ELECTRICAL INSTALLATION ENGINEER

NEWS LETTER

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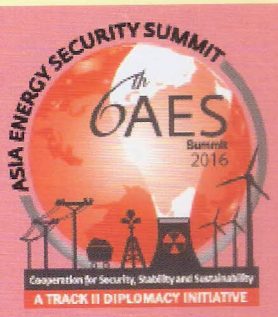
EVENTS



Events Profile: For the year 2016, IPPAI will host the **6th Asia Energy Security Summit** where government, industry leaders, regulators, policymakers, academicians and think tanks from across the world discuss and debate issues relating to the entire energy spectrum, particularly the emerging issues and challenges in the energy landscape of Asia. The proceedings from the previous conclaves are carried forward for review and discussion.

Date: 1st – 3rd March 2016

Venue: Radisson Goa Candolim, Goa, India

Website:
http://asiaenergysecurity.com/Welcome.aspx

L&T Training Programme

Introduction to Industrial Electrical Systems
2nd – 4th March 2016

Switchgear Selection - Motor Control Centre (MCC)
7th – 8th March 2016

Selection & Application of Drives
7th – 9th March 2016

Switchgear Selection - Power Control Centre (PCC)
9th – 10th March 2016

Industrial Protection with Numerical Relays
14th – 17th March 2016

Best Maintenance Practices in LV Switchgear
21st – 25th March 2016

Selection, Protection & Maintenance of Transformer
24th – 25th March 2016

Fire Detection & Security Solutions
30th March 2016

Building Management & Energy Management Systems
31st March 2016

Venue: L&T Ltd.,
Switchgear Training Centre, Nilgiris

Contact Tel.: 04232517107 **Fax:** 04232517158

Email: stc_coonoor@lntebg.com

SOLAR MIDDLE EAST

Events Profile: Solar Middle East is the region's largest trade event for the solar industry. Solar Middle East is 45% bigger than 2015. Network with 3,500 + senior-level decision makers from 84 countries worldwide. Learn about the latest technologies, developments and trends in the solar industry by attending our Free solar conference.

Date: 1st – 3rd March 2016

Venue: Dubai World Trade Centre, UAE

Website: http://solarmiddleeast.ae/en/Home/

Events Profile: Sustainable Energy & Technology Asia exhibition & conference, developed specifically for international, governmental and industry discussions and collaboration on developing sustainable energy policies for the region's future economic development.

Date: 23rd – 25th March 2016

Venue: BITEC (Bangkok International Trade & Exhibition Centre), Bangkok, Thailand

Website:
http://www.seta.asia/about-seta/seta-2016/

EDITORIAL

Dear Members, Fellow Professionals and Friends,

Seasons Greetings & Best Wishes!!

This being a LEAP Year, we have an extra day this month, for all the activities of work and pleasure. **Every Leap year is also the year of Olympics** and India is expected to perform much better in this Olympics than in the earlier Editions.

February is a month when India celebrates the **"National Science Day" on the 28th** and it will be valuable to review the situation and the activities with regard to this in our country. The basics and researches in the areas of Physics, Chemistry, Mathematics Biology and other disciplines of Science evolve Technologies and Engineering for providing all kinds of Products and Services for serving the mankind and Societies at large. For example, the basics of Electricity, Magnetism, Material Sciences of Conductors, Insulations, Metals and Strictures form the core of Electrical Engineering starting from Generation to ultimate Utilization of Electrical Energy. Researches keep going on in various areas of Reducing the Losses, Improving Efficiencies and Improving the Quality of Electricity. It will be interesting to look at the role of Science and Technology in the important area of 'Renewable Energy Mission' which has to be put on fast track to save the Environment and to ensure adequate and sustainable supplies of Electricity and Fuel in tune with the growing demands. Generation of Electricity from Wind and Water are based on the conversion of Potential and Kinetic Energies to Electrical Energy, where as the Generation of Electricity directly from the Sun or from the Biomass involve lot of processes and complexity and Chemistry and Chemical Technologies have their roles in these. As we all know, both Solar Energy and Bio Energy have huge potentials and can help replace Coal and Oil to a great extent. Coal and Oil, which are Fossils and which are also depleting fast, form the major sources of Primary Energy at present, for conversion to different Secondary Forms like Electricity, Fuel and Heat. In recent times lot of Researches and Developments have happened in the areas of Production of Bio Coal, Bio Carbon and Bio Oil from Biomass and further steps to evolve processes and Technologies which can be economically viable and application of them in substantial measures can go a long way in the spread of Renewable Energies. Let us remember that our Country is blessed with lot of potentials particularly with regard to Bio Energy and 'Networking' with the Countries who have already done lot of work in these areas and stepping up our own R & D are the needs of the hour.

February is also the Budget time in our Country. With very ambitious Plans for Growth and the needs for resources for proceeding with them, there could be lot of levies like the increases in Excise Duties on Petroleum Products we witnessed recently. We sincerely hope that good senses will prevail with the Government for cutting down all kinds of wasteful expenses and for introducing all kinds of austerity measures so that the resources generated will really work towards Developments.

We thank all those members who have helped us by participating in the advertisements appearing for the issue January 2016 – Dehn India Pvt. Ltd., Ashlok Safe Earthing Electrode Ltd., Abirami Electricals, Supreme Power Equipment Pvt. Ltd., Power Links, OBO Bettermann India Pvt. Ltd., Pentagon Switchgear Pvt Ltd., Cape Electric Pvt. Ltd., FLIR Systems India Pvt. Ltd., Electrotherm India Ltd., Universal Earthing Systems Pvt. Ltd., Sun Sine Solution Pvt. Ltd., JL Seagull Power Products, Wilson Power and Distribution Technologies Pvt. Ltd., Elektrotec 2016, Galaxy Earthing Electrodes Pvt. Ltd.

EDITOR

ENJOY SOLAR ENERGY TODAY AND HELP THE PEOPLE OF TOMORROW

ELECTRICAL INSTALLATION ENGINEER

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MEMBERS DETAILS

S.No.	Company Name	District	Contact No.	License No.
16.	B.R. Ganeshkumar	Chennai	044-25513837, 94432 28033	ESA 421
17.	Balaji Electrical	Chennai	044-26624891, 98410 77212	ESA 248
18.	Bharath Enterprises	Chennai	044-26366216, 90949 58141	EA 2923
19.	Celestial Associates	Chennai	044-43513003, 94440 37968	EA 2465
20.	Chennai Engineering Services	Chennai	044-24361140, 98416 45133	EA 2018
21.	Crown Electricals	Chennai	044-24335518, 98844 95520	EA 1280
22.	CVT Enterprises	Chennai	94440 81304	EA 2315
23.	D. Sudhakar Electricals	Chennai	044-28490004, 95566 07711	EA 2894
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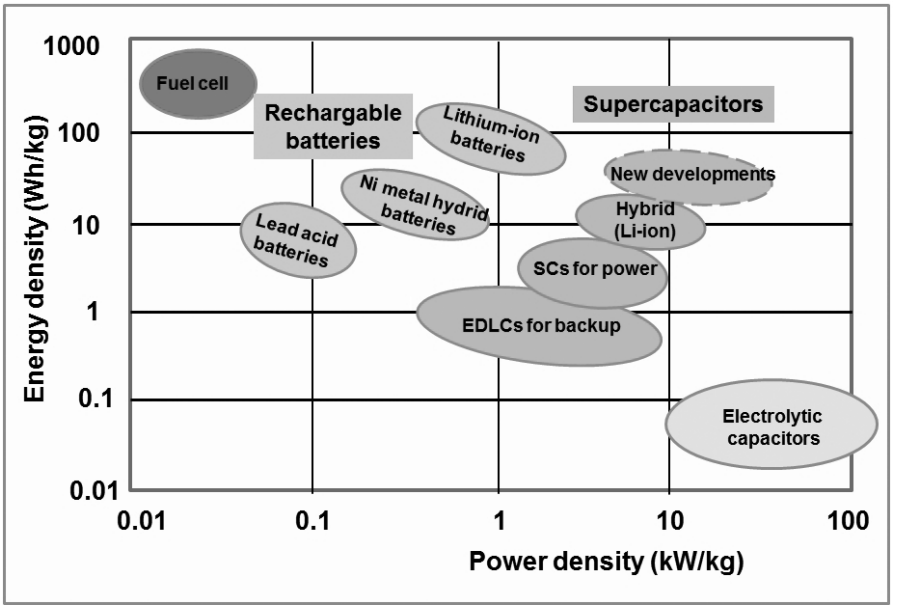
25.	Delta Engineers	Chennai	044-22460025, 98410 79058	ESA 169
26.	Devee Enterprises	Chennai	044-24338659, 94440 22041	EA 2142
27.	Devee Enterprises Electricals Pvt. Ltd.	Chennai	044- 42184476, 99401 63476	EA 2184
28.	Ecube Projects	Chennai	044-43566688, 95431 91961	EA 2890
29.	Elecproj India	Chennai	044-24852230, 98407 90077	EA 1859
30.	Electro Mechanical Engineers	Chennai	044-24984887, 94980 27093	EA 2117

NITROGEN CAN TRIPLE ENERGY CAPACITY OF SUPERCAPACITORS

Nitrogen can triple the energy storage capacity of carbon-based supercapacitors, researchers in China and the United States say, potentially helping make them competitive against some advanced batteries.

Supercapacitors can capture and release energy much more quickly than batteries, but they usually can store less energy. Most supercapacitors in use today use carbon-based electrodes, because their high-surface area stores more charge. “We are able to make carbon a much better supercapacitor,” says Fuqiang Huang, a material chemist at the Shanghai Institute of Ceramics.

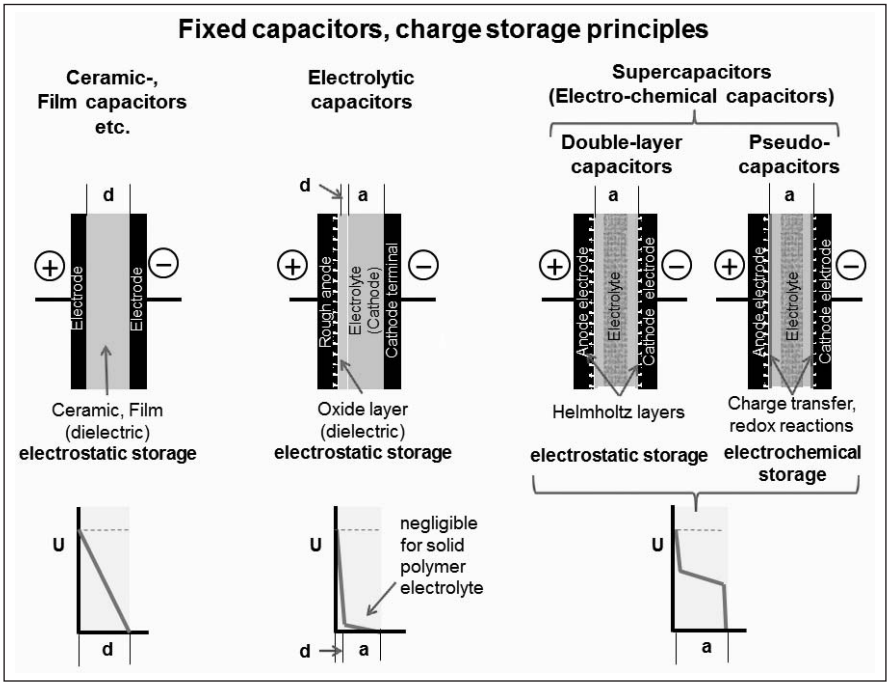


The scientists began with a framework of porous silica and lined the pores with carbon. They next etched away the silica, leaving porous tubes 4 to 6 nanometers wide, each made of five or less layers of graphene-like carbon.

They then doped the carbon with nitrogen atoms. The nitrogen altered the otherwise inert carbon, helping chemical reactions occur within the supercapacitor without affecting its electric conductivity.

These changes enhanced the capacitor’s ability to store energy by roughly threefold without reducing its ability to quickly charge and discharge. “It is as if we have broken the sound barrier,” Huang says.

The scientist say that their devices could store 41 watt-hours per kilogram, comparable to lead-acid batteries.



“A bus can run on an 8 watt-hours per kilogram supercapacitor for 5 kilometers, then recharge for 30 seconds at the depot to run on the trip again,” says I-Wei Chen, a materials physicist at the University of Pennsylvania who also worked on the breakthrough. ”This works in a small city or an airport, but there is obviously a lot to be desired,” he says. “Our battery has five times the energy, so it can run 25 kilometers and still charge at the same speed. We are then talking about serious applications in a serious way in transportation.”

The new supercapacitor does not store as much energy as lithium-ion batteries, which achieve 70 to 250 watt-hours per kilogram. However, the researchers say their supercapacitor beats them on power. The nitrogen supercapacitor can crank out 26 kilowatts per kilogram, while lithium-ion batteries are only capable of 0.2 to 1 kilowatts per kilogram.

The scientists are now investigating ways to create these supercapacitors in a scalable, robust, and inexpensive manner, Huang says. They are also experimenting with a variety of electrolytes to further improve the energy and power of these devices.

Among the insulation characteristics that stand in line for our further discussion are Partial Discharge and Thermal / Electrical withstand levels. Before addressing these topics, let us have a snap view of **Dielectric Dissipation Factor** which is related to "**Tan Delta**" which we have learnt earlier. When an alternating voltage 'V' with frequency 'F' (50 Hz) is applied across an insulation, it will have two branches – one across the capacitance of the insulation (V_c) and the other across its series loss resistance (V_R). Now dielectric dissipation factor is the tangent of the dielectric loss angle that exists between V_c and V_R i.e. $DDF = V_R / V_c = R_s / x_c = 2\pi fc.R_s$. Thus any increase in the value of series loss resistance, either due to contamination or impurities in the insulation, supply frequency will enhance the value of DDF and hence dielectric losses. Ageing of insulation can also be considered as a factor in this regard i.e. dielectric power loss = $I^2R_S = I^2 \times c \times DDF$

$$I^2R_S = \frac{I^2 . DDF}{2\pi f.c}$$

Now it is the turn of Partial Discharge to come under our focus.

1. **Partial Discharge (Weak spots in an insulation):** PD test is a qualitative tool to evaluate the condition of cable / equipment insulation. Partial Discharge (PD) is generally referred to as a local electric discharge process in which the distance between two electrodes is only partially bridged (e.g) a partial puncture of the insulation. It originates either directly at one of the electrodes or in a cavity of the dielectric where no electrodes exist. It is mainly due to the local overstressing of weak points in an insulation. Partial Discharges always present because of in homogeneities or small impurities faults in insulating materials either during manufacture or in operation which cannot be prevented. It is difficult to completely eliminate these problematic areas. When partial discharges are present, the voltage withstand level of the insulation gets reduced i.e. the time to failure gets reduced when the voltage applied across the insulation is increased. These discharges are termed as **electrical termites**, since they eat away the equipment insulation. Location of partial discharges and its measurements are helpful in evaluating the integrity of equipment insulation. It helps to identify the defects in the incipient stage itself so that adequate measures can be initiated in time to avoid insulation breakdown or failure. It also ensures the remaining quality of the insulation material.

(A) Typical Partial Discharge Phenomenon:

Refer Table Partial Discharges in next page

When dealing with PDs, three stages of information are required. These stages are *detection, classification and location.*

The discharge detection is generally performed with the commercially discharge detectors. It can be performed in many ways – by acoustic or optical means or by electrical methods. All these methods are helpful in determining the presence and magnitude of partial discharges.

