ELECTRICAL INSTALLATION ENGINEER

NEWS LETTER

TAMILNADU ELECTRICAL INSTALLATION ENGINEERS' ASSOCIATION 'A' GRADE (Regn. No. 211/1992)
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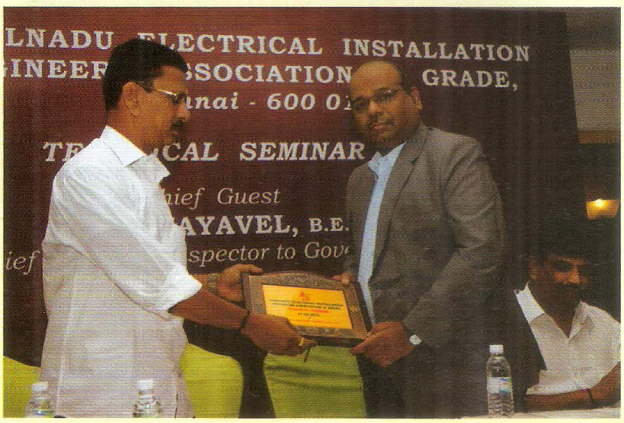
TECHNICAL SEMINAR - 27.02.2016

Lighting the Kuthuvilaku from left to right: **Mr. B. PAALANI KUMAR**, *Vice President - Chennai, TNEIEA;*
Mr. S. RAVICHANDRAN, *HAVELLS INDIA LTD.;* **Mr. K. KANNAN**, *Secretary, TNEIEA;*
Mr. U. BASKARAN, *President, TNEIEA;*
Mr. C. THAYABHARAN, *SOORYA ELECTROCOMPONENTS (P) LTD.;*
Mr. VENKATRAMANA, *MAHINDRA & MAHINDRA LTD.;* **Mr. P. SUYAMBU**, *Treasurer, TNEIEA*



Mr. U. BASKARAN, *President, TNEIEA*
honouring **Mr. S. RAVICHANDRAN**,
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Mr. B. PAALANI KUMAR, *Vice President - Chennai,*
TNEIEA honouring **Mr. VENKATRAMANA**,
MAHINDRA & MAHINDRA LTD.

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SRI VAARI ELECTRICALS

Mr. U. BASKARAN,
President, TNEIEA
honouring **Mr. M. BALAMURUGAN,**
Committee Member, TNEIEA

Delegates at the seminar

Delegates at the seminar

EDITORIAL

Dear Members, Fellow Professionals, Friends and Well wishers,

Best Wishes For A Happy And Prosperous "Dhurmukhi Varusham"

Seasons Greetings To One And All!

April marks the commencement of many things New and Happy. The new Financial Year as well as the Tamil New Year, as believed by many, commences this month. The New Year 'Dhurmukhi' is also mentioned as 'Dhunmukhi' in some of the texts and the general prediction for the year is that though there may be problems of delayed and excess rains towards the end of the year etc, the overall Prosperity and Progress is not in doubt. Tamilnadu will also be preparing to install a New Ministry in May to run the Government and the activity and noise levels would 'Peak' during this month. It is interesting that the Government is taking all measures to ensure 100% or as high a percentage as possible of voting, so that the Government that will be formed will truly represent the Peoples' wish. Though the differences between the contesting parties and the people involved may become intolerable at times, the Citizens of this State and the Country are quite clear about the needs of Patriotism, Cleanliness, Focus towards all round Development and Peace and Welfare, in framing policies and running the Government. We all realize that the Power of the People is important in a Democracy and it is also a fact that it is ultimately the Initiative, Zeal and involvement of the People in all activities that ensures the Progress. It can clearly be seen from the overall Progress this Country has achieved over the past 50 years, be it Roads and Rail or Agriculture, Horticulture, Milk and Eggs or Power Generation and Distribution or the Quality and Quantities of Industrial Production or the Progress we have had in Science and Technology, and IT Enabled and all other kinds of Services and so on, taking the Prestige of "Brand India" to a Good Height. We are also aware that the "Cleanliness" both in running the Government and the atmosphere around has suffered badly over the years and it is time that we all resolve to contribute our might to clean up the situation fast.

One of the recent news items says that India is one of the Countries with sizable investments and activities with regard to Renewable Energy. There is also another News item which says that the local Oil and Coal Production are going up to reduce our import bills which will be Good for our Economy. Such information increases our hope of Better Progress and Better Days ahead with improved Power situation.

April is also a month when **"Earth Day"** is celebrated on the 22nd. One of the important requirements in our Country to protect the earth and to make full use of it is to ensure proper Waste Disposal and Institute Waste to Energy Programs at all possible situations and locations. Municipal Solid and Liquid wastes are problems which are still not addressed properly and adequately in our Country. Even in Wastes from Agriculture and Plantations and cattle, we are missing lot of opportunities to extract Energy before giving it back to earth as manure. All these can go to enrich the earth for better use and better productivity. One other important dimension for making best use of available earth/ land in our country is to improve and extend irrigation, which is being planned in massive scale by the Government, as seen in the current year's Budget.

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

EDITOR

OBITUARY

A. GANAPATHY
Date of Death
29.03.2016

On behalf of The Tamilnadu Electrical Installation Engineers Assn. 'A' Grade extends ***Heartfelt Condolences*** for the demise of Our Member **Thiru A. GANAPATHY,** *Proprietor*, ***Ganapathy Electrical Engineering Company,*** Chennai-59.

We pray the almighty to rest his Soul in Peace.

ELECTRICAL INSTALLATION ENGINEER

President : U. BASKARAN
Secretary : K. KANNAN
Treasurer : P. SUYAMBU

Editor : G. VENKATESH
Advisor : S. MAHADEVAN
Printer : M. VENKATARAMAN

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47.	Jaico Electricals	Chennai	044-24951050, 98848 33253	EA 2681
48.	Jayaam Power Electricals	Chennai	99621 42199, 94442 26802	EA 2865
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57.	Kiruthika Electricals & Enterprises	Chennai	044-24927988, 97109 43801	ESA 380
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60.	KSA Power Infra Pvt. Ltd	Chennai	044-42034399, 43114273	ESA 411

EVENTS

L&T Training Programme

Switchgear Selection – Motor Control Centre (MCC)	2nd – 3rd May 2016
Switchgear Selection – Power Control Centre (PCC)	4th – 5th May 2016
Electrical Safety	6th May 2016
Best Maintenance Practices in LV Switchgear	9th – 13th May 2016
Breaker Maintenance Workshop – C – Power ACB	16th – 18th May 2016
Introduction to Industrial Electrical Systems	16th – 18th May 2016
Breaker Maintenance Workshop – U – Power Omega ACB	19th – 20th May 2016
Switchboard Electrical Design	23rd – 25th May 2016
Design of Control Circuits	26th – 27th May 2016

Venue: L&T Ltd., Switchgear Training Centre, Nilgiris
Contact Tel.:0423-2517107 Fax:0423-2517158
Email: stc_coonoor@lntebg.com

Events Profile: The Global Algae Biodiesel World 2016 examines the vast global market potential of biofuel from algae. It explores the technology, new research, and knowledge for developing this next-generation biofuel. This is a programmed where you shall study & learn the ALGAE System in totality from the top Algae scientists, experts and technologists.

Date: 7th – 8th May 2016
Venue: Jaipur, India
Website: http://www.indiamart.com/advancedbiofuelcenter/biodiesel-training-course.html

Events Profile: The launch of three mega urban schemes in India, i.e., Smart Cities Mission, Atal Mission for Rejuvenation and Urban Transformation (AMRUT), and Housing for All in urban areas, will set in motion the process of urban transformation to enable better living. The missions are new, innovative and focused on pressing needs to improve the quality of life for citizens today, and in the future.

Date: 11th – 13th May 2016
Venue: Pragati Maidan, New Delhi
Website: http://www.smartcitiesindia.com/

Events Profile: Expo intends to accelerate the growth of India's Renewable Energy sector and contribute to the country's sustainable economic development. The show aims to upscale and mainstream the applications of renewable energy resources, showcase innovations, and enrich deliberations by providing the industry with an international exhibition and conference platform.

Date: 7th – 9th September 2016
Venue: India Expo Centre, Greater Noida, India
Website: http://www.renewableenergyindiaexpo.com/

KNOW THY POWER NETWORK - 103

You are welcome to the world of Electrical Equipment. As a part of our care for these equipment, we need to monitor their performance and comfort / happiness levels regularly. In the last article, the required indicators were listed out. Now it is time for us to learn them one by one; AGEING OF EQUIPMENT is the topic that stands before us at present.

The reality of human life lies in the risks / stresses / scars we face and how we manage them. As we age, these risks / stresses go up. Our equipment cannot be an exception to it; they are also covered by the same universal law. Our equipment too get aged as years go by. Their ageing is controlled / influenced by so many **intrinsic** and **extrinsic factors**. So it is pertinent for us to study whether the ageing of the equipment especially its insulation is due to normal service related factors or some other unwanted factors. As the service life of the equipment increases, the propensity or probability of developing age related repairs / failures increases irrespective of other associated factors like the quality of inputs and severity of the operating environment. *How ever the scale of ageing is measurable. When all known factors are within the permissible level, the ageing will be slow; if not, it will be at an enhanced level* and it is not desirable from any point of view. The roles played by intrinsic and extrinsic factors become significant in this context.

Among the intrinsic factors are the adequacy of design, quality of manufacture, and the nature and quality of the insulation and other materials used. By now, you would have inferred what can be the "extrinsic factors". If not kindly read further. These factors are nothing but those exist in the operating environment of the equipment like the quality of inputs, its loading pattern, presence of dust, dirt, oil leaks, water entry, contaminant laden air, clogged intercoolers, inadequate lubrication, hot spots, high / low surrounding temperatures, poor air circulation and high vibrations and noise levels of the equipment and its foundations. Thus we can note that intrinsic factors generally relate to design and manufacture of the equipment whereas extrinsic factors relate to its service conditions and the way in which we handle / treat the equipment. If the hostile service conditions faced by the equipment become exacerbated / aggravated, then accelerated ageing will take place.

Among these factors are moisture ingress, high operating temperature, poor maintenance / lubrication and presence of undesirable contaminants. They play significant role in causing the faster rate of ageing of the equipment which remains "irreversible". Moisture ingress brings a highly deleterious effect on the integrity of the insulation. As moisture in the cellulose changes the conductivity and the geometery of the insulation, it enhances the deterioration rates of the paper insulation. Thermal ageing or quick degradation of the paper insulation is generally brought by high operating temperature because the service life of paper insulation is temperature dependent. Presence of pollutants or contaminants in the surrounding atmosphere and on the equipment insulation play a different role. It impacts the capacitance and dielectric loss factors of the insulation and lead to higher dielectric losses with the attendant heating of the insulation.

With this brief insight, let us learn the various facts / dimensions of "Insulation Ageing" like thermal, mechanical, electrical, physical and environmental ageing, among other things. These ageing conditions are generally revealed by various diagnostic tests and residual life determination. First let us focus on the **"Ageing phenomenon"**.

Ageing is an inescapable phenomenon faced / experienced by all living and most inert things. "Time" plays an important role in this process. It brings in its trial a number of changes – both visible and invisible. The ageing process is always associated with the passage of time and is measured by changes with time. Don't think that the "ageing" is always a degrading process; sometime it may be beneficial "Aged Wine" and "matured human beings" can be cited as good examples. But when we consider the field of electrical insulation, the ageing process never produces the desired effects; actually the changes observed in the insulation with time are for the "worse". If it occurs slowly in steps, it is acceptable; if comes at an accelerated or faster rate, it is undesirable. This characteristic feature of ageing brings it to "centre stage" or becomes the chief concern of both the manufacturer and the equipment users as well. The reliable methods to measure the ageing characteristic of the equipment thus gains importance and becomes an essential topic for the manufacturers and end users as well. These methods facilitate the normal graceful and productive life of equipment. It can enhance / extend the productive life of equipment for some more years. *Further, when we focus more on "ageing", the subject becomes "more complex". Similar to human beings equipment ageing, is not an aspect of one stressed or burnt out system; it is the combined effect of stresses on all the components of the equipment - a "Multifactor ageing". It is where the greatest frustration starch. With every activity, the equipment is constantly ageing – slowly but steadily moving towards its final destination viz. "disposal as a scrap". Thus we can easily see the root causes of its degradation or ageing lies in "activity" and "operating environment" greater.*

Its operation and greater adverse conditions of its operating environment, the shorter will be its life span and faster / quicker will be its journey to its end. This places a greater emphasis on the "multi stress ageing" of the equipment i.e no pointed focus need to be placed on any one single factor like "Thermal ageing" or "Voltage ageing". **In this context, we have to keep in mind that ageing by simultaneous stresses consumers a large portion of the equipment's life than the sum of life expended when the equipment is aged separately by each stress. "Connect with your equipment or know your equipment and moves with it is the essence or central theme of this topic / viz Equipment Ageing Phenomena.** If we understand this essence or the various dimensions of multi stress ageing, then it is easy for us to handle the ageing of equipment and meet the reality of the situation with our limited resources. Thus handling the "aged equipments" really an "art" and you will understand its importance and nuances by moving further. Ok!

Electrical equipment is chief component viz. electrical insulation normally operates at a temperature above ambient; therefore it is exposed to thermal stresses. Voltage is applied across its terminals during its service; hence it faces electrical stresses continuously. If the equipment falls under the category of "Rotating Machinery", then its insulation is open to mechanical stresses brought by vibrational forces. Added to this, the rotors face centrifugal forces and other forces like friction. As the equipment is operated in earth's atmosphere, it experiences environmental stresses additionally. *To repeat, all these stresses will not act independently or sequentially one by one. They appear simultaneously and their combined effects always endanger the equipment in point. Thus we can see that most electrical equipment are subjected to a variety of life threatening stresses called "Multifactor stresses".* Let us study these stress producing ageing phenomena in detail, especially the interactions between different stresses.

Kinds of Insulation Ageing

1. Temperature or Thermal Ageing: (degradation caused by temperature). It is a well known phenomenon. One of the principal cause of equipment ageing and finally its dielectric failure. (Low voltage static equipment, low voltage random wound motors and the equipment that are subject to large number of starts and stops generally experienced Thermal ageing only i.e. other ageing factors play a limited role in the degradation of their insulation). Without any exceptions large rotating machines and large power transformers experience this ageing.	It is mainly brought by the operation of the equipment at elevated temperatures, exceeding its normal operating temperature or maximum continuous operating temperature. It brings thermally accelerated chemical reactions of the insulating material with in itself (dissociation of its basic molecules) or with environmental gases (o_2), water and other chemicals. This activity causes the loss of its dielectric strength, brittleness and lower mechanical strength or integrity. This ageing is treated as a chemical process and it is generally governed by Arrhenius equation. It can be treated as MACROSCOPIC AGEING OF THE INSULATION.
2. Mechanical Ageing: (Deterioration of Mechanical parts or components). This kind of ageing is generally noticed in large power transformers and large rotating machines	It is brought by various mechanical forces like vibration, friction and metal fatigue. It results in cracking and other problems. All these lead in turn to a decline in dielectric strength. In large machines this ageing produces more significant damaging effects than that produced by thermal or voltage ageing. Mechanical stresses influence the activation energy for the insulation degradation processes.
3. Voltage (Electrical) Ageing: A common phenomenon faced by large rotating machinery, capacitors and large power transformers (no reliable, predictive tests are currently available to indicate the rate of voltage ageing that set in the insulation or the degradation suffered by the insulation).	Mainly due to the effects of electrical field or the application of voltages greater than its normal endurance levels. Creation of partial discharges in voids or discontinuities, lower dielectric strength and effects of conduction are some of its final products. All these finally end in the reduction of its dielectric strength. It also generates Harmful Electro chemical effects, ionic erosion, internal discharges, corona, intense oxidation and dielectric heating are among the other possible effects faced by the insulation. This ageing is considered as A MICROSCOPIC AGEING OF THE INSULATION

4. Ambient or Environmental Ageing: (Accumulation of pollutants and the surrounding hostile operating environment. i.e not conducive for the prolonged service life of the equipment). Among these unfriendly factors are humidity, contaminants, ionizing radiation as seen in nuclear power plants	Presence of contaminants (conducting particles) on the insulation. It markedly reduces its dielectric strength; the associated chemicals increase the conductivity of the insulation, enhances the Tan delta and the consequential dielectric losses and heating.

