Conservation Act, 2001. The mission of the Bureau of Energy Efficiency is to assist in developing policies and strategies with a thrust on self-regulation and market principles, within the overall framework of the Energy Conservation Act, 2001 with the primary objective of reducing energy intensity of the Indian economy. This will be achieved with active participation of all stakeholders, resulting in accelerated and sustained adoption of energy efficiency in all sectors.

About Emerson Climate Technologies: Emerson Climate Technologies, a business of Emerson, is the world's leading provider of heating, air conditioning and refrigeration solutions for residential, industrial and commercial applications. The group combines best-in-class technology with proven engineering, design, distribution, educational and monitoring services to provide customized, integrated climate-control solutions for customers worldwide. Emerson Climate Technologies' innovative solutions, which include industry-leading brands such as Copeland Scroll and White-Rodgers, improve human comfort, safeguard food and protect the environment. For more information, visit EmersonClimate.com.

About International Copper Promotion Council (India): The International Copper Promotion Council (India), member of Copper Alliance. It is the Indian arm of the International Copper Association, the leading not-for-profit organization for the promotion and defence of copper globally. ICPCI is driven by the same objective as that of its parent organisation, which is to 'defend and grow markets for copper based on its superior technical performance and its contribution to a higher quality of life worldwide'. ICPCI contributes mainly through its catalytic role, accelerating changes and transforming the long-term markets for Copper in a sustainable way through its major initiatives like Building Construction and Sustainable Electrical Energy. ICPCI's activities focus on helping end users to better understand and appreciate the positive attributes of copper.

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ELECTRIC LIGHT SOURCES AND THEIR ACCESSORIES

Section 2 - CONTROL GEARS FOR LIGHT SOURCES

1 BALLAST

1.1 General

The ballast is an inductive device which provides sufficient voltage for lamp ignition and regulates the voltage and current across the lamp for its optimum operation. The life and light output ratings of discharge lamps are based on their use with a ballast providing proper characteristics. A ballast that does not provide proper electrical values may reduce lamp life or light output or both. The ballast consumes power and hence the luminaire efficacy, that is, lumens per watt consumed is lower than the lamp efficacy.

1.2 Electromagnetic Ballast

1.2.1 *Construction and Operation*

The construction of a ballast is similar to a transformer with a core and coil. The core is made up of laminated steel sheet of 0.2 to 0.5 mm thickness, stacked together and is wound with the coil made of copper or aluminium wire. The assembly is impregnated with a non-electrically conducting material that provides electrical insulation while aiding in heat dissipation, and with leads attached, is placed into a case. The case is filled with a potting material (polyester compound, for example, containing filler such as silica). This compound completely fills the case encapsulating the core and coil. The base is then attached and the leads are terminated to the connector block. This is the most economic and common type of fluorescent lamp ballast. The core is generally made of J type or L type lamination and is surrounded by coil.

In the case of fluorescent lamps the laminations are mainly of J, L or U and T type. Whereas in the case of HID ballasts the lamination is E and I type. In order to reduce watt loss or power consumption of the ballast, various qualities or grades of silicon laminations are used namely, M45, M43, M22, etc. The coil comprises wound aluminium or copper wire to achieve proper inductance. In the case of canister type ballasts the core is bolted around the coil and the entire mass of the core-coil is potted in polyester resin inside a canister. The new technology ballast is the open type VPIT ballast. Here the ballast core along with coil is crimped with the base plate. The mass is vacuum pressure impregnated in a white unsaturated polyester resin. This type of ballast is superior to the canister type in terms of watt loss, temperature rise, ballast lumen factor and life.

Because of the magnetic elements in the ballast, vibrations are set up in the luminaire based on the input power frequency. This may produce an audible hum which is undesirable. This sound level produced will depend upon the ballast and luminaire construction and mounting. Therefore the shell type of ballast which is made of E and I or T and U or T and E type of laminations are clamped or bolted together. The amount of copper or aluminium conductor contained in this type of ballast is less than the core type of ballast and thus there are less overall losses. In the shell type ballast the coil is surrounded by the lamination core. These types of reactor ballasts are used for HID lamps alongwith a capacitor.

The lead-lag ballast design approach is commonly used to operate twin lamps namely, 36/40 W fluorescent lamps in two independent circuits. A current limiting reactor operates one lamp and a combination reactor and capacitor

connected in series operates the second. The lamps operate independently so that a failure of one has no effect on the other. The input current of the combination of the capacitors and reactors is lower than the sum of the two individual operating currents. These elements provide a high power factor and reduce the stroboscopic effect.

Rapid start and instant start ballasts are designed to start the lamp rapidly or instantly. The design of this ballast is essentially the combination of the two parts. One is the normal core and coil ballast and the other one is the filament heating transformer which helps in starting the lamp instantly whereas the ballast performs the usual function of operating the lamps by controlling the running current. The filament heating transformer helps in starting the lamp rapidly or instantly.

Where the line voltage is below or above the specified lamp starting voltage range, a transformer is used in conjunction with the reactor to provide proper starting voltage. This is normally accomplished with the combination of primary and secondary coils forming a one piece single high reactance autotransformer. These autotransformer type ballasts are commonly used for low pressure sodium vapour lamps.

The power factor of this circuit is about 50 percent lagging. High power factor versions are available in which a capacitor is installed in the circuit to increase the power factor of the system to better than 90 percent. These ballasts are also known as booster ballasts and are of two types namely, combination of autotransformer and reactor or center tapped ballast combined with capacitor in order to boost the voltage.

1.2.2 *Selection of Electromagnetic Ballast*

While selecting the luminaire the following electrical parameters are to be considered:

a) Starting current;

b) Running current;

c) Lamp wattage;

d) Ballast losses;

e) Winding temperature (t_w) – t_w is the maximum winding temperature which can be withstood by the ballast continuously for 10 years; and

f) Temperature rise (Δt) – Δt means temperature rise of the winding of the ballast above the ambient temperature.

$t_w = \Delta t + t_a$ where t_a is the ambient temperature.

Thus, the objective should be to select a ballast having a low value of Δt and a higher value of t_w.

1.2.3 *General Guidelines on Watt Loss of Ballast*

Sl. No.	*Lamp*	*Watt Loss*
i)	36/40W FTL	9W
ii)	80W HPMV	14W
iii)	125W HPMV	17W
iv)	250W HPMV	23W
v)	400W HPMV	30W
vi)	70W HPSV/MH	15W
vii)	150W HPSV/MH	22W
viii)	250W HPSV/MH	32W
ix)	400W HPSV/MH	42W

NOTE: *MH = Metal Halide lamp*

1.3 Electronic Ballast

1.3.1 *Construction and Operation*

It consists of electronic components and operates the lamp at 20 to 60 kHz frequency. The electronic ballast has approximately half the power loss of the magnetic ballast. The lamp efficacy also increases by 10 to 15 percent when the lamp operates at a frequency above 20 kHz. Hence a 36 W fluorescent lamp operating at 32 W can deliver its desired lumen output.

The electronic ballast is available in instant start or warm start version. The instant start ballast was developed to start the lamp without any delay or flashing. Instead of heating the electrodes prior to starting, the instant start ballast provides a high initial voltage to strike the lamp.

The high voltage is required to initiate the discharge between the unheated electrodes. Since there is no heating operation of electrodes, power loss is lower than the rapid start ballast system. The warm start ballast heats the electrodes to approximately 1 470°F (800°C) before applying the voltage. Electrode heating reduces the amount of voltage required to start the lamp.

The harmonic distortion of the electronic ballast is generally below 30 percent but better designs are available with total harmonic distortion (THD) of less than 10 percent. The power factor of a luminaire with electronic ballast varies from 0.75 to 0.99 lag based on the design and the application. Another important parameter of the electronic ballast is the current crest factor and this is usually less than 1.7.

The lamp current crest factor (CCF) directly impacts lamp life. It is defined as peak current divided by average current as delivered by the ballast to the lamp. It is recommended to have a crest factor less than 1.7. It may be noted that with a perfect current sine wave having a crest factor of 1.414 maximum lamp life can be obtained.