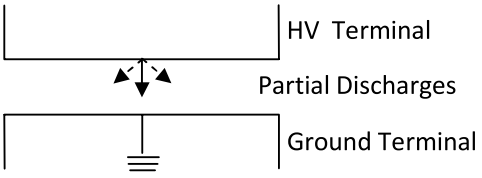
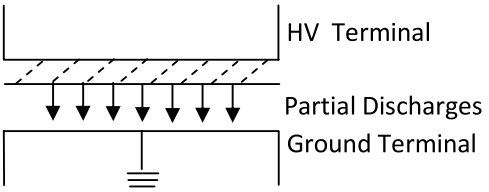
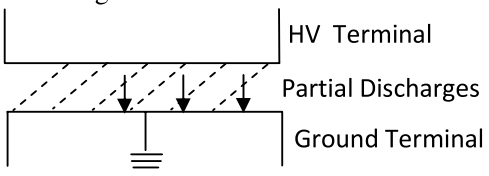
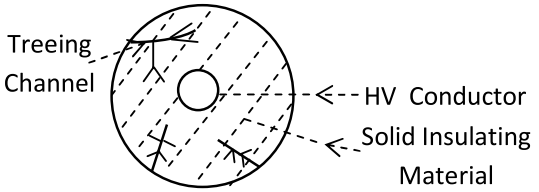
The second stage concerned with partial discharge is the "classification". Here the recognition of the nature of defects, whether is internal, surface, corona or treeing discharges is established. This information is essential for assessing the harmfulness of the discharges present. The third stage Viz "location", focuses on the locating the position / place of the discharge in a dielectric. This information reveals the interface between the materials involved and the local field strength where the discharge takes place. This step is vital for the estimation of the risks involved. With the information received from all these test methods, the evaluation of the PD in question is carried out. Once this is performed a decision can be taken in regard to rejection, reconstruction / remaking and repair of equipment. The acceptable PD levels of equipment are left to the judgement of users. Normally it is around 5 – 10 pico columbs. One more point that requires our focus is the role played by "electrical noise" – the major enemy of field measurements.

Earlier, partial discharge measurements were limited to laboratory only in view of the high levels of electrical noise present in the switchyards which produce erroneous results. Many electrical noise sources exist in the field.

Among them are,

- Power supply
- Voltage regulator
- HV source for the test
- Filters used with the HV source
- Feeder line and electrodes

- Coupling capacitor
- Loose conductive objects in the vicinity of test location
- Nearby radio transmitters
- Interference currents in the ground system of PD measuring instrument.

1.	Corona Discharge	It starts from the high stress points like sharp edges or thin conductors connected to high voltage terminals in air / gas insulated installations / liquid insulating materials to Ground Terminals. 
2.	Surface or sliding discharges	It occurs on the interfaces of different insulating materials like gas / solid interface 
3.	Discharge in laminated material	- do -
4.	Cavity Discharge	It occurs in the voids / cavities formed in liquid and solid insulating material 
5.	Partial Discharges in solid insulating material like XLPE as "Treeing Channels"	

(Gas spaces in solid insulation are the locations or starting points for these electrical termites. - Partial Discharge)
Various methods are adopted to suppress the noise signals emanating from these sources.
Electro magnetic noise signals can be subdivided into two types (1) Impulsive (2) Periodic noise

Impulsive noise	Generally distributed in time domain and lies in a wide frequency bond (few K Hz to M Hz)
Periodic noise or Harmonic noise	Continuous in time but occupies only discrete frequency bands

Electrical noise normally gets into PD measurement circuit through three distinct paths.

(1) HV terminals of the test object
(2) Through the power supply of PD measuring equipment
(3) Electro magnetic induction within the loop of testing circuit.

Other sources of noise signals are,

- Nearby radio station signals
- Corona discharges
- Switching impulses or switching surges caused by the switches / breakers in the vicinity of testing location.

Just to understand the background noise level during PD tests, let us make a comparison.

- Noise level is a well shielded testing lab 1 pico columbs or less
- Noise level is an energised switch yard 500 pico columbs or more

To get accurate field test results, it is essential to adopt reliable noise / interference suppression methods. Otherwise misleading results will be obtained. Among the available methods are

- Tuneable narrow band and amplifier
- Bridge circuit
- Additional shielding of measuring cables that connect the bridge circuit with the test objects

Thermal and Electrical Withstand Levels

A. Thermal Endurance or Withstand

The estimation of designed / current thermal endurance level is vital for the determination of equipment happiness index. The thermal capability of an insulation system is normally defined by its withstand level. Beyond this level, the system loses its cohesiveness and integrity and behave erratically and finally ends in failure / breakdown. Under no circumstances this withstand level should be breached / exceeded. The maximum temperature upto which the equipment insulation remains healthy or unaffected is determined by conducting laboratory tests; based on this, an index called **"Thermal Index"** is assigned to it. This Thermal index value is used to group the insulation system on hand to various thermal classes. Among the available thermal classes are, mentioned in the table.

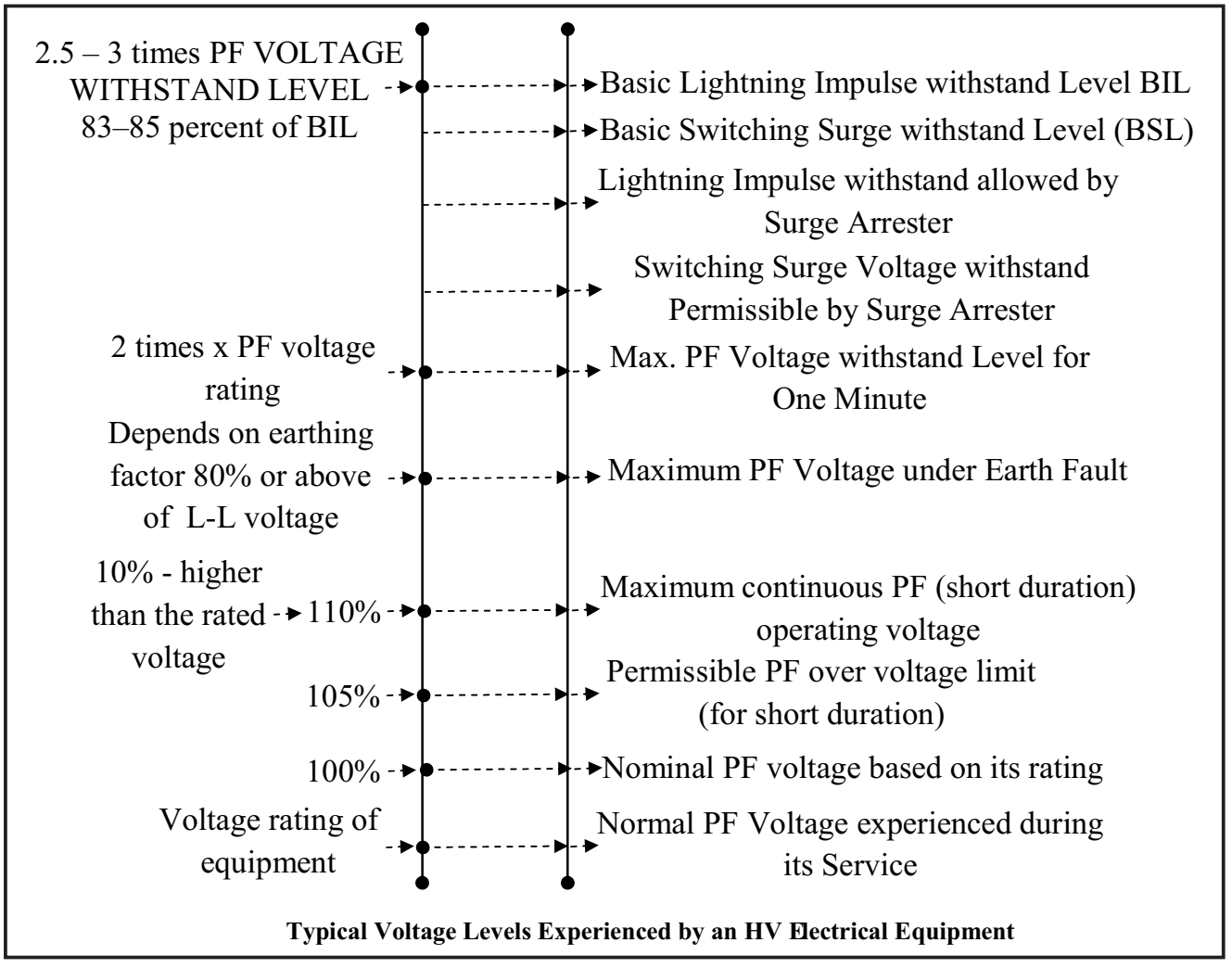
Class	Withstand Temperature (°c)	Insulation Material
Y	90	Organic in nature
A	105	Impregnated with insulation oil / Varnish
E	120	-do-
B	130	Inorganic in nature
F	155	Upgraded "class B" material
H	180	Inorganic material with silicone resin
C	Above 180	-do-

Thermal endurance is one of the factors that influence the "Thermal Ageing" of the insulation. If the equipment is operated at higher / elevated temperatures, at most part of its service life, it is easily vulnerable to rapid thermal ageing, an important factor in the life of an electrical equipment.

In this context, it may be noted that the rating of an electrical equipment is fixed on the basis of its maximum or highest operating temperature which can be safely allowed. Based on this temperature standardisation, its maximum continuous rating (MCR) is assigned. All these indicate that the equipment under use should always be operated without exceeding / transgressing the maximum allowable / tolerance limit fixed by its thermal endurance level. If the temperature exceeds this withstand level, insulation softening, flash point, melting, smoke, burning and deposition of carbon black will occur. So prior to the determining the happiness index of an equipment, it is essential to assess the level of its operating temperature (thermal withstand level) and the number of times it normally exceeds this limit without energising the alarm and trip circuits, if any, connected to protect the equipment. It is also desirable to record the number of occasions, its temperature alarm and trip circuits have operated and the operating condition prevailed then. In this regard the equipment cooling methods also need a close look. Its adequacy should be brought under a scanner; if need arises necessary improvements should be made. The failure / repair of the equipment, if any carried out due to its higher operating temperature and the improvements, if any, carried out to the equipment insulation may also be recorded. When the insulation gets weakened due to longer service period, there will be a fall in its temperature withstand level. Then it will have significantly shorter service life between major repairs to avoid this. The equipment are normally derated or made to work below its normal rating. This can only be a stop gap or adhoc measure to avoid its permanency; adequate measures are to be carried out to enhance the Thermal withstand level of the insulation concerned.

Voltage Endurance Level

It is an important parameter to evaluate insulation health status and to ensure the service reliability of an electrical equipment. To estimate this withstand level, the equipment insulation should be subjected to standard over voltages at power frequency and impulse levels. These withstand levels are called PF (50 Hz) dielectric strength and impulse strength. Insulations with higher voltage withstand levels will last longer in service. Before leaving the manufacturer's works all the electrical equipment are subjected to standard PF over voltage and voltage impulse tests as "Proof Tests". Thereafter, the equipment never experience such high voltage stress tests except after winding repairs.



Typical Voltage Levels Experienced by an HV Electrical Equipment

The crest impulse dielectric strength of mineral oil impregnated proper press board insulation which is generally employed in transformers and reactors and oil filled circuit breakers is significantly higher than its crest (50Hz) PF dielectric strength. Normally this impulse withstand level is 2.5 – 3 times greater than that experienced with 50Hz voltage. In the case of dry type insulation, which is normally used in the rotating machines like generators, motors and the static equipment like cast resin transformers, the impulse withstand level of the insulation is comparatively lower. The voltage withstand levels (both PF and impulse) falls down when the service life of the equipment goes up. Hence it is an important factor to be considered while dealing with its happiness index. Further it is added that the electrical equipment insulation failures occur mostly due to occasional transient over voltages like switching surges or lightning over voltages that enter through the connected power lines. In short, the failure in service are generally due to the impingement of randomly occurring over voltage stresses on insulation systems already weakened by ageing.

Let me sign off here. Kindly stay tuned till next month.

(To be continued...)

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UNESCO AND PANASONIC LAUNCH EDUCATIONAL SUPPORT PROGRAMS FOR THE NEXT GENERATION IN OFF-GRID COMMUNITIES IN MYANMAR

UNESCO and Panasonic Corporation signed a project agreement for Myanmar in November 2015 to promote educational support aimed at sustainable development for the next generation of young people living in the vicinity of the Ancient City of Bagan in Myanmar, which is currently a nominee for UNESCO World Heritage listing. The signing marks the launch of the following joint projects today.

Donation of 500 units of **"eneloop solar storage"** to schools around the Ancient City of Bagan(Panasonic will donate a total of 500 units of its **"eneloop solar storage"** to around 40 schools located in off-grid communities in the vicinity of the Ancient City of Bagan in Myanmar. At present, 1.2 billion people*2, or about 17% of the world's population, live in areas without electricity. In Myanmar, 68% of its population*2 is said to have no access to electricity. Young people who live in off-grid communities around the Ancient City of Bagan are suffering from an educational disadvantage as they have no other choice but to study in a poorly-lit classroom, with limited daylight hours.

Panasonic's **"eneloop solar storage"** is a compact power storage system with LED lights, which stores power generated by solar cells during the day and provides lighting at night or for classrooms. Through this donation, Panasonic will support the development of a school environment where young people can study anytime of the day under safe and bright lights.

Educational support project for sustainable development of communities around the Ancient City of Bagan. In partnership with Myanmar's Ministry of Education, local government and communities, Panasonic will provide support for this educational initiative over the course of two years. Specifically, with a view to developing future leaders of the country, an education curriculum covering the areas of "**sustainable growth**," "**science**" and "**society**" will be created in conjunction with the Ministry of Education. The program will be offered to young people and teachers/instructors living in off-grid communities near the Ancient City of Bagan, who are responsible for the next generation.

Further, in coordination with Panasonic's ongoing **Eco Learning Program*3**, an environmental education program will be conducted to raise environmental awareness of the next generation of children and to motivate them to take concrete action.

Bagan is an ancient city located in the Mandalay Region of Burma (Myanmar). From the 9th to 13th centuries, the city was the capital of the Kingdom of Pagan, the first kingdom to unify the regions that would later constitute modern Myanmar. During the kingdom's height between the 11th and 13th centuries, over 10,000 Buddhist temples, pagodas and monasteries were constructed in the Bagan plains alone, of which the remains of over 2200 temples and pagodas still survive to the present day.

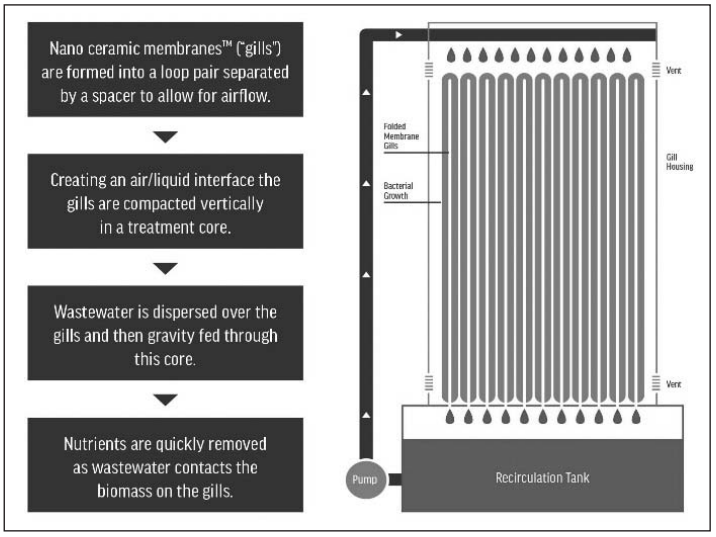
Read more: http://www.pv-magazine.com/services/press-releases/details/beitrag/panasonic-to-contribute-off-grid-solar—storage-for-myanmar_100022576/#ixzz3vshWeMca

"Civilizations have arisen in other parts of the world. In ancient and modern times, wonderful ideas have been carried forward from one race to another...But mark you, my friends, it has been always with the blast of war trumpets and the march of embattled cohorts. Each idea had to be soaked in a deluge of blood..... Each word of power had to be followed by the groans of millions, by the wails of orphans, by the tears of widows. This, many other nations have taught; but India for thousands of years peacefully existed. Here activity prevailed when even Greece did not exist... Even earlier, when history has no record, and tradition dares not peer into the gloom of that intense past, even from until now, ideas after ideas have marched out from her, but every word has been spoken with a blessing behind it and peace before it. We, of all nations of the world, have never been a conquering race, and that blessing is on our head, and therefore we live....!"