Let us get some more information about the degration process brought by voltage (Electrical) ageing phenomena in the electrical insulation. Five mechanisms generally involve in it and lead to insulation breakdown. These are,

(i)	Electrolysis	Electro chemical changes that occur with HVDC or HVAC
(ii)	Partial Discharges (introduction of Electrical Termites)	It generates discharges in voids / gas spaces at insulation surfaces or within internal gas cavities. These discharges when develop or grow sufficiently into insulation will become "Electrical Trees".
(iii)	Arcing	It causes "arcing" between conductors over insulation surfaces or through internal cracks.
(iv)	Dielectric heating	This heating is mainly due to the losses in the dielectric system. The consequent thermal effects are too well known to repeat.
(v)	Electrostatic Attraction	This phenomenon is associated with the electrostatic attraction of conducting particles or conducting liquids into the high electric field regions of the insulation.

The rates at which their mechanisms lead to the insulation breakdown is important. Interactions of thermal ageing and voltage ageing are also important.

Let me sign off. In the next article, the tests that will reveal the setting of ageing in the insulation and its rate of spread will be dealt with. Still then stay tuned.

(To be continued...)

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Mobile: 98402 07703

ANDHRA PRADESH SAVES 421 MILLION UNIT POWER USING LED BULBS: SURVEY

Andhra Pradesh saved about 421 mn unit of power last year thanks to a major push given by the state government to use of LED bulbs in four of the 13 districts, an independent survey has revealed.

The state government distributed 57.03 lakh LED bulbs (two nine Watt bulbs per house) in Anantapuram, Guntur, West Godavari and Srikakulam districts, while overall 1.75 crore bulbs were distributed so far in all the 13 districts as against the target of 1.87 crore.

A study conducted by Andhra University and Engineering Staff College of India – covering 57,667 households in the four districts – reveal that 421 million unit of power could be saved in one year because of the use of LED bulbs.

The actual energy saving per bulb has been 73.7 unit on an average, as against the projected 55.65 units. Union Power Minister Piyush Goyal would formally release the study at a function in Nellore on February 27 in the presence of Union Urban Development Minister M Venkaiah Naidu and AP Chief Minister N Chandrababu Naidu.

A release from the AP State Energy Conversation Mission (SECM) quoted Energy Secretary Ajay Jain as saying the state government has now decided to cover 100 percent households in the state under the LED bulb distribution programme. Under the scheme two bulbs (of nine Watts) would be given at a subsidised price of Rs 10 each.

The two power distribution companies have submitted proposals to the government for additional 57 lakh LED bulbs to cover 100 percent households. With this, the total number of LED bulbs goes up to 2.44 crore, SECM chief executive officier A Chandrasekhar Reddy said.

Courtesy: Ieema Journal, March 2016

SOLAR IMPULSE POISED TO RESUME ROUND-THE-WORLD FLIGHT

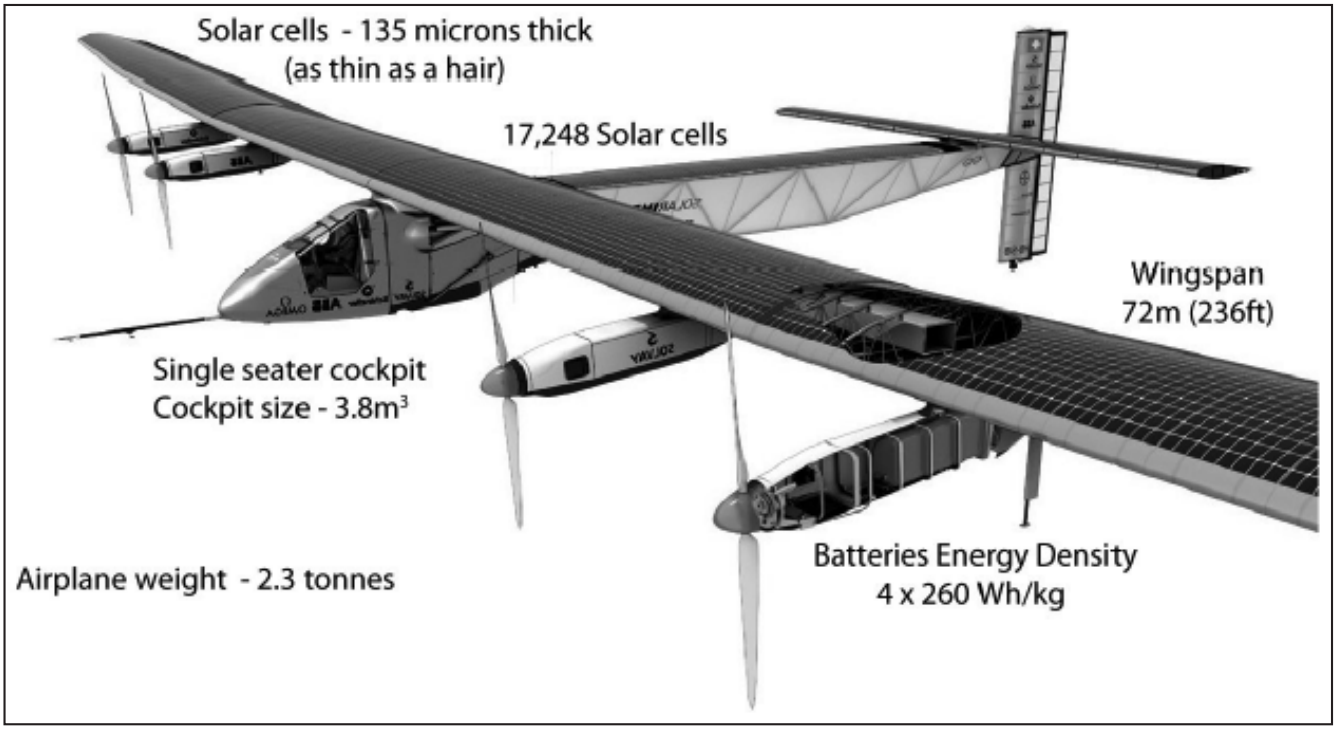
Solar Impulse 2, the solar-powered aircraft, will continue its round-the-world journey in mid April, after being grounded at Kalaeloa airport in Hawaii for eight months.

Last week, Solar Impulse pilot and co-founder Andre Borschberg confirmed that, as planned, the Solar Impulse 2 (Si2) aircraft is poised and ready to resume its round-the-world attempt in April.

"We had a problem with the batteries, we overheated them," CEO said at the Young Presidents' Organization EDGE event in Dubai. "The technology works very well – but we decided to change them, not to take any risks, so now we are ready."

The world's first solar-powered circumnavigation attempt began on March 9 2015 in Abu Dhabi. Si2, piloted by Solar Impulse founder Bertrand Piccard and CEO, and co-founder Borschberg, was expected to complete a five months round-the-world journey over India, Burma, China, the Pacific Ocean, the U.S., the Atlantic, southern Europe and back to Abu Dhabi some time around late July.

Unfortunately, after completing the longest leg of the journey, a record-breaking non-stop solo flight of five days from Japan to Hawaii, the aircraft could not return to the skies. Certain parts of the four 70 liter lithium polymer batteries, attached to the plane's wings, were damaged due to overheating on that longest leg.



"During the first ascent on day one of the flight from Nagoya to Hawaii, the battery temperature increased too much due to over insulation," the Solar Impulse team explained in the statement.

After the damage proved to be irreversible, the crew postponed the next leg of the round-the-world journey until mid-spring 2016. At the end of the last year the project had raised a further $20 million in funding, adding to the optimism that the aircraft will be able to continue its historic journey. It is yet undecided where Si2 is landing next time. The destination would depend on weather conditions: "It's extremely difficult to plan where we'll be heading for, it can be LA, it can be San Francisco, it can be Phoenix, everything is open," Borschberg said.

Si2's wings, fuselage and horizontal tailplane are mounted with 17,248 monocrystalline silicon cells, provided by SunPower. The solar cells cover a total area of 250 square meters, delivering a combined power output of 45 kWp. The aircraft is equipped with the power storage, which makes it able to fly at night.

Read more:.pv-magazine

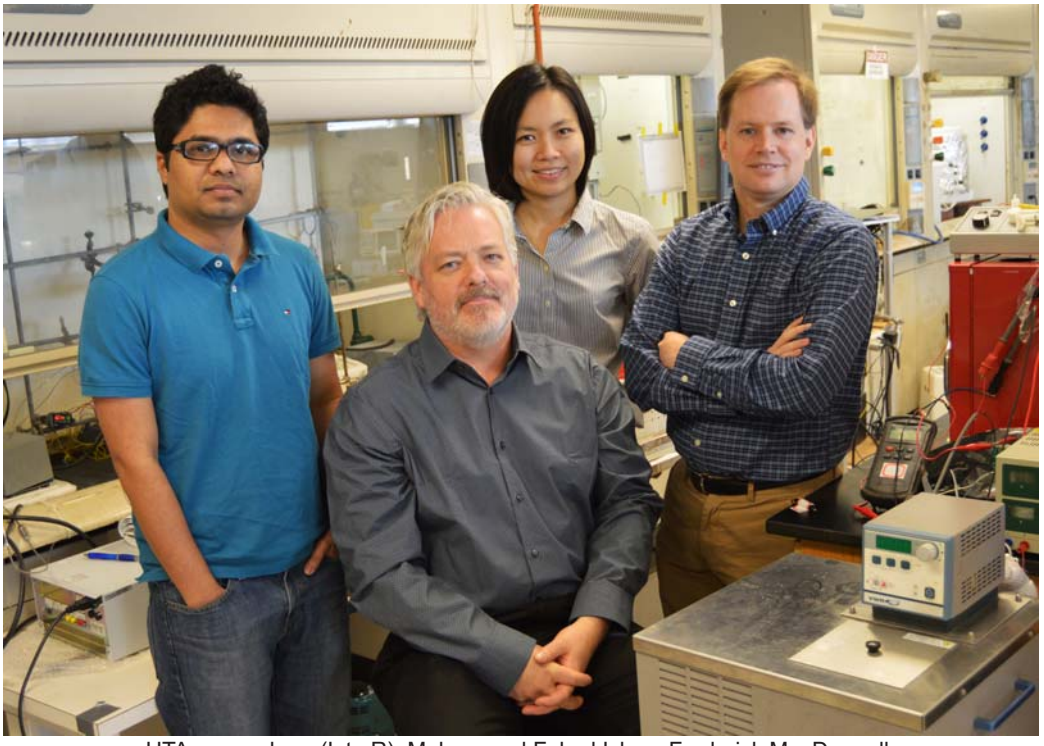
The world has the habit of making room for the man whose words and actions show that he knows where he is going - NAPOLEON HILL

LIQUID HYDROCARBON FUEL CREATED FROM CO_2 AND WATER IN BREAKTHROUGH ONE-STEP PROCESS

As scientists look for ways to help remove excess carbon dioxide from the atmosphere, a number of experiments have focused on employing this gas to create usable fuels. Both hydrogen and methanol have resulted from such experiments, but the processes often involve a range of intricate steps and a variety of methods. Now researchers have demonstrated a one-step conversion of carbon dioxide and water directly into a simple and inexpensive liquid hydrocarbon fuel using a combination of high-intensity light, concentrated heat, and high pressure.

According to the researchers from the University of Texas at Arlington (UTA), this breakthrough sustainable fuels technology uses carbon dioxide from the atmosphere, with the added benefit of also producing oxygen as a byproduct, which should create a clear positive environmental impact.

"We are the first to use both light and heat to synthesize liquid hydrocarbons in a single stage reactor from carbon dioxide and water," said Brian Dennis, UTA professor of mechanical and aerospace engineering and co-principal investigator of the project. "Concentrated light drives the photochemical reaction, which generates high-energy intermediates and heat to drive thermochemical carbon-chain-forming reactions, thus producing hydrocarbons in a single-step process."



UTA researchers (L to R), Mohammad Fakrul Islam, Frederick MacDonnell, Wilaiwan Chanmanee and Brian Dennis, whose research is a first in producing usable liquid hydrocarbon fuel from sunlight, water and CO_2 (Credit: UTA)

Known as solar photothermochemical alkane reverse combustion, the one-step conversion process turns carbon dioxide and water into oxygen and liquid hydrocarbons using a photothermochemical flow reactor operating at around 180° C to 200° C (356 to 392° F) and at pressures up to six atmospheres. "Our process also has an important advantage over battery or gaseous-hydrogen powered vehicle technologies as many of the hydrocarbon products from our reaction are exactly what we use in cars, trucks and planes, so there would be no need to change the current fuel distribution system," said Frederick MacDonnell, UTA interim chair of chemistry and biochemistry and co-principal investigator of the project.

To initiate the hybrid photochemical and thermochemical reaction, a titanium dioxide (TiO2) photocatalyst was used. Titanium dioxide is very effective in the realm of hydrolysis – the breaking down of water into hydrogen and oxygen – and is a very effective catalyst under UV light, but it is not so efficient in ordinary visible light."Our next step is to develop a photo-catalyst better matched to the solar spectrum," MacDonnell said. "Then we could more effectively use the entire spectrum of incident light to work towards the overall goal of a sustainable solar

liquid fuel."According to the research, the team suggests that cobalt, ruthenium, or even iron may be considered as good candidates for a new catalyst, particularly as the TiO2 in the experiment was observed to drop in photoluminescent intensity at higher pressures.

In the future, the researchers imagine parabolic mirrors could also be used to concentrate sunlight onto the catalyst in the reactor, thereby providing both the required heating and photo-excitation for the reaction to occur without the need for other external power sources. The team also believes that any excess heat created in this way may be used to help power other aspects of a solar fuels facility, such as material separation and the purification of water.

Source: University of Texas at Arlington

REVERSIBLE FUEL CELL GOES BOTH WAYS FOR THE US NAVY

Boeing has delivered a new type of fuel cell to the US Navy for testing that can both store energy and generate electricity. Called a "reversible solid oxide fuel cell," it's designed to absorb energy from renewable sources, such as wind and solar, then release it as required to provide commercial and military users with a cleaner, more sustainable source of power.

One of the major failings of renewable energy sources is that most of them are notoriously unreliable. The sun only shines part of the time and the wind is as unpredictable as… well, the weather. This is a particular problem for the US military, which operates under a policy of becoming a greener fighting force, but still needs power sources that are constant and predictable.

Sixteen months in development, the Boeing fuel cell system relies on a catalytic electrolysis process that uses electricity to break up water or other materials to generate hydrogen gas, which it then compresses and stores for later use. When electricity is needed, the fuel cell can reverse itself and burn the hydrogen to produce electricity with only water for waste. Boeing claims that this is the first time that both sides of the cycle have been combined into a single system.

The Boeing system was first tested on the Southern California Edison power grid at Boeing's Huntington Beach, California, facility. It will now be connected to the Navy microgrid at the Naval Facilities Engineering Command, Engineering, and Expeditionary Warfare Center in Port Hueneme, California to see it can support military requirements.