The electronic ballast is also available in a constant wattage version. This ballast is an integrated circuit (IC) based design which delivers constant lamp wattage and hence constant illumination level irrespective of supply voltage variation.

The power factor of this ballast is usually 0.99. Another feature of the electronic ballast is its low striking voltage and wide range of operating voltage. It strikes the lamp at 100 V and its operating voltage varies from 100 to 300 V.

Since the watt loss or power consumption of the electronic ballast is very low, the ballast lumen factor in the case of the electronic ballast is very high (0.98 to 1.5).

Ballast Factor (BF):

$$BF = \frac{\text{Light output of lamp with the Test Ballast (lumen)}}{\text{Light output of the lamp with a Reference Ballast (lumen)}}$$

With the improvement in solid state devices and the availability of sophisticated integrated circuit functions, there are now commercially available electronic ballasts that provide 50 Hz ac input to the ballast and operate the lamps at 20 to 50 kHz, with resulting improvements in ballast efficiency and lamp efficacy. Designs are available for rapid start and instant start of lamps. In order to offset the higher costs of electronic ballasts, some are designed for use with multiple lamps.

The better designs have circuits which keep the line current harmonic distortion below 20 percent and provide a power factor in excess of 90 percent.

Electronic ballasts can also be designed to operate off DC and low voltage systems for application in buses, airplanes, trailers and battery operated emergency systems. These ballasts utilize transistors for inverting the voltage and operate at frequencies ranging from 400 Hz to 25 kHz. These ballasts are known as transistor ballasts and are normally used for emergency lighting.

1.3.2 *Selection Criteria of Electronic Ballasts*

a) Total power consumption;

b) Instant start or warm start;

c) Standard or constant wattage;

d) Total harmonic distortion (THD);

e) Current crest factor;

f) Ballast lumen factor;

g) Power factor; and

h) Filter circuit and deactivation circuit as safety feature.

1.4 Hybrid Ballast

This is generally a combination of an electronic control circuit with a reactor ballast. The electronic control circuit helps in starting the lamp whereas the reactor ballast which is usually a lead type ballast controls the normal operation. These types of ballasts are commonly used for lower wattage low pressure sodium vapour lamps.

2 CAPACITOR

The capacitor is an essential component of the control gear. It is a passive element and generally used for improvement of power factor of the discharge lamp circuit. In special operations it is also being used as a part of the starting device as stated above.

A metalized polypropylene capacitor is commonly used for lighting equipment. The capacitor can also be the oil filled paper type in an aluminium can. A discharge resistor of suitable rating is permanently connected across the terminals for safety.

Power factor improvement is done by connecting the capacitors either in parallel across the mains or in series with the ballast. Parallel capacitors are designed for 250 V rating whereas the series capacitors are suitable for 400 V ac supply. Depending on the circuit impedance and the power factor improvement required, the capacitance values are chosen.

The series capacitors with core coil ballasts are quite useful for having a lead lag circuit, for avoiding a stroboscopic effect and achieving a total power factor near unity. The capacitor also helps in filtering voltage spikes travelling on the input line.

It is generally used to improve the power factor of a discharge lamp used with an inductive type electromagnetic ballast. It is made up of zinc and aluminium alloy metalized on 6 micron thick dielectric material of polypropylene film. The film is wrapped around a bobbin and resin inside aluminium or reinforced polypropylene plastic can. An inbuilt discharge resistance of suitable rating is provided across the capacitor terminals for safety. Normally the capacitor is connected across the mains and is designed for 250 V rating.

2.1 General Guidelines of Capacitors for Various Lamps:

Sl .No.	*Lamp*	*Power Factor*	*Capacitor in Parallel*
i)	36/40W FTL	> 0.9	4 µfd
ii)	2x36/40W FTL	> 0.8 / 0.9	6.5/8 µfd
iii)	80W HPMV	> 0.85	8 µfd
iv)	125W HPMV	> 0.85	10 µfd
v)	250W HPMV	> 0.85	15 µfd
vi)	400W HPMV	> 0.85	20 µfd
vii)	70W HPSV	> 0.85	10 µfd
viii)	150W HPSV	> 0.85	15 µfd
ix)	250W HPSV	> 0.85	33 µfd
x)	400W HPSV	> 0.85	42 µfd

3 STARTER

A number of different means of lamp starting have been developed since the advent of the fluorescent lamp. The first was preheated starting, which required an automatic or manual starting switch. The operation of a preheat circuit requires heating of the electrodes prior to application of voltage across the lamp.

It is a device to strike the discharge lamps. The most common type of starter is the glow switch starter. The bulb is filled with an inert gas chosen for the voltage characteristics desired. When the supply voltage is applied to the luminaire, the gas inside the starter produces a glow discharge between the starter contacts. The heat generated flow the glow distorts the bimetallic strip, the contact closes and electrode preheating begins.

Since the contacts are closed, the discharge stops and the bimetal cools down. Immediately the bimetal opens up which creates a inductive spike across the lamp. If the lamp fails to strike, the same process will repeat till the lamp ignites. During the 'on' condition of the lamp, the starter contacts disconnect and it consumes no power.

The starter on-off emits radiations which may be picked up by nearby radios, causing an audible sound. Therefore, the starters for preheat circuits have capacitors for reduction of radio interference.

4 IGNITOR

The ignitor electronic device and is used for striking high pressure sodium vapour and metal halide lamps. In the case of these lamps, high voltage usually higher than supply voltage is required to ionize the discharge path of the lamp filament. The crucial points in the successful ignition of a lamp are the peak voltage, number of pulse and phase positions of the ignition pulse. There are two types of ignitors as stated in **4.1** and **4.2**.

Ignitors are used in the ballast circuit for most high pressure sodium vapour lamps, some metal halide lamps and some speciality arc lamps. The ignitor starts cold lamps by first providing a high enough voltage for ionization of the gas to produce a glow discharge. To complete the starting process, enough power must then be provided by the starting pulses to sustain an arc through a glow-to-arc transition. The range of pulse voltage to start cold lamps is 1 to 5 kV, usually provided by an electronic resonant circuit which applies multiple pulses to the lamp when the circuit is energized. The circuit turns itself off after the lamp starts by sensing the reduction in open circuit voltage or, with some ignitors, after a fixed period of time. Instant restarting of hot lamps is accomplished by increased ignition voltage. Voltage pulses of 10 to 70 kV are required by the range of available HID lamps, and these are again provided by resonant circuits. To reduce the voltage to ground to half these values, ignitor circuits are available to apply opposing pulses simultaneously to the ends of the lamp. Most instant restart lamps are of double ended construction. It minimizes arc-over between lead wires, internal supports or base contacts. These high voltage starting pulses are normally applied in one or several short bursts, using the open circuit voltage reduction upon restart to turn off the ignitor.

4.1 Impulse Type

In the case of an impulse type ignitor the ballast is used as an autotransformer to generate a peak voltage of 3 to 5 kV across the lamp. Once the lamp is switched on, the lamp reaches its maximum lumen output within 10 to 15 minutes. The ignitor stops providing pulses after the lamp starts operating. In the case of non integrated luminaires where the lamp is located away from the control gear, the width of the pulse voltage generated by ignitor and ballast is high so as to achieve reliable striking of lamp. The maximum permissible distance of the lamp compartment from control gear is 30 m.

4.2 Superimposed Type

Superimposed ignitors are available for striking sodium vapour and metal halide lamps. This ignitor consists of a core and coil assembly in addition to the electronic components. The ignitor generates a peak voltage of 3 to 5 kV across the lamp terminals and since the ballast is not used as an autotransformer to amplify voltage, the ballast is free from the detrimental effect of pulse voltage in case of malfunctioning of the lamp during the end of its life. Another important characteristic of metal halide lamps is the hot restriking time. If the supply voltage is switched off and immediately switched on, the lamp will have to cool down for 10 to 15 minutes before it reignites.

Instant restriking of a hot metal halide lamp is accomplished by applying a pulse voltage of 25 to 70 kV across the lamp terminals. Most instant hot restriking lamps are of double ended construction to minimize the arc-over voltage between the terminals.

