ELECTRICAL INSTALLATION ENGINEER

NEWS LETTER

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EDITORIAL

Dear Members, Fellow Professionals and Friends,

Seasons Greetings To One And All!

Happy Engineers Day!!

September is a Month when we celebrate **Engineers Day** on the 15th of September all over the country and the theme for this year is, very appropriately, **"Engineering for Change"**. This is a very wide and ongoing theme as well as a simple theme to convey that Engineering is basically meant for change for betterment of both Quality and Value of life through its continuous Inventions and Developments.

When man invented Fire for cooking his food and other conveniences, and invented Wheels for travel and Transportation, 'Engineering' can be considered to have started and the human race started looking for more and more of comforts and ease of doing things. 'Energy' became a basic requirement for conduct of all aspects of living and activities and Engineering played a vital role in harnessing, transforming and using Energy. In the context of current scene of the society world over, Energy is required to be provided in the forms of Heat, Fuel and Electricity and without these, the society and all its activities will come to a halt. With revolutionary growth of Electricity and Electronics, and advancements in the areas of communication, computers, controls, automation and entertainment, the role of engineering in society is enormous. The role of Research and Development and Engineering and Technology in Agriculture and all kinds of processing of grains and food and milk and poultry and all other allied activities are very significant. The historical "Green" and "White" revolutions in our country are classic examples.

Looking at the current challenges facing 'Engineering for Change', the priorities are driven by environmental concerns and pollutions of various kinds. Energy is a priority area calling for speedy activities of more and more of Renewable Energy. There are lot of actions initiated and are in progress with regard to Solar and Wind energies but vast areas of Waste to Energy and Bio Energy call for more attention as they can attempt to provide 'Firm' energy solutions. There are lot of activities at present in the area of Electrical Vehicles for transportation and India is working with ambitious targets. There are also developments with 'Hybrid' technologies for Electrical Vehicles using fuel and engines to provide more sustainable solutions. Technology can provide these fuels from renewable energy sources like CBG (Compressed Bio Gas), Bio Diesel and Bio Oil, thus making the solutions attain the multiple purposes of pollution reduction and reduced carbon footprints and energy efficiency too.

Water is another important area requiring immediate attention to treat, recycle and reuse, apart from storage of rain and flood waters for better distribution and use.

We thank all those members who have helped us by participating in the advertisement appearing for the issue Aug 2019 – Galaxy Earthing Electrodes Pvt. Ltd., Indo Swiss, Power Cable Corporation, Power Square Engineers (Indotech Transformers Ltd.), Ringlet, Supreme Power Equipment Pvt. Ltd., Visewham Electricals.

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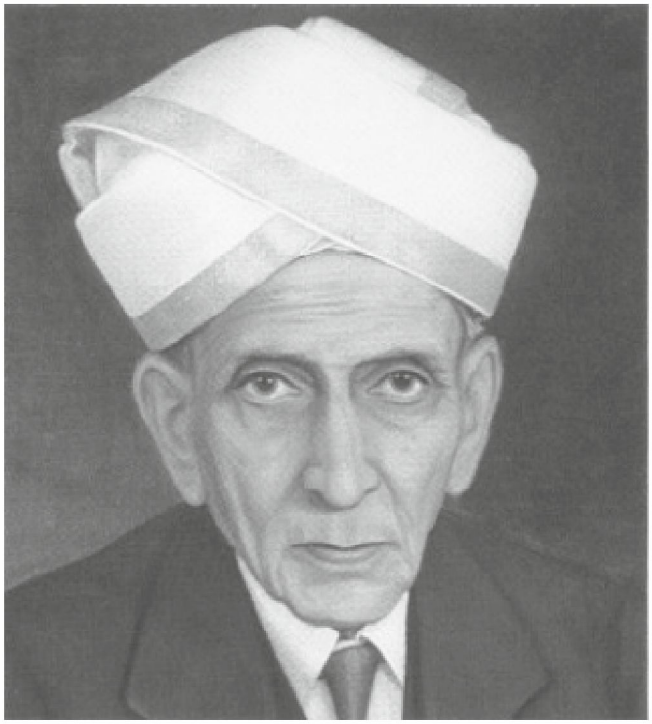
52ND ENGINEERS DAY – 2019

THEME: "ENGINEERING FOR CHANGE"



Sir Mokshagundam Visvesvaraya

September 15 is celebrated every year in the country since 1967 as "Engineers' Day" to commemorate the birthday of the legendary engineer **Sir Mokshagundam Visvesvaraya**. Sir Visvesvaraya, an eminent Indian engineer and statesman was born in a remote village of Karnataka, the State that is incidentally now the Hi-tech State of the country. Due to his outstanding contribution to the society, Government of India conferred "Bharat Ratna" on this legend in the year 1955. He was also called the precursor of economic planning in India. His learned discourse on economic planning in India, Planned Economy for India and Reconstructing India, was the first available document on the planning effort of the country and it is still held as the parent source matter for economic planners.

A theme of national importance is chosen every year by the Council of the Institution and deliberated at its various State/Local Centres to educate the engineering fraternity in general and the society in particular. This year the 52nd Engineers' Day will be celebrated all over the country and the Council of the Institution has selected the theme as "Engineering for Change" to mark the occasion.

52nd Theme: "Engineering for Change" 'Change' is the most important challenge faced by the engineers of a developing India. They are further being challenged by the changing climate and ever increasing population. Extensive research is being carried out in all engineering disciplines to cope with such emerging challenges. Information and communication technology and Electronics are playing a key role in several initiatives such as Digital India, Make in India, Startup India and Smart Cities. Keeping in view of the rapid transformation and innovation at international level, engineers of our country should be prepared to cope-up with the changes. The complexity further increases due to environmental concerns and actions needed for sustainable development.

Engineers now cannot restrict themselves to a particular discipline. Good understanding of interdisciplinary innovations, design, planning and undertaking of researches and projects on that is the need of the hour.

Renewable energy has become the key notion of all Electrical as well as Environmental engineers as we have to move away from fossil fuel to save the environment. Wind energy and solar PV energy are now finding place amidst the conventional energy supply of the nation and interconnectivity of those with the main grid is being looked into. To facilitate the mobility of the huge population of our country, 'Green transport' is required to be implemented for all mass transport system.

Therefore the theme "Engineers for Change" calls upon the engineers to be the harbinger for the change by exploring the disruptive technologies in all engineering sectors to enable India to lead the crusade of mitigation of climate change. The theme 'Engineering for Change' is chosen for Engineer's Day 2019 celebrations to address all these aspects.

"Remember, your work may be only to sweep a railway crossing, but it is your duty to keep it so clean that no other crossing in the world is as clean as yours." - SIR M. VISVESWARAYA

KNOW THY POWER NETWORK – 144

TRADE OFF IN POWER SECTOR

As outlined in earlier article, a new topic viz. Trade Off in power sector is brought out now.

V. A SNAP SHOT

- Trade Off is nothing but the compromise we normally do while arriving at a decision.
- It can either be formed as give and take policy or weighment of pros & cons before taking a decision.
- It is a part of the quality measure required for the growth of the organization.
- This knowledge is essentially required by all the engineers working in the organization, especially by the top management.
- It is the part of the day-to-day routine we normally perform, though we may not understand its significance in full.
- Simply put, it is an essential requirement of any engineering decision-it lies in our technical domain.
- In technical parlance, it is generally termed as "Factor of Safety".
- It is a Balancing Act.
- In the practical world, it gives us good exposure to how to interrupt, analyse and decide technical issues.
- It can be called as "Technical Debate or Patimandram". It is useful for all issues which have bi-partisan support.
- For all issues that have far reaching consequences, it is a "Sine qui non".
- In essence, it does not deal much about making the right choice; it is more about "impacting factors" or "the consequences of making wrong decisions".
- It is generally based on "This Vs That" situation or "to adopt Vs not to adopt".

Certain procedures/techniques

- Most of the times, it helps to reach a fair decision, when the merits/advantages of an issue far out weigh its demerits/drawbacks.
- On regularly performing this Trade-Off procedures, you may be incalculated with positive ways of looking at any issue and land in fairly correct decisions.
- Invariably it helps to reach and connect with people and equipment.

– It often leads to the "simplification of a complex decision making process".
– In general, the decisive conclusion lies at the intersection of two different view points and other conditions. The answers of various approaches will decide whether the suggested solutions are achievable or not.

ii. REQUIREMENTS

– To derive full benefits of this Trade-off or adjustment concept, we require,
  ✓ Cost-Benefit Analysis
  ✓ Financial Analysis
  ✓ Safety Analysis
  ✓ Quality Level Analysis
  ✓ Other necessary technical aspects and analysis
  ✓ Based on these, a decision can be taken which facilitates reliability and risk management.

iii. ILLUSTRATIONS

To bring out clearly, how this concept works out in various situations, several cases which are familiar in our day-to-day life (non-technical sector) and in the Power Sector (Technical Area) are illustrated here under. A wide range of issues fall under this Trade-off category. A list containing the topics where it can be applied to get a fairly correct decision is furnished though this list is unending/exhaustive.

Now let us have a few topics discussed as samples. The topic titled LED lamps Vs FT lamps and CFLs lamps already been brought in our NEWSLETTER (June 2019 issue).

What is 5G Communication? Should we go for 5G communication?

It is the latest "New Generation Mobile Radio Communication" (a wide spread microwave network) which is based on Microwaves. It is the main building block for Internet of Things, Smart Homes and Smart Cities. Massive infrastructures are required to cover each and every part in the network so that no dead spots/blind spots are left uncovered. As you expect, it brings a tsunami of microwave radiation (waves with high intensity and penetration capabilities). These waves orginate/emnate from the location very close to or around the Transmitters, Receivers and other allied devices. It is desirable to weigh the pros & cons of the issues involved before supporting this 5G Technology.

FOR (IN SUPPORT OF)	AGAINST
– A giant leap in the communication arena with enormous and unbelivable benefits for mankind.	– A very strong electric field intervention happened (exposure to high intensity external radiation). It is experienced throughout the network. This undesirable exposure to invariably enhances the chances of an outbreak of deadly cancer and similar diseases. We may experience a "Big Radiation Tsunami". Microwave communication has already been brought under the category of Cancer causing or Carciginic agent.
– Helps the atonomous working of vehicles to the falling of empty milk bottles in our houses, automatic working of garden sprinklers.	– It seems that we are in the verge/edge opening of Pandora's box. – Considerable hazards to the lives of humans, animals and their freedom and a real threat to them.
– Nothing can escape from its radar/camera every item/thing in our daily life can communicate with each other.	– Our freedom is restricted since everything will be brought under digital control. – A total surviliance system.
– Brings seamless connection of mobile phone networks.	– We may become digital/technical slaves. – A serious intervention to nature exists.
– It reduces our physical exertion-brings	– The counter measures are urgently needed as microwaves can

multiple benefits like Smart Homes and Smart Cities. So it will automatically assumes the role of "a necessity". Nothing will move without the aid of 5G network in future.	paralise mankind physically and mentally-a serious threat to mankind.

2. Should we go for Electric Vehicle on Large scale or adopt Electric Vehicles in Phases.

Now there is a big support for the adoption of environment friendly Electric Vehicles like Electric Scooter, Electric Car and Electric Bus. Let us place this topic on the anvil of Trade-off and see how it comes out.