"This fuel cell solution is an exciting new technology providing our customers with a flexible, affordable, and environmentally progressive option for energy storage and power generation," says Lance Towers, director, Advanced Technology Programs. "Boeing is known for successful innovation and technology advancement. As the company begins its second century, it's not surprising that we'd be at the forefront of helping solve the energy and technology challenges of the 21st century."

Source: Boeing

SUZLON S111 WIND TURBINE: PERFORMANCE EXCEEDS DESIGN POWER CURVE

The Suzlon Group has announced the completion of the Type Testing and Certification of its S111 turbine for 50 Hz and 60 Hz variants. The testing was carried out by an accredited independent third party testing agency, and the certification was awarded by TÜV NORD.

This certification acknowledges conformity with standards and regulations for the design, testing and manufacturing of S111. It also meets with the Indian Grid Regulations. Suzlon currently has more than 7350MW of installed capacity of the 2.1MW class turbines globally.

The S111, belonging to the reliable and proven 2.1MW family, has been designed to ensure highest safety while offering lowest lifecycle cost that helps drive down the cost of energy for customers. It features a rotor diameter of 111.8 meters with a swept area of more than 9,500 square meters, making it one of the highest yielding wind turbines in its class. The S111 delivered approximately 102% of its design power curve, translating to higher than projected power generation, and improved returns for customers.

Speaking on the development, Mr. Duncan Koerbel, Chief Technology Officer (CTO), Suzlon Energy, said, "This is the third consecutive blade program where the certified performance has exceeded our design goals. This is a tribute to our multinational R&D teams located in Germany, the Netherlands, Denmark, USA and India. Our aerodynamics and system design capabilities continue to improve, leading to better AEP (annual energy production) of wind power plants. The 2.1MW platform currently has more than 3,500 turbines installed in 17 countries with over 92,253,180 operating hours. The new S111 blade has been designed to optimally harness available wind, delivering nearly 20% higher energy as compared to the S97, thereby ensuring higher ROI to customers."

Mr. Tulsi Tanti, Chairman, Suzlon Group, said, "We are pleased to present these findings to the market. This result is a testament to our ability to build on our vast global operating experience. We have continuously evolved our technology and products to deliver ever improving returns to our customers. We have introduced the next generation turbine, the S111-2.1MW, specially designed for low wind sites, in US and India. I firmly believe that technology is the key differentiator in our industry, and the key to market leadership. Suzlon endeavours to bring down the cost of energy and provide clean and affordable energy for all."

Courtesy : Energetica - India

Issue a blanket pardon. Forgive everyone who has ever hurt you in any way. Forgiveness is a perfectly selfish act. It sets you free from the past - BRIAN TRACY

SOLAR ENERGY IN SEA WATER HEATS ALASKA'S LARGEST AQUARIUM

When fuel oil sold at $5 per gallon, the 120,000-square-foot **Alaska SeaLife Center**, in **Seward**, spent $463,000 on space and water heating (the fish tanks stay at ocean temperature). Operations Manager Darryl Schaefermeyer turned off the boilers. **The facility is now heated, right through the sub-arctic winter, by a seawater heat pump.**

Heating costs have fallen by half.

Designed by Andy Baker of the Anchorage consulting firm YourCleanEnergy, the 180-ton heat-pump system uses Resurrection Bay as a huge solar collector and thermal storage system.Solar gain in the North Pacific Gyre is carried by trade winds into the Alaska Coastal Current, which keeps the bay ice-free through the winter. Because it's more than 900 feet deep, the bay is an immense thermal mass. Despite the inflow of glacier melt, the water reaches 52°F (11°C) by late October and falls only to 37°F (3°C) by spring. Similar natural systems are exploited by heat-pump systems in Norway and Canada.

At the aquarium, electric pumps push seawater through a titanium-plate heat exchanger to warm a mixture of glycol and water. The cooled seawater returns to the ocean. The glycol passes through two parallel rotary screw compressor heat pumps, where it comes into contact with R-134a refrigerant.The heat pumps are Trane RTWD units manufactured in Pueblo, Colo. The refrigerant boils and the vapour is compressed, which raises its temperature. The hot high-pressure vapour goes through another heat exchanger, heating fresh water to 100°F to 120°F (38°C to 49°C). This hot-water loop is pumped to air handlers to warm ventilation air, preheats the 600-gallon domestic hot-water tank, and melts snow and ice on outdoor pavement.

The pumps and accessories run on grid electricity at 11 cents per kilowatt-hour (generated 85 percent with natural gas, 15 percent from hydro). For 2013, comparing electric power used to heat produced yields a system coefficient of performance of 2.77, representing a 277 percent efficiency increase over straight electric heat or fuel oil. For 2013, the SeaLife Center saved an average of $9,800 per month on heating bills compared to the old oil-fired boilers.

Built for $830,000, the heat-pump system will pay for itself in less than nine years, with CO_2 emission reduction of 420,000 pounds per year. The SeaLife Center received $713,000 in federal and state grants to design and install the system.

While 80 percent of heat loads are now on the seawater heat-pump system, loads requiring temperatures higher than 120°F (49°C) are served by an electric boiler. The State of Alaska has provided an emerging-technology grant to design and install new heat pumps using CO_2 refrigerant. The new pumps will operate at vapour pressures up to 2,000 psi and produce hot water up to 194°F (90°C) — all using Resurrection Bay as the heat source.

The SeaLife Center draws about 160,000 visitors each year to see Steller sea lions, harbor seals, sea otters, rare seabirds and fish from all depths. More than 90 staffers, plus interns and volunteers, work on marine research and ocean wildlife rescue.

Courtesy: Solar Energy

INSTALLED SOLAR POWER CAPACITY TOUCHES 5,000 MW IN JANUARY

The government said the installed capacity of solar power crossed 5,000 MW in January and expressed confidence that the target of 18,000 MW would be achieved by 2017-end. "The installed capacity of solar power in India crossed the milestone of 5,000 MW in January this year and would achieve target of 18,000 MW by end of next year," Ministry of New and Renewable Energy said in a statement.

Parliamentary Consultative Committee attached to the Ministers of Power and New & Renewable Energy held meeting in Tirupati, Andra Pradesh yesterday and reviewed progress of implementation of solar park scheme and also steps taken by the NTPC to reduce emissions and increase efficiency.

The meeting was chaired by Power, Coal Minister New and Renewable Energy Piyush Goyal and was attended by members of Lok Sabha Bharat Singh, Om Prakash Yadav, Sushil Kishore Singh, Jayadev Galla and member of the Rajya Sabha Bashistha Narain Singh.

Goyal welcomed the members and informed them that the NDA government has initiated world's largest renewable energy programme by increasing fivefold target from existing 35,000 MW to 175 GW capacity by 2022.

The statement further said the government has initiated several projects like Scheme for Development of Solar Parks. It is envisaged to achieve 20 GW through ultra mega solar parks.

Courtesy: Ieema Journal, March 2016

SAFT AND ROLLS ROYCE TO DELIVER HYBRID POWER SYSTEM FOR INNOVATIVE NORWEGIAN VESSEL

Saft, the world's leading designer and manufacturer of advanced technology batteries for industry, has won a major contract from Rolls Royce Marine to supply the specialized marine lithium-ion (Seanergy®) battery system for an innovative hybrid multi-application vessel under construction in Denmark for Kystverket, the Norwegian Coastal Administration (NCA).

It is Saft's second major contract signed end of last year in the marine segment. The high energy battery system onboard the OV Bøkfjord will help Kystverket meet its ambitious climate and environmental targets, reduce maintenance and make fuel savings of 25 percent.

The multi-purpose workboat is under construction at the Hvide shipyard in Denmark, where it will be fitted with a Rolls Royce hybrid power system that includes diesel gensets and a SaftLi-ion Super Phosphate (SLFP) battery system integrated into the vessel's automation and Power Management System.

The battery system will play a critical role in meeting peak power demand (for example when the vessel is using its dynamic positioning system DPS). Not only will the battery enable the ship to operate using only one diesel engine, but by smoothing out the peaks and troughs in demand the engine will also operate at its peak efficiency point. This offers the possibility for fuel savings of up to 25 percent together with further operational savings resulting from the reduced requirement for maintenance of the gensets.

The Saft battery system has also been sized to supply hotel loads when the OV Bøkfjord is berthed overnight in a dock that does not have a shore to ship power connection.

To ensure that the OV Bøkfjord will be complete in time for delivery in summer 2016, Saft has scheduled the battery system for fast delivery in May 2016, complete with certification from DNV GL, within four months of receiving the order. The air-cooled battery system will have an energy storage capacity of 857 kWh, a nominal voltage of 647 V and a maximum voltage of 745 V.

The Rolls Royce system is based on Saft's patent pending Li-ion Super-Iron Phosphate® (SLFP) technology, which received Bureau Veritas certification in early 2015 and which is on course to receive certification from Lloyds Register and DNV GL.

As a Li-ion technology, SLFP has the advantages of high efficiency, long calendar and cycling life, fast-charge capability and high power output. It is also modular, meaning that a battery system can be tailored to closely match the customer's power and voltage requirements. Compared with other Li-ion chemistries, SLFP technology is particularly well suited to civil marine applications as it delivers reliable performance over a wide temperature range, has high tolerance to electrical and mechanical abuse, and a high inherent level of safety.

Source: SAFT

SAVING SUNSHINE FOR A RAINY DAY: NEW CATALYST OFFERS EFFICIENT STORAGE OF GREEN ENERGY

The team has designed the most efficient catalyst for storing energy in chemical form, by splitting water into hydrogen and oxygen, just like plants do during photosynthesis. Oxygen is released harmlessly into the atmosphere, and hydrogen, as H_2, can be converted back into energy using hydrogen fuel cells.

"Today on a solar farm or a wind farm, storage is typically provided with batteries. But batteries are expensive, and can typically only store a fixed amount of energy," says Sargent. "That's why discovering a more efficient and highly scalable means of storing energy generated by renewables is one of the grand challenges in this field."

You may have seen the popular high-school science demonstration where the teacher splits water into its component elements, hydrogen and oxygen, by running electricity through it. Today this requires so much electrical input that it's impractical to store energy this way—too great proportion of the energy generated is lost in the process of storing it.

This new catalyst facilitates the oxygen-evolution portion of the chemical reaction, making the conversion from H_2O into O_2 and H_2 more energy-efficient than ever before. The intrinsic efficiency of the new catalyst material is over three times more efficient than the best state-of-the-art catalyst. The new catalyst is made of abundant and low-cost metals tungsten, iron and cobalt, which are much less expensive than state-of-the-art catalysts based on precious metals. It showed no signs of degradation over more than 500 hours of continuous activity, unlike other efficient but short-lived catalysts. Their work was published today in the leading journal *Science*.

"With the aid of theoretical predictions, we became convinced that including tungsten could lead to a better oxygen-evolving catalyst. Unfortunately, prior work did not show how to mix tungsten homogeneously with the active metals such as iron and cobalt," says Dr. Bo Zhang, one of the study's lead authors. "We invented a new way to distribute the catalyst homogenously in a gel, and as a result built a device that works incredibly efficiently and robustly."

This research united engineers, chemists, materials scientists, mathematicians, physicists, and computer scientists across three countries. The team developed a new materials synthesis strategy to mix multiple metals homogeneously—thereby overcoming the propensity of multi-metal mixtures to separate into distinct phases," said Jeffrey C. Grossman, the Morton and Claire Goulder and Family Professor in Environmental Systems at Massachusetts Institute of Technology. "This work impressively highlights the power of tightly coupled computational materials science with advanced experimental techniques, and sets a high bar for such a combined approach. It opens new avenues to speed progress in efficient materials for energy conversion and storage."

"This work demonstrates the utility of using theory to guide the development of improved water-oxidation catalysts for further advances in the field of solar fuels," said Gary Brudvig, a professor in the Department of Chemistry at Yale University and director of the Yale Energy Sciences Institute.

"The intensive research by the Sargent group in the University of Toronto led to the discovery of oxy-hydroxide materials that exhibit electrochemically induced oxygen evolution at the lowest overpotential and show no degradation," said University Professor Gabor A. Somorjai of the University of California, Berkeley, a leader in this field. "The authors should be complimented on the combined experimental and theoretical studies that led to this very important finding."

Read more at: http://phys.org/news/2016-03-sunshine-rainy-day-catalyst-efficient.html#jCp

NTPC TIES UP WITH GERMAN BODIES FOR RESEARCH IN SOLAR ENERGY

In a bid to consolidate presence in renewable energy, state-run power generator NTPC Ltd has tied up with German institutions DLR Cologne and Institute of Solar Energy. "NTPC through its R&D wing, NETRA is collaborating with two German Institutions DLR Cologne and Institute of Solar Energy (ISE), Fraunhofer, Freiburg on Solar Energy Research," a source said.

"NETRA have signed contract agreements with DLR Cologne for Research in Solar Thermal and ISE Fraunhofer for Research in Solar PV," said the source. Under this programme, NETRA plans to setup state of art evaluation facilities for CSP, CPV and Solar PV and conduct various programs for knowledge sharing, capacity building with German Institution in the area of Solar Energy. The programme is funded by German Government under the aegis of Indo-German Research Cooperation. NTPC has envisaged a broad base generation mix by evaluating conventional and alternate sources of energy to ensure long run competitiveness and mitigate fuel risks.

NTPC has drafted its business plan of capacity addition of about 1,000 MW through renewable resources by 2017. NTPC has already commissioned 110 MW Solar PV Projects. Another 15 MW Solar PV and 8 MW Small Hydro Projects are in progress.

At present, NTPC has an installed capacity 45,548 MW. The company has planned to reduce its dependence on fossil fuels to 56 percent by 2032 from existing about 85 percent.

Courtesy: Ieema Journal, March 2016

A GROUP OF PV THIEVES ARRESTED IN GERMANY

A crime group arrested in Germany is suspected of at least 22 PV thefts at the solar facilities in Brandenburg, Bavaria and Hesse.

A joint group of German and Polish police forces announced today that the "solar thieves" responsible for at least 22 robberies at the PV solar facilities in Germany have been placed under arrest. On Sunday night, these six 18- to 39-year-old-men broke into a solar park in Busek, the west-central German federal land Hesse, and attempted to steal €50,000 (US $55.8 thousand) worth of inverters. The police report describes in details how criminals, who arrived from Poland, spent hours disassembling solar arrays and demonstrating their experience in this very specific type of theft. 24 inverters were found in their car, after police forces stopped it right next to the crime scene, catching the thieves red handed.

Last year German viamon GmbH introduced its theft protection device, invisible from the outside, it has a GPS tracker and enables retrieval of the stolen module

Last year, there were more than 60 robberies at solar PV farms in the federal state Brandenburg alone; and 21 have already been recorded this year. Some facilities have been robbed up to five times over the last three years. Each time a farm has been stripped of at least €50,000 worth of modules and inverters, which means even higher repair and replacement costs for the operator.

In August 2015, the government of the state Brandenburg, close the German capital Berlin, established a special criminal investigation division "Helios", which is specifically dealing with the cases of theft of modules and other hardware from solar farms. The investigators soon got on the trail of a criminal group from a Polish city Zielona Gora, located in the western part of the country, near the German border. According to the police, solar modules from German PV plants are being transported to Poland for wider distribution.

To be able to catch the "solar thieves" red handed, the German "Helios" division joined forces with the Organized Crime Investigation office in Zielona Gora, Poland.

Read more: http://www.pv-magazine.com

You need to be Brave. You cannot live with one foot in the past; you need to step fully into the present to LIVE PROPERLY.

GAMESA INTO SOLAR RACE

Gamesa has announced its strategic entry into solar market with a 10 MW order to be commissioned by September 2015.