Courtesy: National Lighting Code 2010

POWER SYSTEM GROUNDING

The purpose of a grounding system is to limit the potential gradient within and immediately outside, say a substation area to a value that is considered safe for the personnel. This requirement must be met under normal and abnormal operating conditions of the power system. A grounding system is used for (i) Providing a uniform electric potential in all non-current carrying parts of the structure and apparatus, as well as ensuring that the operators and attendants are always working at the same electric potential. (ii) Achieving a low uniform potential gradient throughout the grounding system. This will reduce the chances of large potential differences between reasonable stride and reach distances. Failure to do this could result in electric shock or injury to attendants when short circuit or other abnormal occurrences take place. (iii) Grounding for lightning and surge protection.

Adequate grounding is required to prevent dangerous conditions, which may arise at station or line installations. Structures and equipment may become alive from a power circuit by means of failure of insulation, breakage or displacement of a conductor, arcing from the power circuit, induction.

The resistance to earth of the complete grounding connection is never quite zero, and large currents passing through this resistance may cause between the grounded apparatus and earth, a potential difference (IR) which creates a hazard. With a given rod in soil of uniform resistivity, the greatest potential gradient exists in the region immediately adjacent to the rod.

Measurements show that 90% of the total potential difference may exist within the reach or stride of a man. A low resistance between the grounding connection and earth is therefore necessary to keep potentials to a minimum.

Because lightning arrestor currents have high frequency components, the inductance of the grounding conductor may introduce a high impedance component to the lightning current.

As a result, the potential drop per foot in the grounding conductor may be high and may cause a “side stroke” to nearby grounded objects.

An induced voltage may also occur in parallel conductors adjacent to the grounding conductor. Therefore, lightning arrestor grounding conductors should be short and direct for both safety of personnel and effectiveness of the lightning arrestor.

For safety of personnel, a grounding system must ensure that the accessible non-current carrying metal parts are maintained at the same potential and that the difference between this potential and that of the surrounding earth is not dangerously high. By non-current carrying metal parts, we mean those parts that are not required to carry any current during normal operating conditions of the power system but they are called upon to carry in high value of current at times of faults and other abnormalities.

An adequate grounding system is essential to protect by dissipating into the earth, the energy released by lightning discharges, system fault currents and other system disturbances.

Otherwise, these disturbances may cause extensive damage in equipment, and apparatus including non-associated equipment, such as communication cables; etc. Such damage might include insulation breakdown, electrically ignited explosions and fires.

An adequate grounding system is also essential for the proper operation of the system. The grounding system must, at times, carry heavy power and fault currents without being damaged and without causing dangerously high potential gradients. Protective devices, system voltage conditions and the effectiveness of overhead ground cable, etc. are dependent on adequate grounding system.

Grounding is an important feature of substation design. Special attention should be given to the grounding system because the substation is: (i) The scene of frequent activity by operating and maintenance personnel. (ii) A switching centre upon which continuity of service may be dependent. (iii) A place of energy concentration.

In distribution systems, particularly at transformer locations, grounding connections are necessary to maintain the potential of the low voltage circuit at the correct value with reference to the earth, and to ensure the correct functioning of lightning arrestors. In order to ensure that the potential of motor frames and associated equipment is maintained at a low value with reference to the earth, Grounding connections on utilization equipment are necessary. The grounds on such equipment carry current only in the event of break-down of insulation or during the operation of lightning arrestors.

Courtesy: The Journal of CPRI, A Golden Jubilee Edition

TAMILNADU ELECTRICAL INSTALLATION ENGINEERS ASSOCIATION 'A' GRADE

OUR PUBLICATIONS

Sl.No.	Title-Description of the Books	Cost (Rs.)
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4	(1) Installation of Captive generator (2) Electricity H.V. & M.V. Installation Proposals (3) Precautionary Measures to be taken in Design & Installation of building services including Electrical Services (4) The Indian Standard Specification	90
5	Self Certification Procedure	60
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13	Technical Hand Book on Electrical Information	30
14	Indian Electricity Act 2003, Indian Electricity Rules 1956	75
15	Over Voltage Phenomena in a Power Network – an Overview	100
16	A Treatise on Power Quality with a Focus on Harmonics	300

OTHER PUBLICATIONS

1	National Electric Code 2011 (NEC 2011)	4,070
2	National Lighting Code 2010 (NLC 2010)	3,370
3	Saving of Electricity by System Management	450

N.B. Packing & Forwarding charges Extra

PLEASE NOTE: Outstation members are requested to send the payment by D.D. only in favour of "TAMILNADU ELECTRICAL INSTALLATION ENGINEERS ASSOCIATION 'A' GRADE"

HELP LINE

Query:

Do manufacturers follow any standards regarding Nameplate in LV Switch Gear such as Breakers?

SVE Energy Pvt. Ltd., Chennai

Explanation:

Understanding Circuit Breaker Markings

IEC 60947 is the circuit breaker standard and covers the marking of breakers in detail. Any manufacturer following this standard should comply with the markings.

Name Plate and Breaker Markings

The illustration shows a standard nameplate from a Schneider NSX circuit breaker. Other manufacturers should have similar information on the breaker. The standard requires the following by information to be identified and marked on the circuit breaker.

Visible and legible when breaker installed:

- rated current (In)
- suitability for isolation, if applicable
- indication of the open and closed positions

Marked, but need not be visible when installed:

- manufacturer's name or trade mark and circuit breaker type designation or serial number
- manufacturing standards the breaker complies with utilization category
- rated operational voltage (Ue)
- rated impulse withstand voltage (Uimp)
- rated frequency and/or the indication d.c.
- rated service short-circuit breaking capacity (Ics) at corresponding rated voltage (Ue)
- rated ultimate short-circuit breaking capacity (Icu) at corresponding rated voltage (Ue)
- rated short-time withstand current (Icw), and associated short-time delay (for utilization category B)
- line and load terminals (unless their connection is immaterial)
- neutral pole terminal, if applicable (by the letter N)
- protective earth terminal, where applicable, by symbol
- reference temperature for non-compensated thermal releases, if different from 30 °C

Additional Circuit Breaker Information

In addition to the above the following should be either marked on the circuit breaker or made available in technical documentation:

- rated short-circuit making capacity (Icm)
- rated insulation voltage (Ui),
- pollution degree if other than 3
- conventional enclosed thermal current (Ithe) if different from the rated current
- IP Code, where applicable
- minimum enclosure size and ventilation data (if any) to which marked ratings apply
- details of minimum distance between circuit-breaker and earthed metal parts for circuit breakers intended for use without enclosures
- suitability for environment A or environment B, as applicable
- r.m.s. sensing, if applicable

Auxiliary Devices

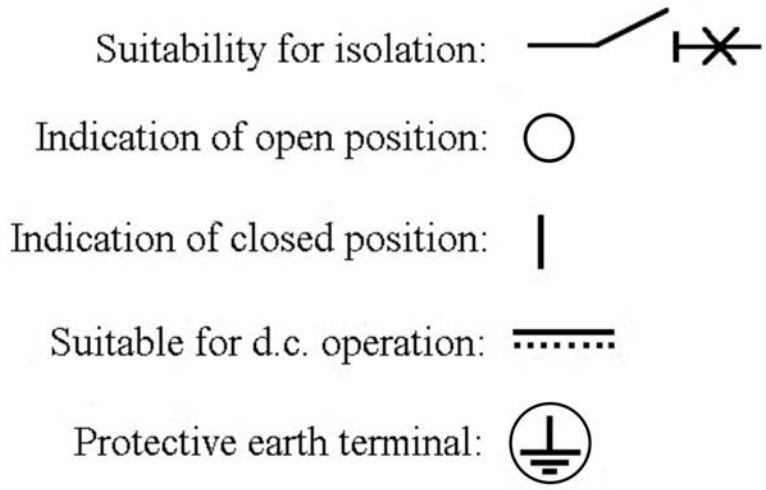
Any auxiliary devices should be marked or technical information provided with the following:

- rated control circuit voltage and frequency of any closing
- rated control circuit voltage and frequency of any shunt release and/or under-voltage release

- rated current of indirect over-current releases
- number and type of auxiliary contacts and rated frequency
- rated voltages of auxiliary switches (if different from those of the main circuit)

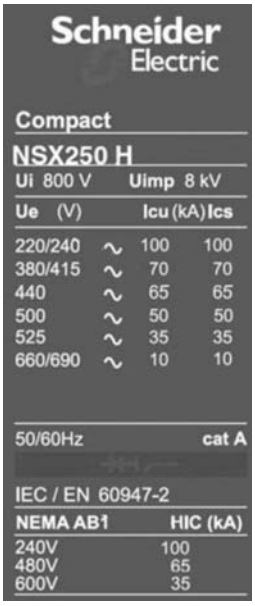
Symbols

The standard identifies the following symbols in connection with circuit breaker markings:



Courtesy: **http://myelectrical.com/notes/entryid/108/understanding-circuit-breaker-markings, by** Steven

Hopefully now, the next time we look at a breaker, it should all make sense.