Electric Vehicles	Internal Combustion Engine Vehicles
Merits (Advantages)	**Merits (Advantages)**
– Very friendly to environment-a green car – Reduces our oil import bill – Helps in curbing pollution in our cities – No of moving parts used are comparatively less station). – Range of fully charged battery (300-400 kwH)	– Initial/investment cost is comparatively low; operating cost is also at the affordable level. Instant refueling. The driver need not have Range Anxiety. – (It is nothing but drivers' worries about next fuelling (around 20 components only)
De-Merits (Disadvantages)	**De-Merits (Disadvantages)**
– Instant refueling is not possible; a minimum of 45 mins to 1 hour is required. Spare batteries are must. – Range Anxiety is high. – Public charging infrastructure are still in the incipient stage. – Very high cost. Its prices are 50% more than that of ICE car of the same size. In real terms it is a deterrant. – For the manufacture of batteries we have to depend on imports. – i.e. we have no indigenous support. A strong EVECO system with reskilling of existing workforce is needed.	– Unfriendly to environment – Main source of environmental pollution – Leads to very high imports of oil. (drain on our foreign exchange funds). – One of the contributors our health condition because of its high carbon emission; pollutes air and makes our breathing difficult and leads to various diseases. – No of moving parts used are >2000.

Present Scenario

Presently Govt of India undertake many steps to spread the application of EVS and reduce the usage of ICE vehicles. Among them are, FAME (Faster Adoption and Manufacture of E-vehicle), provision of funds for green mobility and Make in India schemes and faster buildup of Public Charging Infrastructure. It also encourages the usage of replaceable/detachable charged batteries and Sustainable Electricity Generation by Mini, Micro and Nano Grids.

Considered Final View

In view of the low buildup of the charging infrastructure and the high cost of Electric Vehicle and also the fact that it will impact the present Automobile Echo System where a large number of Service Centres, Spare Parts, Manufactures and Dealers are involved (nearly lakh people are employed), it is suggested that E-Vehicle may be introduced on roads in a gradual manner or in phases.

3. Electrical Power Delivery System – Should it be OH line or Underground Cable System.

Consequent to the sudden spurt in the electrical accidents brought by snapping of OH Electricity Lines and falling/tilting OH line supports, there is a clamour for the conversion of existing OH line networks into UG cable networks. This brings it under Trade off Category.

OH Line System	UG Cable System
Merits	**Merits**
– Installation cost is less. – Fault rectification is easy. Down time is less. Interruption to consumers is less. – Installation can be carried out quickly.	– For the same size of conductor, it carries more power than OH system. – An efficient system. – From aesthetic point of view and reliable power supply this cable system is preferred. – No maintenance required.
De-Merits	**De-Merits**
– Vulnerable to frequent break downs. – Snapping of conductors and falling of poles. – From aesthetic points of view, it is not desirable. Regular maintenance is needed; frequent electrocution of human and animals is experienced in its network.	– Very high installation cost, though it is called "bury and forget system" in reality, it is not so. – Fault rectification time and downtime are more in this network. – Exposed to cable movements in sandy soil, frequent joint failures and dig-in-faults and water logging/moisture ingress problems. – Elecrtrocution due to leaky cables, poor laying of cables and dig-in-faults cannot be averted. Probably, its severity when compared to that of OH lines, can be limited especially during thunder storm and rainy days.

Limiting Electrical accidents cannot be considered as a justifiable/valid ground for the conversion of the existing OH lines structures into UG cable system at a phenomenal cost. In this context, the main factors that are required to be factored in or taken into account are,

- Cost of conversion.
- Down time involved the time required for the rectification of faults, it cost and the (losses suffered by) consumers due to such and unscheduled shut downs.
- Cost-benefits analysis of the works involved.

In these (two) systems to ensure minimum/zero losses effective short circuit and earth fault protection and its prompt operation are essentially required since both the systems have their own merits and de-merits. This is the main point that needs to focused i.e. effective protective system to be given the Prime Focus. The rest are only supplementary factors. Financially hard pressed power utilities like TANGEDCO should have this priority issue (whether to go for the UG conversion) a pointed attention; otherwise unwanted financial burden will be thrusted on them. This statement depicts the final considered view of this topic viz. cost benefits analyasis of this proposal to convert OH network to UG cable network.

In the forth coming issue the topics/issues that will be discussed under Trade Off are

Technical Topics

- Single phase or three phase motor should be preferred for agricultural pumping.
- Should we go for the selection of Power Transformer with higher percentage impedance for use in transmission and sub-transmission sub stations.
- When we purchase efficient air conditioning equipment and refrigerator, should we go for higher star rated equipment (5 star) or limited to equipment with 3 star or less.

- Non-technical topics.
- Is higher population desirable?
- Work-life balance
- Measures based on politics vs economics.
- Sports-adoption of pace vs spin bowling in cricket.
- From the view point of environment, which is the best choice plastic bags or cotton bags.

Let me sign off here. Till then please stay tuned.

(To be continued…)
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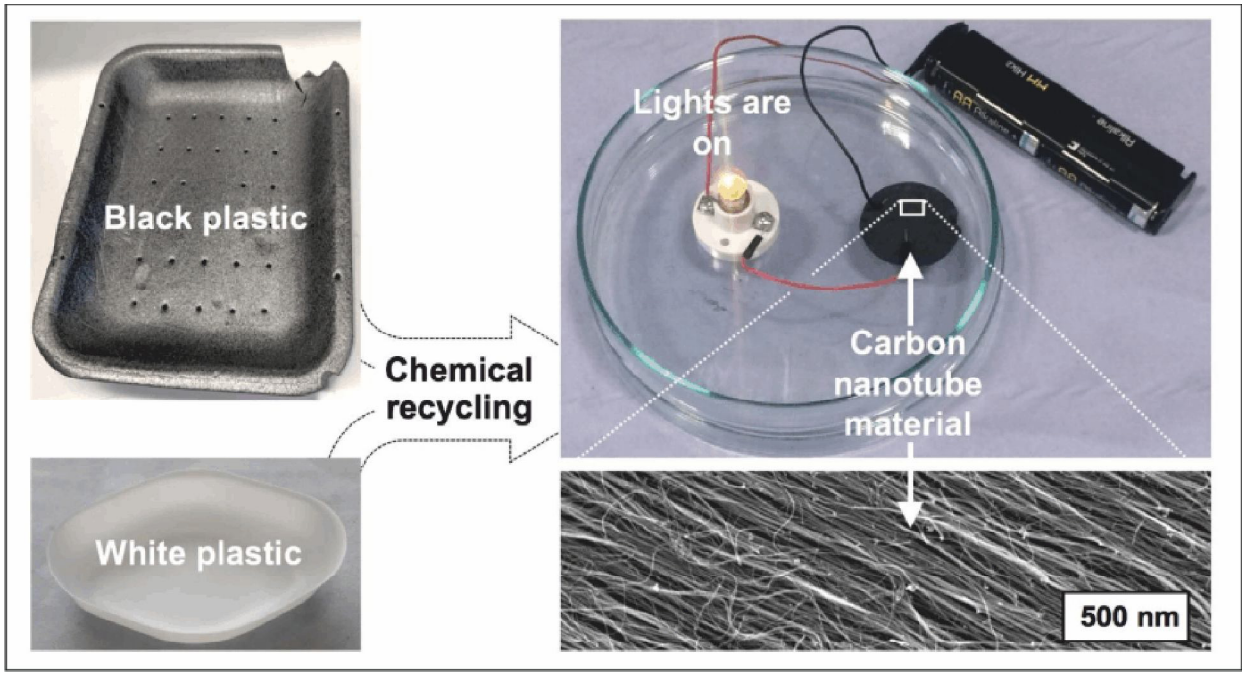
BLACK PLASTICS COULD CREATE RENEWABLE ENERGY : NEW RESEARCH COULD HELP TO REDUCE PLASTIC WASTE IN THE FUTURE

Research from Swansea University has found how plastics commonly found in food packaging can be recycled to create new materials like wires for electricity — and could help to reduce the amount of plastic waste in the future.



While a small proportion of the hundreds of types of plastics can be recycled by conventional technology, researchers found that there are other things that can be done to reuse plastics after they've served their original purpose.

The research, published in The Journal for Carbon Research, focuses on chemical recycling which uses the constituent elements of the plastic to make new materials. While all plastics are made of carbon, hydrogen and sometimes oxygen, the amounts and arrangements of these three elements make each plastic unique. As plastics are very pure and highly refined chemicals, they can be broken down into these elements and then bonded in different arrangements to make high value materials such as carbon nanotubes.

Dr Alvin Orbaek White, a Sêr Cymru II Fellow at the Energy Safety Research Institute (ESRI) at Swansea University said: "Carbon nanotubes are tiny molecules with incredible physical properties. The structure of a carbon nanotube looks a piece of chicken wire wrapped into a cylinder and when carbon is arranged like this it can conduct both heat and electricity. These two different forms of energy are each very important to control and use in the right quantities, depending on your needs.

"Nanotubes can be used to make a huge range of things, such as conductive films for touchscreen displays, flexible electronics fabrics that create energy, antennas for 5G networks while NASA has used them to prevent electric shocks on the Juno spacecraft." During the study, the research team tested plastics, in particular black plastics, which are commonly used as packaging for ready meals and fruit and vegetables in supermarkets, but can't be easily recycled. They removed the carbon and then constructed nanotube molecules from the bottom up using the carbon atoms and used the nanotubes to transmit electricity to a light bulb in a small demonstrator model.

Now the research team plan to make high purity carbon electrical cables using waste plastic materials and to improve the nanotube material's electrical performance and increase the output, so they are ready for large-scale deployment in the next three years.

Dr Orbaek White said: "The research is significant as carbon nanotubes can be used to solve the problem of electricity cables overheating and failing, which is responsible for about 8% of electricity is lost in transmission and distribution globally.

"This may not seem like much, but it is low because electricity cables are short, which means that power stations have to be close to the location where electricity is used, otherwise the energy is lost in transmission.

"Many long range cables, which are made of metals, can't operate at full capacity because they would overheat and melt. This presents a real problem for a renewable energy future using wind or solar, because the best sites are far from where people live."

INDIA'S FIRST DEDICATED HIGHWAY CORRIDORS FOR EVS EXPECTED BY MAR 2020

Working on the need for switching to cleaner technology in the transport sector, NHEV Official says India's first highway corridors for EVs with charging stations are expected to come up along the Delhi-Jaipur and Delhi-Agra highways by 2020.

According to reports, India first highway corridors with charging stations for electric vehicles are expected to come up along the Delhi-Jaipur and Delhi-Agra highways by 2020.

The combined stretch of the corridors on the Yamuna Expressway (between Delhi and Agra) and the National Highway 48 (between Delhi and Jaipur) will be 500 km, and 18 charging stations will be setup near toll plazas on the two routes, the official said.

The e-corridors are proposed to be the first under the Ease of Doing Business Programme (EODB) of the Advance Services for Social and Administrative Reforms (ASSAR), a private entity which is supported by the central government, an official engaged in the project said.

"The project is about converting 500-km of expressway into electric corridors with facilities for charging electric vehicles. Test runs on these corridors are expected to begin this September and these e-corridors will be launched in March 2020," National Programme Director EODB at ASSAR, Abhijeet Sinha, said.

Eighteen charging stations will be setup on the two routes.Eight will be between Delhi-Agra and 10 between Delhi-Jaipur. Besides charging their vehicles, people can also change batteries, he told. "These stations will be developed near toll plazas. Every station will have eight to 10 chargers and 20 charging points," Sinha said.

"Six more charging stations have been proposed between Pari Chowk in Greater Noida and Delhi, a region which has dense population. We have made a recommendation in this regard to the Noida Authority for facilitating land," said Sinha, who is also the Programme Director for NHEV (National Highways for Electric Vehicles) 2020.

On the cost of the entire project, he said developing a single charging station would cost somewhere around Rs two crore and the electricity charges would be extra. "Developing a km stretch of a four-lane highway costs anywhere between Rs 14 crore and Rs 20 crore," he said, citing official statistics. "The normal power tariff comes to Rs 6 to Rs 8 per unit across states. We are trying to get uniform rates across the states for the project as it progresses," Sinha added.

Sinha said the immediate focus is towards developing infrastructure for electric vehicles in the country. The Housing and Urban Affairs ministry had made amendments to the Model Building Byelaws (MBBL) 2016 and Urban Regional Development Plans Formulation and Implementation (URDPFI) Guidelines 2014, making provisions for establishing EV charging infrastructure.