- Swami Vivekananda (Indian Philosopher)

ENERGY EFFICIENT WAY TO TREAT WATER

Wastewater treatment has traditionally been an expensive, energy-hungry process. But armed with a cutting edge, membrane technology, Australian biotechnology company BioGill has developed a solution that promises effective treatment and significant cost savings for industry, sewage treatment facilities, and aquaculture farms.



Wastewater from industry and sewage facilities undergoes a lengthy treatment process before it is clean enough to be safely discharged into sewers or waterways. Besides, the removal of organic compounds from effluent can be an expensive, energy-intensive, and at times difficult affair. But a coincidental meeting between an Australian clean-tech entrepreneur and microbiology researchers has given rise to a solution that not only makes water treatment more cost effective and easier, but can also contribute solutions to other pressing development challenges such as sustainable aquaculture and a lack of access to sanitation in rural areas.

Meet BioGill, an Australian company that has developed a unique system, which treats water that may typically be too dirty or oily for other systems, using less energy. This is being done with nothing more than a low-energy pump and a special technology called an attached growth membrane system.

In conventional wastewater facilities, biological nutrients such as dissolved organic carbon molecules and ammonia are removed from water by bacteria which metabolise, or "consume", these compounds. These bacteria are usually found in the water itself, and aerators submerged in tanks encourage them to multiply and form a 'biomass', known as activated sludge, that digests the organic pollutants in the water stream.The disadvantage of such systems is that in order to sustain the submerged bacteria, the aerators require the use of energy-guzzling pumps to provide dissolved oxygen into the liquid. Also, before water enters these tanks, it has to be stripped of any oil and grease, as these elements substantially limit the amount of oxygen dissolved into the tanks, suffocating the working bacteria.

Magic's in the membrane suspended in the air

The alternative product developed by BioGill is an attached growth media bioreactor, which is placed above ground next to or above a treatment tank. The difference between this technology and conventional systems lies in the composition of the patented Nano-ceramic membrane and the structure of the bioreactor system. According to Mikael Krogh, managing director of BioGill Asia, the BioGills are "five-star accommodation for bacteria, with free access to air and nutrition". These special membranes, originally developed by the Australian Nuclear Science and Technology Organisation (ANSTO) in the early 2000s as a way to speed up the growth of *Penicillium* fungus, not only support the growth of bacteria, but also allow microbes to move through the membrane.ANSTO's membranes were discovered by BioGill's founder John West at a science convention in 2007, after which he purchased the license to use them for water treatment in 2009, and took over the full intellectual property rights to the technology in 2012. This is also when he began to commercialise the product. There are just two main components in the BioGill bioreactor: a 'gill structure', which is a set of membranes folded into a loop and a low-pressure water pump, which takes water from a treatment tank up to the top of the BioGill and disperses it over the membranes.

Water sprays over the top of the membranes and propelled by nothing but gravity, travels down over them. Bacteria in the water clump together, adhere to, and grow on the membrane, and after about six weeks, form a stable body of biomass that can digest nutrients rapidly. Microorganisms growing on the gills are able to feed off

nutrients in the liquid stream on one side of the gill while drawing oxygen from the opposite side.This process of passing liquid over the membranes continues until the water in the tank has reached the desired level of treatment, then it moves onto the next stage of treatment and the tank is filled with a new batch of water. Alternatively, the treatment system can be configured in a continual flow design. Because the membranes are not submerged in the wastewater, air is able to flow through the unit freely, providing oxygen for the biomass to thrive. This eliminates the need for mechanical aeration, which reduces the energy footprint of the technology by up to 80 per cent, says Krogh, who heads the company's Singapore office, set up earlier this year. Thanks to the abundance of oxygen, bacteria are not suffocated by oil and grease, and the system removes odour, despite being located above ground, he adds. Unlike most attached growth technologies, BioGill systems are capable of dealing with water that may otherwise be considered too difficult to treat.

BioGill is able to achieve this because the technology offers a unique method of delivering oxygen and nutrients to the biomass, which allows it to treat wastewater with higher levels of organic compounds.This is in contrast to conventional systems, where limited access to oxygen restricts how much nutrient content the submerged biomass can treat, explains Krogh.These qualities make the BioGill bioreactor ideal for a number of applications ranging from treating industrial wastewater, to helping the aquaculture industry provide a clean and healthy living environment for their stock, notes Krogh.In Asia Pacific, the BioGill systems can also help alleviate pressure on increasingly stressed sewage treatment systems, and even help with de-centralised water treatment in remote areas which cannot access the municipal sewage network, Krogh shares.

One product, many applications

According to Krogh, in the food and beverage sector, commercial kitchens typically have to invest in expensive and troublesome grease traps before they are allowed to discharge wastewater into the sewage system, but using the BioGill system allows firms to meet regulations on fat, oil, and grease removal with much less cost and effort.

Earlier this year, Sydney Water, Australia's largest water utility, approved BioGill technology for biological treatment of grease traps, following successful demonstration projects.Commercial kitchens, as well as high sugar food production facilities, dairies, and breweries are ideal examples where BioGill bioreactors can save operators a lot of cost and effort, he notes.A multinational confectionary company is among BioGill's biggest food clients, and the company also has a 48-unit installation at a juice processing plant and a smaller set-up at a dairy in New South Wales, Australia.Units are also successfully treating wastewater at fast food restaurants, wineries, and meat and vegetable processing facilities across the world. BioGill reactors can also help with sanitation in areas which cannot connect to the main sewer network, says Krogh.

For example, the technology helped an eco-resort on Fiji's Mantaray Island, cope with increased sewage output in a sustainable way.In 2013, the resort needed to scale up its ability to treat wastewater from the hotel kitchens and sewage treatment capabilities because an expansion of the resort was underway. Two BioGill bioreactors were installed to meet these requirements. The modules reduced the amount of organic compounds in the water by 96 percent and nitrogen by 70 percent, producing water for irrigation of the resort grounds. The resort manager also reported that because of this, no wastewater had been discharged into the ocean, protecting the island's natural assets.When retrofitted into existing sewage plants, the technology can improve struggling or ageing facilities to improve their performance, notes Krogh.

In the Philippines' capital Manila for example, four BioGillbireactors were installed at a decentralised sewage treatment plant run by the local urban water authorities, who wanted to reduce power consumption. Thanks to the units, the facility manager was able to reduce energy consumption by about 80 percent, yielding annual energy savings of about US$17,672. Turning to the potential of the technology to boost food security in Asia, Krogh shares that the region's increasingly affluent middle class is driving demand for high value protein. "The only sustainable way to meet this demand is to grow fish," he says, adding that cattle farming is heavily resource intensive and often entails deforestation for ranches, while wild fishing represents a serious threat to marine ecosystems.

Untapped potential

Regardless of the industry, the process of installing and operating the bioreactor is virtually the same, requiring low and easy maintenance notes Krogh. Customers inform BioGill of the nutrient composition of the wastewater and the desired outcome.This information allows BioGill to calculate the number of units required, and then all clients need to do is plug them in and wait for about six weeks for the biomass to grow.

Since it was founded, BioGill has sold about 200 units to clients from a variety of industries in 17 countries including Australia, Canada, Chile, India, Taiwan and Singapore. The company also has a sales office in Singapore, and intends to open a new assembly hub in Shanghai in 2016.

Decentralised sewage, aquaculture and treating the food industry's wastewater are some of the known applications of BioGill, but the company is constantly discovering new uses for the product and is involved in several studies to test these, shares Krogh.One new initiative with Singapore Polytechnic is assessing the potential of BioGill bioreactors to remove oil and other hydrocarbons from the surface of seawater in ports, while another trial at a floating fish farm in Singapore explores the use of the system in closed fish cages in the ocean.As the company consolidates its presence in the region and looks for new distributors for its product, Krogh is optimistic about the system's potential to not only serve as an energy-efficient wastewater treatment alternative, but also to promote sanitation and food security. "It's easy to operate, has low energy costs, and multiple areas of application," he says. "We are excited to help address Asia's sustainable development challenges through our product."

About Bio Gill

The Bio Gill technology was developed in the research laboratories of the Australian Nuclear Science and Technology Organisation, ANSTO, a Commonwealth research agency.ANSTO is responsible for delivering specialised advice, scientific services and products to government, industry, academia and other research organisations.A group of research scientists from the Institute of Materials Engineering at ANSTO were involved in the ground breaking research into the use of nano-particulate materials originating from the synroc waste form technology.Between 2004-2009, the technology was further developed and incubated within ANSTO, with a view to commercialisation.

In 2007, John West took part in an industry event at ANSTO and attended a presentation on a new nano-particulate membrane technology. John was so impressed he stayed on to meet the research team and learn more about the invention.Over the ensuing two years, John negotiated with ANSTO for the exclusive rights to licence and commercialise the technology, now known as BioGill. John established BioGill Environmental Pty Ltd as the vehicle to commercialise this award winning technology.BioGill units have been successfully demonstrated on many different industrial wastewater streams such as effluent from food processors, breweries, wineries, commercial kitchens and grease traps as well as sewage and grey water. In aquaculture, the technology provides clean, safe biofiltration to maintain high quality pond water.

SCIENTISTS HAVE A NEW RECIPE FOR BATTERIES

Scientists at the University of Maryland have a new recipe for batteries: Bake a leaf, and add sodium. They used a carbonized oak leaf, pumped full of sodium, as a demonstration battery's negative terminal, or anode, according to a paper published yesterday in the journal *ACS Applied Materials Interfaces.*

"Leaves are so abundant. All we had to do was pick one up off the ground here on campus," said Hongbian Li, a visiting professor at the University of Maryland's department of materials science and engineering and one of the main authors of the paper. Li is a member of the faculty at the National Center for Nanoscience and Technology in Beijing, China.

Other studies have shown that melon skin, banana peels and peat moss can be used in this way, but a leaf needs less preparation.The scientists are trying to make a battery using sodium where most rechargeable batteries sold today use lithium. Sodium would hold more charge, but can't handle as many charge-and-discharge cycles as lithium can. One of the roadblocks has been finding an anode material that is compatible with sodium, which is slightly larger than lithium. Some scientists have explored graphene, dotted with various materials to attract and retain the sodium, but these are time consuming and expensive to produce. In this case, they simply heated the leaf for an hour at 1,000 degrees C (don't try this at home) to burn off all but the underlying carbon structure. The lower side of the maple leaf is studded with pores for the leaf to absorb water. In this new design, the pores absorb the sodium electrolyte. At the top, the layers of carbon that made the leaf tough become sheets of nanostructured carbon to absorb the sodium that carries the charge.

"The natural shape of a leaf already matches a battery's needs: a low surface area, which decreases defects; a lot of small structures packed closely together, which maximizes space; and internal structures of the right size and shape to be used with sodium electrolyte," said FeiShen, a visiting student in the department of materials science and engineering and the other main author of the paper."We have tried other natural materials, such as wood fiber, to make a battery," said Liangbing Hu, an assistant professor of materials science and engineering. "A leaf is designed by nature to store energy for later use, and using leaves in this way could make large-scale storage environmentally friendly."

The next step, Hu said, is "to investigate different types of leaves to find the best thickness, structure and flexibility" for electrical energy storage. The researchers have no plans to commercialize at this time. The work was supported by the Department of Energy's Energy Frontier Research Center program, as part of Nanostructures for Electrical Energy Storage.

Source: Maryland Nano Center

JAPAN BUILDING WORLD'S LARGEST FLOATING SOLAR POWER PLANT

Kyocera Corp. has come up with a smart way to build and deploy solar power plants without gobbling up precious agricultural land in space-challenged Japan: build the plants on freshwater dams and lakes.The concept isn't exactly new. Cielet Terre, based in Lille, France, began pioneering the idea there in 2006. And in 2007, Far Niente, a Napa Valley wine producer, began operating a small floating solar-power generation system installed on a pond to cut energy costs and to avoid destroying valuable vine acreage.

Kyocera TCL Solar and joint-venture partner Century Tokyo Leasing Corp. (working together with Ciel et Terre) already have three sizable water-based installations in operation near the city of Kobe, in the island of Honshu's Hyogo Prefecture. Now they've begun constructing what they claim is the world's largest floating solar plant, in Chiba, near Tokyo.

The 13.7-megawatt power station, being built for Chiba Prefecture's Public Enterprise Agency, is located on the Yamakura Dam reservoir, 75 kilometers east of the capital. It will consist of some 51,000 Kyocera solar modules covering an area of 180,000 square meters, and will generate an estimated 16,170 megawatt-hours annually. That is "enough electricity to power approximately 4,970 typical households," says Kyocera. That capacity is sufficient to offset 8,170 tons of carbon dioxide emissions a year, the amount put into the atmosphere by consuming 19,000 barrels of oil. Three substations will collect the generated current, which is to be integrated and fed into Tokyo Electric Power Company's (TEPCO) 154-kilovolt grid lines.

The mounting platform is supplied by Cielet Terre. The support modules making up the platform use no metal; recyclable, high-density polyethylene resistant to corrosion and the sun's ultraviolet rays is the material of choice. In addition to helping conserve land space and requiring no excavation work, these floating installations, Ciel et Terre says, reduce water evaporation, slow the growth of algae, and do not impact water quality.

To maintain the integrity of the Yamakura Dam's walls, Kyocera will anchor the platform to the bottom of the reservoir. The company says the setup will remain secure even in the face of typhoons, which Japan experiences every year. Kyocera, a Kyoto-based manufacturer of advanced ceramics, has branched out into areas like semiconductor packaging and electronic components, as well manufacturing and operating conventional solar-power generating systems. Now, several Kyocera companies are working together to create a niche industry around floating solar installations.

The parent company supplies the 270-watt, multi cystalline 60-cell solar modules (18.4-percent cell efficiency, 16.4-percent module efficiency); Kyocera Communications Systems undertakes plant engineering, procurement and construction; Kyocera Solar Corp. operates and maintains the plants; and, as noted above, the Kyocera TCL Solar joint-venture runs the overall business.

"Due to the rapid implementation of solar power in Japan, securing tracts of land suitable for utility-scale solar power plants is becoming difficult," Toshihide Koyano, executive officer and general manager of Kyocera's solar energy group told IEEE Spectrum. "On the other hand, because there are many reservoirs for agricultural use and flood-control, we believe there's great potential for floating solar-power generation business."He added that Kyocera is currently working on developing at least 10 more projects and is also considering installing floating installations overseas.The cost of the Yamakura Dam solar power station is not being disclosed. But a Kyocera spokesperson told Spectrum that although the cost of the floating support modules making up the platform is higher than that of platforms used in land-mounted installations, "Implementation costs for floating solar plants and ground-mounted systems are about the same," given that there is no civil engineering work involved.