Courtesy: Schneider Electric

IEC 60947-4-1 ed3.1 Consol. with am1 (In a nutshell)

TITLE - *Low-voltage switchgear and controlgear*

ABSTRACT

IEC 60947-4-1:2009+A1:2012 applies to the types of equipment whose main contacts are intended to be connected to circuits the rated voltage of which does not exceed 1 000 V a.c. or 1 500 V d.c. Starters and/or contactors dealt with in this standard are not normally designed to interrupt short-circuit currents. Therefore, suitable short-circuit protection forms part of the installation but not necessarily of the contactor or the starter. This third edition replaces the second edition published in 2000 and its Amendments 1 (2002) and 2 (2005). It is a technical revision. This edition includes the following significant technical changes with respect to the previous edition (2000) and its Amendments 1 (2002) and 2 (2005):

- deletion of the test at -5 °C and +20 °C for thermal overload relays that are not compensated for ambient air temperature;
- addition of conditions of the tests according to Annex Q of IEC 60947-1;
- EMC tests: clarification of acceptance criteria and alignment with IEC 60947-1 for fast transient severity level;
- Annex B, test for Icd: modification of the duration of the dielectric test voltage from 5 s to 60 s;
- Annex B, electrical durability: improvement of the statistical aspects;
- Annex H: clarification and introduction of new extended functions within electronic overload relays;
- Annex K, procedure to determine data for electromechanical contactors used in functional safety applications: creation of this new annex. This standard shall be read in conjunction with IEC 60947-1, Low voltage switchgear and controlgear - Part 1: General rules. The provisions of the general rules are applicable to this standard, where specifically called for.

This consolidated version consists of the third edition (2009) and its amendment 1 (2012). Therefore, no need to order amendment in addition to this publication.

This publication shall be read in conjunction with **IEC 60947-1:2007**

Courtesy: Webstore International Electrotechnical Commission

ENERGY STORY IN BRIEF (PART 27)

Solar Energy - Potentials, Challenges, Solutions and Initiatives:

General:

India is a vast country with an area of over 3.2 Million sq. km. and a population of over 1.2 billion people. Most parts of the country have about 250-300 sunny days. Average solar radiation incident over the land area is in the range of 4-7 kWh per day. The energy scene in India is a complex picture of a variety of energy sources being used to meet the growing energy needs. The total installed power generation capacity in India is about 180,000 MW.

However, there is a gap in the demand and supply position. It is estimated that there are lots of villages in the country that are still to be electrified of which thousands of them are situated in remote and difficult areas such as hilly regions, forests, deserts and islands and are not likely to be electrified with the conventional grid.

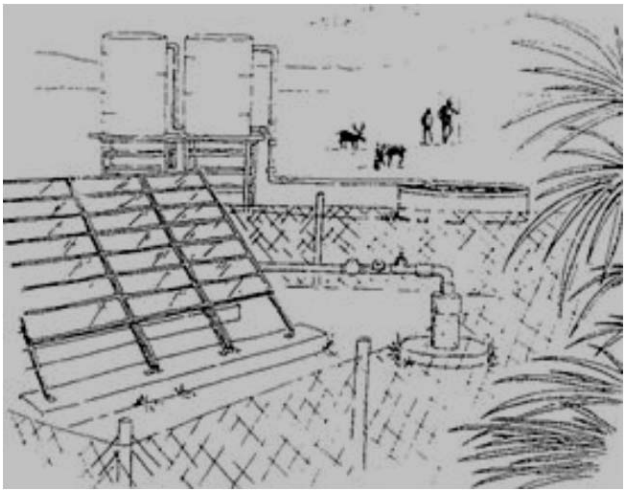
In this part and in the following Parts of this Presentation, we will focus on some of the specific areas and challenges and some of the important Technical Solutions which has a very large scope.

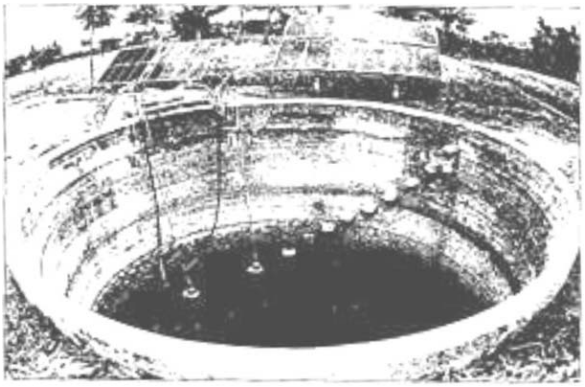
Water Pumping for Irrigation, Domestic and Community Water Supply:

It is estimated that almost 25 to 30% of the total Energy Consumption of the Country is used for Agriculture, which is primarily Pumping for Irrigation. At present India has almost 20 Million Irrigation Pumping Sets that are connected using Grid Power and there is also substantial uses of Diesel Driven Pumping sets for Agriculture in the Farms which are either unreachable by the Grid or could not be given connection due to tight Power Situation. Actually the Power Consumption percentage could go more than 30% if the domestic and community water pumping is included. Hence it can be seen that if "Solar Energy" can help address the Water Pumping Solutions, it will be very helpful. Solar Photovoltaic (SPV) water pumping systems are technically proven and have potential of re-placing diesel pumping systems, commonly used in unelectrified locations for lifting water from shallow depths. The pumps can also bring the benefits of irrigation and drinking water supply in backward areas not served by the existing grid and where supplying diesel is a problem. It is clear that there is a vast potential for the use of solar photovoltaic technology in India.

One interesting dimension that comes out is that in case of Pumping, particularly for Irrigation, the Solar Energy can be directly used, without any Battery Storage needs, which makes it less complex, more reliable and also cost effective. In case of Irrigation, another interesting and important point to keep in mind is that Pumping is needed only when 'Sun Light' is there and the Pump operates with the Solar Enegy.

Solar Operated Pumping Systems for Agriculture and other Applications





Pictures Showing Solar Pumping Systems for Bore Wells and Open Wells

The following are some of the Solutions that can be applied

With 900W Solar Array with Frame Work and mounted on pillars and manual tracking arrangement as per design and practice of connection and control panels etc., and with manual tracking to focus to the Sun, done for about 5 times a day or atleast, 3 times a day that can help ensure maximum output, the following 3 alternative packages could help tackle the 3 different application areas that are identified that cater to substantial portion of requirements.

1) Arrangement with Floating D.C. Pump for open wells with surface of Water levels of around 10 Mts or 35Ft. with water output of around 1,20,000 Lts per sunny day. The Pump can operate for depths upto 13 mts.

The Float is a hallow, Automobile Tyre like, but moulded out of PVC and with 'foam' filler, capable of floating stable with pumpset mounted on it. The Advantage is Maximum Discharge (Max. Efficiency in its class) as the suction head is '0'. Though 'Bore Wells' are increasing, still there are a large number of 'Open Wells' in use in the Country, and it can be put at about 20 to 25% of the total irrigation wells. The solution can easily employed for irrigating about 3 Acres of wetland or about 5 Acres of dry land with pumping of about 1 Lakh litres per sunny day, mentioned above.