Gamesa's 2015-2017 Business Plan includes the analysis of complementary areas with its onshore wind business, such as solar and offgrid, to explore opportunities in this sectors that offer a high level of synergy with the wind business and that would add value to Gamesa's business beyond 2018.

The Company will offer Solar EPC solutions for MW Scale Solar PV, Roof-Top PV projects and Rural/Micro-Grid Projects besides continuing to expand its Inverter Solutions.

"Today, as a nation we have harnessed only 3.8 GW of solar power when we actually have tremendous opportunity to harness what is remaining of the 750 GW the country has to offer. We are globally renowned for our expertise and technical prowess in harnessing both sun and wind, and hence our foray into solar has been a very carefully thought out one that will be carried out even more meticulously. We were certain we wanted to gain our customers trust through our ability to cater to domestic demands and innovate locally before exploring new avenues of business. With a strong backing of skilled workforce and unparalleled O&M service network. " said Mr. Ramesh Kymal, Chairman and Managing Director, Gamesa India.

The No.1 player in wind turbine manufacturing with a market share of 32 per cent last year according to BTM, Gamesa India has set itself a target of 1000 MW in fiscal year 2016. The company has a good order coverage as on date & is confident of reaching this target.

With an aim to consolidate its market & technology leadership, Gamesa India has commissioned its globally acknowledged turbine, the G114-2.0MW at Tagguppatti site in AP. A member of the 2.0 MW platform & tailor-made for low wind speed sites, the G114 consists of longer blades & taller towers, thereby increasing the efficiency. With a rotor spanning 114 metres, the G114's rotor swept area is 38% greater than that of the current G97-2.0 MW, while it produces 20% more energy. The turbine is also suited for Indian Conditions such Grid Volatility, High temperature & dusty environments.

"I believe that innovation is the key to growth-be it business innovation or product/service innovation. The launch of our new G114 variant testifies our relentless efforts in reducing the cost of energy. Undoubtedly, this model will play a crucial role in making wind power an affordable and sustainable solution," added Mr Kymal.

Over the past 12 years Gamesa has installed over 19,300 MW of the 2.0 MW platform, one of the most reliable turbines in the market, in 34 countries. In November last year, Gamesa India inaugurated the expanded nacelle facility in Mamandur, close to Chennai, in India which will mainly be used to produce the nacelles for G114-2.0 MW turbine model.

NEPAL TO BUY 600 MW ENERGY FROM INDIA

The Nepalese government has proposed to import 600 MW energy from India to lessen its increasing power woes. Though Nepal at present imports 230 MW from India, according to a Nepalese official, India will sell 80 MW electricity to the country from Tuesday via newly installed 400 KV Mujjafarpur - Dhalkebar transmission line.

An announcement was made on Monday to import electricity from India after the Indian nodal agency NTPC Vidyut Vyapar Nigam agreed to sell power at Rs. 5.5 per unit (lRs.3.44) to the Nepal Electricity Authority (NEA).

Earlier, the Nepal Electricity Authority, the state-owned sole utility for power generation and distribution, said different power tariff proposed by India-assigned NTPC Vidyut Vyapar Nigam and Power Trading Corporation (PTC) to Nepal had hit roadblock to import electricity from India.

Two Indian nodal agencies, NTPC and Power Trading Corporation (PTC), were competing each other to sell electricity to Nepal but there was price war between the two. A team of NTPC arrived in Kathmandu on Sunday to discuss and settle the tariff with the NEA officials.

The formal announcement of importing electricity will be made during the visit of Napelese Prime Minister K.P. Oli to India that begins from Friday, Nepal's energy secretary. After NTPC charged the rate higher than what the PTC offered, the NEA made a request to the Indian side to reconsider its proposal.

After Nepal's request, another round of negotiation took place between the NTPC and NEA and the deal was finally sealed. With the import, daily power outages in Nepal will come down to 11 hours from 13 hours, said officials.

At present Nepal's total energy demand is 1,300 MW but the Himalayan country is able to provide just 829 MW. The government is going to declare energy emergency probably on Monday owing the growing energy crisis, giving power projects construction a priority and importing 600 MW electricity from India on a temporary basis to cope with the demand.

By the end of 2016, the electricity demand in Nepal will reach 1,500 MW so there is no other alternative for Nepal except to import from India, said the document prepared by the ministry of energy while giving reason why energy emergency was needed to be declared.

Courtesy: Ieema Journal, March 2016

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- **Study of Harmonics level to avoid EB penalty.**
- **Performance study of compressor.**
- **Performance study of Motor and pump.**
- **Power factor correction for all process & Welding industries.**
- **Study of lighting as per BEE standard.**
- **Performance study of HVAC including chillers plant.**
- **Awareness programme on Energy conservation**
- **Work shop on Energy Management**
- **Engineering project on Energy conservation**
- **Short term training on Energy Management.**

All industries/designated consumers and Educational institutions may utilise the above services for saving of power.

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TINY RED CRYSTALS DRAMATICALLY INCREASE BIOGAS PRODUCTION

UNSW Australia-led researchers have discovered a way to produce a tenfold increase in the amount of methane gas emitted by naturally occurring microbes living in coal seams and on food waste. The innovation could benefit the environment by extending the lifespan of coal seam gas wells, as well as improving the economics of using woody crops and left-over food as commercial sources of biogas.

The technique involves the addition of small amounts of a synthetic dye that forms previously unobserved needle-like crystals to help the methane-producing microbes grow faster. “It’s simple. If the microbes grow faster, they fart more methane,” says study senior author UNSW Associate Professor Mike Manefield.

Biogas emitted by microbes will be vital for meeting the world’s future energy needs and helping reduce greenhouse gas emissions from the burning of other fossil fuels, Associate Professor Manefield says. “Our research in the lab and in coal boreholes near Lithgow has shown that the crystals can lead to a massive leap in methane production — a tenfold increase from coal, and an 18-fold increase from food waste. This is very exciting and likely to be a game changer. We also expect our approach will work with renewable feedstocks for methane-producing microbes, such as woody plant material and the by-products of municipal wastewater treatment.”

The study, by an international team spear-headed by UNSW’s Dr Sabrina Beckmann, is published in the journal *Energy and Environmental Science*. The five-year-long research project was supported by the Australian Research Council and industry partner Biogas Energy.

The researchers studied a small synthetic molecule called neutral red that has been used for more than 150 years as a textile dye, or for staining cells under a microscope. “We knew it was able to shuttle electrons about and we wondered if it could deliver them directly to the microbes that produce methane. Usually these ancient critters get electrons from hydrogen gas,” says Associate Professor Manefield. When we added neutral red in the laboratory to a mixture of coal and naturally occurring groundwater microbes, in the absence of oxygen, we discovered it formed crystals that had never been seen before.

“The crystals act as electron sponges, harvesting electrons from minerals and bacteria in the mixture and then transferring them with a lot of power to the methane-producing microbes, boosting their growth.” The patented technology was also tested in a real-life environment in coal boreholes near Lithgow.

Small amounts of neutral red were injected 80 metres underground at three sites into the water-saturated coal seam. A fivefold to tenfold increase in methane production was observed during a 12-month period.”Coal seam gas wells usually have a short lifespan and spent ones litter the countryside. Enhancing their methane production could reduce the need to build new ones,” Associate Professor Manefield says.

LUMINATION™ LINEAR SUSPENDED LED

A new era for LED lighting – Lumination™ Linear Suspended LED from GE Lighting

GE Lighting has launched the new Lumination™ LED Linear. Its immaculate design aesthetic and ultra-thin profile provides double asymmetric light distribution, delivering the ideal solution for retail settings and a wide range of other projects.

Lumination™ Linear Suspended is a thin and uniform illuminated lighting panel suspending from the ceiling, powered with Intrinsix™ technology to maximise the performance, control and efficiency of the LEDs within the fixture. When turned on, it produces a perfectly even glow, and while off, it is nearly transparent with the LEDs hidden inside the frame. The double asymmetric distribution provides glare free, vertical and horizontal illuminance.

The minimalist design of the fixture creates an exceptionally thin profile that appears to float across the ceiling landscape and works well in a variety of environments including retail spaces, conference rooms, open-plan offices or reception areas. The effect is dramatic and opens up a new world of striking design possibilities.

Simon Fisher, General Manager EMEA – Commercial Office from GE Lighting said: “Lumination™ Linear Suspended allows specifiers to really unlock the potential of LED technology. It offers a multitude of benefits

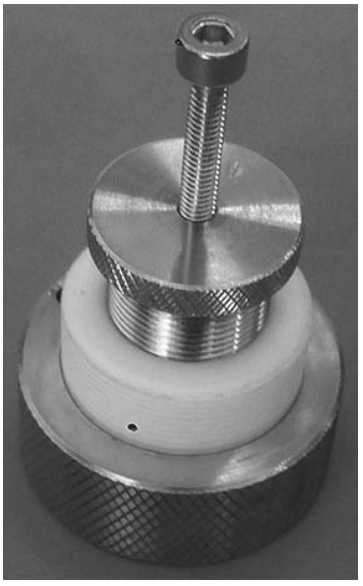
including energy efficiency, long life, contemporary aesthetics and the ability to deliver precision, uniform lighting that's vital to successful retail and office spaces. In addition, the Lumination™ Linear is completely transparent when switched off, meaning the level of perceived clutter is greatly reduced – this is beneficial in terms of improving the look of the environment in which it is installed."

Lumination™ Linear Suspended is available with different mounting options. Wire suspended with remote gear housing, suspended with a surface mounted gear housing for solid ceilings and also for installation onto a track system. Linear is available in a 1800mm and 1200mm length, in both 'with aisle' or 'cross aisle' installation. The luminaires are easy to install, design to be 'plug and play' solution further reducing maintenance costs.

The overall performance of Lumination™ Linear Suspended is exceptional. Available in 4000K/3500K/3000K, with 80 CRI, the LED solution offers good colour quality and colour consistency. Incredibly efficient, it has a long lifetime (up to 92 LPW, rated life 50,000 hours at L85). Lumination Linear Suspended is fully dimmable and can be linked to sensors and controlled according to the level of natural light present for the best possible energy saving. Dimming is provided via analogue (1-10V) or digital (DALI) signal.

For further information please visit: www.gelighting.com

ENVIRONMENTALLY-FRIENDLY LIQUID BATTERY



A new liquid battery that is more environmentally friendly than its existing counterparts could help lead to safe, inexpensive storage of renewable energy for power grids, researchers in Shanghai say. The new battery also has a much longer cycle life and much greater power than any current rechargeable battery, the scientists add.

The sun and wind are variable sources of power. As such, utility companies want massive rechargeable battery farms that can store the surplus energy from these renewable power sources for use when the sun goes down and the wind does not blow. However, one concern with many current rechargeable batteries is safety. For instance, many of these devices contain corrosive, toxic, or flammable components, or require searing-hot operating temperatures. In addition, today's rechargeable batteries are often too expensive for use in large-scale energy storage. Most offer too few total charge-discharge cycles, which requires their regular replacement, increasing costs. Many also depend on metals from rare ores, driving up costs.

Now researchers have created a battery that uses environmentally-friendly liquids to store and release energy. The new battery possesses a cathode made of: water-soluble iodide and triiodide ions; a watery electrolyte containing either lithium or sulfur ions that the cathode is dissolved in; a solid anode made of polyimide; and a polymer membrane that separates the anode and the cathode and allows ions to diffuse across it. When the battery is charging, the iodide oxidizes to form triiodide, and lithium or sodium ions flow across the membrane to chemically react with the polyimide. When the battery is discharging electricity, this process reverses. The scientists detailed their findings online in the 22 January edition of the journal *Science Advances*.

The researchers note that the cathode, anode, and electrolyte do not rely on metals. Furthermore, they calculated that sodium-ion and lithium-ion versions of this battery had energy densities of roughly 63.8 and 65.3 watt-hours per kilogram, respectively, comparable with other liquid batteries used for grid-level energy storage. Moreover, this new battery has a super-long life of 50,000 cycles, much better than any other rechargeable battery, the researchers say. "The super-long cycling life potentially reduces battery cost," says study co-author Yonggang Wang, an electrochemist at Fudan University in Shanghai.

Just as important, say the researchers, is that the battery can be charged or discharged in only 6.6 seconds—a level of power much greater than current rechargeable batteries and close to super capacitors in capability. "High power is important for fast-rate energy storage," Wang says.

The next steps for this research are larger batteries and better energy density, Wang says. ***Courtesy: IEEE***

NOW, SOLAR ENERGY CAN POWER AIR CONDITIONER, REFRIGERATOR

Making a marked departure from the conventional system, a Chennai-based company provides a comprehensive system that ensures that a 2 kW solar panel can power a 1.5 tonne air conditioner, one 300 litre refrigerator, five fans, five LED tube lights (4 feet in length and 16 watts each) and eight LED bulbs (6 watts each) during the day.

There are many innovative systems that make this possible. In lieu of silicon crystalline panels that are routinely used, Basil Energetics Pvt Ltd uses thin film solar panels. Though efficiency of thin film panel is the same as silicon panel at 25 degree C, the energy yield of thin film is higher than silicon panel.

"This is because power rating is done at 25 degree C. In India, the outside temperature far exceeds 25 degree C, especially during summer. And for every 1 degree C increase in temperature, the loss in power rating is 0.5 per cent in the case of silicon panels; it is only 0.25 per cent with thin films. So 5 per cent more energy output is achieved by thin film panels," said Dr. R. Ramarathnam, Chairman of Basil Energetics. **"Solar panels need light not heat. That's why they are more efficient in higher latitudes".**

Another advantage with the thin film panel is that unlike silicon panels where power production gets completely cut off even if a small part of the panel is covered by shade, only that part of the thin film panel that is not exposed to sunlight stops producing power.

Basil Energetics also manufactures electrical appliances that run on both direct current (D/C) and alternating current (A/C). The driver circuitry designed by Basil and more efficient motors manufactured by the company are used in the air conditioner, refrigerator and fan. Also, the refrigerator and air conditioner use a motor that runs on a variable speed compressor. "Our fans consume only 20 watts [normal fans need 75 watts] and a 1.5 tonne air conditioner requires only 1,200 watts initially and then run at 250-260 watts. The average consumption is only 333 watts, while normal air conditioners always need 1,650 watts," he said. "Our refrigerators consume only 40 watts, while conventional ones consume 150 watts".

But the brain of the whole system is a smart grid (iGrid) that manages the load by monitoring the power availability in the panel on one hand and load demand on the other to ensure smooth functioning in four different scenarios. All appliances are run on panel-produced power when there is adequate power, but when the demand is higher than the power produced, the iGrid runs as many appliances as possible using solar power and the remaining from the grid. During the night, the iGrid draws power from the grid while excess power produced during the day (when all appliances are not used) is fed to the grid. "This management is done automatically," Dr Ramarathnam said. "A battery can also be connected to the iGrid to run the appliances in the night".

Since the appliances use less power than conventional ones, the area of the thin film panel required is less. A thin film panel of 160 sq. feet area can provide 2 kW power when appliances manufactured by Basil are used, a 400 sq. feet area silicon panel is required in the case of conventional appliances, he said.

In the case of 2 kW capacity the investment would work out to Rs.4,20,000 for the panel, iGrid, and appliances and installation. "The payback period will be 5-5.5 years depending on usage and tariff," he said. It works out to Rs.1,10,000 in the case of 330 watts that can power a 180 litre refrigerator, three fans, two tube lights and two bulbs.