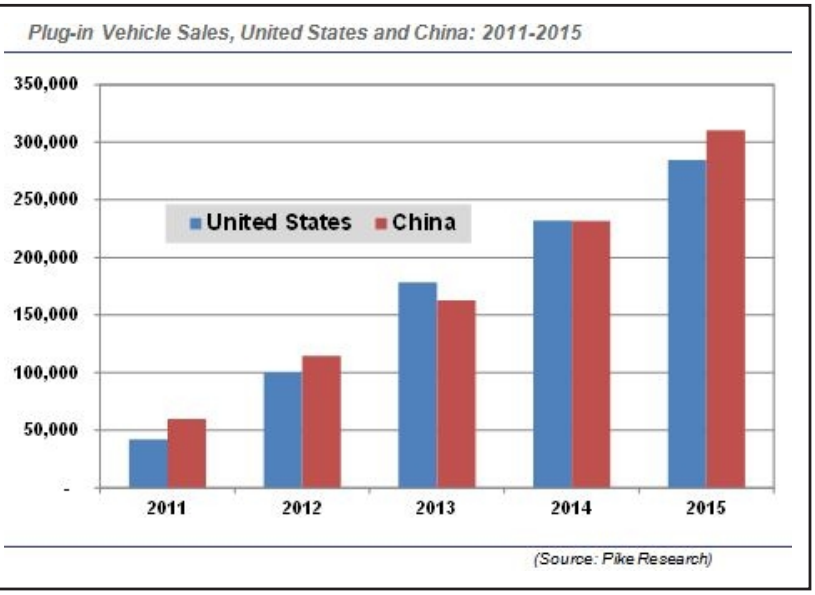
The Yamakura Dam plant is due to begin operation by March 2018.

Courtesy : IEEE

IN COAL-POWERED CHINA, ELECTRIC CAR SURGE FUELS FEAR OF WORSENING SMOG

Automakers' latest projections for rapid growth of China's green car market have added to concerns of worsening smog as the uptake of electric vehicles powered by coal-fired grids races ahead of a switch to cleaner energy. Volkswagen AG plans 15 new-energy models over 3-5 years, its China chief told a green car conference in Beijing on Saturday, predicting - like the government - that Chinese production of electric and plug-in hybrid vehicles would grow almost six times to 2 million annually by 2020. At the same event, BYD Co Ltd's chairman told media that the Chinese automaker's electric vehicle sales would double in each of the next three years.

The government has been promoting electric vehicles to cut the smog that frequently envelops Chinese cities, helping sales quadruple last year and making China the biggest market, the finance minister said at the conference. Less than 1 percent of passenger cars are now new energy, but the pace of growth raises their potential to worsen smog. A series of studies by Tsinghua University, whose alumni includes the incumbent president, showed electric vehicles charged in China produce two to five times as much particulate matter and chemicals that contribute to smog versus gas-engine cars. Hybrid vehicles fare little better. "International experience shows that cleaning up the air doesn't need to rely on electric vehicles," said Los Angeles-based An Feng, director of the Innovation Center for Energy and Transportation. "Clean up the power plants."



China plans to convert the grid to renewable fuel or clean-coal technology as part of efforts to cut carbon emissions by 60 percent by 2020. That will speed the green impact of electric vehicles, said environmental science professor Huo Hong at the elite Tsinghua university. But that goal will be "really difficult to achieve". Tsinghua's studies call into question the wisdom of aggressively promoting vehicles which the university said could not be considered environmentally friendly for at least a decade in many areas of China unless grid reform accelerates. China's industry, environment and science ministries, which devise most new energy vehicle policies, did not respond to requests for comment. BYD and Volkswagen declined to immediately comment.

POLICY MISMATCH

To promote new-energy vehicles, the government has offered various incentives in recent years including tax breaks, and set targets such as having 5 million new-energy vehicles on the road by 2020 - more than 8 times the current number. Authorities in some cities particularly affected by smog have gone further. Beijing and Tianjin, for instance, have exempted new-energy vehicles from limits on the number of new cars granted license plates, and exempted them from driving restrictions that other cars face on certain days of the week.

This month, the industrial Hebei province decreed that all new residential complexes must have car-charging facilities. In western Beijing, 62-year-old retired truck and taxi driver Zhang Zhijun bought a BYD Tang hybrid

last month and plans to trade in his gas-engine Toyota Corolla for an electric car for short rides like taking his grandson to school.

"Right now smog is very heavy in China. This way, if everyone does their part, it will definitely cut down on pollution," Zhang said. But Beijing, Tianjin and Hebei are all more than 90 percent reliant on coal for energy, Tsinghua's research showed. Huo and academics point out that, at the very least, the proliferation of electric vehicles pushes more sources of pollution away from heavily populated urban centers.Whatever the impact, Qin Lihong, president of startup electric automaker Next EV, said cleaning the grid would be the quickest route to clear skies.

ENORMOUS BLADES COULD LEAD TO MORE OFFSHORE ENERGY IN US

A new design for gigantic blades longer than two football fields could help bring offshore 50-megawatt (MW) wind turbines to the United States and the world.

Sandia National Laboratories' research on the extreme-scale Segmented Ultralight Morphing Rotor (SUMR) is funded by the Department of Energy's (DOE) Advanced Research Projects Agency-Energy program. The challenge: Design a low-cost offshore 50-MW turbine requiring a rotor blade more than 650 feet (200 meters) long, two and a half times longer than any existing wind blade. The team is led by the University of Virginia and includes Sandia and researchers from the university of Illinois, the University of Colorado, the Colorado School of Mines and the National Renewable Energy Laboratory. Corporate advisory partners include Dominion Resources, General Electric Co., Siemens AG and Vestas Wind Systems.

Sandia's previous work on 13-MW systems uses 100-meter blades (328 feet) on which the initial SUMR designs are based. While a 50-MW horizontal wind turbine is well beyond the size of any current design, studies show that load alignment can dramatically reduce peak stresses and fatigue on the rotor blades. This reduces costs and allows construction of blades big enough for a 50-MW system. Most current U.S. wind turbines produce power in the 1 to 2-MW range, with blades about 165 feet (50 meters) long, while the largest commercially available turbine is rated at 8 MW with blades 262 feet (80 meters) long.

"The U.S. has great offshore wind energy potential, but offshore installations are expensive, so larger turbines are needed to capture that energy at an affordable cost," Griffith said. Barriers remain before designers can scale up to a 50-MW turbine — more than six times the power output of the largest current turbines.

"Conventional upwind blades are expensive to manufacture, deploy and maintain beyond 10-15 MW. They must be stiff, to avoid fatigue and eliminate the risk of tower strikes in strong gusts. Those stiff blades are heavy, and their mass, which is directly related to cost, becomes even more problematic at the extreme scale due to gravity loads and other changes," Griffith said. He said the new blades could be more easily and cost-effectively manufactured in segments, avoiding the unprecedented-scale equipment needed for transport and assembly of blades built as single units. The exascale turbines would be sited downwind, unlike conventional turbines that are configured with the rotor blades upwind of the tower.

SUMR's load-alignment is bio-inspired by the way palm trees move in storms. The lightweight, segmented trunk approximates a series of cylindrical shells that bend in the wind while retaining segment stiffness. This alignment radically reduces the mass required for blade stiffening by reducing the forces on the blades using the palm-tree inspired load-alignment approach. Segmented turbine blades have a significant advantage in parts of the world at risk for severe storms, such as hurricanes, where offshore turbines must withstand tremendous wind speeds over 200 mph. The blades align themselves to reduce cantilever forces on the blade through a trunnion hinge near the hub that responds to changes in wind speed. "At dangerous wind speeds, the blades are stowed and aligned with the wind direction, reducing the risk of damage. At lower wind speeds, the blades spread out more to maximize energy production." Griffith said. Moving toward exascale turbines could be an important way to meet DOE's goal of providing 20 percent of the nation's energy from wind by 2030, as detailed in its recent Wind Vision Report.

MOLECULAR BIOLOGY

Molecular biology has been used by scientists in the US to make a catalyst that can split water into hydrogen and oxygen. It means that a truly renewable biotechnological material could be used to help cars run on water.

In China, chemists have announced a nanofabric – a catalyst put together atoms at a time – that could begin the process of turning the greenhouse gas carbon dioxide back into fuel. And with what seems like perfect timing, a new technological venture in Switzerland hopes to be the first commercial plant to harvest carbon dioxide from the air. The first two propositions are still in the laboratory stage, and the third has yet to prove its viability. But the laboratory advances keep alive the hopes of the ultimate in energy recycling. In the first process, water provides the energy for a chemical reaction that propels a vehicle, and then ends up again as water from the exhaust pipe of a car. And in the second, a gas released as emissions from fossil fuel could get turned back into fuel.

Platinum catalyst

The hydrogen fuel cell long ago began to deliver energy for manned space flight, and is already in use in urban public transport, with a platinum catalyst fusing hydrogen fuel and oxygen from the air to release electrical energy and water. But platinum is rare and costly to mine. And hydrogen, although the commonest element in the universe, is tricky stuff to handle in bulk.

Trevor Douglas, professor of chemistry at the University of Indiana, US, and colleagues report in Nature Chemistry that they exploited the capacity of a virus to self-assemble genetic building blocks and incorporate a very sensitive enzyme called hydrogenase that can absorb protons and spit out hydrogen gas. They have dubbed it P22-Hyd. "The end result is a virus-like particle that behaves the same as a highly sophisticated material that catalyses the production of hydrogen," Professor Douglas explains. "The material is comparable to platinum, except that it's truly renewable. You don't need to mine it; you can create it at room temperature on a massive scale using fermentation technology. It's biodegradable. It's a very green process to make a high-end sustainable material."

P22-Hyd works in two directions: it breaks the chemical bonds of water to make hydrogen, and it works in reverse to recombine hydrogen and oxygen to generate power. So it could be used both to make hydrogen and to burn it.So far, the scientists have established what could emerge, and such research is just another example of the ingenuity and imagination that engineers and chemists are demonstrating in a host of attempts to find new ways to confront the global energy crisis precipitated by climate change, which is itself a consequence of the prodigal combustion of fossil fuels. Climate change is driven by the remorseless build-up in the atmosphere of carbon dioxide released by fossil fuel combustion – and chemists have already proposed that the greenhouse gas could be recycled.

Attempts to capture carbon have not been promising so far, and the technology required to turn carbon dioxide back into something that burns is still in its infancy.

Atomic structure

But Shan Gao and research colleagues at the Hefei National Laboratory for Physics at the Microscale, China, report in Nature journal that they have found a way to arrange the atomic structure of cobalt and cobalt oxide to turn the metal into something that can more efficiently "reduce" carbon dioxide into the raw material for high-value chemicals one of which would be liquid fuel. Importantly, the new arrangement of cobalt and cobalt oxide is in layers only four atoms thick, and it is this exquisitely refined structure that enables the process of reduction to begin at low energies – which in turn could make it a practical tool for conversion of large quantities of captured carbon dioxide into something of value.

Right now, what is billed as the world's first commercial technology to filter carbon dioxide from the air expects only to retrieve 900 tonnes of the greenhouse gas a year – equivalent to the emissions from the exhausts of 200 cars – and sell it to greenhouses to fertilise commercial crops, or to the soft drinks market to provide the fizz in a soda. But the captured gas could ultimately be available as a raw material for fuel, according to Dominique Kronenberg, chief operating officer of Swiss-based enterprise Climeworks AG, which is working on commercial demonstration of atmospheric CO_2 capture technology.

"We have a fundamental belief that things can't go on the way they've been going on, with more and more oil being pumped out of the ground," he says. "There will be an end sooner or later."

Climate News Network

FLOOD RELIEF CONTRIBUTION

CONTRIBUTION RECEIVED FROM OUR MEMBERS

Sl. No.	Paritculars	Amount Rs.
1.	Ganesh Electricals, Porur, Chennai	100000
2.	R.J. Enterprises, Chennai	10000
3.	Sakthi Electrical Traders, Chennai	10000
4.	Shastha Electricals, Chennai	10000
5.	Shri Vaari Electricals Pvt. Ltd., Chennai	10000
6.	Sivasakthi Electricals, Chennai	10000
7.	Sivasakthi Enterprises, Chennai	10000
8.	Tandem Enterprises, Chennai	10000
9.	A.R.S. Electricals P. Ltd., Chennai	5000
10.	Balaji Electrical, Chennai	5000
11.	Shrishti Power Technologies P. Ltd., Chennai	5000
12.	Sri Balaji Engineering, Aralvaimozhi	5000
13.	SVE Energy Pvt. Ltd., Chennai	5000
14.	Adithya Mechatroniks, Coimbatore	3000
15.	AVB Technologies, Chennai	3000
16.	Shree Sakthie Electrical & Engineering, Salem	2500
17.	Abhinaya Electrical Services, Coimbatore	2000
18.	Anver Electrical Service, Tirunelveli	2000
19.	Devee Enterprises Electricals Pvt. Ltd., Chennai	2000
20.	Eskay Enterprises, Chennai	2000
21.	Guru Engineers, Chennai	2000
22.	Hopes Engineering, Madurai	2000
23.	Yesar Electrics, Rajapalayam	2000
24.	A. Dhanapal, Dharmapuri	1000
25.	Arun Enterprises, Theni	1000
26.	Ashok Power Planning, Chennai	1000
27.	Bhabu Electricals, Kumbakonam	1000
28.	Bhuvanesh Electricals, Ranipet	1000
29.	Chemin Controls & Instrumentation P. Ltd., Pondicherry	1000
30.	Delta Engineers, Chennai	1000

Sl. No.	Paritculars	Amount Rs.
31.	DNR Consultancy, Chennai	1000
32.	EA Facilities Services Pvt. Ltd., Chennai	1000
33.	Electro Rak India Pvt. Ltd., Chennai	1000
34.	Essar Electricals, Chennai	1000
35.	Godrej & Boyce MFG Co. Ltd., Chennai	1000
36.	Jayam Power Controls, Coimbatore	1000
37.	Johnsons Electrical Tradings, Vaniyambadi	1000
38.	Jothi Power Electricals, Chennai	1000
39.	K.G.S. Electricals, Chennai	1000
40.	Karthik Electricals, Chengalpattu	1000
41.	Kevin Electricals Pvt. Ltd., Chennai	1000
42.	Mani Enginering, Salem	1000
43.	Microtech Engineering Corporation, Chennai	1000
44.	Moon Power Systems, Chennai	1000
45.	N.Vasu, Ranipet	1000
46.	N.K. Electricals, Coimbatore	1000
47.	Power & Services, Hosur	1000
48.	Prayagaa Enterprises P. Ltd., Chennai	1000
49.	Saro Electricals, Ranipet	1000
50.	Shree Engineers, Arakkonam	1000
51.	Spaark Electricals, Chennai	1000
52.	Sri Balaji Enterprises, Chennai	1000
53.	Sri Renukadevi Enterprises, Chennai	1000
54.	Subash Electricals, Ambur	1000
55.	Sudha Sudhan Engineers, Chennai	1000
56.	Sundhar Electricals Pvt. Ltd., Karur	1000
57.	Swan Electric Contracts Co P. Ltd., Chennai	1000
58.	Symtec, Chennai	1000
59.	Tech-up Engineering P. Ltd., Trichy	1000
60.	Transclean Electricals, Chennai	1000
61.	Vinpower Engineers & Associates, Erode	1000

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Rs. 5,00,000/-
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towards the material purchased for the flood relief at Cuddalore on 26.12.2015

GREEN ENERGY STORAGE FOR DEMAND MANAGEMENT

Continuous efforts were made to find effective methods for storing Green energy, i.e. hydro, wind, solar etc as they are produced from seasonal natural resources and have to be consumed then and there. So lot of efforts was made to store these energies when the demand is low and to utilize it when the demand is peaking.