2) System with 900 W panel and AC/DC specially designed and with controls Pump Submersible Type - which can work on different heads and discharges on different Sunlight intensities. This combination can help cater to deeper open wells with water surface below 13 Mts., as well as Bore Wells of different depths upto 60Mts or 200ft. We can decide to deal with Bore Wells of depths upto 40 Mts or130 Ft. with output of around 18,000 Lts per sunny day.

3) System same as 2) above but with a combination of Batteries, Charger and around 20 No.s of CFL Lights of appx. 11 Watts each. This system could cater to multi apartment Urban Buildings with water requirement of about 8,000 Lts. Per day to be pumped for a total head of about 40 Mts. or less. This will leave around 4 to 5 Hrs of Solar Power to be stored in Batteries which will be used for the lights which can exclusively take care of common area lighting needs comfortably. This idea could be standardized for use in all medium and small residential apartments of about 12 to 18 Flats comfortably using the open terrace above such buildings.

(To be continued)

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SOWING THE SEEDS OF INCLUSIVE EDUCATION

Cisco's CEED platform has been started with the objective to quality remote education to students living in remote and rural areas

How does CEED work?

- Teachers sitting at a remote location are connected via the Internet to the classroom using the CEED platform. The remote teacher needs a computer with Internet connectivity, webcam and a digital notepad/electronic whiteboard.
- Remote classrooms need a computer with Internet connectivity, webcam, mic, speakers and a projector.
- The remote teacher and the students in classrooms, to whom the subject/topic is to be taught, log-on at the pre-appointed time to the CEED platform. Several remote classrooms can simultaneously connect to the session at a specified time.
- Students at the remote classrooms can be assisted by their teacher who is on-site. The remote teacher conducts the class. Just like the traditional classroom, students listen to the instructor and raise queries, which the instructor is able to respond to, in real-time.
- Basis the feedback of the teacher on the ground remedial/coaching classes, mentoring etc. can be scheduled as per requirements of a school/cluster of schools.

What are the advantages of CEED?

- CEED requires no special setup. A computer with Internet is all that is needed.
- Teachers and students can be connected from multiple locations (including from home).
- Scales up easily and is great for small-to-large education environments.
- Simple scheduling and registration and click "Join Class" from the home page.

Inclusive growth means an economic growth whose fruits are broad-based and leads to the upliftment of a population that is not a part of the mainstream economy. Economic growth is a crucial component of poverty alleviation, and therefore, if there is inclusive growth, there is rapid transformation of all sections of the society. The poor, illiterate and other disadvantaged sections can have equality of opportunity only if there is a time-bound plan for inclusive growth that can bring in transformation.

India has witnessed rapid economic growth in the last few years, but at the same time, it is taking inordinately long for the benefits of this growth to trickle down to the larger population. Most of the rural areas in India lack proper infrastructure for education and healthcare. Hence, inorganic means are required to ensure that the capabilities of all sections of the society are enhanced so that they are able to partake in the overall economic development.

These methods of inclusive development contribute to the economic, political and social stability and further accelerate the growth of the nation.

Inclusive education

Cisco has started the Cisco Education Enabled Delivery (CEED) platform to enable access to quality education to one and all. The initiative aims to provide quality remote education, both supplemental and intervention coaching, to students living in remote and rural areas. The students are connected with qualified teachers based in the cities. Using the network as the platform, CEED uses Cisco collaborative tools and security technology delivering content out of the cloud and over the video.

A part of a comprehensive, integrated, and open learning platform, CEED is designed to bring collaboration and video to the heart of teaching and learning. In this platform, the power of networking, internet, video and collaboration tools developed by Cisco get leveraged to create a real-time interactive environment between the remote teacher and the students. It preserves every aspect of a traditional classroom, except for the fact that the remote teacher is

not in the same classroom as the students. The main focus is on ensuring that students are provided high quality teaching.

In CEED, students can interactively raise and answer questions using the equipment (screen, projector, speakers, mic and electronic whiteboard). This system of teaching ensures that the same remote teacher is able to teach several classes in different locations.

The curriculum is developed specially to ensure that it is easily disseminated through the use of the educational tools and aids that are being used.

In case a teacher or supervisor is present at the rural school, a special instructor is assisted by the teacher in the classroom to increase interactivity in the class, and also so that the instructor can attend to the specific needs of the class. This will ensure that all rural schools offer all subjects with the same level of expert teaching, that a child in a city or a metro gets access to. Along with its ecosystem partners, Cisco is responsible for development, creation and delivery of the coursework which is based on the regular curriculum or syllabus.

Implementations of CEED

The CEED programme from Cisco was initiated as a pilot programme in the villages of Raichur. The success of the Raichur pilot led to remote intervention coaching using CEED deployment at two boys' hostels in Shimoga and other two in Raichur. Over 1,000 students have benefited from using the platform. Children of class seven and eight are taught English, Mathematics, Science and Social Sciences across four schools, three times a week by a teacher (remotely from the city), using local vernacular language (Kannada) as the medium of instruction.

The programme is also being implemented in schools in Kerala and other states. Recently, approximately 30 Indian army soldiers in Jabalpur graduated from Cisco's basic computing and networking skills programme offered through CEED. For training purposes, Cisco's expert engineers located in Bangalore volunteered their time to train and mentor the retiring soldiers based in Jabalpur in basic networking technology. The employees also donated their personal copies of books for several advanced courses such as Inter-Connecting Cisco Network Devices 1 and 2 (ICND) and CCNA. Cisco set up a practice lab of networking and computing devices.

A computer scientist with over 25 years of work experience, ARAVIND SITARAMAN, President Inclusive Growth, Cisco has done pioneering work in several start-up companies and high-tech companies in the US. He is regarded as one of Cisco Systems' leading innovators with 54 US patents. He has led and been part of several international standard bodies

WHAT IS DIFFERENCE ?

Between OCCUPATION and PROFESSION

The words occupation and profession are interchangeable. Profession and occupation are almost the same, with only minor differences between them.

The difference between occupation and profession can be stated with a simple example: Designing a building would be called a profession, whereas, constructing a building is an occupation.

A profession needs extensive training and specialized knowledge. On the other hand, an occupation does not need any extensive training. A person with an occupation need not have specialized knowledge of his trade.

Between SKILL and QUALITY

A quality is something that is ours, is part of our personality, it comes naturally to us. For example, someone may say 'oh, she is always very kind'. Being kind is a characteristic or quality that a person has.

Other qualities people can have, honest, reliable, hard-working, truthful, calm, able to get on with others or even the ability to cope with difficult situations. Whereas a skill is something that you have learned to do.

Destiny is not a matter of chance, it's a matter of choice; it's not a thing to be waited for, it's a thing to be achieved - WILLIAM JENNINGS BRYAN

THOSE WHO ARE 60 PLUS / MINUS

Many people feel unhappy, health-wise and security-wise, after 60 years of age, owing to the diminishing importance given to them and their opinions. But, it need not be so, if only we understand the basic principles of life and follow them scrupulously. Here are Ten Mantras to age gracefully and make life after retirement pleasant.

Ida Herbert, the 96-year-old yoga instructor who has been named the oldest living yoga teacher in Canada by the Guinness World Records

1. ***Never say 'I am aged':*** There are three ages, chronological, biological, and psychological. The first is calculated based on our date of birth; the second is determined by the health conditions; the third is how old we feel we are. While we don't have control over the first, we can take care of our health with good diet, exercise and a cheerful attitude. A positive attitude and optimistic thinking can reverse the third age.

2. ***Health is wealth:*** If you really love your kith and kin, taking care of your health should be your priority. Thus, you will not be a burden to them. Have an annual health check-up and take the prescribed medicines regularly. Do take health insurance coverage.

3. ***Money is important:*** Money is essential for meeting the basic necessities of life, keeping good health and earning family respect and security. Don't spend beyond your means even for your children. You have lived for them all through and it is time you enjoyed a harmonious life with your spouse. If your children are grateful and they take care of you, you are blessed. But, never take it for granted.