"In the initial stages, the plan is to attract larger fleet operators like state transports and taxi services," he added. Earlier this year, the central government had issued a set of guidelines to set up charging stations for electric vehicles across the country, outlining ways to build such fuelling points every 25 km. The government expects 25 percent of the total vehicles on roads will be electric vehicles by 2030, necessitating to erect robust electric vehicle (EV) charging infrastructure across the country, according to the Union Housing and Urban Affairs Ministry.

When one door of happines closes, another opens; but often we look so long at the closed door that we do not see the one which has been opened for us.
– HELEN KELLER

RINGLET

~ DIRECT CHANNEL PARTNER of :hager

Distribution boards

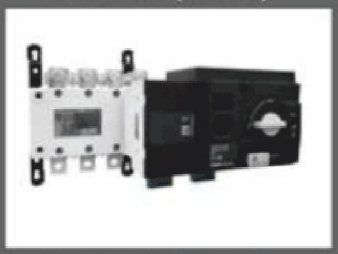
Miniature Circuit Breakers (MCB)

Moulded Case Circuit Breakers (MCCB)

Residual Current Circuit Breakers (RCCB)

RCBO ,RCD+MCB modules

Manual Changeover Switches



Automatic Transfer Switches

Time Switches

Digital Energy Meters

Contactors

Isolating Switches

Surge Protection Devices

LED Indicators

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RINGLET

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ULTRA-THIN LAYERS OF RUST GENERATE ELECTRICITY FROM FLOWING WATER

There are many ways to generate electricity — batteries, solar panels, wind turbines, and hydroelectric dams, to name a few examples. .... And now there's rust.

New research conducted by scientists at Caltech and Northwestern University shows that thin films of rust — iron oxide — can generate electricity when saltwater flows over them. These films represent an entirely new way of generating electricity and could be used to develop new forms of sustainable power production. Interactions between metal compounds and saltwater often generate electricity, but this is usually the result of a chemical reaction in which one or more compounds are converted to new compounds. Reactions like these are what is at work inside batteries.

In contrast, the phenomenon discovered by Tom Miller, Caltech professor of chemistry, and Franz Geiger, Dow Professor of Chemistry at Northwestern, does not involve chemical reactions, but rather converts the kinetic energy of flowing saltwater into electricity. The phenomenon, the electrokinetic effect, has been observed before in thin films of graphene — sheets of carbon atoms arranged in a hexagonal lattice — and it is remarkably efficient. The effect is around 30 percent efficient at converting kinetic energy into electricity. For reference, the best solar panels are only about 20 percent efficient.

"A similar effect has been seen in some other materials. You can take a drop of saltwater and drag it across graphene and see some electricity generated," Miller says.

However, it is difficult to fabricate graphene films and scale them up to usable sizes. The iron oxide films discovered by Miller and Geiger are relatively easy to produce and scalable to larger sizes, Miller says. "It's basically just rust on iron, so it's pretty easy to make in large areas," Miller says. "This is a more robust implementation of the thing seen in graphene."

Though rust will form on iron alloys on its own, the team needed to ensure it formed in a consistently thin layer. To do that, they used a process called physical vapor deposition (PVD), which turns normally solid materials,

in this case iron oxide, into a vapour that condenses on a desired surface. PVD allowed them to create an iron oxide layer 10 nanometers thick, about 10 thousand times thinner than a human hair.

When they took that rust-coated iron and flowed saltwater solutions of varying concentrations over it, they found that it generated several tens of millivolts and several microamps per cm-2.

"For perspective, plates having an area of 10 square meters each would generate a few kilowatts per hour — enough for a standard US home," Miller says. "Of course, less demanding applications, including low-power devices in remote locations, are more promising in the near term."

The mechanism behind the electricity generation is complex, involving ion adsorption and desorption, but it essentially works like this: The ions present in saltwater attract electrons in the iron beneath the layer of rust. As the saltwater flows, so do those ions, and through that attractive force, they drag the electrons in the iron along with them, generating an electrical current.

Miller says this effect could be useful in specific scenarios where there are moving saline solutions, like in the ocean or the human body. "For example, tidal energy, or things bobbing in the ocean, like buoys, could be used for passive electrical energy conversion," he says. "You have saltwater flowing in your veins in periodic pulses. That could be used to generate electricity for powering implants."

WINDOW FILM COULD EVEN OUT THE INDOOR TEMPERATURE USING SOLAR ENERGY

On sunny summer days it can be little short of unbearable to stay indoors or in cars. The heat radiates in and creates an unpleasantly high temperature for people, animals and plants. Using energy-intensive systems such as air conditioning and fans means combating the thermal energy with other forms of energy. Researchers at Chalmers University of Technology are proposing a method that utilises the heat and distributes it evenly over a longer period instead.

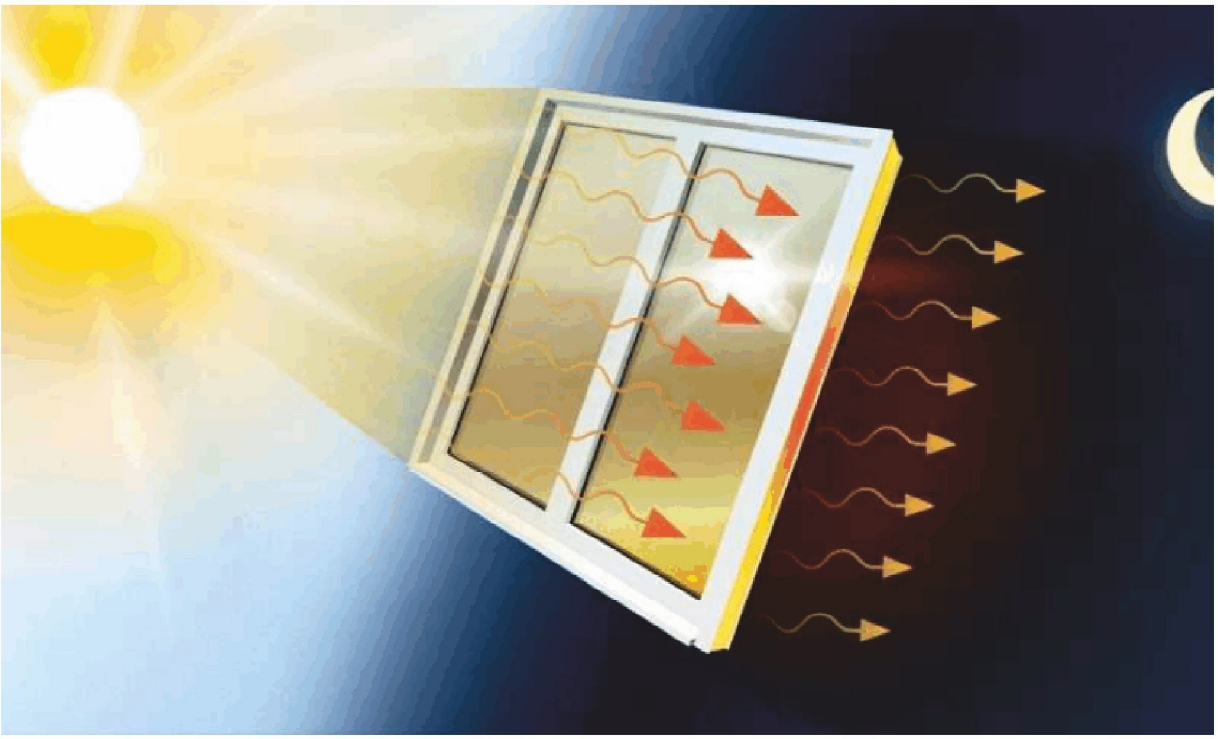
When their specially designed molecule is struck by the sun's rays it captures photons and simultaneously changes form — it is isomerised. When the sun stops shining on the window film the molecules release heat for up to eight hours after the sun has set.

"The aim is to create a pleasant indoor environment even when the sun is at its hottest, without consuming any energy or having to shut ourselves behind blinds. Why not make the most of the energy that we get free of charge instead of trying to fight it," says chemist Kasper Moth-Poulsen, who is leading the research.

At dawn when the film has not absorbed any solar energy it is yellow or orange, since these colours are the opposite of blue and green, which is the light spectrum that the researchers have chosen to capture from the sun. When the molecule captures solar energy and is isomerised, it loses its colour and then becomes entirely transparent. As long as the sun is shining on the film it captures energy, which means that not as much heat penetrates through the film and into the room. At dusk, when there is less sunlight, heat starts to be released from the film and it gradually returns to its yellow shade and is ready to capture sunlight again the following day.

"For example, airports and office complexes should be able to reduce their energy consumption while also creating a more pleasant climate with our film, since the current heating and cooling systems often do not keep up with rapid temperature fluctuations," says Moth-Poulsen.

The molecule is part of a concept the research team calls MOST, which stands for 'Molecular Solar Thermal Storage'. Previously the team presented an energy system for houses based on the same molecule. In that case — after the solar energy had been captured by the molecule — it could be stored for an extended period, such as from summer to winter, and then used to heat an entire house. The researchers realised that they could shorten the step to application by optimising the molecule for a window film as well, which would also create better conditions for the slightly more complex energy system for houses.



What the researchers still have to do is to increase the concentration of the molecule in the film whilst also retaining the film's properties, and bring down the price of the molecule. But according to Moth-Poulsen they are very close to this innovation.

"The step to applying our film is so short that it could happen very soon. We are at a very exciting stage with MOST," he says.

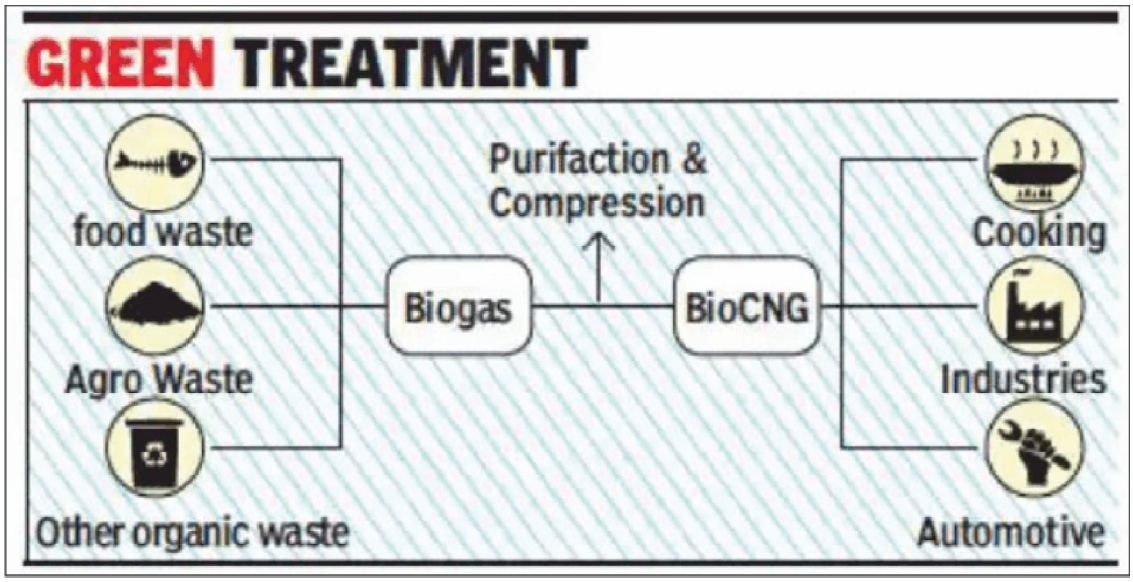
THREE BIO-CNG PLANTS TO TREAT 300 TONS OF BIO-WASTE IN CHENNAI

The news that has now come out is GCC or Greater Chennai Corporation would be setting up as many as 3 bio CNG plants to bring down the amount of organic and food waste entering its landfills by 300 tonnes by next month. Information gathered is these 3 bio CNG plants would bottle compressed natural bi gas produced from the bio waste.