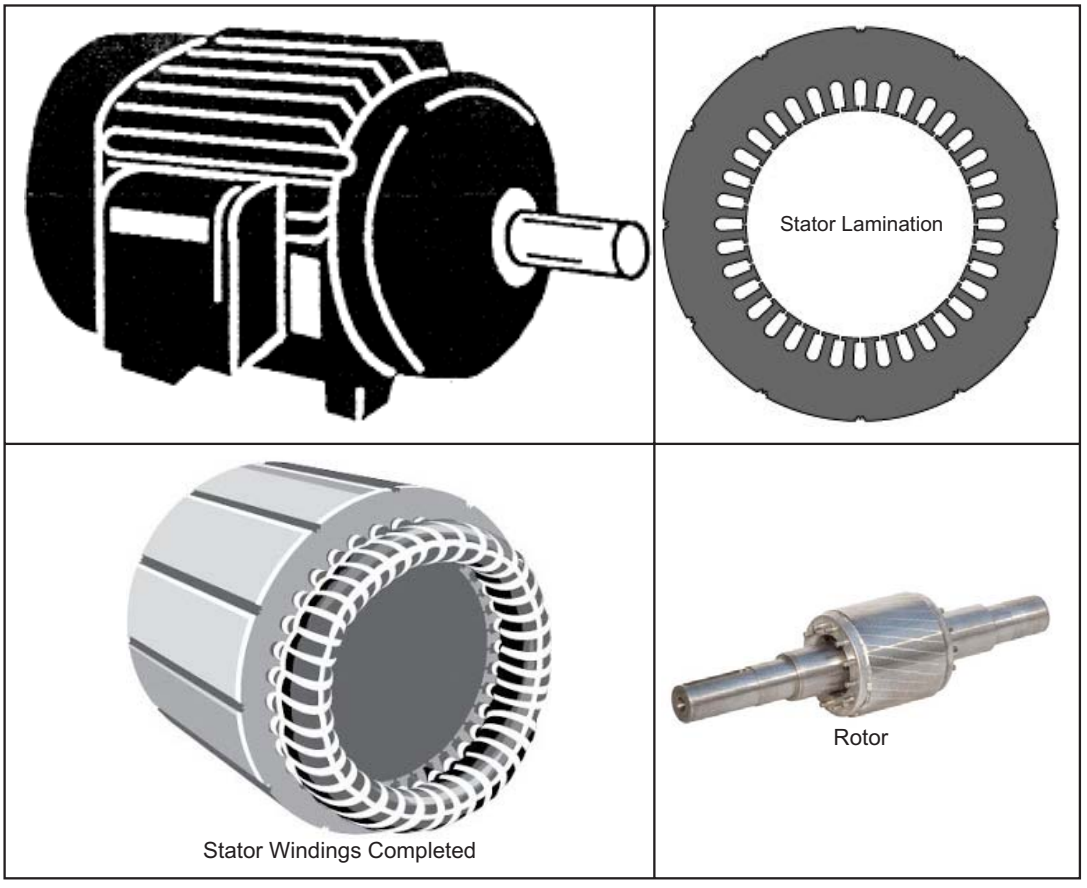
The company has so far completed 24 projects in a short span of 13 months.

Courtesy: The Hindu, dt. 21.03.2016

I challenge you to make your life a masterpiece. I challenge you to join the ranks of those people who live what they teach, who walk their talk. - ANTHONY ROBBINS

ENERGY CONSERVATION THROUGH ENERGY EFFICIENCY – 13

Electrical Losses - Magnetization Losses and AC Motors
Energy Efficient Motors



Description

Energy efficient motors use less electricity, run cooler, and often last longer than the Standard motors of the same size.

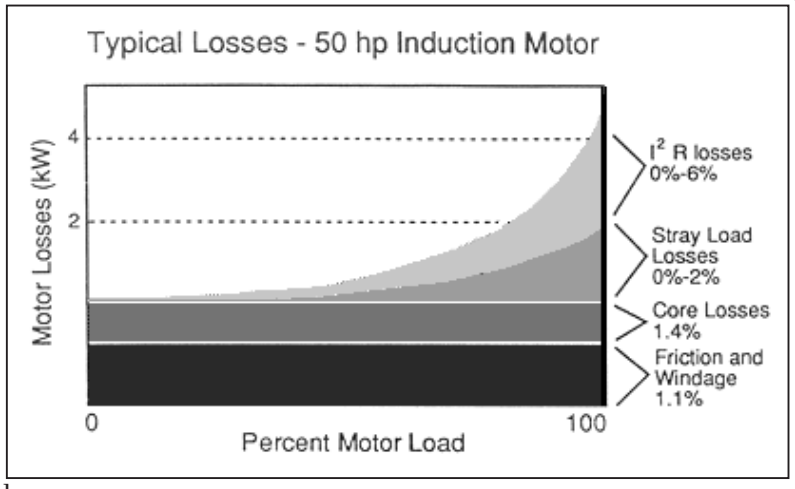
To effectively evaluate the benefits of high efficiency electric motors, we must define “efficiency”. For an electric motor, efficiency is the ratio of mechanical power delivered by the motor (output) to the electrical power supplied to the motor (input).

Efficiency = (Mechanical Power Output / Electrical Power Input) x 100%

Thus, a motor that is 85 percent efficient converts 85 percent of the electrical energy input into mechanical energy. The remaining 15 percent of the electrical energy is dissipated as heat, evidenced by a rise in motor temperature. Energy efficient electric motors utilize improved motor design and high quality materials to reduce motor losses, therefore improving motor efficiency. The improved design results in less heat dissipation and reduced noise output.

Motor efficiency is a factor of a variety of mechanical and electrical imperfections within the motor. Resistance (I^2R) losses in the stator windings and rotor bars can constitute up to a 15 percent loss in efficiency in three-phase motors. I^2R losses in single phase fractional horsepower motors may be as high as 30 percent. Magnetization losses in the stator and rotor cores cause about a 1 percent to 7 percent efficiency loss. Friction losses in the bearings and inefficiency in the cooling fans result in 0.5 percent to 1.5 percent loss in motor efficiency. Friction and magnetization losses are independent of motor load and relate solely to motor size and design. The remaining losses are referred to as stray load losses. Severely under loaded motors have lower efficiencies because the friction and windage and core losses remain constant and comprise an increasingly larger percentage of total motor power consumption. The figure below shows the various components of motor losses as a function of motor load.

The construction materials and mechanical and electrical design of a motor dictate its final efficiency. Energy efficient motors utilize high quality materials and employ optimized design to achieve higher efficiencies. Large diameter copper wire in the stator and more aluminum in the rotor reduce resistance losses of the energy efficient motor. Improved rotor configuration and optimized rotor-to-stator air gap result in reduced stray load losses. An optimized cooling fan design provides ample motor cooling with a minimum of windage loss. Thinner and higher quality steel laminations in the rotor and stator core allow the energy efficient motor to operate with substantially lower magnetization losses. High quality bearings result in reduced friction losses.



The percentages of losses given and dealt above refer to Full Load conditions and as we saw in the earlier part, the Motors can be taken to work on an average say, 50 to 75% Load, which can be healthy for the Motors, providing a cushion for any emergency. This is one of the important reasons why the Energy Efficient Motors are designed to have 'Flat Efficiency Characteristics' from 50% Load to 100% Load. As the Core losses are constant losses and the Load losses are variable with Load, at a situation of Motors working for long periods on part Loads, the percentage of Core losses out of the total losses increase.

Fixed losses...

Core losses are those found in the stator-rotor magnetic steel and are due to hysteresis effect and eddy current effect during 50 Hz magnetization of the core material. They are dependent on the flux density (or magnetic induction), the frequency and the quality of the magnetic material as well as on lamination thickness. These losses are independent of load and account for 20 – 25 % of the total losses under full load conditions. They vary with the core material and geometry and with input voltage. The hysteresis losses which are a function of flux density, are be reduced by utilizing low-loss grade of silicon steel laminations. The reduction of flux density is achieved by suitable increase in the core length of stator and rotor. Eddy current losses are generated by circulating current within the core steel laminations. These are reduced by using thinner laminations.

Briefly, Use of thinner gauge, lower loss core steel reduces eddy current losses. Longer core adds more steel to the design, which reduces losses due to lower operating flux densities.

Friction and windage losses are caused by friction in the bearings of the motor and aerodynamic losses associated with the ventilation fan and other rotating parts.

Important Points to note with regard to Magnetization Losses in Motors:

The quantum of Core losses and thus the Efficiency of Electrical Systems are decided by the following:

a) DESIGN

- Magnetisation
- Shape and size of lamination
- Friction
- Cooling

b) MATERIAL

- Electrical steel (high permeability)
- Winding material (Al, Cu)

c) PROCESSING

- Punching
- Laser cutting
- Welding,reveting
- Clamping
- Shrinking

Appropriate Production Processes include activities like, addition of Si to Chemical Composition, Degree of Cleanliness and optimising the Process of Cold Rolling and Annealing.

d) ENVIRONENTAL CONDITIONS

- **Temperature**
- **Operation in (air ,water, oil freezing media)**

Laminated and Insulated Core Materials manufactured and supplied are Graded based on the Total losses of Watts per Kg of Steel @ Flux Density of 1.5 Tesla and 50 c/s. The losses could be from 7W/Kg to 14 W/Kg for the standard Core materials available in the Market. Special Low Loss Steel Laminations have Loss Levels of around 2 W/Kg. By lowering Flux Densities, lower losses levels can be obtained.

(To be continued)

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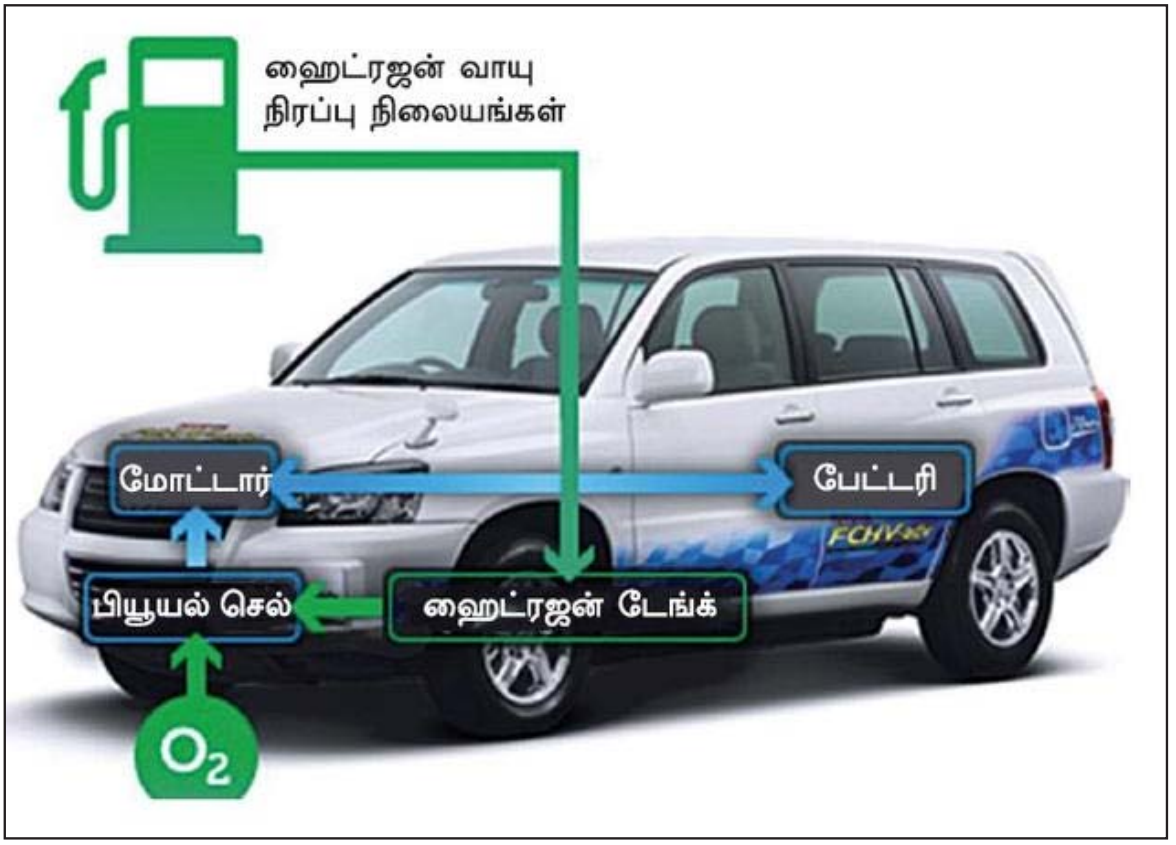
ஹோண்டாவின் ஹைட்ரஜன் கார் - கிளாரிட்டி

ஹைட்ரஜன் வாயுவை ஒரு முறை நிரப்பினால் 750 கி.மீ. தூரம் வரை இது ஓடும்.



கார்களுக்குத் தேவைப்படும் ஹைட்ரஜனை நிரப்ப அதிகபட்சம் 5 நிமிஷம் போதுமானது.

சுற்றுச் சூழலை பாதிக்காத கார்களை உருவாக்கும் முயற்சியில் அடுத்த கட்டத்தை நோக்கி முன்னேறியுள்ளது ஹோண்டா நிறுவனம். இந்நிறுவனம் கடந்த வாரம் ஜப்பானில் **கிளாரிட்டி** என்ற பெயரிலான ஹைட்ரஜனில் ஓடக் கூடிய கார்களை அறிமுகப்படுத்தியுள்ளது. ஐந்து பேர் பயணிக்கும் வகையில் வடிவமைக்கப்பட்ட இந்த கார்தான் **ஹைட்ரஜனில் செயல்படும் முதலாவது காராகும்**.

முதல் ஆண்டில் 200 கார்களைத் தயாரித்து அரசு அலுவலகங்கள், நகராட்சி அமைப்புகளுக்கு அளிக்கத் திட்டமிட்டுள்ளதாக நிறுவனத்தின் தலைவர் தகஹிரோ ஹசிகோ தெரிவித்தார்.

அடுத்த ஒன்றரை ஆண்டுகளில் இது பொதுமக்களுக்கு விற்பனைக்கு விட திட்டமிட்டுள்ளது ஹோண்டா. இந்தக் காரின் விலை 76 லட்சம் ஜப்பான் யென் (ரூ. 45 லட்சம்) சுற்றுச் சூழலை பாதிக்காத இந்த காருக்கு 20 லட்சம் ஜப்பான் யென் மானியம் அளிக்கப்படும் என ஜப்பானிய அரசு தெரிவித்துள்ளது.

ஹைட்ரஜனும் ஆக்சிஜனும் சேர்த்து உருவாகும் ஆற்றலில் மின்சாரம் உற்பத்தியாகி அதன் மூலம் இந்த கார் ஓடுகிறது. இந்த கார் ஓடும்போது வெறுமனே தண்ணீர் மட்டுமே வெளியாகும். புகை வெளியேறாது.

இந்த ஆண்டிலேயே இந்த காரை அமெரிக்காவிலும், ஐரோப்பிய நாடுகளிலும் அறிமுகப்படுத்த உள்ளதாக ஹோண்டா தெரிவிக்கிறது. பொதுவாக பேட்டரிகள் மின்னுற்பத்தி செய்பவை. இவற்றில் தேக்கி வைத்துள்ள மின்சாரம் தீர்ந்தவுடன் இவற்றை ரீ சார்ஜ் செய்ய வேண்டும்.

ஆனால் பியூயல் செல் பேட்டரிகள் ரசாயன மாற்றத்தில் மின்னுற்பத்தி செய்பவை. இதற்கு மூல பொருள் ஹைட்ரஜன், ஆக்சிஜன் சேரும்போது மின்னுற்பத்தி செய்யும். இத்தகைய பியூயல் செல் ஹைட்ரஜன், ஆக்சிஜன் சப்ளை இருக்கும் வரை மின்சாரத்தை உற்பத்தி செய்யும். இத்தகைய பியூயல் செல்கள் மிகச் சிறிய அளவிலிருந்து பெரிய அளவில் வரை தயாரிக்கப்படுகின்றன.