4. ***Relaxation and recreation:*** The most relaxing and recreating forces are a healthy religious attitude, good sleep, music and laughter. Have faith in God, learn to sleep well, love good music and see the funny side of life.

5. ***Time is precious:*** It is almost like holding a horses' reins. When they are in your hands, you can control them. Imagine that everyday you are born again. Yesterday is a cancelled cheque. Tomorrow is a promissory note. Today is ready cash - use it profitably. Live this moment; live it fully, now, in the present time.

6. ***Change is the only permanent thing:*** We should accept change - it is inevitable. The only way to make sense out of change is to join in the dance. Change has brought about many pleasant things. We should be happy that our children are blessed.

7. ***Enlightened selfishness:*** All of us are basically selfish. Whatever we do, we expect something in return. We should definitely be grateful to those who stood by us. But, our focus should be on the internal satisfaction and the happiness we derive by doing good for others, without expecting anything in return. Perform a random act of kindness daily.

8. ***Forget and forgive:*** Don't be bothered too much about others' mistakes. We are not spiritual enough to show our other cheek when we are slapped in one. But for the sake of our own health and happiness, let us forgive and forget them. Otherwise, we will be only increasing our blood pressure.

9. ***Everything has a purpose:*** Take life as it comes. Accept yourself as you are and also accept others for what they are. Everybody is unique and is right in his own way.

10. ***Overcome the fear of death:*** We all know that one day we have to leave this world. Still we are afraid of death. We think that our spouse and children will be unable to withstand our loss. But the truth is no one is going to die for you; they may be depressed for some time. Time heals everything and they will go on.

HOME FESTIVALS

Masi (February/March)

Above, this is the month of Mahasivaratri, Siva's great night. In the above painting four stories associated with the festival are told. At lower left a hunter has been cornered in a tree-top by wild beasts, where he must spend the night. To avoid sleep he plucks leaves from the bilva tree, sacred to Lord Siva, and drops them upon a sivalinga below-a traditional form of worship. Many undertake fasts and stay awake the whole night, praying to Lord Siva both at home and in temples (lower right). The home observance of Karadainombu (upper right) derives from the story of Savitri and her husband, Satyavan. They enter a forest, where he dies. When Lord Yama, the God of Death, comes to take his life, Savithri persuades Yama to let him live. The intent of the observance is that wives not be separated from their husbands. Another explanation of this festival (upper left) is that on this day Lord Siva tied a thread to parvati's right hand after their marriage as a sign of protection and fidelity.

(To be continued)

Bharathathin Dharmam (பாரதத்தின் தர்மம்)

YAKSHA PRASNA Aranyaka Parva - *Mahabharata* 32 (117/124)

115. Q: Who is joyous?

A: The man who cooks vegetables in his own house on the fifth or sixth part of the day, but who is not in need and who never goes out from his house is truly happy.

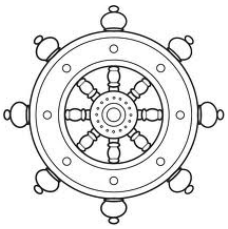
116. Q: What is the wonder?

A. Day after day beings are entering the abode of Yama, yet those that remain believe that they will live for ever. What can be more wonderful than this?

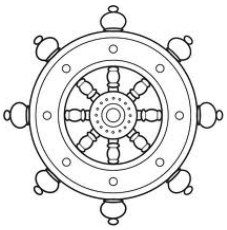
117. Q: What is the way and what is the news?

A: Ligic is uncertain. The Srutis are contradictory. There is not one Rishi whose opinion is authoritative. Truth about Dharma is hidden. That alone is the path which great men tread. In the frying pan of this illusory world time is cooking the beings in the fire of the Sun with fuel of days and nights and with the ladle constituted by months and seasons. This is news.

(To be continued)



CONCEPT OF DHARMA



DUTIES OF PARENTS AND TEACHERS

'Samskar' which as expounded by Adi Shankaracharya, means generating good qualities and reducing bad temperaments and qualities is a must for every individual. It must start from childhood. It is a slow process but a sure process. By imparting good 'Samskar' only an individual get transformed into a good individual. He is the 'brick' for the National reconstruction. Therefore, Bharat Vikas Parishad is aiming at "Rashtra Punarnirman" [National Reconstruction] through "Vyaktinirman" [creating good individuals]. REMEMBER as Sadhu Vasvani often used to say: Nava Bharat will be built not in the Assembly or Parliament, but in the home and the school. Therefore, in this important task, primary duty is of parents and teachers. They should perform their duty properly.

- Sow the seeds of character, honesty and morality, which together constitute rules of Dharma in the virgin mind of a child through stories of 'Satpurushas' and by your own righteous conduct. This provides immunity against sinful thoughts.
- Teach discipline [Anushashana] which means willing or self imposed obedience to good rules of conduct, and respect and obedience to parents, elders and teachers.
- Impart training to the head [intellectual], heart [mental] and body [physical]. All the three are necessary.
- Spare some time and give attention to watch children. Answer their questions patiently. Treat them with all love and affection.
- Mothers should not entrust their children to ayah or baby sitting. This is nothing but shirking the responsibility as a mother and dereliction of duty.
- Please give primary education to your children in mother tongue and never in English. It may be learnt later.
- Teach selflessness, teach them to share food, any eatables or fruits with others.
- Mind, literacy or bookish knowledge is not education. An illiterate may be or could be highly educated, whereas a highly literate may be highly uneducated in the sense of being a man without ethics or moral. He may be a demon in human form. Therefore, give good education in addition to literacy.
- Ask children to do household work like sweeping, cleaning, keeping clothes and articles in an orderly manner. This will go a long way in doing things in a proper manner, later in life also.
- Teach them to live a simple and less-expensive life and not to go after luxury, particularly during studentship period which is sure to divert the attention of students from studies.
- Teach them not to indulge in violence, mental or physical against other human beings or living beings, by inculcating quality of compassion.
- Teach them to live for higher values and not to become a prey for baser instincts.
- Prevent them from falling into bad habits like consumption of alcohol, drug addiction and smoking and indulge in immoral acts which are sure to destroy physical and mental strength.
- Prayer has a great force in man making and character building. Pray before any God of your choice [Istadevata] or great personality, by placing his photograph or idol in a prominent place in the house. All the members of family should join the prayer. Take food after prayer along with children.

In sum, the 'Samskar' is a continuing process – throughout the life of an individual. Teach yourself first and others next.

By these methods, any child can be made a good, better, or even the best individual, just as a sculptor can convert a piece of stone with angularities into a beautiful idol of his choice. Children are the raw material and parents and teachers should play the role of sculptors to make them better youths and human beings.

Remember that the measure of happiness of any Nation is not the economic prosperity, but the personality of substantial number of youths as expounded in Taittriya Upanishad in the following verse:

"Youth should be good, in that, learned, of sterling character, physically fit and strong as well determined. This is the measure of happiness of human society."

That is why Swami Vivekananda insisted on man making, character building education, which unfortunately has been forgotten.

Our National ideals:

Our National Ideals have also been expounded by Swami Vivekananda in his powerful words thus:

The National ideals of India are renunciation and service. Intensify her in those channels, and the rest will take care of itself.

The Indian nation can not be killed. Deathless it stands, and it will stand so long as that spirit shall remain as the background, so long as her people do not give up their spirituality.

Aye, a glorious destiny, my brethren, as far back as the days of the Upanishads we have thrown the challenge to the world – 'Na dhanena na prjaya tyagenaike amritatwamansshuh – not by wealth, not by progeny, but by renunciation alone immorality is reached'. Race after race has taken the challenge up, and tried their utmost to solve the world-riddle on the plane of desires. They have all failed in the past, the old ones have become extinct under the weight of wickedness and misery, which lust for power and gold brings in its train, and the new ones are tottering to their fall. The question has yet to be decided whether peace will survive or war; whether patience will survive or non-forbearance; whether goodness will survive or wickedness; whether muscle will survive or brain; whether worldliness will survive or spirituality.