In the next week, tenders would be called for and this was according to the commissioner, Mr. G. Prakash. Private-public partnership would play an important role in the setting up of these 3 plants. It must be noted that the private company would be the in-charge of manufacture and maintenance of the plants. An amount of Rs 9.3 crores would be spent on setting of these 3 plants in places like Pallikaranai, Sholinganallur and in the abandoned asphalt complex in Anna Nagar.

Last month in the state assembly, rural and municipal administration minister, Mr. Velumani made many heads turn when he announced the setting up of one such plant. Point is the civic body has now decided to set up three such plants. Similar plants were set up at Mahindra World City and this was according to Mr. Madhusudhan Reddy, corporation deputy commissioner. He then threw light about the presence of such plant in Tirupati and how the plants would be expanded to handle 100 tonnes in the future.

Information is 384 tonnes of wet waste gets processed by the civic body and this is under various projects including 33 bio-mechanisation plants. Raw biogas cannot be used as a fuel but its compressed and purified form finds use as an automotive fuel is known.



The bio CNG plant present at Mahindra World City processes 8 tonnes of food and kitchen waste into 1000 cubic meters of raw bio gas. Later, enrichment of this raw biogas is done to yield 400 kg of purified CNG grade fuel every day. As a by product every day, 4 tonnes of organic fertilizer is also produced. The superb information is bio CNG could replace CNG as an automotive fuel (for CNG buses and tractors) and LPG for cooking purposes and to power street lights.

There are as many as 17 operational bio CNG plants in 9 states and the state of Maharashtra has got the highest number of plants. This was as per a report by Citizen Consumer and Civic Action Group persons, Mr. Jeyakumar and Mr. Vamsi Sankar. It should be taken into account that the combined capacity of these 17 plants is 46,178 kg per day. It is well known that for dry waste incinerators in places like Madhavaram, Manali and Tirivottriyur has been planned by the corporation of Chennai. The point is out of 5500 tonnes of waste generated every day 55 percent is wet waste.

Architecture begins where engineering ends.

— WALTER GROPIUS, German architect

PROMISING NEW SOLAR-POWERED PATH TO HYDROGEN FUEL PRODUCTION

Engineers at Lehigh University are the first to utilize a single enzyme biomineralization process to create a catalyst that uses the energy of captured sunlight to split water molecules to produce hydrogen. The synthesis process is performed at room temperature and under ambient pressure, overcoming the sustainability and scalability challenges of previously reported methods.

Solar-driven water splitting is a promising route towards a renewable energy-based economy. The generated hydrogen could serve as both a transportation fuel and a critical chemical feedstock for fertilizer and chemical production. Both of these sectors currently contribute a large fraction of total greenhouse gas emissions.

One of the challenges to realizing the promise of solar-driven energy production is that, while the required water is an abundant resource, previously-explored methods utilize complex routes that require environmentally-damaging solvents and massive amounts of energy to produce at large scale. The expense and harm to the environment have made these methods unworkable as a long-term solution.

Now a team of engineers at Lehigh University have harnessed a biomineralization approach to synthesizing both quantum confined nanoparticle metal sulfide particles and the supporting reduced graphene oxide material to create a photocatalyst that splits water to form hydrogen. The team reported their results in an article entitled: "Enzymatic synthesis of supported CdS quantum dot/reduced graphene oxide photocatalysts" featured on the cover of the August 7th issue of Green Chemistry, a journal of the Royal Society of Chemistry.

The paper's authors include: Steven McIntosh, Professor in Lehigh's Department of Chemical and Biomolecular Engineering, along with Leah C. Spangler, former Ph.D. student and John D. Sakizadeh, current Ph.D. student; as well, as Christopher J. Kiely, Harold B. Chambers Senior Professor in Lehigh's Department of Materials Science and Engineering and Joseph P. Cline, a Ph.D. student working with Kiely.

"Our water-based process represents a scalable green route for the production of this promising photocatalyst technology," said McIntosh, who is also Associate Director of Lehigh's Institute for Functional Materials and Devices.

Over the past several years, McIntosh's group has developed a single enzyme approach for biomineralization — the process by which living organisms produce minerals of size-controlled, quantum confined metal sulfide nanocrystals. In a previous collaboration with Kiely, the lab successfully demonstrated the first precisely controlled, biological way to manufacture quantum dots. Their one-step method began with engineered bacterial cells in a simple, aqueous solution and ended with functional semiconducting nanoparticles, all without resorting to high temperatures and toxic chemicals. The method was featured in a New York Times article: "How a Mysterious Bacteria Almost Gave You a Better TV."

"Other groups have experimented with biomineralization for chemical synthesis of nanomaterials," says Spangler, lead author and currently a Postdoctoral Research Fellow at Princeton University. "The challenge has been achieving control over the properties of the materials such as particle size and crystallinity so that the resulting material can be used in energy applications."

McIntosh describes how Spangler was able to tune the group's established biomineralization process to not only synthesize the cadmium sulfide nanoparticles but also to reduce graphene oxide to the more conductive reduced graphene oxide form.

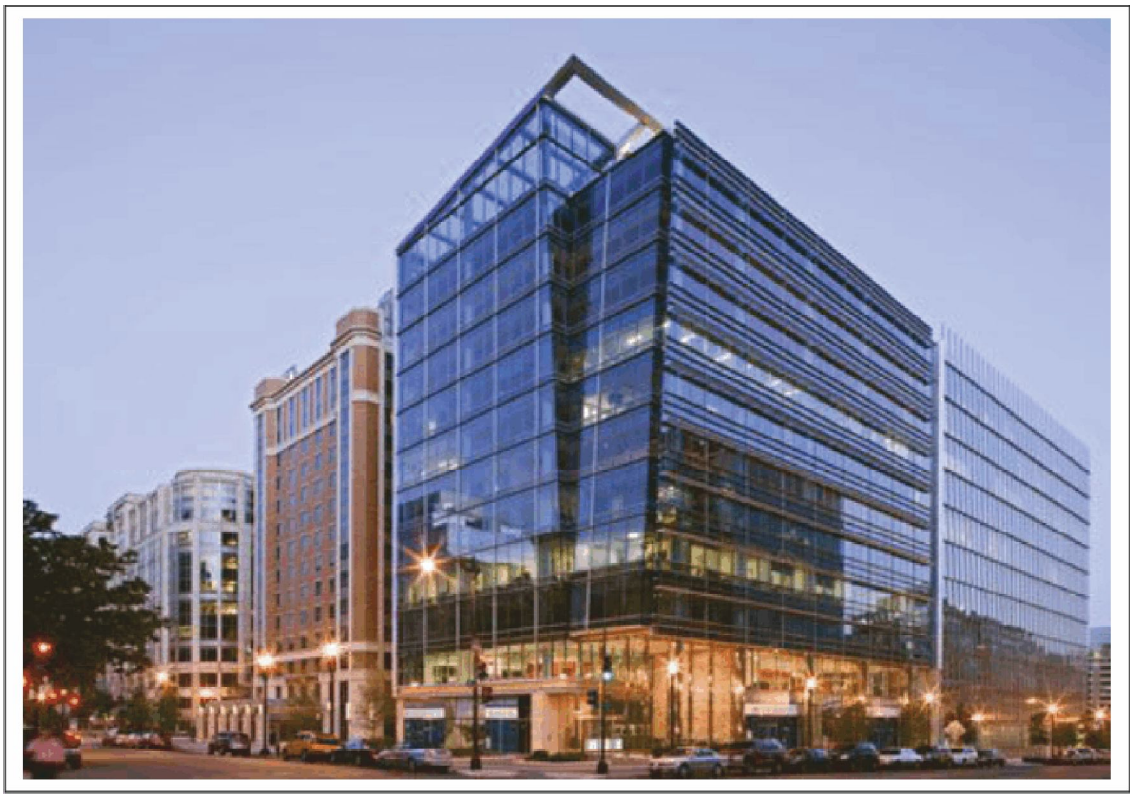
"She was then able to bind the two components together to create a more efficient photocatalyst consisting of the nanoparticles supported on the reduced graphene oxide," says McIntosh. "Thus her hard work and resulting discovery enabled both critical components for the photocatalyst to be synthesized in a green manner."

The team's work demonstrates the utility of biomineralization to realize benign synthesis of functional materials for use in the energy sector. "Industry may consider implementation of such novel synthesis routes at scale," adds Kiely. "Other scientists may also be able to utilize the concepts in this work to create other materials of critical technological importance."

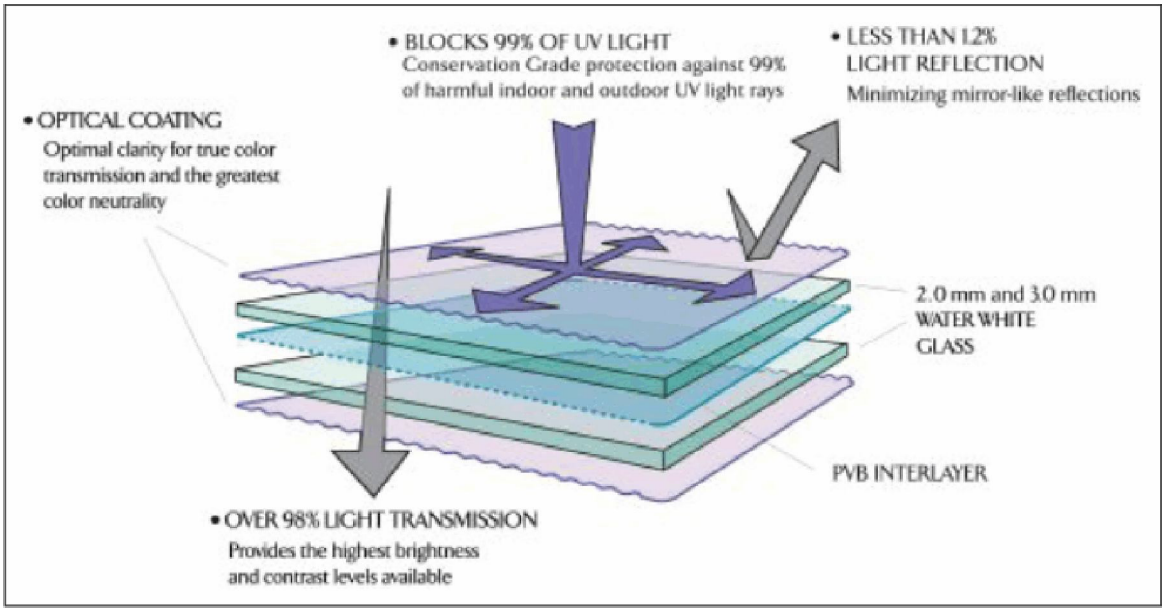
McIntosh emphasizes the potential of this promising new method as "a green route, to a green energy source, using abundant resources." "It is critical to recognize that any practical solution to the greening of our energy sector will have to be implemented at enormous scale to have any substantial impact," he adds.

A CASE FOR GREENER BUILDINGS SANS GLASS

Glass facade buildings may be good to look at and come with a view of the skyline from the inside but in India, it does more harm than good.



Shiny glass facade buildings have become popular with architects and their clients in India as they provide a view of the city skyline, while letting in ample natural light. But the sunlight also brings heat, and in sealed buildings, there is nowhere for it to escape, much like in the greenhouses.



To avoid this greenhouse effect, air conditioning has been the standard solution. But that is problematic in itself. In architecture, these buildings are famously called 'Ice Tea Buildings' which effectively means that we first boil the tea and then cool it with ice.