சுற்றுச் சூழலை காக்கும் இந்த ரகக் கார்களை ஊக்குவிக்க ஹைட்ரஜன் வாயு நிரப்பு நிலையங்களை அதிக எண்ணிக்கையில் தொடங்க ஜப்பான் அரசு முடிவு செய்துள்ளது.

ஹைட்ரஜன் வாயுவை ஒரு முறை நிரப்பினால் 750 கி.மீ. தூரம் வரை இது ஓடும்.

பேட்டரி கார்களை ரீ சார்ஜ் செய்ய நீண்ட நேரம் பிடிக்கும். ஆனால் பியூயல் செல் ***கார்களுக்குத் தேவைப்படும் ஹைட்ரஜனை நிரப்ப அதிகபட்சம் 5 நிமிஷம் போதுமானது.*** *அந்த வகையில் இந்த காருக்கு மிகுந்த வரவேற்பிருக்கும் என்பது நிச்சயம்.*

Courtesy: தி இந்து, 14.03.2016

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RANA KAPOOR | YES BANK LTD. | ENTREPRENEUR

RANA KAPOOR
Founder, YES Bank Ltd

"The art of banking is the management of Risk. You run a risk if you do something, but you run a bigger risk if you don't do anything. It's not like we don't have problems. It's just that the risk and credit culture of the bank is part of our blood stream," – Dr. Rana Kapoor, Founder, MD and CEO of YES bank.

In 1979, when kapoor was summer trainee (while studying at Rutger's University) in New Jersey, U.S., he used to go to New York City often and was awestruck by the big banks and its buildings towering over the skyline. He wanted something like that in India. As he progressed in his work life, starting as a corporate banker in bank of America, then an investment banker in ANZ Grindlays and later, as an entrepreneur in Rabo India Finance in partnership with Rabo bank in India, he felt that he would eventually get to build a bank of his own. When he got the right opportunity, he evangelized his dream to a group of people, thus evolving a common platform for sharing a dream and making it a collective proposition and **YES BANK** was born in 2004.

Since incorporation, the bank has grown very well. With over 350 branches and 600 ATMs throughout the country, it has reported a net interest income of Rs. 1,616 crore and net profit of Rs. 977 crore for the financial year ending March 2012.

In a span of nine years, the bank has received significant national and global recognition and accolades. It was recognized as **India's No.1 new private sector bank at the Financial Express Best Banks Awards 2011, and the fastest growing bank in the Business Today – KPMG Best Banks Annual Survey 2008, 2009 and 2010.**

The really bold decision of the bank, apart from naming it YES, was to come out with an initial public offering (IPO) within nine months of its inception. Strong governance and transparency in the business model, right from the beginning, has built confidence with the team, in the market place and with the regulators.

20 MOST PEACEFUL COUNTRIES IN THE WORLD - 17

AUSTRALIA

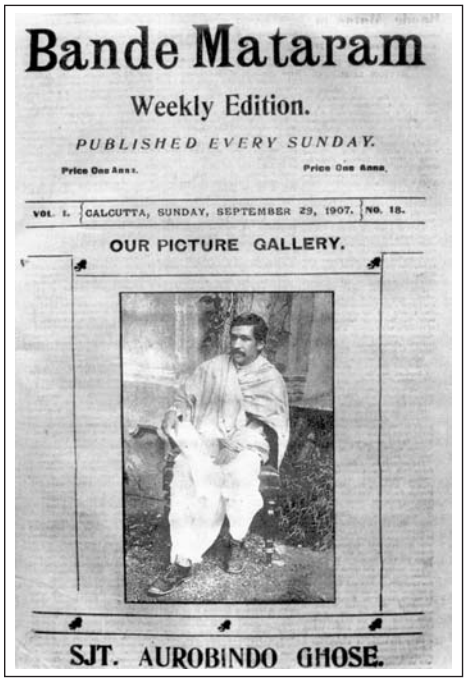
Australia is a beautiful and peaceful country that offers cultural diversity, spectacular beaches, loads of breathtaking natural beauty, wonderful fauna and friendly people with an amazing sense of humour. Although Australia is a large country, approximately the same size as the USA, it has a small population of about 20 million, so there's a lot of uninhabited space worth visiting. Australia's low crime rate, stable political system, high standards of health care and well-maintained roads make it a safe and comparatively easy country to live in or just to explore.

(To be continued)
Courtesy: Amerikanki

SRI AUROBINDO - 2

Baroda and Calcutta (1893–1910)

In Baroda, Aurobindo joined the state service in 1893, working first in the Survey and Settlements department, later moving to the Department of Revenue and then to the Secretariat, and much miscellaneous work like teaching grammar and assisting in writing speeches for the Maharaja of Gaekwad until 1897. In 1897 during his work in Baroda he started working as a part-time French teacher at Baroda College (now Maharaja Sayajirao University of Baroda). He was later promoted to the post of vice-principal. At Baroda, Sri Aurobindo self-studied Sanskrit and Bengali.


Bande Mataram

Weekly Edition.

PUBLISHED EVERY SUNDAY.

Price One Anna. Price One Anna.

VOL. I. CALCUTTA, SUNDAY, SEPTEMBER 29, 1907. NO. 18.

OUR PICTURE GALLERY.

SJT. AUROBINDO GHOSE.

During his stay at Baroda he contributed to many articles to *Indu Prakash* and spoke as a chairman of the Baroda college board. He started taking an active interest in the politics of India's independence struggle against British rule, working behind the scenes as his position in the Baroda state administration barred him from overt political activity. He linked up with resistance groups in Bengal and Madhya Pradesh, while traveling to these states. He established contact with Lokmanya Tilak and Sister Nivedita. He arranged the military training of Jatindra Nath Banerjee (Niralamba Swami) in the Baroda army and then dispatched him to organise the resistance groups in Bengal.

Aurobindo often travelled between Baroda and Bengal, at first in a bid to re-establish links with his parent's families and other Bengali relatives, including his cousin Sarojini and brother Barin, and later increasingly to establish resistance groups across the Presidency. He formally moved to Calcutta in 1906 after the announcement of the Partition of Bengal. Age 28, he had married 14-year-old Mrinalini, daughter of Bhupal Chandra Bose, a senior official in government service, when he visited Calcutta in 1901. Mrinalini died in December 1918 during the influenza pandemic.

Aurobindo was influenced by studies on rebellion and revolutions against England in medieval France and the revolts in America and Italy. In his public activities he favoured non-co-operation and passive resistance; in private he took up secret revolutionary activity as a preparation for open revolt, in case that the passive revolt failed.

In Bengal, with Barin's help, he established contacts with revolutionaries, inspiring radicals such as Bagha Jatin, Jatin Banerjee and Surendranath Tagore. He helped establish a series of youth clubs, including the Anushilan Samiti of Calcutta in 1902.

Aurobindo attended the 1906 Congress meeting headed by Dadabhai Naoroji and participated as a councillor informing the fourfold objectives of "Swaraj, Swadesh, Boycott and national education". In 1907 at the Surat session of Congress where moderates and extremists had a major showdown, he led with extremists along with Bal Gangadhar Tilak. The Congress split after this session. In 1907–1908 Aurobindo travelled extensively to Pune, Bombay and Baroda to firm up support for the nationalist cause, giving speeches and meeting with groups. He was arrested again in May 1908 in connection with the Alipore Bomb Case. He was acquitted in the ensuing trial and released after a year of isolated incarceration.

Once out of the prison he started two new publications, *Karmayogin* in English and *Dharma* in Bengali. He also delivered the Uttarpara Speech hinting at the transformation of his focus to spiritual matters. The British persecution continued because of his writings in his new journals and in April 1910 Aurobindo moved to Pondicherry, where Britain's secret police monitored his activities.

Conversion from politics to spirituality

In July 1905 then Viceroy of India, Lord Curzon, partitioned Bengal. This sparked an outburst of public anger against the British, leading to civil unrest and a nationalist campaign by groups of revolutionaries, who included Aurobindo. In 1908, Khudiram Bose and Prafulla Chaki attempted to kill Magistrate Kingsford, a judge known for handing down particularly severe sentences against nationalists. However, the bomb thrown at his horse carriage missed its target and instead landed in another carriage and killed two British women, the wife and daughter of barrister Pringle Kennedy. Aurobindo was also arrested on charges of planning and overseeing the attack and imprisoned in solitary confinement in Alipore Jail. The trial of the Alipore Bomb Case lasted for a year, but eventually he was acquitted on May 6th 1909. His defence counsel was Chittaranjan Das. During this period in the Jail, his view of life was radically changed due to spiritual experiences and realizations. Consequently, his aim went far beyond the service and liberation of the country.

Aurobindo said he was "visited" by Vivekananda in the Alipore Jail: "It is a fact that I was hearing constantly the voice of Vivekananda speaking to me for a fortnight in the jail in my solitary meditation and felt his presence."

In his autobiographical notes, Aurobindo said he felt a vast sense of calmness when he first came back to India. He could not explain this and continued to have various such experiences from time to time. He knew nothing of yoga at that time and started his practise of it without a teacher, except for some rules that he learned from Ganganath, a friend who was a disciple of Brahmananda. In 1907, Barin introduced Aurobindo to Vishnu Bhaskar Lele, a Maharashtrian yogi. Aurobindo was influenced by the guidance he got from the yogi, who had instructed Aurobindo to depend on an inner guide and any kind of external guru or guidance would not be required.

In 1910 Aurobindo withdrew himself from all political activities and went into hiding at Chandannagar while the British were trying to prosecute him for sedition on the basis of a signed article titled 'To My Countrymen', published in *Karmayogin*. As Aurobindo disappeared from view, the warrant was held back and the prosecution postponed. Aurobindo manoeuvred the police into open action and a warrant was issued on 4 April 1910, but the warrant could not be executed because on that date he had reached Pondicherry, then a French colony. The warrant against Aurobindo was withdrawn.

Pondicherry (1910–1950)

In Pondicherry, Aurobindo dedicated himself to his spiritual and philosophical pursuits. In 1914, after four years of secluded yoga, he started a monthly philosophical magazine called *Arya*. This ceased publication in 1921. Many years later, he revised some of these works before they were published in book form. Some of the book series derived out of this publication were *The Life Divine*, *The Synthesis of Yoga*, *Essays on The Gita*, *The Secret of The Veda*, *Hymns to the Mystic Fire*, *The Upanishads*, *The Renaissance in India*, *War and Self-determination*, *The Human Cycle*, *The Ideal of Human Unity* and *The Future Poetry* were published in this magazine.

At the beginning of his stay at Pondicherry, there were few followers, but with time their numbers grew, resulting **in the formation of the Sri Aurobindo Ashram in 1926**. From 1926 he started to sign himself as *Sri Aurobindo*, *Sri* (meaning holy in Sanskrit) being commonly used as an honorific.

For some time afterwards, his main literary output was his voluminous correspondence with his disciples. His letters, most of which were written in the 1930s, numbered in the several thousands. Many were brief comments made in the margins of his disciple's notebooks in answer to their questions and reports of their spiritual practice—others extended to several pages of carefully composed explanations of practical aspects of his teachings. These were later collected and published in book form in three volumes of *Letters on Yoga*. In the late 1930s, he resumed work on a poem he had started earlier—he continued to expand and revise this poem for the rest of his life. It became perhaps his greatest literary achievement, *Savitri*, an epic spiritual poem in blank verse of approximately 24,000 lines.

Aurobindo died on 5 December 1950. Around 60,000 people attended his funeral. Prime Minister Jawaharlal Nehru and President Rajendra Prasad praised him for his contribution to Yogic philosophy and the independence struggle. **National and international newspapers commemorated his death.**

Mirra Richard and the development of the Ashram

Aurobindo's close spiritual collaborator, Mirra Richard (b. Alfassa), came to be known as *The Mother*. She was a French national, born in Paris on 21 February 1878. In her 20s she studied occultism with Max Theon. Along with her husband, Paul Richard, she went to Pondicherry on 29 March 1914, and finally settled there in 1920. Aurobindo considered her his spiritual equal and collaborator. After 24 November 1926, when Aurobindo retired into seclusion, he left it to her to plan, build and run the ashram, the community of disciples which had gathered around them. Some time later, when families with children joined the ashram, she established and supervised the Sri Aurobindo International Centre of Education with its experiments in the field of education. When he died in 1950, she continued their spiritual work, directed the ashram, and guided their disciples.

Philosophy and spiritual vision

Aurobindo's concept of the Integral Yoga system is described in his books, *The Synthesis of Yoga* and *The Life Divine*. *The Life Divine* is a compilation of essays published serially in *Arya*.

Aurobindo argues that divine *Brahman* manifests as empirical reality through *lîlâ*, or divine play. Instead of positing that the world we experience is an illusion (*mâyâ*), Aurobindo argues that life itself is Divine.

Aurobindo believed that Darwinism merely describes a phenomenon of the evolution of matter into life, but does not explain the reason behind it, while he finds life to be already present in matter, because all of existence is a manifestation of *Brahman*. He argues that nature (which he interpreted as divine) has evolved life out of matter and then mind out of life. All of existence, he argues, is attempting to manifest to the level of the supermind - that evolution had a purpose. He stated that he found the task of understanding the nature of reality arduous and difficult to justify by immediate tangible results.

Legacy

Aurobindo was an Indian nationalist but is best known for his philosophy on human evolution and Integral Yoga.

அன்றாடம் பேரிச்சம்பழம் சாப்பிடுவதால் கிடைக்கும் நன்மைகள்

அன்றாடம் பேரிச்சம் பழம் சாப்பிடுவது மிகவும் நல்லது. ஏன் என்று பலருக்கு தெரியாது. இருப்பினும் அதனை சாப்பிட்டால், உடலில் இரத்தத்தின் அளவு அதிகரிக்கும் என்று மட்டும் தெரியும். ஆனால் பேரிச்சம் பழத்தில் உடலுக்கு தேவையான எண்ணற்ற சத்துக்கள் நிறைந்துள்ளன. இதனால் உடலில் ஏற்படும் பல்வேறு பிரச்சனைகளைத் தடுக்கலாம். இந்த பேரிச்சம் பழத்தை அப்படியே அல்லது சட்னி செய்தும் சாப்பிடலாம். இங்கு பேரிச்சம் பழத்தை தினமும் சாப்பிட்டு வந்தால் கிடைக்கும் நன்மைகள் கொடுக்கப்பட்டுள்ளன. அதைப் படித்து, செய்து சுவைத்துப் பாருங்கள். இரத்த சர்க்கரையின் அளவு சீராக இருக்கும். உங்களுக்கு இனிப்பான பொருளை உட்கொள்ள ஆசை இருந்தால், பேரிச்சம் பழம் வாங்கி சாப்பிடுங்கள். ஏனெனில் பேரிச்சம் பழத்தில் இருப்பது ஆரோக்கியமான சர்க்கரை. ஆகவே இதனை உட்கொண்டு வந்தால், இரத்தத்தில் உள்ள சர்க்கரையின் அளவு சீராக இருக்கும்.

எடையை அதிகரிக்கும்:

உடல் எடையை அதிகரிக்க நினைப்போர், பேரிச்சம் பழத்தை உட்கொள்வது நல்லது. அதிலும் இதனை அதிக அளவில் சாப்பிட வேண்டும். மேலும் இதில் சோடியம், கொலஸ்ட்ரால் இல்லாததால், இதனை உட்கொள்வதன் மூலம் ஆரோக்கியமான வழியில் உடல் எடையை அதிகரிக்கலாம்.

செரிமானத்தை சீராக்கும்:

பேரிச்சம் பழத்தில் நார்ச்சத்து அதிக அளவில் இருப்பதால், இதனை அன்றாடம் உட்கொண்டு வந்தால் செரிமான மண்டலம் சீராக இயங்கும்.