Energy storage systems provide a wide array of technological approaches for managing power supply in order to create a more resilient energy infrastructure and bring cost savings to utilities as well as consumers.

The diverse approaches currently being deployed around the world can broadly be divided into the following main categories:

- **Pumped Hydro-Power** - creating large-scale reservoirs of potential energy with water; Pumped storage reservoirs aren't really a means of **generating** electrical power. They're a way of **storing** energy so that we can release it quickly when we need it.
- **Thermal** - capturing heat and cold to create energy on demand
- **Compressed Air Energy Storage** - utilizing compressed air to create a potent energy reserve in the form of pressure.
- **Kinetic energy**
- **Chemical energy**
- **Power to gas**

As stated earlier, electricity must be used as it is being generated and cannot be stored as it is; it has to be converted immediately into another form of energy such as potential, kinetic or chemical and stored.

Load balancing, **load matching**, or **daily peak demand reserve** refers to the use of various techniques by electrical power generation stations to store excess electrical power during low demand periods for release as demand rises. The goal for the power supply system is to achieve a load factor of one.

The load factor is defined as the average load divided by the peak load in a specified time period.

$$f_{\text{Load}} = \frac{\text{Average load}}{\text{Maximum load in given time period}}$$

Storing electrical energy in the form of potential energy:

Pumped-Storage Hydroelectricity (PSH)

A traditional way of storing electrical energy on a large scale is by pumped-storage hydroelectricity; used by large electric power systems for load balancing. This method stores energy in the form of gravitational potential energy of water, pumped from a lower elevation reservoir to a higher elevation reservoir. Low-cost off-peak electric power is used to run the pumps. During periods of high electrical demand, the stored water is released through turbines (a rotary mechanical device that extracts energy from a fluid flow and converts it into useful work) to produce electric power. When there is higher demand, water is released back into the lower reservoir through a turbo gen sets, generating electricity. Reversible turbine/generator assemblies act as pump and turbine usually a Francis turbine design. In addition to electrical production, they may also be used for pumped storage, where a reservoir is filled by the turbine (acting as a pump) driven by the generator acting as a large electrical motor during periods of low power demand, and then reversed and used to generate power during peak demand. Nearly all facilities use the height difference between two natural bodies of water or artificial reservoirs. Pure pumped-storage plants just shift the water between reservoirs, while the "pump-back" approach is a combination of pumped storage and conventional hydroelectric plants that use natural stream-flow. Plants that do not use pumped-storage are referred to as conventional hydroelectric plants; conventional hydroelectric plants that have significant storage capacity may be able to play a similar role in the electrical grid as pumped storage, by deferring output until needed.

Although the losses of the pumping process makes the plant a net consumer of energy overall, the system increases revenue by selling more electricity during periods of *peak demand*, when electricity prices are highest.

Pumped storage is the largest-capacity form of grid energy storage available and as of March 2012, the Electric Power Research Institute (EPRI) reports that PSH accounts for more than 99% of bulk storage capacity worldwide, representing around 127,000 MW. PSH reported energy efficiency varies in practice between 70% and 80%, with some claiming up to 87%.

Some areas of the world such as Norway, Washington and Oregon in the United States, and Wales in the United Kingdom, have used geographic features to store large quantities of water in elevated reservoirs, using excess electricity at times of low demand to pump water up into their reservoirs. The facilities then release the water

which passes through turbine generators and converts the stored potential energy back to electricity when electrical demand peaks. In another example, pumped-storage hydroelectricity in Norway has an instantaneous capacity of 25–30 GW that can be expanded to 60 GW—enough to be the battery of Europe—with efforts underway in 2014 to expand its power transfer links with Germany.

Taking into account evaporation losses from the exposed water surface and conversion losses, energy recovery of 80% or more can be regained. The technique is currently the most cost-effective means of storing large amounts of electrical energy on an operating basis, but capital costs and the presence of appropriate geography are critical deciding factors.

The relatively low energy density of pumped storage systems requires either a very large body of water or a large variation in height. For example, 1000 kilograms of water (1 cubic meter) at the top of a 100 meter tower has a potential energy of about 0.272 kW·h (capable of raising the temperature of the same amount of water by only 0.23 Celsius = 0.42 Fahrenheit). The only way to store a significant amount of energy is by having a large body of water located on a hill relatively near, but as high as possible above, a second body of water. In some places this occurs naturally, in others one or both bodies of water have been man-made. Projects in which both reservoirs are artificial and in which no natural waterways are involved are commonly referred to as “closed loop”.

This system may be economical because it flattens out load variations on the power grid, permitting thermal power stations such as coal-fired plants and nuclear power plants that provide base-load electricity to continue operating at peak efficiency (Base load power plants), while reducing the need for “peaking” power plants that use the same fuels as many baseload thermal plants, gas and oil, but have been designed for flexibility rather than maximal thermal efficiency. However, capital costs for purpose-built hydrostorage are relatively high.

Along with energy management, pumped storage systems help control electrical network frequency and provide reserve generation. Thermal plants are much less able to respond to sudden changes in electrical demand, potentially causing frequency and voltage instability. Pumped storage plants, like other hydroelectric plants, can respond to load changes within seconds.

The upper reservoir (LlynStwlan) and dam of the Festiniog Pumped Storage Scheme in north Wales. The lower power station has four water turbines which generate 360 MW of electricity within 60 seconds of the need arising. The size of the dam can be judged from the road below.

The first use of pumped storage was in the 1890s in Italy and Switzerland. In the 1930s reversible hydroelectric turbines became available solution. These turbines could operate as both turbine-generators and in reverse as electric motor driven pumps. The latest in large-scale engineering technology are variable speed machines for greater efficiency. These machines generate in synchronization with the network frequency, but operate synchronously (independent of the network frequency) as motor-pumps.

The first use of pumped-storage in the United States was in 1930 by the Connecticut Electric and Power Company, using a large reservoir located near New Milford, Connecticut, pumping water from the Housatonic River to the storage reservoir 230 feet above.

The important use for pumped storage is to level the fluctuating output of intermittent energy sources. The pumped storage provides a load at times of high electricity output and low electricity demand, enabling additional system peak capacity. In certain jurisdictions, electricity prices may be close to zero or occasionally negative (Ontario in early September, 2006), on occasions that there is more electrical generation than load available to absorb it; although at present this is rarely due to wind alone, increased wind generation may increase the likelihood of such occurrences.

Kadamparai Hydroelectric Pumped Storage Power Plant

In our country, the 400MW Kadamparai pumped storage plant came up in Tamilnadu state during the years 1987-89. It is located on a river of the same name and utilizes the base created for the earlier 60MW Aliyar project. An upper reservoir had to be created by construction of a masonry-earthen dam. Its underground power house has four vertical Francis reversible units rated at 102MW, with generators of 100MW. The first unit was supplied by Boving and GE of the UK, while the latter collaborated... with India's BHEL to supply the other three units, all of mixed type. The Kadamparai Pumped Storage Hydro Electric station (4 x100 MW) in Coimbatore District was commissioned in the year 1986 and is the first of its kind in the country to operate both in operation and pumping mode since 1987. In this Power House the off peak energy is utilized to pump water to the upper reservoir and during peak hours the Power House is put in generation mode.

Thermal energy storage

Pumped Heat Electrical Storage (PHES)

In Pumped Heat Electrical Storage (PHES), electricity is used to drive a storage engine connected to two large thermal stores. To store electricity, the electrical energy drives a heat pump, which pumps heat from the "cold store" to the "hot store" (similar to the operation of a refrigerator). To recover the energy, the heat pump is reversed to become a heat engine. The engine takes heat from the hot store, delivers waste heat to the cold store, and produces mechanical work. When recovering electricity the heat engine drives a generator.

PHES can address markets that require response times in the region of minutes upwards. The system uses gravel as the storage medium, so it offers a very low cost storage solution. There is no potential supply constraints on any of the materials used in this system. Plant size is expected to be in the range of 2-5 MW per unit. Grouping of units can provide GW-sized installations. This covers all markets currently addressed by pumped hydro and a number of others that are suitable for local distribution for example, voltage support. Technology is in development stage and commercial systems are due in 2014.

Storing electrical energy in the form of pressure energy:

Compressed air energy storage is a way to store energy generated at one time for use at another time using compressed air. At utility scale, energy generated during periods of low energy demand (off-peak) can be released to meet higher demand (peak load) periods. Small scale systems have long been used in such applications as propulsion of mine locomotives. Large scale applications must conserve the heat energy associated with compressing air; dissipating heat lowers the energy efficiency of the storage system.

Compressed air can be squirrelled away in hermetically sealed underground caverns. Then, when electricity is needed, the air can be released and used to turn a generator.

At the moment, however, there are only two compressed-air energy-storage plants in the world (one in America and one in Germany), and neither was built to make use of wind power. Instead, they are designed to take advantage of variations in the price of electricity. When power is cheap, it is used to run their compressors. When it is expensive, the valves are opened and the generators turn.

Compressed-air plants are inefficient, and so they are commercially viable only in places where the price of power varies dramatically. But the intermittent nature of wind power can cause just that sort of variability. At any rate, a group of municipal power companies in the American Midwest reckon that building a wind-powered compressed-air plant to take advantage of the blustery Great Plains will be worthwhile.

Meanwhile, General Compression, a small firm based in Attleboro, Massachusetts, is taking another approach. Its windmill compresses air directly. This has the advantage of eliminating two wasteful steps: the conversion of the mechanical power of a windmill into electricity and its subsequent reconversion into mechanical power in a compressor. But an air-compressing windmill, while fine for storing energy, cannot transmit electricity directly to the grid.

Compression of air generates heat; the air is warmer after compression. Expansion requires heat. If no extra heat is added, the air will be much colder after expansion. If the heat generated during compression can be stored and used during expansion, the efficiency of the storage improves considerably.

There are three ways in which a CAES system can deal with the heat. Air storage can be adiabatic, diabatic, or isothermal:

- Adiabatic storage retains the heat produced by compression and returns it to the air when the air is expanded to generate power. This is a subject of ongoing study, with no utility scale plants as of 2010, but a German project ADELE is planned to enter development in 2013. The theoretical efficiency of adiabatic storage approaches 100% with perfect insulation, but in practice round trip efficiency is expected to be 70%. Heat can be stored in a solid such as concrete or stone, or more likely in a fluid such as hot oil (up to 300°C) or molten salt solutions (600°C).
- Diabatic storage dissipates the extra heat with intercoolers (thus approaching isothermal compression) into the atmosphere as waste. Upon removal from storage, the air must be re-heated prior to expansion in the turbine to power a generator which can be accomplished with a natural gas fired burner for utility grade storage or with a heated metal mass. The lost heat degrades efficiency, but this approach is simpler and is thus far the only system which has been implemented commercially. The McIntosh, Alabama CAES plant requires 2.5 MJ of electricity and 1.2 MJ lower heating value (LHV) of gas for each mega joule of energy output. A General Electric 7FA 2x1 combined cycle plant, one of the most efficient natural gas plants in operation, uses 6.6 MJ (LHV) of gas per kW–h generated, a 54% thermal efficiency comparable to the McIntosh 6.8 MJ, at 53% thermal efficiency.
- Isothermal compression and expansion approaches attempt to maintain operating temperature by constant heat exchange to the environment. They are only practical for low power levels, without very effective heat exchangers. The theoretical efficiency of isothermal energy storage approaches 100% for perfect heat transfer to the environment. In practice neither of these perfect thermo dynamic cycles is obtainable, as some heat losses are unavoidable.

A different, highly efficient arrangement, which fits neatly into none of the above categories, uses high, medium and low pressure pistons in series, with each stage followed by an air blast venturi pump that draws ambient air over an air-to-air (or air-to-seawater) heat exchanger between each expansion stage. Early compressed air torpedo designs used a similar approach, substituting seawater for air. The venturi warms the exhaust of the preceding stage and admits this preheated air to the following stage. This approach was widely adopted in various compressed air vehicles such as H.K. Porter, Inc's mining locomotives and trams. Here the heat of compression is effectively stored in the atmosphere (or sea) and returned later on.

Compression can be done with electrically powered turbo-compressors and expansion with turbo 'expanders' or air engines driving electrical generators to produce electricity.

The storage vessel is often an underground cavern created by solution mining (salt is dissolved in water for extraction) or by utilizing an abandoned mine. Plants operate on a daily cycle, charging at night and discharging during the day.

Compressed air energy storage can also be employed on a smaller scale such as exploited by air cars and air-driven locomotives.

Storing electricity in the form of chemical energy

- **Solid State Batteries** - a range of electro chemical storage solutions, including advanced chemistry batteries and capacitors.
- **Flow Batteries** - batteries where the energy is stored directly in the electrolyte solution for a longer cycle life, and quick response times.

This "dispatchable power" better enables the grid to balance the amount of energy placed on the grid as demand rises and falls.

Although different types of batteries have been researched and tested for long-duration energy storage, flow batteries are starting to be installed at the demonstration level on the grid. They also show a promising cost trajectory, as flow battery manufacturers think they can make significant cost reductions given greater production scale. In a flow battery, chemical solutions serve as the positive and negative electrolytes. They are typically stored in separate tanks and delivered to an electro chemical cell stack (resembling a fuel cell) via a recirculation pump. Some designs eliminate one of the tanks by adding passages within the remaining container to separate and recirculate the electrolyte to the electrodes.

Flow batteries are scalable in that the cell stack size can be increased if more power is needed for an application. Adding more electrolyte results in a battery, that runs longer. Flow battery technology will compete with today's energy storage technologies as well as other advanced technologies including sodium sulphur, sodium nickel chloride and flywheels for a share of the grid-connected energy storage market, according to a report from IHS

Technology. Although only 200 MW of energy storage systems currently are installed in the U.S., annual installations are expected to reach more than 2,500 MW in 2017.

Flow batteries present an alternative as they can store up to 12 hours of charge at a time as the electrolyte circulates for constant recharging. Their lifespan also is measured in decades. By comparison, a lithium-ion battery has a lifespan of 5-7 years.

American Vanadium's flow battery, called CellCube, uses vanadium as its electrolyte. Vanadium is the only element that enables one element on both the anode and the cathode.

Flow batteries offer the promise of cost effectiveness, but affordability poses a second concern in the early stages of the technology's commercial deployment.

Flow batteries take up much more space to hold the same amount of energy compared with alternatives, notably lithium-ion batteries.

Despite some of the hills that flow batteries still must scale, recent improvements in cost and efficiency, along side new regulatory requirements, show that electrical storage will be a big part of the next-generation power grids that take full advantage of renewable power source.

Storing electricity in the form of kinetic energy

Flywheels as Mechanical Batteries

Flywheels - mechanical devices that stores energy in the form of rotational kinetic energy to deliver instantaneously electrical energy.

Flywheels Energy Storage (FES) is a relatively new concept that is being used to overcome the limitations of intermittent energy supplies, such as Solar PV or Wind Turbines that do not produce electricity throughout the year, as they are seasonal.

A flywheel energy storage system can be described as a mechanical battery, in that it does not create electricity, it simply converts and stores the energy as kinetic energy until it is needed. In a matter of seconds, the electricity can be created from the spinning flywheel making it the ideal solution to help regulate supply in the electrical grid.