The same principle is used for such buildings in which their facades are made of glass which absorbs a lot of heat and then to cool, power guzzling air conditioning solutions are installed. So this 'monstrosity' is not a result of studies or based on a need, but the need to copy western countries that have much cooler climes. But when it comes to India, this adoption brings a lot of challenges with it.

IamRenew had the opportunity to talk to Gaurav Shorey, founding member of the GRIHA Rating system and a zealous promoter for the cause of sustainability in India. Currently, he is supporting BEE, Government of India, in 'building for energy conservation' as an ECBC Master Trainer.

Gaurav says that the "impact of glass is felt at two levels; that is operational energy (that households consume directly) and embodied energy (energy spent in manufacturing an item). Items like steel, cement and glass have the highest embodied energy and today we know that embodied energy relates to the highest carbon emissions. So any material like aluminium, glass, cement etc used in the buildings today has the highest embodied energy today and the highest negative impact on the environment."

The International Energy Agency estimates that about 40% of global carbon dioxide emissions come from constructing, heating, cooling and demolishing buildings. Air conditioning is a growing proportion of this: energy used on cooling has doubled since 2000 and accounts for about 14% of all energy use now.

He further added that many companies, especially glass companies like Saint Gobain which market their glass as green, are at fault. They have been marketing their products as being less heat absorbent or reflective against the conventional glass. In this process, they add dye to the glass or add films to the glass to make it less heat absorbing.

The solution, however, strips the glass of its recyclability. Laminated glass panels still contribute to the climate crisis because they become much more expensive to make and almost impossible to recycle, i.e. 100% non-recyclable as against conventional glass which can be recycled as many times.

On this conundrum, Shorey said that the best solution is to consider using National Codes for buildings which mandate only 40% coverage of building by the glass facades, like ECBC that gives us a thumb rule for architects to reduce the amount of glass used in the building.

"The best thing to do is to reduce the amount of glass in the building and shade the glass" he adds. "In India, we always had chajjas over our windows, balconies and roshandaans…those not only protect our glass from rain but protect the glass from the heat of the sun."

He further elaborated that the "first thing to do is avoid facing the sun that means avoid east and west direction facing building construction or the widest area of the building doesn't face the sun. Secondly, to reduce the amount of window area which is reducing the effective aperture of the building that will also drastically reduce the need for glass as well as reduce the need for cooling just as the old buildings and bungalows were constructed in India." He termed that these principles are 'natural response' to constructing any building in India.

He then talked about the fallacy in our thinking that we can mess around with the climate of the country by thinking that ACs will help but that too comes with a huge cost and generates huge amounts of heat. For which he suggested that we can take the movement of seasonal winds, sun angle and use national building codes that specify these as guidelines for the construction of energy-efficient and well-lit houses.

Touching upon Aesthetics as a grey area, Shorey pointed out that this is the area where all conversation about green buildings gets stuck especially for developers who want appeasing designs. He pressed upon the need for the conversation to steer away from western aesthetics because buildings that work there will not work in India as they come with a lot of maintenance burden.

He pointed that these glass buildings are a burden for water resources too as a lot of water is used to clean the panels which is a two-edged sword. One it uses a lot of water, manpower, and risk of life is involved second the cleaner the building the hotter it gets inside which peaks the electricity needed to cool these shiny monstrosities.

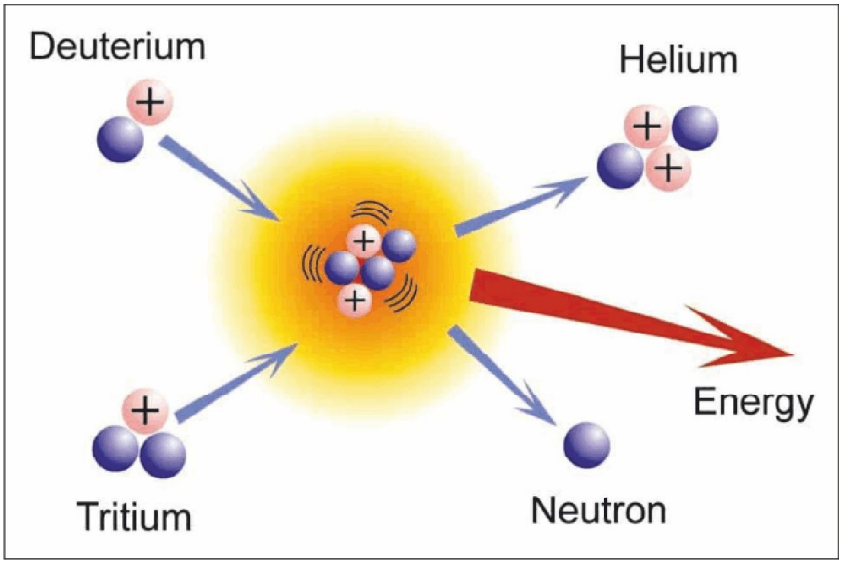
Shorey then quipped that even Britishers followed the Indian context when they designed the buildings in India, unlike the Indian architects who are blindly following the template rather than the principle on which these buildings need to be made.

This Article by Sneha Verma. Sneha has worked with News agencies such as DD, PTI and ANI and after covering politics, in search for fresh air, she later joined Iamrenew team. She has done her graduation in Journalism & Masscom. from IP university and PGD in HR from TISS.

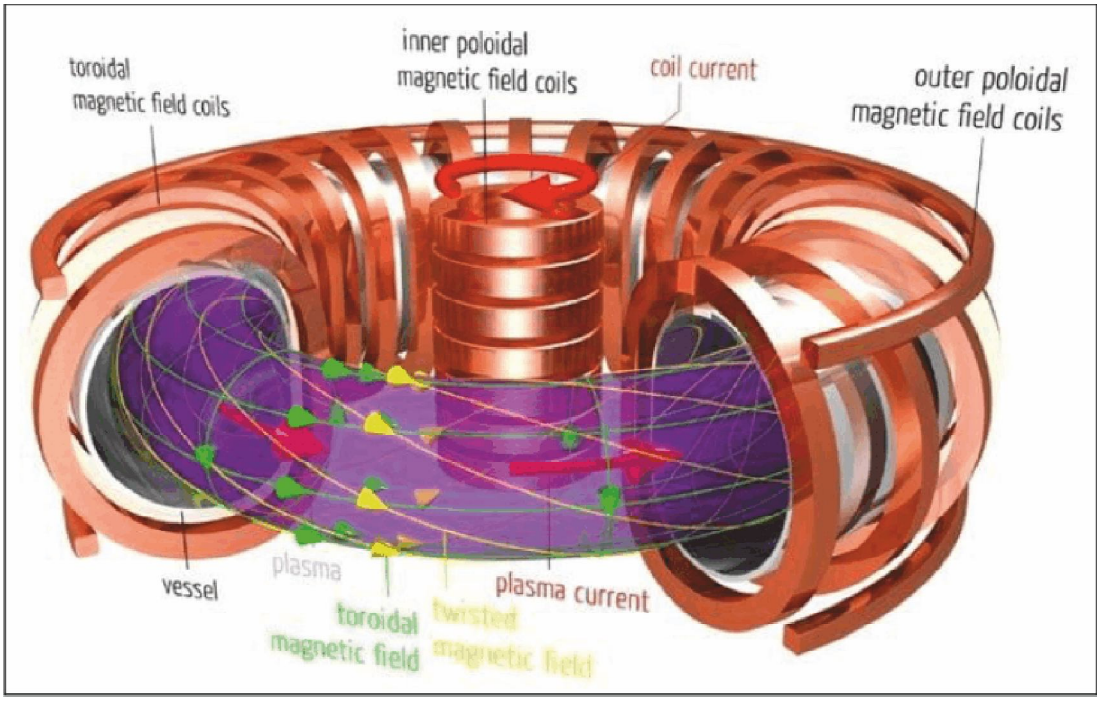
Courtesy Iamrenew.com

NUCLEAR FUSION — THE BETTER ALTERNATIVE TO ENERGY PRODUCTION

In order to meet the guidelines of the Paris Climate Agreement of 2015, the world must sharply cut carbon emissions — yet, they continue to increase every year. But what if there was one energy solution that could solve both of these pressing problems?



Strange as it may seem, nuclear energy is not readily thought of when talking about renewable energy sources. But it is a clean energy source that has nearly zero emissions, and can generate a tremendous amount of energy.



The United States generates more nuclear energy than any other country in the world and fully 20 percent of the total energy requirement of the US is met through nuclear energy.

Nuclear energy all by itself conjures up visions of bombs, radioactivity and meltdowns. And these events paint a powerful and scary picture for most folks. However, there are two types of nuclear reactions, and both of them can generate energy: nuclear fission and nuclear fusion.

Fission and fusion

Many people believe that both nuclear fission and nuclear fusion are used in nuclear power plants to generate electricity, but this is wrong. Today's nuclear power plants use nuclear fission to generate energy. Nuclear fission involves the splitting of the nucleus of an atom into two or more smaller parts.

Nuclear fission has its potential drawbacks, including possible nuclear meltdowns and radioactive waste that remains hazardous for thousands of years. The Chernobyl accident and Fukushima disaster are just two events that come to mind.

Nuclear fusion, on the other hand, has long been considered the holy grail of limitless energy production. Since the 1940s, scientists have been looking for ways to initiate and control fusion reactions to produce useful energy. And there is no dangerous radioactive nuclear waste since the fuel for a fusion reaction is not uranium or plutonium, but hydrogen.

HOW DOES FUSION PRODUCE ENERGY?

Atoms never rest: the hotter they are, the faster they move. In the Sun's core, where temperatures reach 15,000,000 °C, hydrogen atoms are in a constant state of agitation. As they collide at very high speeds, the natural electrostatic repulsion that exists between the positive charges of their nuclei is overcome and the atoms fuse. The fusion of light hydrogen atoms produces a heavier element, helium.

The mass of the resulting helium atom is not the exact sum of the initial atoms, however—some mass has been lost and great amounts of energy have been gained. This is what Einstein's famous formula $E=mc^2$ describes: the tiny bit of lost mass (m), multiplied by the square of the speed of light (c^2), results in a very large figure (E), which is the amount of energy created by a fusion reaction.

Every second, our Sun turns 600 million tonnes of hydrogen into helium, releasing an enormous amount of energy. But without the benefit of gravitational forces at work in our Universe, achieving fusion on Earth has required a different approach.

Twentieth-century fusion science identified the most efficient fusion reaction in the laboratory setting to be the reaction between two hydrogen (H) isotopes deuterium (D) and tritium (T). The DT fusion reaction produces the highest energy gain at the "lowest" temperatures. It requires nonetheless temperatures of 150,000,000 degrees Celsius—ten times higher than the hydrogen reaction occurring in the Sun.

"Achieving controlled fusion reactions that net more power than they take to generate, and at commercial scale, is seen as a potential answer to climate change," writes Nathanial Gronewold for Scientific American, reports Oilprice.com.

"Fusion energy would eliminate the need for fossil fuels and solve the intermittency and reliability concerns inherent with renewable energy sources. The energy would be generated without the dangerous amounts of radiation that raises concerns about fission nuclear energy."