This is the theme of Indian life work, the burden of her eternal song, the backbone of her existence – the foundation of her being, the raison d-etre of her very existence – the spiritualization of human race. In this, her life course she has never deviated whether the Tartar ruled or the Turk, whether the Moghuls ruled or the English" [India and Her Problems, PP-10, 12-13].

We must ensure that our Nation does not deviate from its life course during our own rule.

BANANA

Yellow Skin Banana with Dark spots on it

Full ripe banana with dark patches on yellow skin produces a substance called TNF (Tumor Necrosis Factor) which has the ability to combat abnormal cells. The more darker patches it has the higher will be its immunity enhancement quality; hence, the riper the banana the better the anti-cancer quality.

Health benefits of Bananas

Eyes - Maintenance of night vision

Cardiovascular - Prevention of hypertension

Stomach - Prevention of peptic ulcers

Bone - Protection from breakdown

Intestinal - Electrolyte replacement in diarrhea, Ease of constipation

Kidneys - Decreased risk of cancer

Whiten your Teeth with Banana Peel

Take a piece of the inside of the banana peel and gently rub around on your teeth for about 2 minutes. The amazing minerals in the peel like potassium, magnesium and manganese absorb into your teeth and whiten them.

HUMOUR

SLEEPING: A Sunday school teacher asked her little children, as they were on the way to church service, "And why is it necessary to be quiet in church?" One bright little girl replied, "Because people are sleeping."

DIGGING THE GARDEN: An old man lived alone in Idaho. He wanted to spade his potato garden, but it was very hard work. His only son, Bubba, who used to help him, was in prison.

The old man wrote a letter to his son and described his predicament.

Dear Bubba: I am feeling pretty bad because it looks like I won't be able to plant my potato garden this year. I'm just getting too old to be digging up a garden plot. If you were here, all my troubles would be over. I know you would dig the plot for me.

Love, Dad: A few days later, he received a letter from his son.

Dear Dad: For heaven's sake, Dad, don't dig up that garden. That's where I buried the BODIES.

Love, Bubba: At 4 a.m. the next morning, FBI agents and local Police showed up and dug up the entire area without finding any bodies. They apologized to the old man and left.

That same day, the old man received another letter from his son.

Dear Dad: Go ahead and plant the potatoes now. It's the best I could do under the circumstances. Love, Bubba

BIG HANDS: The teacher asked little Peter; "If I have 5 mangoes in one hand and five mangoes in the other, what do I have?" "Big Hands," said Peter.

LETTER TO GOD: Little Billy wanted $100 badly and prayed for two weeks but nothing happened.

Then he decided to write God a letter requesting the $100. When the postal authorities received the letter addressed to God, USA, they decided to send it to President Bush.

The President was so impressed, touched, and amused that he instructed his secretary to send Billy a $5.00 bill.

President Bush thought this would appear to be a lot of money to a little boy.

Billy was delighted with the $5.00 and sat down to write a thank you note to God, which read:

Dear God, Thank you very much for sending the money, however, I noticed that for some reason you had to send it through Washington D.C. and, as usual, those crooks deducted $95.00.

Thanks, Billy

- 0.01% is Mightier than 99.99%
- SINCERITY leads to "Sufferings", as that Deed starts with that, indicated in its First 'three' letterrs, "SIN"!
- Children Run faster than Adults. Simple! Because, ChildRUN And aDULts!
- 'PAIN' always comes, because of the Last Two letters in that Four letter word, "IN"!
- People always say that they are Forgetting, Forgetting, Forgettting. But they never FORGET to say that they are 'Forgetting'!
- More 'Memories' can only give us Worries ! Make, 'M', upside down which looks as 'W'... So, 'MeMory' sounds as "We-Worry"!

"TIRUKKURAL" AND MANAGEMENT-1

MANAGEMENT AND LEADERSHIP

The three sections of the ancient Tamil text *Tirukkural*, are entitled *Aram, Porul,* and *Inbam*, which have various translations depending on the author. For example, one translates them as "Virtues, Wealth and Love;" another as "Fundamental Principles of Life, Management and Love;" another scholar, equates them as "Cosmic and Moral Order, Political Skill and Social Life, and Pleasure."

Before we go deep into analyzing the Morals or lessons from the Kural on these, let us have some of the important comments about Tirukkural, one of the Great Moral Books of the World.

"There hardly exists in the literature of the world a collection of maxims in which we find such lofty wisdom as in Thirukkural" **Albert Schweitzer**

"I wanted to learn Tamil, only to enable me to study Valluvar's Thirukkural through his mother tongue itself…. It is a treasure of wisdom **Mahatma Ghandi**

"O king, who rules over the land where tame birds fall asleep to the music of the rice pounders! The wonder of the thought contained in one of Valluvar's little verses is similar to the drop of water on the tip of the tiniest flower, which reflects the whole length of the tallest palmyra tree." **Kapilar**

"Thirukkural is as clear as an unpolluted spring. Yes! Thirukkural, the unique book, has come to remove the impurities of this world." **GU Pope**

"As Vishnu, when he appeared as Vamana, or the dwarf, measured with two steps heaven & earth, so with the two lines of his diminutive veppa footed kural verse Thiruvalluvar has measured the universe." **Paranar**

THIRUVALLUVAR TEMPLE

A calm and quiet area appears in the midst of the busy Mylapore area in Chennai with a few trees and the structures look very ancient. Thiruvalluvar koil is the place of worship which was built around the spot where Thiruvalluvar the famous tamil poet, who composed the immortal thirukural was left behind by his parents as a new born child, under a tree inside the temple of Lord Shiva. Arumugam who takes care of all the rituals in the temple comes from a family which has been serving the temple for the last 4 generations. He spoke about this historic place and narrated a few interesting anecdotes which is believed to have happened in the life of Thiruvalluvar who lived around 2000 years ago. Thiruvalluvar was embraced into their lives by a couple. They heard the child crying when they came to the Shiva temple and the child grew up to be a weaver. He was also well versed in tamil and wrote books. He is said to have composed a few poems everyday which formed the thirukural. Once it is also believed that the trees bent and gave him shade as he was busily immersed in writing his poems and the sunlight was scorching him. He was married to Vasuki who is always described and upheld for her devotion to her husband.

There is a well which is not used anymore but which has its own tale to tell about Thiruvalluvar and his wife Vasuki. She usually attended to her husband instantly. Once when he called her she was drawing water from the well, she just left the bucket and went rushing and the bucket was supposedly standing in mid air till she came back.

The statues of Thiruvalluvar as a baby and his parents have been built and the base of the tree where he was left behind has been preserved.

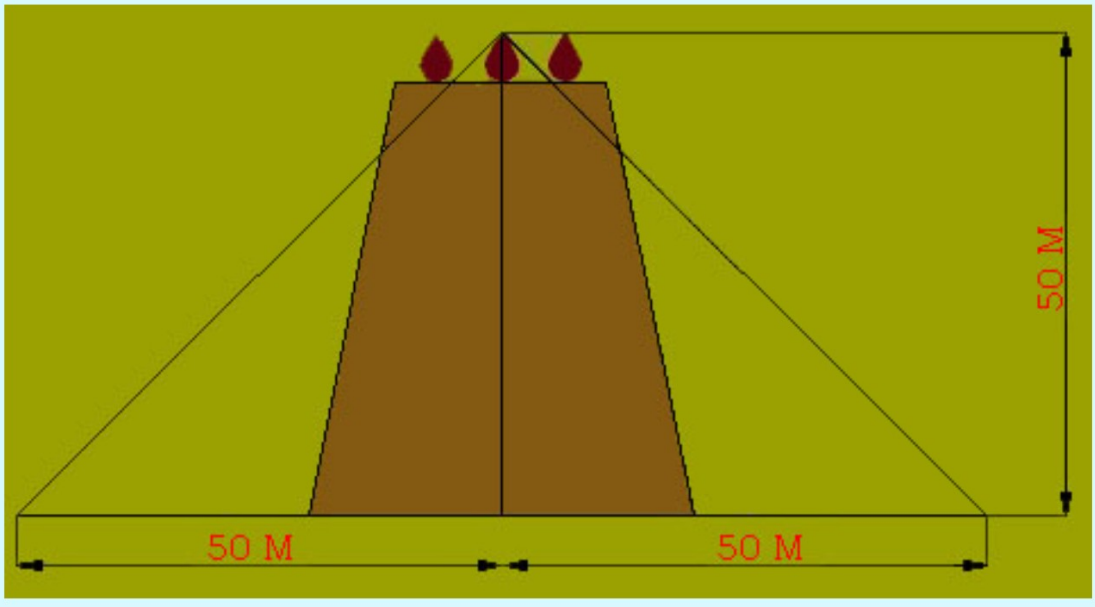
பிரமிப்பூட்டும் தமிழர்களின் விஞ்ஞானம்

மன்னராட்சி காலத்தில் ஊரில் கோயில் கோபுரத்தை விட உயரமாக எந்தக் கட்டிடமும் இருக்கக் கூடாது என்று ஒரு எழுதாத சட்டம் இருந்ததாம். என்ன காரணம்? தேடிப் பார்ப்போம் வாருங்கள்.