It is based on a really old concept and is very similar to an old-fashioned pottery wheel where the potter makes the wheel spin. As the potter works, he removes energy from the system, so he has to keep the wheel spinning.

A flywheel is a heavy shaft mounted rotating disc that speeds up when electrical energy is applied to it. When energy is needed, the flywheel is slowed and the kinetic energy is converted back to electrical energy, where it can be transmitted to where it is required.

The energy a flywheel contains is a function of the speed that it is spinning multiplied by the moment of inertia.

The moment of inertia states that the effective mass of a spinning object is not dependant on how much actual mass the spinning object contains. Instead, it is dependant on where the mass is located in relation to the central point that it is rotating around.

For example, if spinning at the same speed, a solid flywheel will store less energy than a flywheel of the same mass that has spokes and its weight situated around the rim of the wheel.

The speed that the flywheel rotates has a larger effect on the energy stored within it compared to the moment of inertia. If a flywheel with a rim weighing 1kg is replaced with a flywheel with a 2kg rim, it has the potential to store double the energy. If the same flywheel is run at double the speed it can quadruple the potential energy that it can store.

- Historically, flywheels have been huge steel structures with the majority of the weight distributed towards the rim of the wheel. However, over the last 30 years, scientific innovation has meant that flywheels can store more energy in less weight and volume, increasing their potential for energy storage. Newer flywheels are made from very strong composite materials and are operated on a bed of near frictionless magnetic bearings housed in a vacuum enclosure. This allows the flywheels to be spun at incredible speeds helping maximize the energy that they can store. In fact NASA scientists have managed to get flywheels to spin in excess of 60,000 revolutions per minute, which is nearly 2.5 times the speed of sound. The amount of kinetic energy that can be stored at this speed makes them ideal for replacing chemical batteries in the future.
- There is also potential to use magnetic levitation as a way of prolonging the life of the flywheel energy storage systems. Since there is no friction on a system that is magnetically levitated there will be no wear on the system, so it is thought that these systems could last fifteen years or more as opposed to a chemical battery that may only last five years.

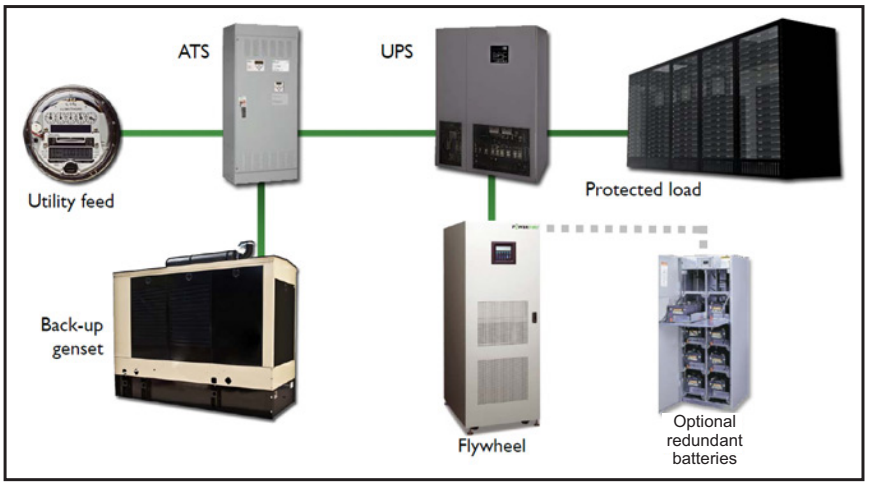
Key advantages of high-speed flywheels:

Faster, stronger, lighter, smaller

First generation flywheels, still sold today, were introduced in the mid-'90s. They use a massive steel disk rotating at a relatively slow speed.

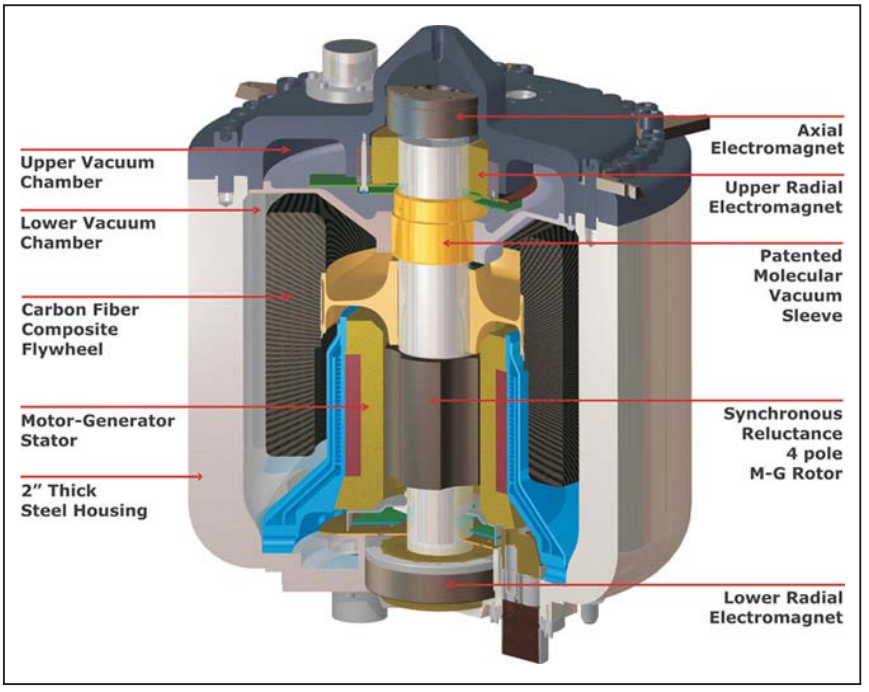
Kinetic energy is roughly equal to mass times velocity squared. So doubling mass doubles energy storage, but doubling the rotational speed quadruples energy storage.

Thus, it makes sense to use less mass to create a lighter, more compact footprint, but make the material stronger and safer (hence POWER*THRU*'s carbon-fiber-composite flywheel cylinder) and spin it faster to maximize energy density.



Patented, bearing-free operation

Heavy steel flywheels have mechanical bearings that must be replaced every 2-3 years at a heavy cost and the better part of a day's worth of downtime. Not so with the POWER*THRU* system. Its small spinning mass is completely magnetically levitated: no bearings. This eliminates a mechanical point of failure, as well as the friction, heat generation/cooling needs, energy waste and maintenance/downtime issues related to bearings.

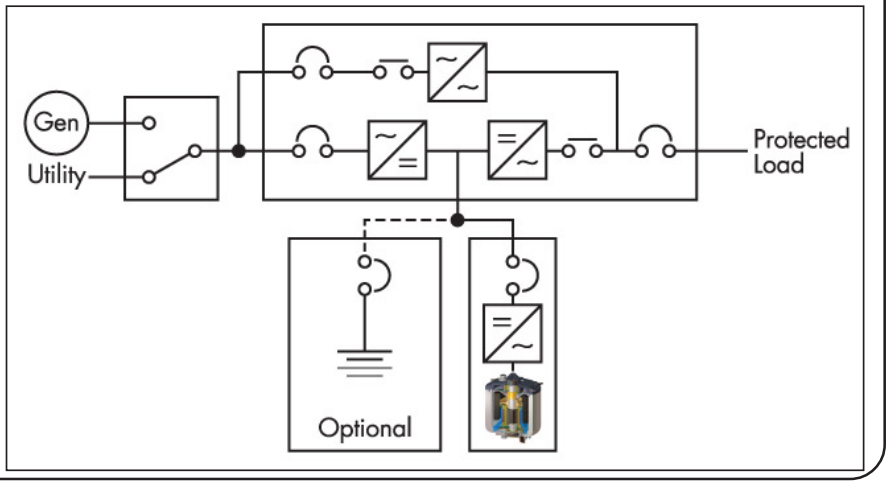


Patented, pump-free operation

Flywheels spin in a vacuum to minimize aerodynamic drag. Other systems use a constantly operating mechanical pump to maintain a rough vacuum. POWER*THRU*'s award-winning systems use a patented molecular vacuum sleeve on the flywheel shaft. The shaft speed, combined with the sleeve's helical grooves, maintains the system's high vacuum (<5 millitorr, or >99.9993% evacuated). This eliminates a mechanical point of failure, energy consumption and maintenance/downtime issues related to a continuously operating mechanical pump. POWER*THRU* products are developed for commercial applications and not home use.

Synchronous reluctance motor-generator

POWER*THRU* uses a synchronous reluctance motor-generator design that's more energy efficient than permanent magnet types used in conventional flywheel systems. Permanent magnets are sensitive to heat and become less capable of operating to full capacity over time. This is particularly an issue in a vacuum environment. POWER*THRU*'s synchronous reluctance motor-generator design is somewhat more costly, but has no demagnetization issues even in



temperature and vacuum extremes. This ensures performance of POWER*THRU* system will not degrade over time.

What is new in green or renewable electricity storage?

power to gas systems

In Europe, there is a concern with respect to renewable; Storage, usually electrochemical batteries, is used to smooth out sub-one hour power fluctuations of wind farms. However, such storage systems are too costly, although there are quite a few battery-storage projects, most depend on government subsidies for their existence.Some companies have conducted research in the use of power to gas systems (P2G) i.e. using renewable electricity to produce methane. That is similar to "conventional" electro-chemical storage but with the potential to store almost unlimited amounts of energy at close to zero additional cost.The largest currently operational P2G project is located in Werlte, Germany. The plant was designed and built by Etogas for Audi and has a capacity of 6MW. The plant uses renewable power to produce hydrogen which is then combined with CO_2 (from a neighbouring biogas plant - Germany has 8000 biogas plants) to produce methane. The bio-gas plant reuses heat produced by the P2G process thus giving a claimed efficiency of around 78% i.e. 1MWh of electricity gives 780kWh of methane.

Conclusion: Electrical Energy Storage, EES, is one of the key technologies in the areas covered by the IEC. EES techniques have shown unique capabilities in coping with some critical characteristics of electricity, for example hourly variations in demand and price. In the near future EES will become indispensable in emerging IEC-relevant markets in the use of more renewable energy, to achieve CO_2 reduction and for Smart Grids. Historically, EES has played three main roles. First, EES reduces electricity costs by storing electricity obtained at off-peak times when its price is lower, for use at peak times instead of electricity bought then at higher prices. Secondly, in order to improve the reliability of the power supply, EES systems support users when power network failures occur due to natural disasters, for example. Their third role is to maintain and improve power quality, frequency and voltage. Regarding emerging market needs, in on-grid areas, EES is expected to solve problems – such as excessive power fluctuation and undependable power supply – which are associated with the use of large amounts of renewable energy.

*(The author of this article is **Sri K.R. Govindan**, an octogenarian, with sixty years of experience in electrical field of large industries; started his carrier with electricity department of Madras in special maintenance and MRT, and Indian drugs and pharmaceuticals, Madras fertilizers ; **has been a consultant to Petroleum ministry of Saudi Arabia for the electrical systems of their refineries for ten years till 1990** and started his own organization **Kavoori Consultants** and has carried out energy, installation and safety audits in large industries – cement, Petrochemical, paper, sugar, pharmaceuticals and other heavy engineering and other industries; now concentrating on training of electrical executives for large organizations).*

HUMOUR

Grey Hair...

A curious child asked his mother: "Mommy, why are some of your hairs turning grey?"

The mother tried to use this occasion to teach her child: "It is because of you, dear. Every bad action of yours will turn one of my hairs grey!"

The child replied innocently: "Now I know why grandmother has only grey hairs on her head."

Brag...

Q: Men often brag that there are women waiting by the phone at this very moment for their call. Who are these women?

A: Women who answer Toll-free numbers

The First Step...

Two coworkers were talking by the water fountain one guy said, "Today I got through the first step of getting divorced."

The second guy replies, "Oh, did you go to Mr. Guggenheim? Everyone goes to him for divorces."

The first man replies, **"No, I just got married"**.

Typhoid! Tetanus! Measles...!

A new nurse listened while the doctor was yelling, "Typhoid! Tetanus! Measles!"

The new nurse asked another nurse, "Why is he doing that?"

The other nurse replied, "Oh, he just likes to call the shots around here."

Traffic Court...

At a traffic court, the judge asked the motorist: Tell me, why did you park your car here?

The man said: "Well, there was a sign that said **"fine for parking"**.

Microsoft Bulb...

Q: How many Microsoft engineers does it take to screw in a light bulb?

A: None. They just declare darkness the standard.

LIGHT WEIGHT FREYGEIST E-BIKE LOOKS AND LIFTS MORE LIKE A REGULAR BIKE

The Freygeist e-bike weighs 26.5 lb and looks quite similar to a non-electric urban commuter.

Some are louder than others, but e-bikes are usually easy to spot. Evidence like a battery pack sticking up off the down tube, a thick, rectangular top tube or a large motor on the wheel is hard to miss. German startup Freygeist believes that the electric bike should look and feel more like the classic pedal bike. Its new Classic pedelec is virtually indistinguishable as an electric. Thanks to cleanly integrated hardware and a 26.5-lb (12 kg) curb weight. You won't notice the electric drive until it kicks in.

It's not uncommon for e-bikes to have their batteries integrated into the tubes, but Freygeist's design is more seamless than average. The 33V, 337-Wh Panasonic lithium-ion battery is completely contained within the down tube, and while a measuring tape might detect a difference between the Freygeist tube and the average pedal bike tube, our naked eyes don't see it in the photos - it looks like a classic diamond bike frame. The battery feeds an equally inconspicuous rear hub motor offering 250 watts of continuous power and 500 watts of max power.

The only obvious "e-bike" visual on the Freygeist frame is the electrical hardware and wiring routed between the lower down tube and hub motor. Freygeist lists weight of the aluminum-framed, carbon-forked 10-speed at 26.5 lb (12 kg), which puts it on par with some of the lightest e-bikes. Freygeist's low weight helps to optimize motor drive efficiency and make the bike easier to pedal when battery power runs out.

Freygeist estimates range between 44 and 62 miles (70 and 100 km), explaining that efficiency is optimized through low weight, low rolling resistance, seating position and engine coasting. Engine-supported top speed is the standard 15.5 mph (25 km/h) needed to meet pedelec regulations in Freygeist's part of the world.

Freygeist's battery placement doesn't allow for removal during charging, so the owner has to roll the whole bike up to the outlet and connect the charger to the port on the down tube. The full charging process takes three to four hours from a 220V outlet.

Components have clearly been selected to further the bike's urban-e-bike-in-disguise character. Those include a Brooks brown leather saddle and handlebars, Shimano shifters and brakes, and Continental tires.

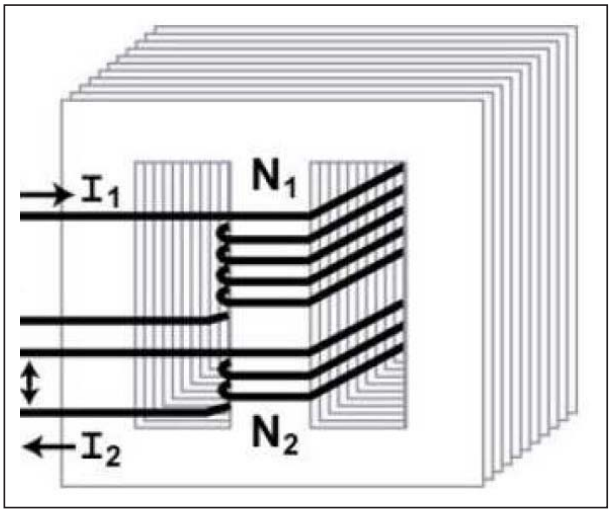
Freygeist offers the Classic for €3,990 (approx. US$4,330) and says that it takes about 21 days for delivery. **The bike was voted a finalist in this year's ISPO Brand New Awards**.