இதய ஆரோக்கியம்:

செரிமானம் சீராக நடைபெறுவதால், உடலில் கெட்ட கொழுப்புகளின் சேர்க்கை குறைந்து, இதன் மூலம் இதயத்திற்கு எவ்வித அழுத்தமும் ஏற்படாமல், இதயத்தின் ஆரோக்கியம் பாதுகாக்கப்படும்.

இரத்த சோகை:

இரும்புச் சத்து குறைபாட்டினால் ஏற்படுவது தான் இரத்த சோகை. இந்த இரும்புச்சத்து பேரிச்சம் பழத்தில் அதிகமாகவே உள்ளது. மேலும் இரும்புச் சத்தானது சிவப்பணுக்கள் ஆக்ஸிஜனை மற்ற பாகங்களுக்கு எடுத்துச் செல்ல உதவி புரியும்.

பொட்டாசியம் நிறைந்தது:

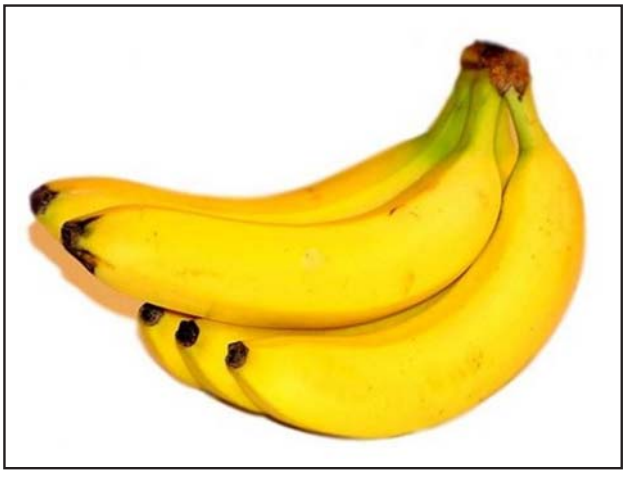
100 கிராம் பேரிச்சம் பழத்தில் 656 மி.கி. பொட்டாசியம் உள்ளது. மேலும் உலக சுகாதார அமைப்பின் படி, ஒருவருக்கு ஒரு நாளைக்கு 3.510 மி.கி. தேவைப்படுகிறது. ஆகவே பேரிச்சம் பழத்தை அன்றாடம் உட்கொண்டு வந்தால் உடலுக்கு வேண்டிய பொட்டாசியத்தைப் பெறலாம்.

நரம்புகளின் இயக்கம்:

பேரிச்சம் பழத்தை வேறு சில சத்துக்களான கால்சியம், மக்னீசியம் மற்றும் வைட்டமின் B6 போன்றவை நிறைந்துள்ளது. இதில் உள்ள கால்சியம் மற்றும் மக்னீசியம் எலும்புகளின் வளர்ச்சிக்கு மிகவும் இன்றியமையாதது. வைட்டமின் B6 புரோட்டீன்களை உடைத்து, நரம்புகளினை சீராக இயக்கும்.

Courtesy: PESOT, November 2015

மன அழுத்தம் குறைக்கும் வாழைப்பழம்



- வாழைப்பழம், நமக்கு அதிகம் தெரிந்த பழம். நாம் அதிகம் புறக்கணிக்கும் பழம் இதுவாகத்தான் இருக்கும். ஆனால், இந்தப் பழம் எவ்வளவு நல்லது தெரியுமா?
- புகைப் பிடிப்பதைக் கைவிட வேண்டுமென யோசிக்கிறீர்களா? அப்போதெல்லாம் ஒரு சின்ன வாழைப்பழத்தைச் சாப்பிட்டுப் பாருங்களேன். அது தரும் உடனடி சக்தியும் மற்றச் சத்துகளும் புகைபிடிப்பதைக் கைவிட உதவுமாம்.
- இதயக் கோளாறு, ரத்தக் கொதிப்பு ஆபத்தை வாழைப்பழம் குறைக்கிறது.
- மாதவிடாய் தசைப்பிடிப்புகளில் இருந்து விடுதலை தருகிறது.
- எலும்புகளை வலுப்படுத்துவதுடன் ரத்தசோகையைத் தடுக்கவும் செய்கிறது.
- மன அழுத்தத்தைக் குறைக்கவும் வாழைப்பழம் உதவுகிறது.

Courtesy: தி இந்து, 27.02.2016

நோய்களை விரட்டும் மூலிகைக் குடிநீர்

கேரளப் பாரம்பரியம் என்றவுடன் புட்டு – கடலைக்கறி, சிவப்பான மட்டையரிசி, மீன் உணவு போன்றவற்றுடன் நினைவுக்கு வரும் மற்றொரு விஷயம் **மூலிகைக் குடிநீர்**. கேரளத்தில் பெரும்பாலான வீடுகளிலும் உணவகங்களிலும் மிதமான சூட்டில் கொடுக்கப்படும் குடிநீரில், பலவகை மூலிகைகள் கலந்திருப்பது, ஆரோக்கியத்துக்குத் தரப்படும் முக்கியத்துவத்தை உணர்த்துகிறது. நீர் மூலம் பரவும் பல நோய்களுக்கு மூலிகைக் குடிநீர் முட்டுக்கட்டையும் போடுகிறது.

தாகச் சமணி, தாக முக்தி என்ற பெயர்களில், குடிநீரில் சேர்க்க வேண்டிய மூலிகைக் கலவைகள் அங்கே சாதாரணமாகக் கிடைக்கின்றன. அந்த மூலிகைகள் அனைத்தும் தமிழகத்திலும் எளிதாகக் கிடைக்கின்றன. இவற்றைப் பயன்படுத்தி நாமும் நோய்களைத் தடுத்துக் கொள்ளலாம். அந்த மூலிகைக் குடிநீர் வகைகள் என்ன?

பதிமுகம் (சாயமரம்) குடிநீர்

கேரளத்தின் சில இடங்களில் தரப்படும் குடிநீர் வெளிர் ரோஜா நிறத்தில் இருப்பதைப் பார்க்கலாம். பதிமுகச் சக்கைகளை நீரில் கொதிக்க வைத்துக் கொடுப்பதே, இந்த நிறத்துக்கும் மணத்துக்கும் காரணம். மாதவிடாய்க் காலங்களில் ஏற்படும் அதிக ரத்தப்போக்கைக் கட்டுப்படுத்துவது மட்டுமின்றி வெள்ளைப்படுதலையும் இது குறைக்கிறது. பிலிப்பைன்ஸ் நாட்டில் ரத்தப்போக்கைத் தடுப்பதற்காகப் பதிமுகம் பயன்படுத்தப்படுகிறது. உடலின் வெப்பத்தை குறைத்துப் பசியையும் தூண்டுகிறது.

இதில் **'Juglone'** எனும் வேதிப் பொருள் கிருமிநாசினியாகவும் செயல்படுகிறது; ரத்த ஓட்டத்தைச் சீராக்குகிறது. வீக்கமுறுக்கி செய்கையைக் கொண்டிருப்பதால், தாய்லாந்து நாட்டு மக்கள் இதை மூட்டுவாத நோய்களுக்கு மருந்தாகப் பயன்படுத்துகின்றனர்.

புற்றுநோய்க்கு 'லட்சுமி தரு'

கேரளத்தில் பயன்படுத்தப்படும் சில வகை குடிநீர் பொடிகளில் லட்சுமி தருவின் இலைகள் ஐம்பது சதவீதம் சேர்க்கப்படுகின்றன. **Simarouba glauca** என்ற தாவரவியல் பெயர் கொண்ட லட்சுமி தரு, 'சொர்க்க மரம்' என்றும் அழைக்கப்படுகிறது. இதற்குப் புற்றுநோயைக் குணப்படுத்தும் தன்மை இருப்பதாக மக்கள் நம்புகின்றனர். இது தொடர்பாக ஆராய்ச்சிகள் நடைபெற்றுக் கொண்டிருக்கின்றன. வலி நிவாரணி, கிருமிநாசினி, புழுக்கொல்லி, பசித்தீ தூண்டி, காய்ச்சல் அகற்றி எனப் பன்முகப் பண்புகள் லட்சுமி தரு தாவரத்துக்கு உண்டு. இதிலுள்ள Ailanthinone, Glaucarbinone வேதிப் பொருட்கள் பல நோய்களைக் குணப்படுத்துவதற்குக் காரணமாக உள்ளன.

சர்வசுகந்தி

சர்வசுகந்தி இலைகளை நீரில் கொதிக்க வைத்துச் சிலர் அருந்துகின்றனர். இதன் தாவரவியல் பெயர் **Pimenta dioica**. சிறந்த எதிர்-ஆக்ஸிகரண (ஆன்ட்டி ஆக்சிடன்ட்) பொருளாகச் செயல்படுகிறது. இலைகளிலுள்ள வாசனை எண்ணெய் காரணமாக, நீரை அருந்தும்போது நல்ல வாசனையுடன் இருக்கிறது. சில பகுதியினர் உணவிலும் இந்த இலைகளைச் சேர்க்கின்றனர்.

தாகமுக்தி குடிநீர்

வெட்டிவேர், பதிமுகம், கருங்காலி, நன்னாரி, சுக்கு, ஏலம், மல்லி ஆகிய மூலிகைகள் தாகமுக்தி குடிநீர் கலவையில் சேர்கின்றன. ஒரு தேக்கரண்டிப் பொடியை, ஐந்து லிட்டர் நீரில் கலந்து லேசாகக் கொதிக்க வைத்துப் பயன்படுத்தலாம். நன்னாரி கலந்திருப்பதால் இந்த நீரை அருந்தும்போது, நன்னாரி சர்பத் போன்ற மணமும் சுவையும் கொண்டிருக்கும். நெடுந்தூரப் பயணத்தின்போது ஏற்படும் சிறுநீர் எரிச்சலுக்கும், தலைவலி, வயிற்று வலி போன்ற அறிகுறிகளுக்கும் தாகமுக்தி குடிநீரைப் பயன்படுத்தலாம்.

தாகச் சமணி குடிநீர்

லட்சுமி தரு இலை, பதிமுகம், கருங்காலி, வெட்டிவேர், கோரைக்கிழங்கு, நன்னாரி, ஏலம், சுக்கு, கிராம்பு, சீரகம், அதிமதுரம் போன்ற மூலிகைகளின் தொகுப்பே **தாகச் சமணி** குடிநீர். இது உடலில் தேங்கிய கழிவை அகற்றி, ரத்தத்தைத் தூய்மைப் படுத்துகிறது. உடலுக்குக் குளிர்ச்சியைக் கொடுத்து உணவு செரிமானத்தை அதிகரிக்கிறது. வெட்டிவேர், ஏலம், நன்னாரி, சீரகம் ஆகியவற்றால் பித்தம் சார்ந்த நோய்களும் குறைகின்றன.

மூலிகைப் பொட்டணங்கள் (கிழி):

டீத்தூள் பொட்டலத்தைப் பாலில் இட்டுக் குடிக்கும் 'டிப் டீ' போல, மூலிகைப் பொட்டலத்தைச் சூடான நீரில் போட்டு **'மூலிகை நீராக'** பயன்படுத்தும் வகையில் மூலிகைப் பொட்டலங்களும் கிடைக்கின்றன.

குடிக்கும் நீரில் சில மூலிகைகளைக் கலந்து நோய்களை நீக்கும் முறை தமிழகத்திலும் பல காலமாக வழக்கில் இருக்கிறது. **சீரக நீர், வெந்தய நீர், நெல்லி நீர், தேற்றான் கொட்டை நீர்** என அடுக்கிக்கொண்டே போகலாம்.

சீரகக் குடிநீர் (அ) ஊறல் நீர்

சிறிது சீரகத்தை நீரிலிட்டுக் கொதிக்க வைத்து வடிகட்டி அந்த நீரைக் குடிக்கலாம் அல்லது சீரகத்தை முதல் நாள் இரவு முழுவதும் நீரில் ஊற வைத்து, காலையில் அந்த ஊறல் குடிநீரை அருந்தலாம். சீரகத்திலுள்ள 'Thymol' எனும் வேதிப்பொருள் செரிமானச் சுரப்பிகளைத் தூண்டி நல்ல பசியை உண்டாக்குகிறது. உடலில் உள்ள வாயுக்களைக் கட்டுப்படுத்துகிறது. கர்ப்பிணிப் பெண்களுக்கு ஏற்படும் செரிமானக் கோளாறுகளுக்குச் சீரக நீர், பக்க விளைவில்லா மருந்து. அசைவ உணவு சாப்பிடும்போது சீரக நீரைப் பயன்படுத்தினால் மந்தம், உப்புசம் பற்றிக் கவலைப்படத் தேவையில்லை. வயிறு சார்ந்த நோய்களைப் போக்குவதுடன் கூடுதல் பலனாக இரும்புச் சத்தையும் சீரகம் அளிக்கிறது.

வெந்தய ஊறல் நீர்

வெந்தய விதைகளை நீரில் ஊற வைத்து அருந்த, பித்தம் சார்ந்த நோய்கள் குறையும். சிறுநீர் எரிச்சல், சிறுநீர்ப் பாதை தாபிதம், வயிற்றுப் புண், மாதவிடாய்க் காலங்களில் ஏற்படும் வயிற்று வலி போன்ற தொந்தரவுகளுக்கு வெந்தய ஊறல் நீர் பயன்படுத்தலாம். வெந்தயத்தில் உள்ள 4 - hydroxyisoluecine எனும் அமினோ அமிலம், கணைய செல்களைத் தூண்டி, இன்சுலின் சுரப்பை முறைப்படுத்துவதாக ஆராய்ச்சி முடிவுகள் கூறுகின்றன. எனவே, நீரிழிவு நோயாளிகளுக்கு இந்த ஊறல் நீரானது அருமருந்து. இரத்தத்தில் கொழுப்புச் சத்து அதிக அளவில் இருப்பவர்களும், உடல் எடையைக் குறைக்க விரும்புபவர்களும் இதை அருந்தலாம்.

எப்படிக் குடிப்பது?

மேற்குறிப்பிட்ட மூலிகைக் கலவைகளை மழை மற்றும் குளிர் காலங்களில் கொதிக்க வைத்து மிதமான சூட்டில் குடிக்கலாம் (கொதிநீர்). அதையே வெயில் காலத்தில், மூலிகைகளை நீரில் கொதிக்க வைத்து, ஆறிய பின் மண் பானைகளில் நீரைச் சேமித்து, குளிர்ந்த நீராகவும் பயன்படுத்தலாம்.

உணவகங்களிலும் வீடுகளிலும் கொதிக்க வைத்து ஆறிய மூலிகை நீரைப் பயன்படுத்தத் தொடங்கிவிட்டால், நீர் மூலம் பரவும் நோய்களை முற்றிலுமாகத் தவிர்த்துவிடலாம். அன்றாடம் குடிக்கும் குடிநீரோடு மூலிகைகளைச் சேர்த்துக்கொண்டால், நோய் எதிர்ப்பு ஆற்றல் அதிகரித்து, புதிது புதிதாக வரும் விநோத வைரஸ்களையும் விரட்டி அடிக்கலாம்.

கட்டுரையாளர், டாக்டர். வி. விக்ரம்குமார், அரசு சித்த மருத்துவர்

தொடர்புக்கு: drvikramkumar86@gmail.com

Courtesy: தி இந்து, 27.02.2016

இரத்த சோகையை போக்கிடும் வெல்லம்

இரத்தசோகையால் ஆயிரக்கணக்கான பருவப் பெண்களும், கர்ப்பிணிகளும் பாதிக்கப்பட்டுள்ளனர். இரத்தசோகையைக் குறைக்கும் ஆற்றல் நிறையவே வெல்லத்தில் உண்டு.