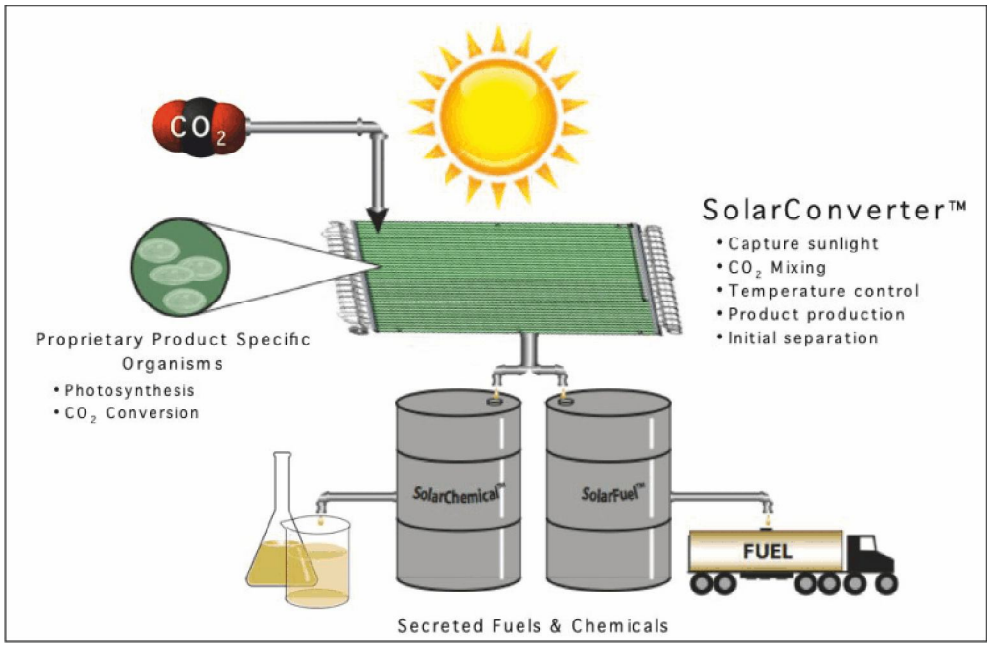
So why aren't we using nuclear fusion?

Bob Mumgaard, the CEO of Commonwealth Fusion Systems, speaking at the MIT Energy Conference in April pointed out that humankind's "desire for deep decarbonization" drives the interest in fusion. Private industry is building off of 70 long years of fusion science research supported by governments.

Fusion still has technological and economic barriers to overcome. Thankfully, there is a great deal of interest in the fusion process, with a number of universities, as well as companies like the Jeff Bezos-backed General Fusion and a huge pool of fusion startups heating up the competition.

And just this week, the International Thermonuclear Experimental Reactor (ITER), based in Southern France, announced that they are now just 6.5 years away from "First Plasma," in a historic milestone. The ITER project is now 65 percent complete. The $23 billion project will be the world's very first commercial-scale fusion reactor.

SOLAR ENERGY BECOMES BIOFUEL WITHOUT SOLAR CELLS



Soon we will be able to replace fossil fuels with a carbon-neutral product created from solar energy, carbon dioxide and water. Researchers at Uppsala University have successfully produced microorganisms that can efficiently produce the alcohol butanol using carbon dioxide and solar energy, without needing to use solar cells.

We have systematically designed and created a series of modified cyanobacteria that gradually produced increasing quantities of butanol in direct processes. When the best cells are used in long-term laboratory experiments, we see levels of production that exceed levels that have been reported in existing articles. Furthermore, it is comparable with indirect processes where bacteria are fed with sugar, says Pia Lindberg, Senior Lecturer at the Department of Chemistry Ångström Laboratory, Uppsala University.

The knowledge and ability to modify cyanobacteria so they can produce a variety of chemicals from carbon dioxide and solar energy is emerging in parallel with advances in technology, synthetic biology, genetically changing them. Through a combination of technical development, systematic methods and the discovery that as more product removed from the cyanobacteria, the more butanol is formed, the study shows the way forward for realising the concept.

We already know it is possible to produce butanol using this process (proof-of-concept). What researchers have now been able to show is that it is possible to achieve significantly higher production, so high that it becomes possible to use in production. In practical terms, butanol can be used in the automotive industry as both an environmentally friendly vehicle fuel — fourth generation biofuel — and as an environmentally friendly component of rubber for tyres. In both cases, fossil fuels are replaced by a carbon-neutral product created from solar energy, carbon dioxide and water.

Even larger industries, in all trades, that currently produce high greenhouse gas emissions from carbon dioxide will be able to use the process with cyanobacteria to bind carbon dioxide and consequently significantly reduce their emissions.

- Microscopic cyanobacteria are the most efficient photosynthetic organisms on earth. In this study, we utilise their ability to efficiently capture the sun's energy and bind to carbon dioxide in the air, alongside with all the tools we have to modify cyanobacteria to produce desirable products. The results show that a direct production of carbon-neutral chemicals and fuels from solar energy will be a possibility in the future, explains Peter Lindblad, Professor at the Department of Chemistry Ångström Laboratory at Uppsala University who is leading the project.

Research at Uppsala University is part of the larger EU Photofuel project being coordinated by vehicle manufacturer VW whose aim is to develop the next generation of techniques for sustainable manufacture of alternative fuels in the transport sector.

NEW MATERIAL COULD UNLOCK POTENTIAL FOR HYDROGEN POWERED VEHICLE REVOLUTION

Scientists have discovered a new material that could hold the key to unlocking the potential of hydrogen powered vehicles. As the world looks towards a gradual move away from fossil fuel powered cars and trucks, greener alternative technologies are being explored, such as electric battery powered vehicles.

Another 'green' technology with great potential is hydrogen power. However, a major obstacle has been the size, complexity, and expense of the fuel systems — until now.

An international team of researchers, led by Professor David Antonelli of Lancaster University, has discovered a new material made from manganese hydride that offers a solution. The new material would be used to make molecular sieves within fuel tanks — which store the hydrogen and work alongside fuel cells in a hydrogen powered 'system'. The material, called KMH-1 (Kubas Manganese Hydride-1), would enable the design of tanks that are far smaller, cheaper, more convenient and energy dense than existing hydrogen fuel technologies, and significantly out-perform battery-powered vehicles.

Professor Antonelli, Chair in Physical Chemistry at Lancaster University and who has been researching this area for more than 15 years, said: "The cost of manufacturing our material is so low, and the energy density it can store is so much higher than a lithium ion battery, that we could see hydrogen fuel cell systems that cost five times less than lithium ion batteries as well as providing a much longer range — potentially enabling journeys up to around four or five times longer between fill-ups."

The material takes advantage of a chemical process called Kubas binding. This process enables the storage of hydrogen by distancing the hydrogen atoms within a H2 molecule and works at room temperature. This eliminates the need to split, and bind, the bonds between atoms, processes that require high energies and extremes of temperature and need complex equipment to deliver.

The KMH-1 material also absorbs and stores any excess energy so external heat and cooling is not needed. This is crucial because it means cooling and heating equipment does not need to be used in vehicles, resulting in systems with the potential to be far more efficient than existing designs.

The sieve works by absorbing hydrogen under around 120 atmospheres of pressure, which is less than a typical scuba tank. It then releases hydrogen from the tank into the fuel cell when the pressure is released.

The researchers' experiments show that the material could enable the storage of four times as much hydrogen in the same volume as existing hydrogen fuel technologies. This is great for vehicle manufactures as it provides them with flexibility to design vehicles with increased range of up to four times, or allowing them to reducing the size of the tanks by up to a factor of four.

Although vehicles, including cars and heavy goods vehicles, are the most obvious application, the researchers believe there are many other applications for KMH-1.

"This material can also be used in portable devices such as drones or within mobile chargers so people could go on week-long camping trips without having to recharge their devices," said Professor Antonelli. "The real advantage this brings is in situations where you anticipate being off grid for long periods of time, such as long haul truck journeys, drones, and robotics. It could also be used to run a house or a remote neighbourhood off a fuel cell." The technology has been licenced by the University of South Wales to a spin-out company part owned by Professor Antonelli, called Kubagen.

At its heart, engineering is about using science to find creative, practical solutions. It is a noble profession.

— QUEEN ELIZABETH II

ENERGY, ELECTRICAL ENERGY AND RENEWABLE ENERGY – 24

Sustainable Growth, Sustainable Electrical Energy and Renewable Energy

Review of Bio Energy and the Potentials

Solar Energy – Focus on Solar Thermal and Electricity.

Review of Bio Energy – continued

We saw broad details of very substantial Bio Energy potentials available in our country and the need for addressing the technology issues of reliable and long lasting solutions. In October 2018, Government came out with an ambitious scheme of producing CBG (Compressed Bio Gas) to the extent of around 60 Million Tons, in around 5000 units spread all over the country and the oil companies, particularly IOC to play the important part of procuring and distributing the CBG through their outlets. These details were published in this series in October 2018 itself and the speed of further actions by all concerned – The Government, IOC and other oil companies and the enterprises that are setting up the CBG Plants – are to be appreciated.

Very interestingly, IOC has been continuously active and one of their recent press releases is given below for information. They have been continuously issuing letters of intent to the entrpreneurs coming forward to produce and supply CBG strictly as per specifications and as per the terms and conditions etc. currently the total no. of letters of intent issued exceed around 300.

News item Economic Times 18th August 2019

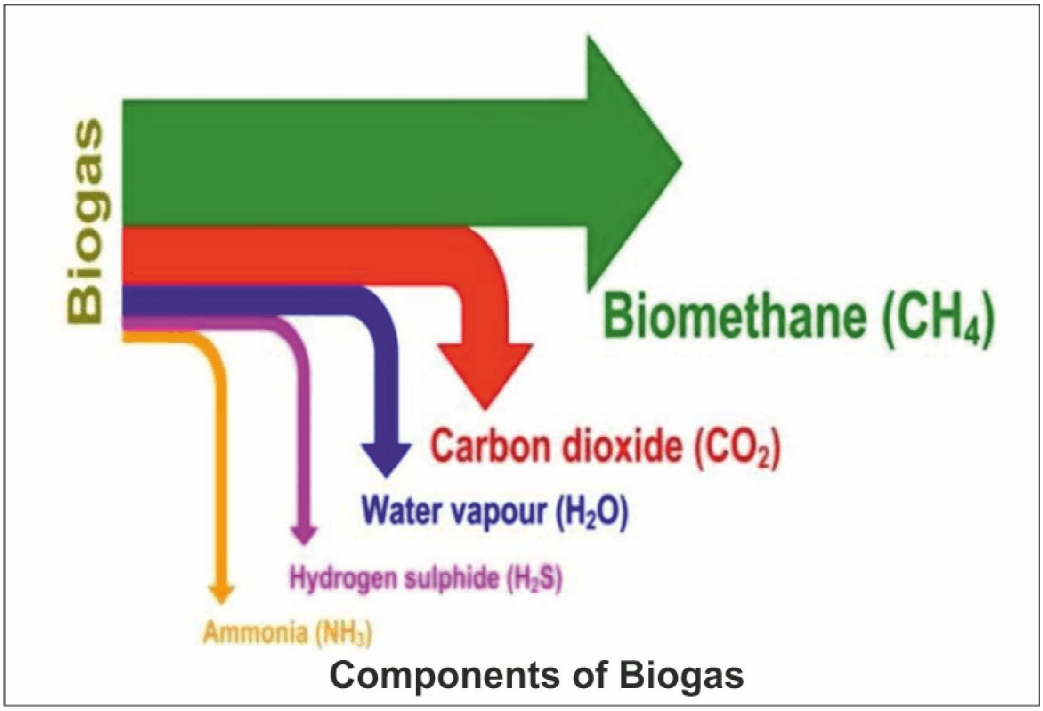
It has issued letters of intent to entrepreneurs to set up 75 plants to supply 792 tonnes per day of compressed biogas (CBG) under the government's sustainable alternative towards affordable transportation (SATAT) scheme that targets setting up 5,000 CBG plants over the next few years.

Broad Technology, Specifications and Business model details as extracted from the IOC White Paper on CBG is provided in this write up for the information of the readers and those who could be interested in manufacture and supply of CBG to IOC and other Oil Marketing Companies.

C.B.G.(**COMPRESSED BIOGAS**)**BIOGAS** GENERATION, PURIFICATION & BOTTLING. Bio-CNG is the purified form of **biogas**, without other gaseous impurities. It is very similar to natural gas in its composition and energy potential, is a renewable energy source, eco-friendly and can replace LPG and CNG easily.