ENERGY CONSERVATION THROUGH ENERGY EFFICIENCY – 11

Electrical Losses - Magnetization Losses

Magnetization losses are 'Constant Losses' and they occur in the Electricity System where ever Electro Magnetism is a part of the System. It is accounted in large measure in the Transformers and the Motors which are major equipments in the Transmission, Distribution and Utilization of Electrical Energy.. They occur all the time and they are fixed losses, unlike the ***I^2R losses*** which are varying losses. The entire Electrical Energy goes through Transformers of different Voltages, Types and Ratings to reach the Electricity at the final consumption point. The major portion of Electricity, to the extent of almost 80%, goes through Motors of very large span of ratings and duties, for conversion to Mechanical Energy to put Electricity into Productive use. The normal proportion of Magnetization Losses out of the total Electrical losses, when the equipments work on 'Full Load' are estimated as, about 10 to 15% in case of Transformers and about 20 to 25% in case of Motors. As these are fixed losses, depending on the loading or No Load conditions, which are quite common, the proportion of Magnetization losses could be much higher even up to say 90% while on low load are no load conditions. Hence they form a large chunk of the Electrical Losses and reducing them can help improve Efficiencies and Conservation of Energy in large measure.

Efficiency Improvements in Transformers and Magnetic Materials – Case Study:



ENERGY EFFICIENT TRANSFORMERS

No – load loss resulted from the magnetization of core laminations, depends upon the following parameters of core: -

1) Thickness varies from 0.23 to 3.0 mm
2) Quality - CRGO, HI-B Grade, Lazer Grade, Amorphous
3) Flux density
4) Specific gravity of core

Reduction in No-load losses can be achieved by

1) Using better quality core
2) Sharpening the edges of the core at with appropriate angle
3) Building Single strip core building for reduced the air gap.
4) Annealing the core so as to

i. Reduce mechanical stress in the lamination to a minimum to yield optimum magnetic proprieties

ii. Prevent contamination of the steel with oxygen and or carbon

iii. Retain or enhance the insulation quality of the lamination coating.

Iron Boron Silicon amorphous alloy is a unique alloy whose structure of metal atoms occurs in random patters as opposed to conventional CRGO steel which has an organized crystalline structure. The higher resistance to magnetization and demagnetization through the crystalline structure leads to higher core losses in CRGO.

DESIGN OF ENERGY EFFICIENT TRANSFORMERS

Cost Benefit Analysis (done in 2013)

For techno commercial study a practical size of 200 KVA,11/0.433KV distribution transformer has been considered. For comparison purpose 200KVA distribution has been designed using three different core materials CRGO M-4,HiB and lazer grade stampings.

The thickness of stampings in case of M-4 and HiB grades has been taken as 0.27mm & that of lazer grade as 0.23mm based on availability of these core materials in the market. The working flux density before approaching the Knee point in case of all the materials and also watt loss/Kg are different .This amounts to that the weight of the core and also losses particularly iron losses are going to be different when designed considering these three

cores. Transformers with three cores under consideration have been designed and weight of core, iron losses 7 also load losses have been detailed out in table –I. Due to variation in total weight of transformers and due to variation in the rate of different cores, the initial cost of the transformers for the three designs works out to be different as indicated in table-I. Here it is pertinent that the initial cost alone cannot be taken for ensuring commercial viability but we need to take into account the variation in the iron and load losses as well.

In case we consider/assume

i. Rate of interest (@ 10 %)
ii. Rate of electrical energy as Rs 3/kwh
iii. Life of transformer (as 25 years)
iv. Load factor of distribution transformer as 60%

The iron and copper losses can be capitalized for working out the commercial feasibility. The capitalized cost of iron losses (Wi), Copper losses (Wc) and total cost (Ct) including initial cost as worked out as indicated in table-I

A 200 KVA 11/0.433 KV Transformer with different three core materials:

Table -1

Parameters	**Conven.**	**EET I**	**EET II**
Core material	CRGO M-4	HiB	Lazer Grade
Thickness	0.27	0.27	0.23
Watt/Kg	1	0.56	0.3
Weight of core	396Kg	457Kg	465Kg
Iron Losses	500 Watts	300 Watts	180 Watts
Load Losses	2800 Watts	2300Watts	2300 Watts
Initial Cost	200000	230000	260000
Wi	119272	71563	42938
Wc	291979	243316	243316
Ct	611251	544879	546254
Saving per transformer		66372	64997

Saving in respect of KW

Total Saving in Losses = 0.82 KW

CALCULATION OF ENERGY SAVING IN MWH:-

Energy saving by Energy Efficient 200 KVA

Transformer = 0.82 KW per hour

Thus saving for 1 KVA = (0.82 / 200) KWh

Net saving by replacing entire transformers of the system will be (It is estimated that a Medium/ Large State like Tamilnadu will have Transformers Installed

Capacity of around 250,00,000 KVA Transformers)

250,00,000 x 0.82/200 KWh = 1,02,500 KWh

= 102 MWh

Calculation of reduction in coal consumption: -

Coal require to generate 1 unit i.e. 1KWh = 0.75 Kg

Coal require to generate 102000KWh = 102000 * 0.75

= 76500 Kg / h

i.e. coal require in a year will be 76500 * 24 * 365

Net Saving in Coal Consumption will be 6,70,140 Tons per year

Environmental benefit

- The heat dissipation by the Tank Surface & Radiators can be reduced by designing better energy efficient transformer thus will be beneficial to the global environment.
- This reduction in the heat dissipation will improves the life of insulations of the core, oil & winding and thus save the wastage in the form of burning or heating.
- Since Generation of power lost in terms of transformer losses will be reduce, the emission of CO_2 will be reduced.

Calculation of co_2 emission reduction: -

60 W of electricity emits Co_2 @ 60 grams/hr [14] i.e. 1 W will emit Co_2 @ 1 gram /hr. Thus, 102000000 W will emit Co_2 102000000 grams /hour i.e. 102000 Kg / hour Co_2 emission will be reduced in the Environment**.**

(To be continued)

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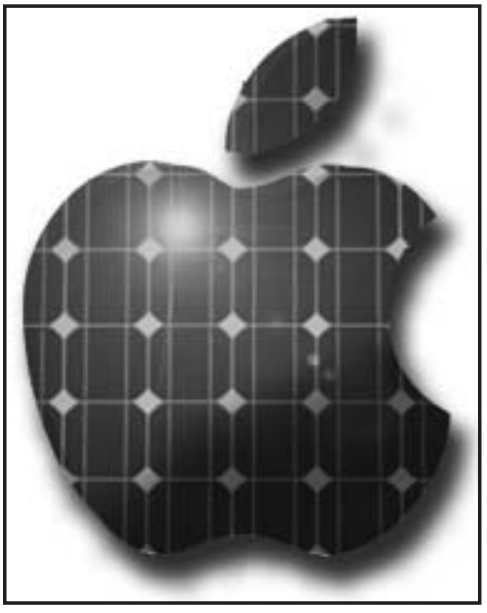
Mobile: 98401 55209

SOLAR - APPLE



Apple Computer, the world's largest technology company, will begin using solar power to run all of its facilities in Singapore from next year, in line with its target to use only renewable energy at its properties worldwide. The United States-based firm will be working with Singapore's solar company Sunseap Group, which will supply the tech giant with energy generated by solar panels on the rooftops of more than 800 buildings in Singapore, including residential blocks.This arrangement will make Apple the first company in Singapore to be 100 per cent powered by renewable energy, according to the statement.

Lisa Jackson, Apple's vice-president of environment, policy and social initiatives, said: "Climate change is one of the great challenges of our time, and it's going to take determination and innovation to make the much needed transition to a green economy." "This deal will cover all of our electricity needs in Singapore, including our 2,500-person corporate campus and new retail store. We're thrilled to be working with Sunseap and the government of Singapore to pioneer new ways to bring solar energy to the country — and bring Apple even closer to our goal of powering our facilities around the world with 100 per cent renewable energy."

Apple has been powering all its data centres worldwide with renewable energy since 2013. All its operations in the U.S. run on only clean energy and by next year, its operations in China will **also** be powered solely by renewables.

In Singapore, Sunseap - one of the biggest homegrown suppliers of solar energy - will channel the surplus power produced by its portfolio of 800 buildings of up to 40 GWh (gigawatt-hours) into Apple's facilities through an off-site power purchase agreement (PPA). The PPA allows companies and building owners to use renewable energy without installing solar systems on their own their rooftops, Sunseapsaid.Currently, about 60 per cent of the power generated by Sunseap across Singapore are from panels spread over 900 tall housing blocks, also known as Housing Development Board (HDB) flats, a company spokesperson said. Of that energy, about 60 to 70 percent are fed into the grid. The deal, of an undisclosed amount, will also include a on-site rooftop solar project of 1.1 MWp (megawatt peak) Sunseap is now installing on the rooftops of Apple's main building in Ang Mo Kio under a solar leasing agreement.

Solar leasing is a scheme under which the solar company pays the upfront and maintenance costs of the solar panels in exchange for monthly payments from a building or property owner. This arrangement allows building owners to begin immediately saving on their energy bills without the huge initial investment, and solar firms to have a predictable cash-flow.

While solar energy accounts for less than 5 per cent of Singapore's energy, the industry has grown in recent years. Currently, about 33 MWp of photovoltaic capacity is installed, generating enough electricity to power 6,600 two-bedroom apartments. By 2020, the Singapore government aims to install 350MWp of solar capacity in the country.

ANURADHA DESAI | V.H. GROUP | ENTREPRENEUR

ANURADHA DESAI
Chairperson, V.H. Group

Up Above In The Sky Our Godjee Must Be Wondering As To What Is Happening To His Earlier **"Snake Charmers"**, *To Become World Class Entrepreneurs!*

Mrs. Anuradha Desai is the chairperson of the flagship Company; **The Venkateswara Hatcheries Group**. With over 30 years of experience in the poultry industry; her dynamic and capable leadership has propelled the Group to unprecedented success nationally & globally in a span of 30 years. She has played a significant role in the quantum leap of egg production, consumption & export in the country. She is the first woman to be elected as **President of World Poultry Science Association (IB)**.

She is the first Indian to take over an **English Premier League (EPL) football club**, the Blackburn Rovers, for almost Rs.165 crore.

Today the **VH Group is a US$1 billion conglomerate, the largest fully integrated poultry group in Asia**. Anuradha has played a significant role in increasing the per capita consumption of eggs in India and also in increasing export of eggs. She never considers herself number one, as it hampers her urge to do better. Her father, **Padmashri Dr. B.V. Rao** was the pioneer of the modern poultry industry. Dr. Rao was also affectionately called **"The Father of Indian Poultry Industry"**. He was the driving force behind transforming poultry from a mere backyard activity into an organized world class industry.

He strived ceaselessly for over four decades acquiring the latest technologies from all over the world and assimilating them into the Indian industry; giving an impetus to indigenous R&D, modernizing the Farm Management system, encouraging value addition, imparting professional training to the farmers, unifying them to shape their own destiny.

His success was due to the fact that he was able to unite the farmers and promoted the slogan, **"My egg, my price, my life"**.

Anuradha is assisted by her brothers Balaji and Venkatesh Rao and her husband Jitendra. The family has made Ande Ka Funda bloom into several verticals which surely has resulted in increase in employment, empowerment of women entrepreneurs in villages, thus reducing poverty.

20 MOST PEACEFUL COUNTRIES IN THE WORLD - 15

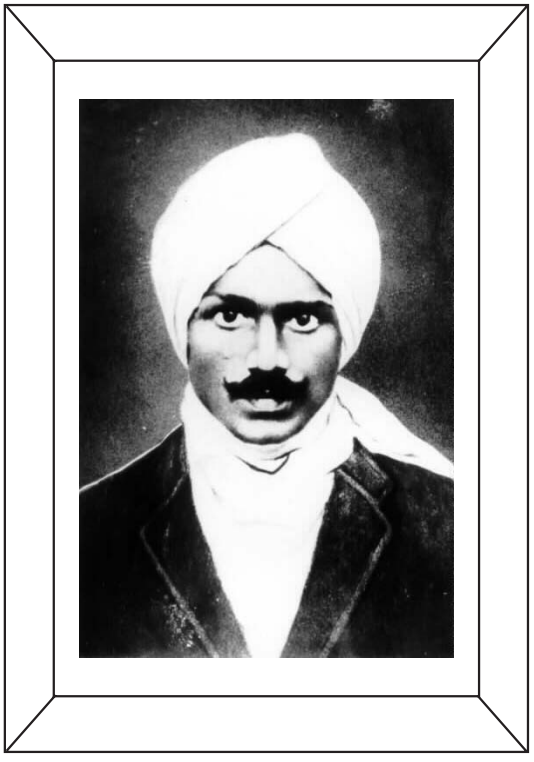
AUSTRIA

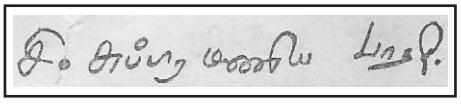
AUSTRIA is a small landlocked South Central European country which gains a place on the list of the most peaceful countries in the world for its stance on international politics. Since World War I and the break-up of the Austro-Hungarian Empire and World War II, Austria has been content to embrace a life of peace and serenity. Many people claim that Austria is a great country to live in and I personally agree with them. After all, with its world-famous resorts in the breathtaking Alps, and magnificent cultural centers like Vienna, I think it's not surprising to see Austria on this list.

(To be continued)
Courtesy: Amerikanki

SUBRAMANIA BHARATHI

Chinnaswami Subramania Bharathi (*11 December 1882 – 11 September 1921*) was an Indian writer, poet, journalist, Indian independence activist and social reformer from Tamil Nadu. Popularly known as **"MAHAKAVI BHARATHI"**, he was a pioneer of modern Tamil poetry and is considered one of the greatest Tamil literary figures of all time. His numerous works were fiery songs kindling patriotism and nationalism during the Indian Independence movement.



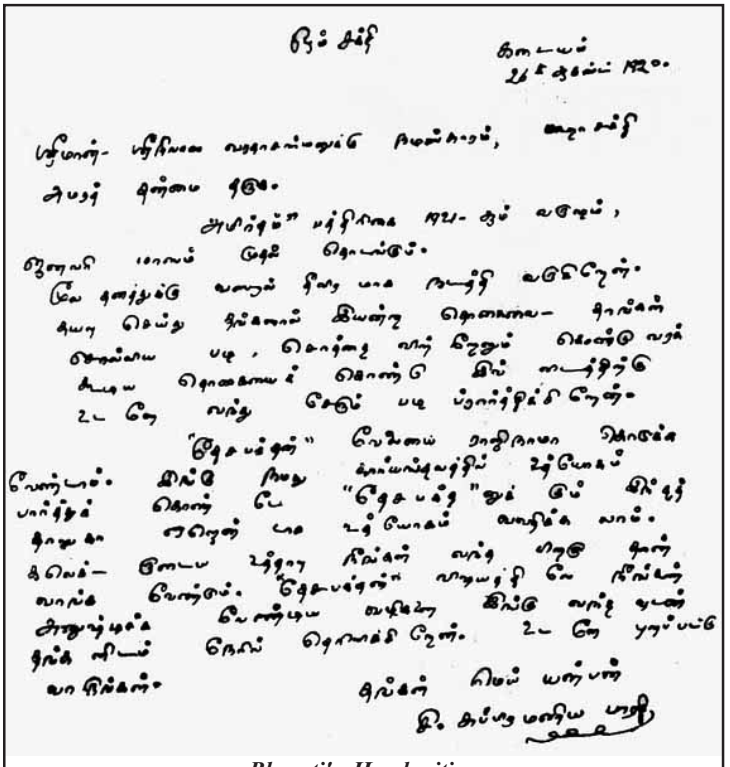


Born in Ettayapuram of the then Tirunelveli district (present day Thoothukudi) in 1882, Bharathi had his early education in Tirunelveli and Varanasi and worked as a journalist with many newspapers, notable among them being the *Swadesamitran* and *India*. Bharathi was also an active member of the Indian National Congress. In 1908, an arrest warrant was issued against Bharathi by the government of India for his revolutionary activities, forcing him to flee to Puducherry, where he lived until 1918.