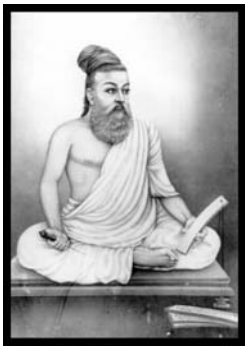
இரும்புச் சத்துக் குறைவுதான் இரத்தசோகைக்கு முக்கியக் காரணம். உடல் வெளுக்கும், நகமும் வெளுக்கும், முகம் வீங்கும், கண் இமை மற்றும் உள் உதடுகளில் வெண்படலம் தெரியும். அடிக்கடி மூச்சுத் திணறும். கை, கால் வலிக்கும். இவை எல்லாம் முக்கிய அறிகுறிகள்.

பனைவெல்லத்தைவிடவும், கரும்பில் இருந்து எடுக்கப்படும் வெல்லத்தில் இரும்புச் சத்து அதிக அளவில் உண்டு. 100 கிராம் வெல்லத்தில் 2.64 மில்லி கிராம் இரும்புச் சத்தும், 80 மில்லி கிராம் கால்ஷியமும் உள்ளது. இரண்டும் சேரும் போது உடலுக்கு நல்ல வலு கிடைக்கும். இது தவிர பொட்டாஷியம், சோடியம், கால்ஷியம், பாஸ்பரஸ், மாங்கனீஸ் மற்றும் துத்தநாகம் ஆகியவையும் வெல்லத்தில் உண்டு.

பெண்களுக்கு மாதவிடாயின் போது சோர்வாகவும், படபடப்பாகவும் இருக்கும். அந்த நிலையில் வெல்லம் சாப்பிட்டால் நிச்சயம் நல்ல பலன் கிடைக்கும். ஒவ்வாமையால் ஏற்படும் ஆஸ்துமா நோய்க்கு வெல்லம் ஒரு வரப்பிரசாதம். பித்தம் மற்றும் காமாலை நோய்களுக்கு வெல்லத்தை துணை மருந்தாக தரலாம். வெல்லத்தை சமையலில் பயன்படுத்தும் போது சுவை அதிகரிக்கும்.

ஓமம். மிளகு, வெல்லம் மூன்றையும் சம அளவில் எடுத்துப் பொடி செய்து, காலை மற்றும் இரவு அரைத் தேக்கரண்டி வீதம் சாப்பிட்டு வந்தால், வயிற்றுக் கடுப்பு தீரும் குடல் புழுக்களைக் கட்டுப்படுத்த அதிகாலையில் வெல்லத்தை சிறிது அளவு உட்கொள்ளலாம்.

TIRUKKURAL AND MANAGEMENT IN A 'NUTSHELL' – 36



As we have been seeing and analyzing, Management means 'Performance' and sustaining Performance. It is the 'Personality' with a large measure of 'IQ', 'EQ', and 'SQ' and involved in continuous improvement through Knowledge and Wisdom, that ensures good and sustaining Performance, can be established through case studies. Once this 'Concept' is accepted, it can easily be seen that every Kural of Tiruvalluvar in the Chapters of **"Araththuppal"** and **"Porutpal"** throws light and direction to improve the Personality and Performance.

In Management, motivating the people to give their Best and correcting them to ensure blemish less performance are all important. The following Kurals will provide directions to the Leader to handle the People with proper 'EQ'.

Kadithuochchi Mella Eriga Nedithuaakkam
Neenggamai Vendu Bavar Kural 562

கடிதுஓச்சி மெல்ல எறிக நெடிதுஆக்கம்
நீங்காமை வேண்டு பவர் குறள் 562

"Those that desire that their power should last, let them handle the rod smartly but lay it on soft"

Veruvantha Seithuozhugum Vengolan Aayin
Oruvandam Ollaik Kedum Kural 563

வெருவந்த செய்துஒழுகும் வெங்கோலன் ஆயின்
ஒருவந்தம் ஒல்லைக் கெடும் குறள் 563

"Behold the Prince who ruleth with a rod of Iron and causeth terror to his people: he will stand without a friend and perish forthwith"

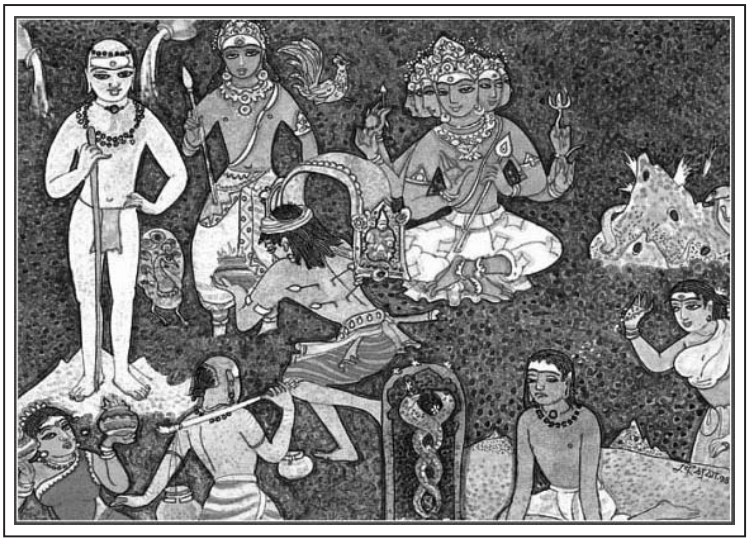
Kadungchollan Kannilan Aayin Nedumselvam
Needuindri Aange Kedum Kural 566

கடுஞ்சொல்லன் கண்ணிலன் ஆயின் நெடுஞ்செல்வம்
நீடுஇன்றி ஆங்கே கெடும் குறள் 566

"If the Prince is harsh of words and unforgiving, his properity, be it ever so great, will come to an end quickly"

HOME FESTIVALS – 5

வைகாசி - Vaikasi (May/June)

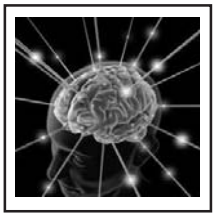


This month is devoted to the worship of Lord Murugan, who is honoured on Vaikasi Vishakham (above). He is shown at far left as Palani, the renunciate, dressed in loincloth, wearing a necklace of rudraksha beads, sacred ash covering His body and holding the sannyasin's staff. To the right He is shown as a prince, with His peacock, and farther to the right as the six-headed Arumugam. Devotees approach Him doing penance by piercing their bodies with small spears and carrying various offerings, including pots of milk and a *kavadi*, a kind of portable arched shrine. At lower right is depicted Naga Chathurthi, celebrating an ancient story in which a young boy bit by a cobra was saved from death when his sister's prayers caused the sands of the cobra's anthill to counteract the poison.

(To be continued)

POWER YOUR MIND - CHARACTER IS EVERYTHING

Money can give you bread
But not hunger
Money can give you a bed
But not sleep.
Money can give you medicine
But not health
Money can give you comfort
But not peace.



Courtesy: Swami Srikantananda

Money can give you power
But not respect.
Money can give you a degree
But not knowledge.
Money can give you security
But not freedom.
It is character and character
Alone that can give You everything.

JOHN E. JAQUA ACADEMIC CENTER FOR STUDENT ATHLETES UNIVERSITY OF OREGON

The John E. Jaqua Academic Center for Student Athletes is a 40,000 sq. foot, state-of-the-art building for the NCAA-mandated academic services for student athletes. It stands as a showpiece, contributing to both recruitment of new athletes as well as retention and success of Oregon's many student athletes. The Center was designed specifically to address the academic needs of student athletes. The architectural and lighting design team created a unique learning environment in which the athletes can succeed on and off the field. The building, made of glass, rests on a "table of water" and a birch forest.

LED lighting was used for various reasons on the exterior hardscape and landscape. Steplights and long linear runs of TivoFlex® LED product from Tivoli Lighting accent the entry steps, as well as the edge of the reflecting pool. It not only fit with the sustainable design goals of the project, but it also provided the intensity needed on the project.

The flexible LED encased oval-shaped, constant color lens of the TivoFlex provided a perfect water-resistant solution to illuminate the interior and exterior steps of the Center. TivoFlex was incorporated into the design of the entry steps and reflecting pool to create a soft glow of illumination upon entry, as well as to provide safe passage and an elegant pathway around the building perimeter. The superior small profile TivoFlex provided seamless illumination for the exterior and interior steps in a warm white hue that accents the surrounding elements.

"The superior color rendition and visual clarity of the low heat LEDs in Tivoflex and their seamless illumination and ability to bend and form to the application, provided us with the ideal solution for this specific application" commented Godfrey. "The particular use of TivoFlex in this application really made the entry steps feel and look as if they are floating in this serene environment further adding to the visual table of water" affect of the entire building."

Award:	A I L Lighting & Architecture Award 2011
Category:	Whole Building
Project:	John E. Jaqua Academic Center for Student Athletes, University of Oregon, Eugene, Ore.
Architect:	ZGF Partnership
Lighting Design:	Mark Godfrey, Lighting Studio at Interface Engineering

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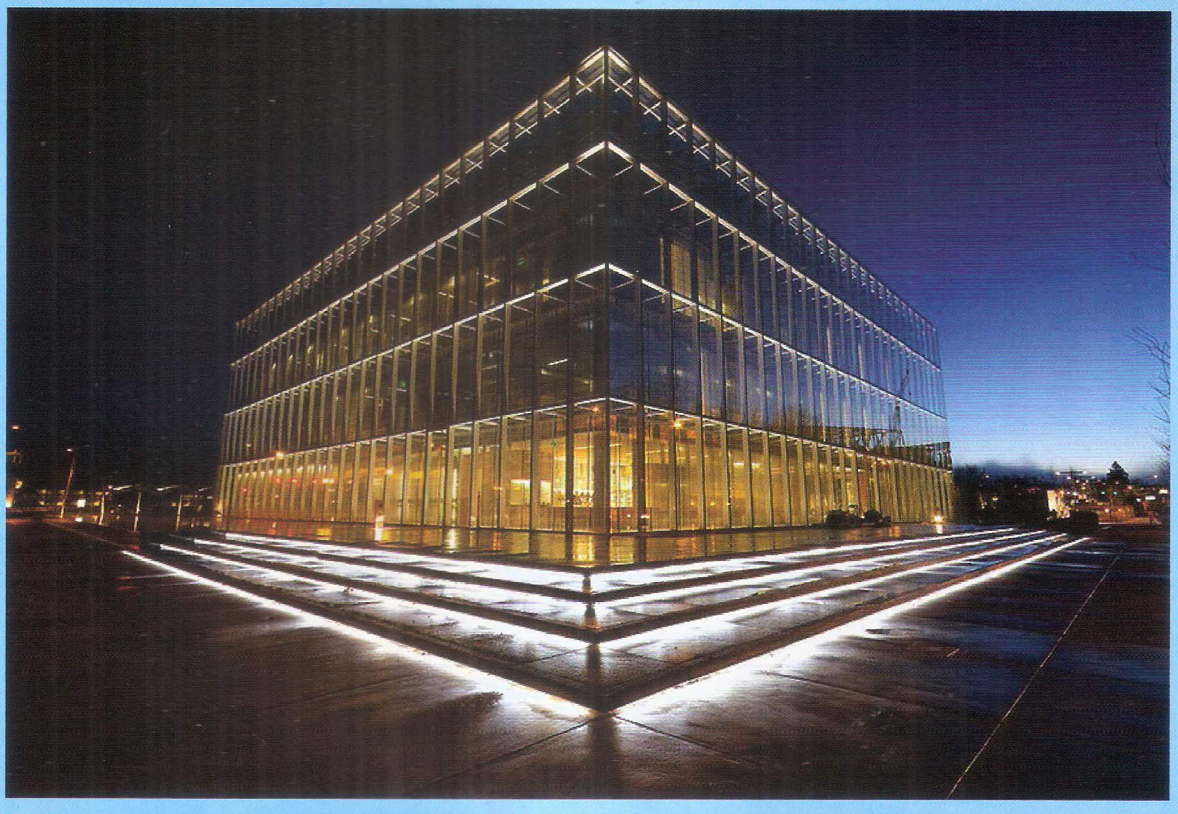

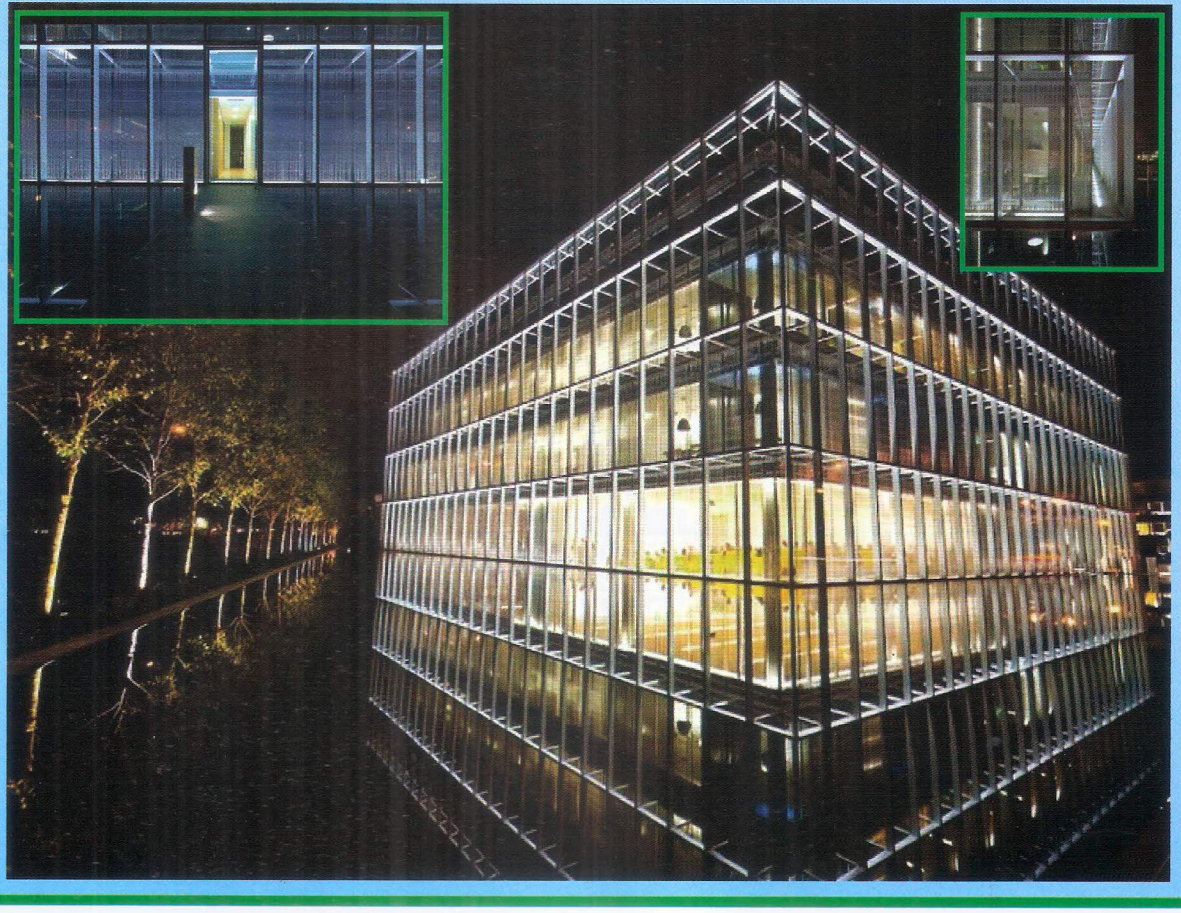

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