1. Waste / Bio-mass sources like agricultural residue, cattle dung, sugarcane press mud, municipal solid waste and sewage treatment plant waste, etc. produce bio-gas through the process of anaerobic

decomposition. The biogas is purified to remove hydrogen sulfide (H_2S), carbon dioxide (CO_2), water vapor and compressed as Compressed Bio Gas (CBG), which has methane (CH_4) content of more than 90%.



2. CBG has calorific value and other properties similar to CNG and hence can be utilized as green renewable automotive fuel. Thus it can replace CNG in automotive, industrial and commercial areas, given the abundance biomass availability within the country.
3. Conversion of agricultural residue, cattle dung and municipal solid waste (MSW) into CBG in a commercial scale is expected to have the following benefits
    - Import reduction of natural gas and crude.
    - Utilization of agricultural residue, cattle dung and MSW for the production of CBG and thus to achieve reduction in emissions and pollution.
    - A boost towards fulfillment of National commitments in achieving climate change goals.
    - Providing a buffer against energy security concerns and crude/gas price fluctuations.
    - Contribution towards Swachh Bharat Mission through responsible waste management
    - Lowering pollution and carbon emission.
    - Providing additional source of revenue to the farmers, rural employment and amelioration of the rural economy.

Compressed Bio Gas (CBG) in India

1. The estimated CBG potential from various sources in India is nearly 62 MMT with biomanure generation capacity of 370 MMT. CBG is envisaged to be produced from various bio-mass / waste sources including agricultural residue, municipal solid waste, sugarcane press mud, distillery spent wash, cattle dung and sewage treatment plant waste.
2. The other waste streams viz. rotten potatoes from cold storage, rotten vegetables, dairy plants, chicken/ poultry litter, food waste, horticulture waste, forestry residues and industrial Effluent Treatment Plants (ETPs) treating organic waste can be used in the generation of biogas.

3. The biogas produced contains approximately 55% to 60% methane, 40% to 45% carbon dioxide and trace amounts of hydrogen sulphide. Biogas is purified to remove carbon dioxide and hydrogen sulphide gases to prepare CBG. The CBG can be transported through cylinder cascades or pipelines to retail outlets. (IOC specifies 250Kg Cascades in one of their communications)
4. Vide Gazette Notification no. 395 dated 16th June 2015, Ministry of Road Transport and Highways, Government of India had permitted usage of bio-compressed natural gas (bio-CNG) for motor vehicles as an alternate composition of the compressed natural gas (CNG).
5. Compressed Bio Gas (CBG) to be supplied shall meet IS 16087:2016 specifications of BIS (detailed below) and any other further revisions in the said specifications.

Table 1 : Composition of CBG

IS 16087 : 2016 Standard		
S No.	**Characteristic**	**Requirement**
1	Methane percentage (CH_4), minimum	90.0 %
2	Only Carbon Dioxide percentage (CO_2), maximum	4%
3	Carbon Dioxide (CO_2)+ Nitrogen (N_2)+ Oxygen (O_2) percentage maximum	10%
4	Oxygen (O_2) percentage maximum	0.5%
5	Total sulphur (including H_2S) mg/m^3, maximum	20 mg/m^3
6	Moisture mg/m^3, maximum	5 mg/m^3

6. Also as per the IS 16087:2016 specifications, the following shall also be met
   i. CBG shall be free from liquids over the entire range of temperature and pressure encountered in storage and dispensing system
   ii. The CBG shall be free from particulate matter such as dirt, dust, etc.
   iii. CBG delivered shall be odorized similar to a level found in local distribution (ref. IS 15319)
7. The CBG is to be compressed at 250 Bar and supplied through Cascades to the Oil Company Retail Outlets as mentioned in the EOI document.

CBG Production Technology

1. Biogas is a product from the process of degradation of organic matter by anaerobic bacteria. The biogas generation process consists of four subsequent chemical and biochemical reactions i.e. Hydrolysis reaction, Acidogenesis reaction, Acetogenesis reaction and Methanogenesis reaction.
2. Hydrolysis reaction decomposes organic molecule such as carbohydrates, proteins and fats into glucose, amino acids and fatty acids, respectively. Acidogenesis converts those generated small organic molecules to volatile organic acids with help from bacteria. During the Acetogenesis process, bacteria in the acetic group digests volatile organic acids and releases acetic acid. Lastly, anaerobic bacteria in the methanogenic producing bacteria group will complete the Methanogenesis process by converting acetic acid to methane gas and other gases like carbon dioxide and hydrogen sulfide.
3. Hydrogen sulfide is a corrosive gas. Presence of carbon-dioxide in the bio-gas reduces its calorific value. Hence the bio-gas needs to be purified. Various technologies are used for removal of hydrogen sulfide, as detailed below:

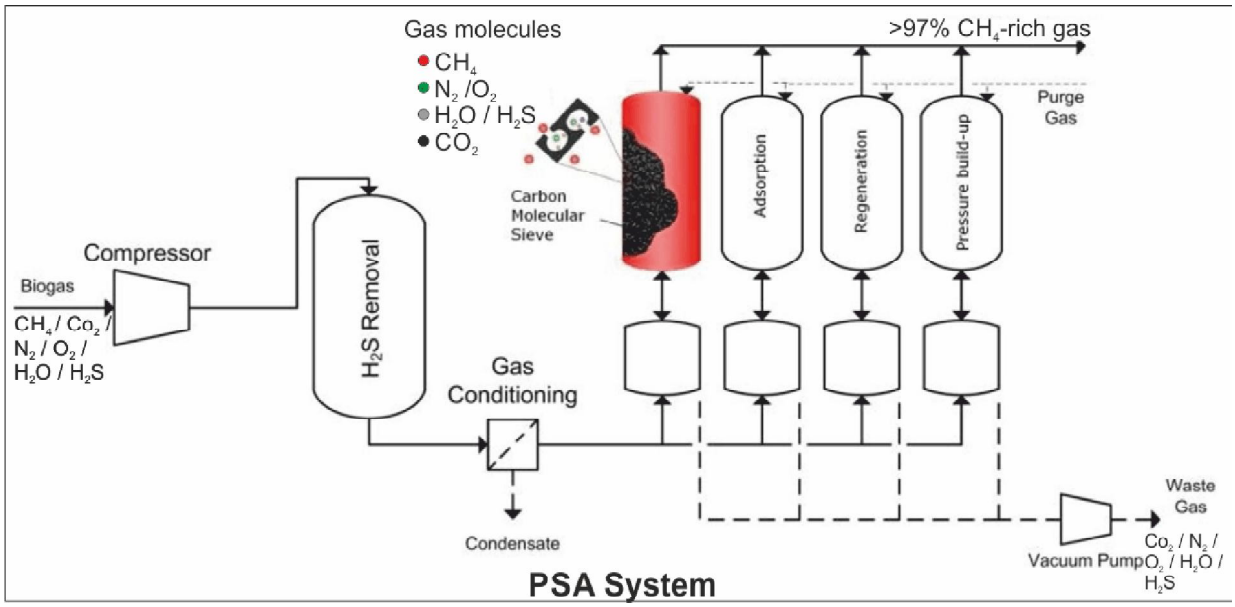
Table 2 : Comparative analysis of technologies to remove Hydrogen Sulphide

Method	Efficiency	Cap Cost	O&M	Complexity
Biological Fixation	Moderate	Moderate	Low	Moderate
Iron chloride dosing	Moderate	Low	Moderate	Low
Water scrubbing	High	High	Moderate	High
Activated Carbon	High	High	Moderate	Moderate
Iron Hydroxide or Oxide	High	Moderate	Moderate	Moderate
Sodium Hydroxide	High	Moderate	High	Moderate

4. For removal of carbon dioxide, the following technologies are used

- **Pressure Swing Adsorption (PSA)**

  This technology is most prevalent for large bio-gas systems in India. With this technique, carbon dioxide is separated from the biogas by adsorption on a surface under elevated pressure. The adsorbing material, usually activated carbon or zeolites, is regenerated by a sequential decrease in pressure before the column is reloaded again, hence the name of the technique. Hydrogen sulphide and water needs to be removed before the PSA-column. There is significant loss of methane (20-30%) in this process.



- **Water scrubbing**

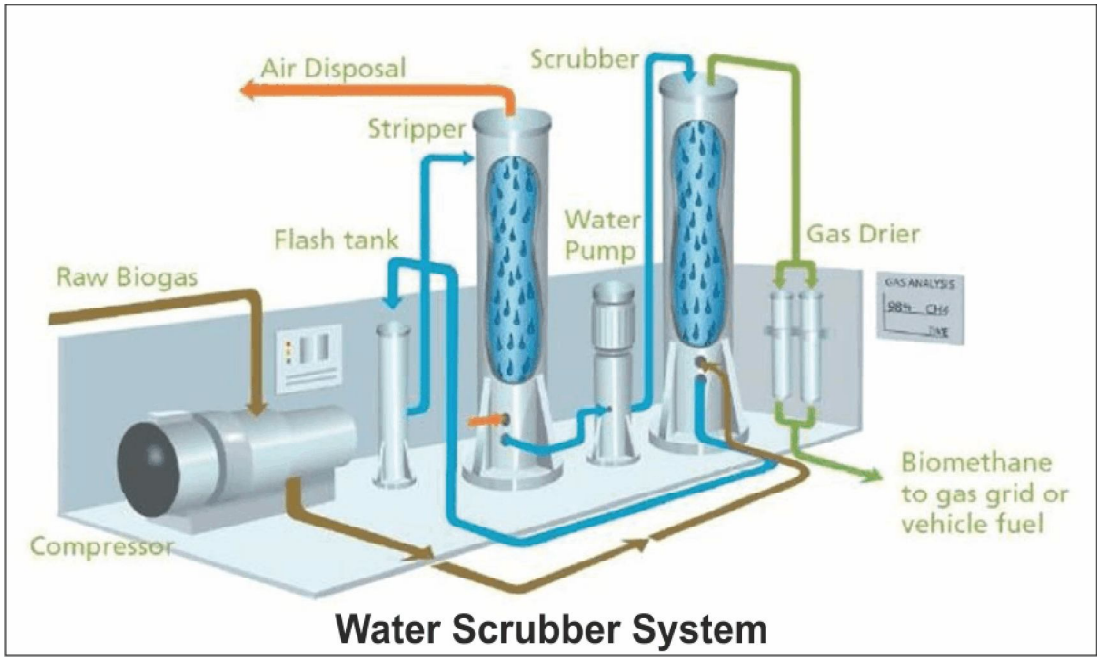
  Carbon dioxide has a higher solubility in water than methane. Carbon dioxide will therefore be dissolved to a higher extent than methane, particularly at lower temperatures. In the scrubber column carbon dioxide is dissolved in the water, while the methane concentration in the gas phase increases. The gas leaving the scrubber has therefore an increased concentration of methane.

  There are technologies available through which 97% purity of methane can be achieved with minimal (<5%) methane loss.

- **Membrane Separation**

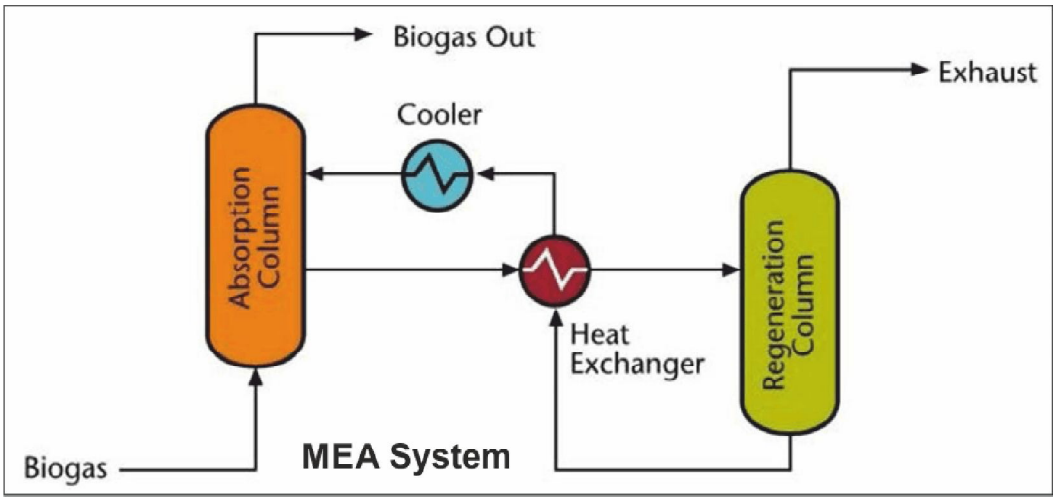
  Dry membranes for biogas upgrading are made of materials that are permeable to carbon dioxide, water and ammonia. Hydrogen sulphide, and oxygen permeate through the membrane to some extent while nitrogen and methane only pass to a very low extent.