Bharathi's works were on varied themes covering religious, political and social aspects. Songs penned by Bharathi are widely used in Tamil films and music concerts.

Early life

Bharathi was born to Chinnasami Subramanya Iyer and Lakhsmiammaal as Subbayya on 11 December 1882 in the village of Ettayapuram. He was educated at a local high school called The M.D.T. Hindu College in Tirunelveli. From a very young age he learnt music and at eleven, he learnt poetry. It was during this time that he was conferred the title of **"Bharathi"**, the one blessed by **Saraswati**, *the goddess of learning*. Bharathi lost his mother at the age of five and his father at the age of sixteen. He married Chellama who was seven years old when he was fourteen years old. He was brought up by his father who wanted him to learn English, excel in arithmetic, and become an engineer. *Through his great efforts he learnt 32 languages (29 Indian languages and 3 foreign languages).*



Bharati's Handwriting

During his stay in Varanasi, Bharati was exposed to Hindu spirituality and nationalism. This broadened his outlook and he learned Sanskrit, Hindi and English. In addition, he changed his outward appearance. He also grew a beard and wore a turban. Though he passed an entrance exam for a job, he returned to Ettayapuram during 1901 and started as the court poet of Raja of Ettayapuram for a couple of years. He was a Tamil teacher from August to November 1904 in Sethupathy High School in Madurai. During this period, Bharati understood the need to be well-informed of the world outside and took interest in the world of journalism and the print media of the West. Bharathi joined as Assistant Editor of the *Swadeshamitran*, a Tamil daily in 1904. In December 1905, he attended the All India Congress session held in Benaras. On his journey back home, he met Sister Nivedita, Swami Vivekananda's spiritual heir. She inspired Bharati to recognise the privileges of women and the emancipation of

women exercised Bharati's mind. He visualised the new woman as an emanation of Shakti, a willing helpmate of man to build a new earth through co-operative endeavour. He considered Nivedita as his Guru and penned a couple of lyrics praising her. He attended the Indian National Congress session in Calcutta under Dadabhai Naoiroji, which demanded Swaraj and boycott of British goods.

By April 1907, he started editing the Tamil weekly *India* and the English newspaper *Bala Bharatham* with M.P.T. Acharya. These newspapers were also a means of expressing Bharati's creativity, which began to peak during this period. Bharati started to publish his poems regularly in these editions. From hymns to nationalistic writings, from contemplations on the relationship between God and Man to songs on the Russian and French revolutions, Bharati's subjects were diverse.

Bharati participated in the historic Surat Congress in 1907 along with V.O. Chidambaram Pillai and Mandayam Srinivachariar, which deepened the divisions within the Indian National Congress between the militant wing led by Tilak and Aurobindo and the moderate wing. Bharati supported Tilak and Aurobindo together with V. O. Chidambaram Pillai and Kanchi Varathaachariyar. Tilak openly supported armed resistance against the British.

In 1908, he gave evidence in the case which had been instituted by the British against V.O. Chidambaram Pillai. In the same year, the proprietor of the journal *India* was arrested in Madras. Faced with the prospect of arrest, Bharati escaped to Pondicherry which was under French rule. From there he edited and published the weekly journal *India*, *Vijaya*, a Tamil daily, *Bala Bharatha*, an English monthly, and *Suryothayam*, a local weekly in Pondicherry. The British tried to suppress Bharati's output by stopping remittances and letters to the papers. Both *India* and *Vijaya* were banned in India in 1909.

During his exile, Bharati had the opportunity to meet many other leaders of the revolutionary wing of the Independence movement like Aurobindo, Lajpat Rai and V.V.S. Aiyar, who had also sought asylum under the French. Bharati assisted Aurobindo in the *Arya* journal and later *Karma Yogi* in Pondicherry. This was also the period when he started learning Vedic literature. Three of his greatest works namely, *Kuyil Pattu*, *Panchali Sabatham* and *Kannan Pattu* were composed during 1912. He also translated Vedic hymns, Patanjali's *Yoga Sutra* and *Bhagavat Gita* to Tamil. Bharati entered India near Cuddalore in November 1918 and was promptly arrested. He was imprisoned in the Central prison in Cuddalore in custody for three weeks from 20 November to 14 December and was released after the intervention of Annie Besant and C.P. Ramaswamy Aiyar. He was stricken by poverty during this period, resulting in his ill health. The following year, 1919, Bharati met Mohandas Karamchand Gandhi. He resumed editing *Swadesimeitran* from 1920 in Madras (modern day Chennai).

Cover page of the 1909 magazine Vijaya, published first from Madras and then from Pondicherry.

Later years and death

He was badly affected by the imprisonments and by 1920, when a General Amnesty Order finally removed restrictions on his movements, Bharati was already struggling. He was struck by an elephant named Lavanya at Parthasarathy temple, Triplicane, Chennai, whom he used to feed regularly. Although he survived the incident, a few months later his health deteriorated and he died on 12 September 1921 early morning around 1 am. Though Bharati was considered a people's poet, a great nationalist, outstanding freedom fighter and social visionary, it was recorded that there were only 14 people to attend his funeral. He delivered his last speech at Karungalpalayam Library in Erode, which was about the topic *Man is Immortal*. The last years of his life were spent in a house in Triplicane, Chennai. The house was bought and renovated by the Government of Tamil Nadu in 1993 and named Bharati Illam (Home of Bharati).

Works

Bharati is considered as one of the pioneers of modern Tamil literature. Bharati used simple words and rhythms, unlike his previous century works in Tamil, which had complex vocabulary. He also employed novel ideas and techniques in his devotional poems. He used a metre called *Nondi Chindu* in most of his works, which was earlier used by Gopalakrisha Bharathiyar.

Bharati's poetry expressed a progressive, reformist ideal. His imagery and the vigour of his verse were a forerunner to modern Tamil poetry in different aspects. He was the forerunner of a forceful kind of poetry that combined classical and contemporary elements. He had a prodigious output penning thousands of verses on diverse topics like Indian Nationalism, love songs, children's songs, songs of nature, glory of the Tamil language, and odes to prominent freedom fighters of India like Tilak, Gandhi and Lajpat Rai. He even penned an ode to New Russia and Belgium. His poetry not only includes works on Hindu deities like Shakti, Kali, Vinayagar, Murugan, Sivan, Kannan(Krishna), but also on other religious gods like Allah and Jesus. His insightful similies have been read by millions of Tamil readers. He was well-versed in various languages and translated speeches of Indian National reform leaders like Aurabindo, Bala Gangadar Tilak and Swami Vivekananda.

He describes the dance of Shakthi in the following lines:

Tamil

சக்திப் பேய் தான் தலையொடு தலைகள் முட்டிச்
சட்டச் சட சட சட வென்றுடைபடு தாளம் கொட்டி அங்கே
எத்திகினிலும் நின்விழி அனல் போய் எட்டித்
தானே எரியும் கோலம் கண்டே சாகும் காலம்
அன்னை அன்னை
ஆடுங்கூத்தை நாடச் செய்தாய் என்னை

[English Translation]

We make Dresses from Silk and Cotton
In quantities as large as mountains
They bring lot of wealth
The traders around the world, to whom we give it
(dresses)

In Bharathiyaar's *Panchali sapatham*, he compares Panchaali (Draupadi) with Bharata matha, the Paandavas with the Indians, the Kauravas with the British and the Kurukshetra war of Mahabharat to that of the Indian freedom struggle. He visualised Draupadi to India and Indian women, who were held by slavery and social clutches of the society.

He is known to have said, "Even if Indians are divided, they are children of one Mother, where is the need for foreigners to interfere?" In the period 1910–1920, he wrote about a new and free India where there are no castes. He talks of building up India's defense, her ships sailing the high seas, success in manufacturing and universal education. He calls for sharing amongst states with wonderful imagery like the diversion of excess water of the Bengal delta to needy regions and a bridge to Sri Lanka

Bharati on feminism

Bharati is considered the first to have advocated and campaigned for women's participation in politics. He advocated greater rights for women and their education. He visualised a modern Indian woman at the vanguard of society. He was of the strong opinion that the world will prosper in knowledge and intellect if both men and women are deemed equal. He condemned the *Shashtras*, the procedures formulated by some orthodox Hindus and weren't held as holy by most Hindus, that suppressed women's rights. Most of his views are considered contemporary even in modern times.

Bharati on caste system

Bharati also fought against the caste system in Hindu society. Although born into an orthodox Brahmin family, he gave up his own caste identity. He considered all living beings as equal and to illustrate this he performed the *upanayanam* for a young Dalit man and made him a Brahmin. He also scorned the divisive tendencies being imparted into the younger generations by their elderly tutors during his time. He openly criticised the preachers for mixing their individual thoughts while teaching the Vedas and the Gita. He strongly advocated bringing the Dalits to the Hindu mainstream.

Tamil

"சாதிகள் இல்லையடி பாப்பா!-குல
தாழ்த்தி உயர்த்தி சொல்லல் பாவம்;
நீதி உயர்ந்த மதி, கல்வி-அன்பு
நிறை உடையவர்கள் மேலோர்."

[English Translation]

There is no caste system.
It is a sin to divide people on caste basis.
The ones who are really of a superior class are the ones excelling in being just, wise, educated and loving.

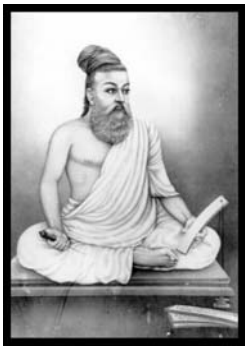
Legacy

Bharathiar University, a state university named after the poet, was established in 1982 at Coimbatore. There is a statue of Bharatiar at Marina Beach and also in the Indian Parliament. A Tamil Movie titled Bharathi was made in the year 2000 on the life of the poet by Gnana Rajasekeran, which won National Film Award for Best Feature Film in Tamil. The movie *Kappalottiya Thamizhan* chronicles the important struggles of V.O.Chidambaranar along with Subramanya Siva and Bharathiar with S.V Subbiah starring as Subramania Bharati.

Many roads are named after him, notable ones including Bharathiar road in Coimbatore and Subramaniam Bharti Marg in New Delhi. The NGO Sevalaya runs the Mahakavi Bharathiya Higher Secondary School. In March 2013, SS Music and Ayngaran International noted British singer Adele's song "Skyfall"'s similarities to Bharati's poem *Achamillai Achamillai*, which contains the lyrics "*Uchchi Meedhu Vaan Idindhu Veezhugindra Podhinum, Achcham Illai Achcham Illai Achcham Enbadhillaiyae*", which loosely translate "Skyfall"'s lyrics, "Let the sky fall, when it crumbles, we will stand tall and face it all together."

எண்ணிய முடிதல் வேண்டும்; நல்லவே எண்ணல் வேண்டும்;
திண்ணிய நெஞ்சம் வேண்டும்; தெளிந்தநல் லறிவு வேண்டும் - மஹாகவி பாரதி

TIRUKKURAL AND MANAGEMENT IN A 'NUTSHELL' – 33



We discussed in the last installment that in Management performing **Effectively** and **Efficiently** is very important. One important theory is that the Performance of Managers depends on **'Personality'**. What is Personality – is it Emotional Stability, Self Esteem, Extroversion…… "Personality" is what one is made up of 'Internally' and 'Externally'. 'Personality' can be understood as a Measure of Combination of 'Quotients' of Intelligence, Emotional and Spiritual (IQ, EQ and SQ) 'Make Up' of the Individual. IQ is Knowledge, Skill, Analytical and Reasoning Capabilities. EQ is the Ability to Work in a Team with all capabilities, specialities and Short comings of other Team Members and SQ is Adherence to the "Values", "Balance", Commitment to Professionalism, Participation and Performance. Tirukkural in essence and in totality deals with all the aspects of IQ, EQ and SQ and 'Personality' refinement and Knowledge and Wisdom of these help perform effectively and efficiently.

Knowledge of IQ

Karkka Kasadarak Karppavai; Katrapin
Nirkka Atharkkuth Thaga *Kural 391*

கற்க கசடறக் கற்பவை; கற்றபின்
நிற்க அதற்குத் தக குறள் 391

"Acquire thoroughly the Knowledge that is worth acquiring : and after acquiring it, walk thou in accordance therewith."

Wisdom of IQ

Sendra Idaththal Selavida Theethuoree
Nandrinpal Uippathu Arivu *Kural 422*

சென்ற இடத்தால் செலவிடா தீதுஒரீஇ
நன்றின்பால் உய்ப்பது அறிவு குறள் 422

"The disciplined understanding curbeth the senses from roving about, keepeth them from evil and directeth them towards the Good"

Knowledge of EQ

Atraraith Theruthal Ombuga; Matruavar
Patrilar; Naanar Pazhi *Kural 506*

அற்றாரைத் தேறுதல் ஓம்புக; மற்றுஅவர்
பற்றிலர்; நாணார் பழி குறள் 506

"Beware of trusting men that have no kindred; for their hearts will be without attachment and they will be callous to shame"

Wisdom of EQ

Seyvaanai Naadi Vinainaadik Kalaththodu
Eytha Unarndhu Seyal *Kural 516*

செய்வானை நாடி வினைநாடிக் காலத்தோடு
எய்த உணர்ந்து செயல் குறள் 516

"Choose the person and give him the work for which he is fit; see that the time is ripe for performance and then get him to begin it"

Knowledge of SQ

Manaththukkan Masilan Athal; Anaithuaran;
Aakula Neera Pira *Kural 34*

மனத்துக்கண் மாசிலன் ஆதல்; அனைத்துஅறன்;
ஆகுல நீர பிற குறள் 34

"Be pure in heart; all Righteousness is contained in this one commandment; all other things are nought but empty display"

Wisdom of SQ

Seyarppalathu Orum Arane; Oruvarkku
Vuyarpala Thorum Pazhi *Kural 40*

செயற்பாலது ஓரும் அறனே; ஒருவற்கு
உயற்பால தோரும் பழி குறள் 40

"That action alone is worth doing which is based on Righteousness; and all action must be shunned which will subject thee to the reproof of the wise".

HOME FESTIVALS – 3 - பங்குனி - Panguni (March-April)

This month brings the popular nine-day festival of Ram Navami, celebrating the birthday of Lord Rama, an incarnation of Lord Vishnu. When the full moon rises, Vishnu in the form of Satyanarayana is worshiped before a decorated kumbha pot with a branch of mango leaves placed in its mouth and a coconut on top. Rice is spread on banana leaves and the sacred vessel is completed with a tray of fruits, flowers an betel leaves and nuts. This month is also known for Sita's marriage to Rama. King Janaka, Dasaratha and priests surround the sacred fire, as Sita garlands Rama in Janaka's royal palace.

(To be continued)

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