கோயில்களையும் உயரமான கோபுரங்களையும் அதன் மேல் இருக்கும் கலசங்களையும் பார்த்திருப்பீர்கள். அவற்றுக்கு பின்னால் இருக்கும் ஆன்மிகம் பற்றி எனக்குத் தெரியாது. ஆனால், அதற்குப் பின்னால் எவ்வளவு பெரிய அறிவியல் ஒளிந்திருக்கிறது என இப்போது தான் தெரிந்தது. கோபுரத்தின் உச்சியில் தங்கம், வெள்ளி, செப்பு அல்லது ஐம்பொன்னால் செய்யப்பட்ட கலசங்கள் இருக்கும். இக்கலசங்களிலும் அதில் கொட்டப்படும் தானியங்களும், உலோகங்களும் மின்காந்த அலைகளை ஈர்க்கும் சக்தியினை (earth) கலசங்களுக்கு கொடுக்கின்றன. நெல், கம்பு, கேழ்வரகு, திணை, வரகு, சோளம், மக்காசோளம், சாமை, எள் ஆகியவற்றை கொட்டினார்கள். குறிப்பாக வரகு தானியத்தை அதிகமாக கொட்டினார்கள். காரணத்தை தேடிப்போனால் ஆச்சரியமாக இருக்கிறது. "வரகு" மின்னலை தாங்கும் அதீத ஆற்றலை பெற்றுள்ளது என இப்போதைய அறிவியல் கூறுகிறது. அப்போது எந்த கல்லூரியிலும் படித்தார்கள் என தெரியவில்லை!!

இவ்வளவு தானா... இல்லை பனிரெண்டு வருடங்களுக்கு ஒருமுறை குடமுழுக்கு விழா என்ற பெயரில் "கலசங்களில் இருக்கும் பழைய தானியங்கள் நீக்கப்பட்டு புதிய தானியங்கள் நிரப்பபடுகிறது", அதை இன்றைக்கு சம்ப்ரதாயமாக மட்டுமே கடைபிடிக்கிறார்கள். காரணத்தை தேடினால், அந்த தானியங்களுக்கு பனிரெண்டு வருடங்கள் தான் சக்தி இருக்கிறது. அதன் பின்பு அது செயல் இழந்து விடுகிறது!! இதை எப்படி ஆராய்ந்தார்கள்!!!. அவ்வளவு தானா அதுவும் இல்லை இன்றைக்கு பெய்வதை போன்று மூன்று நாட்களா மழை பெய்தது அன்று? தொடர்ந்து மூன்று மாதங்கள் பெய்தது, ஒருவேளை தானியங்கள் அனைத்தும் நீரில் மூழ்கி அழிந்து போனால், மீண்டும் எதை வைத்து பயிர் செய்வது? இவ்வளவு உயரமான கோபுரத்தை நீர் சூழ வாய்ப்பே இல்லை இதையே மீண்டும் எடுத்து விதைக்கலாமே!!!

ஒரு இடத்தில் எது மிக உயரமான இடத்தில் அமைந்த இடி தாங்கியோ அது தான் முதலில் "எர்த்" ஆகும். மேலும், அது எத்தனை பேரைக் காப்பாற்றும் என்பது அதன் உயரத்தைப் பொறுத்தது. அடிப்படையில் கலசங்கள் இடிதாங்கிகள். உதாரணமாக கோபுரத்தின் உயரம் ஐம்பது மீட்டர் என்றால் நூறு மீட்டர் விட்டம் அடைக்கும் பரப்பில் எத்தனை பேர் இருந்தாலும் அவர்கள் இடி தாக்காமல் காக்கப்படுவார்கள். அதாவது சுமார் 7500 சதுர மீட்டர் பரப்பில் இருக்கும் மனிதர்கள் காப்பாற்றப்படுவார்கள்!!!. சில கோயில்களுக்கு நான்கு வாயில்கள் உள்ளன, அது நாலாபுறமும் 7500 சதுர மீட்டர் பரப்பளவை காத்துக்கொண்டு நிற்கிறது!!! இது ஒரு தோராயமான கணக்கு தான், இதை விட உயரமான கோபுரங்கள் இதை விட அதிகமான பணிகளை சத்தமில்லாமல் செய்து வருகின்றது!! பிரமிப்பு!!!



அதெப்படி என்று கேட்கிறவர்கள் படத்தைப் பார்க்கவும். இதை எல்லாம் பார்க்க போனால் "கோயில் இல்லா ஊரில் குடியிருக்க வேண்டாம்" என்ற பழமொழி தான் நினைவுக்கு வருகின்றது.

NEW LIGHTING BY PHILIPS REDEFINES THE ICONIC INDIA GATE

New Delhi: Continuing with its tradition of lighting up the heritage and historical monument – The India Gate, Philips India, will contribute to the enhanced look of the iconic symbol of the nation. ELCOMA (the industry body for lighting manufacturers) selected Philips Lighting for this initiative of installing brighter and whiter lights which will transform the majestic view of the India Gate. The new look will be unveiled by Dr. Sudhir Krishna, Secretary, Urban Development Ministry and Mr. A.K. Jain, Special Director General, CPWD on the eve of Gandhi Jayanti.

Speaking on the occasion, , said, "Philips is extremely proud to design the lighting for the India Gate. This time the look is whiter which has also been inspired from many heritage properties around the world. Today's buzz is energy efficiency and we have ensured that the new installation not only saves energy but also enhances the magnificence of the towering monument."

According to ,"redoing the lighting at the India Gate is a part of our "Energy Efficiency Lighting Week" (2nd – 9th October 2012) initiative which is being observed on the sidelines of the Lights India International event taking place in New Delhi. We chose Philips to help us in lighting up the majestic monument. It's a delight to witness the magnificence of white lighting and how it has changed the entire atmosphere surrounding the India Gate.

The new lights are energy efficient and environment friendly and will creatively illuminate the unique features of the India Gate. The CDM (Ceramic Discharge Metal Halide) lamps which have been used will deliver crisp and stable light and will perfectly render the true colours of the Jodhpuri stone of the India Gate. Brighter and whiter lighting will also increase visitors' flow and generate a "feel good" factor among the tourists and city dwellers who are drawn to this monument.

The landscape surrounding the India Gate will also be reinvigorated using coloured LED lights which will strategically redefine the entire look of the monument improving the night time experience by a great deal.

The new lighting solution – CDM that is being used to light up the India Gate has previously been installed at various heritage properties across the world, e.g. Air Force Memorial, Alliance Airport, Texas (USA), Arc de Triomphe, Paris (France), Bunker Hill Monument, Boston, Massachusetts (USA), Guru Tegh Bahadur Memorial, New Delhi (India) and Anandpur Sahib Gurudwara, Punjab (India). Philips will maintain the lighting system for the first six months from the date of installation post which it will be handed over to CPWD for future maintenance.

Courtesy – Philips, India