  Usually membranes are in the form of hollow fibers bundled together.



- **Chemical scrubbing - Monoethylammine (MEA) system**

  This is one of the best systems for bio-gas purification achieving 99.9% purity with negligible loss of methane. The systems are being extensively used in Germany for purification of bio-gas. Carbon dioxide is not only absorbed in the liquid, but also reacts chemically with the amine in the liquid. Since the chemical reaction is strongly selective, the methane loss might be as low as <0.1%.



Apart from the above, there are also developing technologies like Cryogenic upgrading. A comparison of the available technologies is as under:

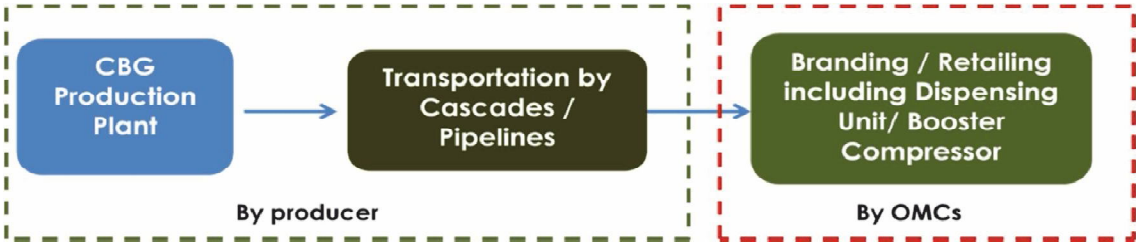
Table 3 : Comparative analysis of technologies to remove Carbon Dioxide

Parameter	**PSA**	**Water Scrubber**	**Mono-ethylammine (MEA) system**
Pre- H_2S removal required	Yes	No	Yes
Working pressure (bar)	4-7	4-7	No pressure
Methane loss	20-30%	5-10%	<0.1%
Methane content in upgraded gas	>96%	>97%	>99%
Electricity consumption (kWh/m^3)	0.25	<0.25	<0.15

Envisaged Business Model for Oil Marketing Companies (OMCs)

1. The CBG Plants shall be set up by mainly through independent Entrepreneurs and in few specific cases OMCs may consider setting up of CBG plant. The marketing of all the CBG produced through such plants will be through OMC network, under their respective brand names.

Producer(s) / Seller(s) (Party/Entrepreneur) shall deliver CBG (within 25 Km, an indicative maximum distance), at Public sector Oil Marketing Companies' existing or new Retail Outlet / Stand alone Selling Point, through Cascades. The equipment for dispensing CBG at Public sector Oil Marketing Companies' existing or new Retail Outlet / Stand alone Selling Point shall be installed and maintained by Public sector Oil Marketing Companies', however, the CBG nozzles shall be manned and operated by RO Dealer. Electricity expenses towards dispensing of CBG through sale point shall be reimbursed to the Party who is actually bearing the costs. The outlet flange of the Cascade / Inlet Flange of Compressor at the Retail Outlet shall be the Point of Sale for CBG. The cascade to remain connected to the compressor at retail outlet till the dispensation is operationally feasible.



Pricing Framework of CBG (To be retailed through OMCs / Fixed for three years from 1.10.2018 / The price will be reviewed at the end of 3 years.)

Item	Unit	Price
Basic Price of CBG meeting IS 16087 : 2016 standard, compressed at 250 bar and delivered at OMC Retail Outlet in cascades	Rs./kg	46.00
GST at 5%	Rs./kg	2.30
Total supply price (incl. GST) to be paid to party	Rs./kg	**48.30**

Additionally, an element of Rs. 2 per kg of CBG towards cost of setting up of infrastructure e.g. booster compressor, dispensing unit, etc. at retail outlet and Rs. 0.50 per kg of CBG towards electricity charges for operation of booster compressor, dispensing unit, etc at retail outlet, shall be provided to OMC or APPLICANT, as per whosoever sets up infrastructure at retail outlet.

It is very interesting that the Bo Energy Initiatives have started in a big way as the potentials in our country are huge. CBG Schemes can help to replace CNG as well as Petrol in a large way. As Government of India has a "Bio Energy Mission" in view, like the powerful Solar Energy Mission in implementation now, we can certainly look for more initiatives supported by Technologies in place.

(To be continued)

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Mobile: 98401 55209

KAMAL BATRA | *Buniyad Group* | ENTREPRENEUR

KAMAL BATRA
Buniyad Group

Buniyad
Real Estate Services

"The Man who will use his skill and constructive imagination to see how much he can give for a dollar, instead of how little he can give, is bound to succeed," Henry Ford.

Generally every entrepreneur in the world starts very small. Kamal Batra started his career with a small business of trading in cement and construction material in Noida, which was then a small town on the outskirts of Delhi. Looking at the fierce pace at which the town was developing, he soon realized that it was on its way to becoming a major business hub in North India. To cater to this booming scenario, he reasoned, there was need for a good service provider in the real estate sector, who could offer an integrated service under one roof. With the innate gift of being an excellent communicator, a patient listener and empathizer, Kamal was bound to succeed in the real estate industry due to his honest approach – and thus was born Buniyad in 1986.

Buniyad has grown into a mega venture, with a 200 strong workforce of experts for every aspect of the real estate business serving more than 1,00,000 clients. It has become a trustworthy company with an impeccable record of deliverance. It imparts services related to the sale purchase of properties, documentation, renting and leasing, investment advisory services, property valuation etc. Buniyad's expertise is unchallenged towards complete customer satisfaction and has an impeccable record of performance in Northern India; mainly Delhi and NCR. The group is vigilant towards the vibrant changes and modernization. Buniyad is an ISO-9001-2000 standard certified company possessing International Service certificate by the Joint Accreditation Service of Australia and New Zealand. Buniyad is made up of relationships that have been built up over the years and its strength is its employees and the fact that it focuses on the growth of its intellectual capital. With an extensive experience in the real estate sector, Kamal is the pillar of strength for the company's employees. With the vision to empower the sector and to bring about a change for development, he has been working hard towards setting new goals for the company and helping the Buniyad team work towards the same. Kamal has been extremely valuable in the smoothe functioning of the company's operations and providing guidance to the board members.

POWER OF GURU

This is interesting info : 1994 The President of India, Shri Shankar Dayal Sharma visited Muscat on an official trip - When the Air India flight landed, 3 rather unusual incidents took place: 1. The Sultan of Oman never goes to the airport to receive dignitaries of any country - never. But he made an exception this time and went to the airport to receive the President of India! 2. When the flight landed, the Sultan of Oman climbed up the steps and received the President from his seat! 3 . After alighting the flight there was a car with the chauffeur standing. But the Sultan signalled the driver to move and he himself drove the car with President as his passenger! Later when the reporters questioned the Sultan why he broke so many protocols, the Sultan replied, "I did not go to the airport to receive Mr. Sharma because he was India's President. I studied in India and learnt so many things, when I was studying in Pune, Mr. Sharma was my Professor - that is why I did this!"

That is the *power* of a *GURU

THE ENGLISH PLURAL ACCORDING TO....

Anyone who enjoyed George Carlin will enjoy this!
*English language isn't the easiest language to figure out.**

We'll begin with a box, and the plural is boxes,
But the plural of ox becomes oxen, not oxes.
One fowl is a goose, but two are called geese,
Yet the plural of moose should never be meese.
You may find a lone mouse or a nest full of mice,
Yet the plural of house is houses, not hice.

If the plural of man is always called men,
Why shouldn't the plural of pan be called pen?
If I speak of my foot and show you my feet,
And I give you a boot, would a pair be called beet?
If one is a tooth and a whole set are teeth,
Why shouldn't the plural of booth be called beeth?

Then one may be that, and three would be those,
Yet hat in the plural would never be hose,
And the plural of cat is cats, not cose.
We speak of a brother and also of brethren,
But though we say mother, we never say methren.
Then the masculine pronouns are he, his and him,
But imagine the feminine: she, shis and shim!

Let's face it - English is a crazy language.
There is no egg in eggplant nor ham in hamburger;
Neither apple nor pine in pineapple.
English muffins weren't invented in England.

We take English for granted, but if we explore its paradoxes,
We find that quicksand can work slowly, boxing rings are square,
And a guinea pig is neither from Guinea nor is it a pig.
And why is it that writers write, but fingers don't fing,
Grocers don't groce and hammers don't ham?

Doesn't it seem crazy that you can make amends but not one amend?
If you have a bunch of odds and ends and get rid of all but one of them,
What do you call it?

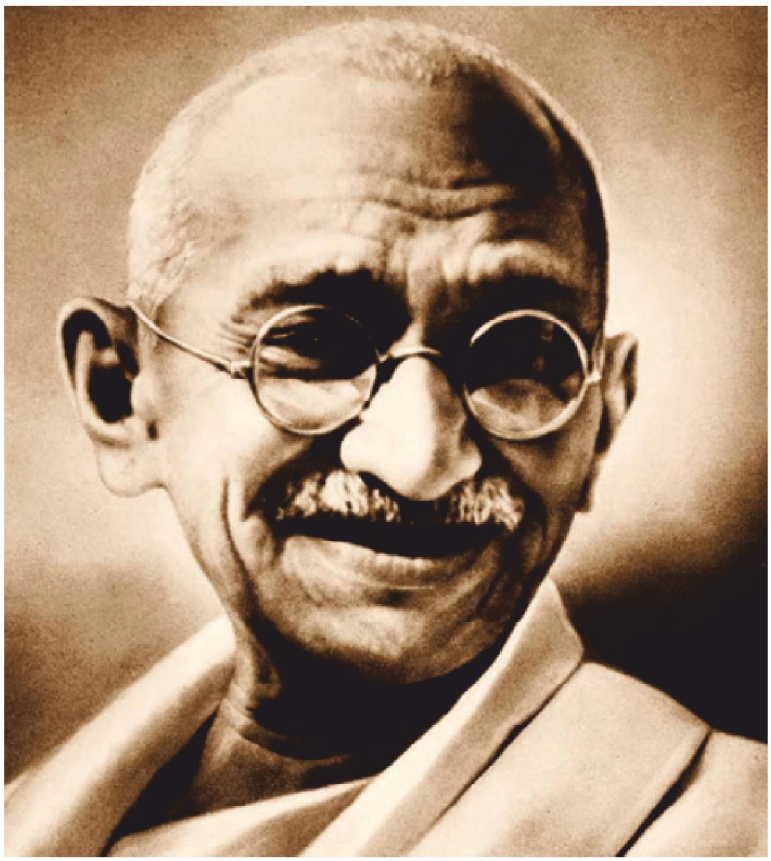
If teachers taught, why didn't preachers praught?
If a vegetarian eats vegetables, what does a humanitarian eat?

Sometimes I think all the folks who grew up speaking English
Should be committed to an asylum for the verbally insane.
In what other language do people recite at a play and play at a recital?

We ship by truck but send cargo by ship...
We have noses that run and feet that smell.
We park in a driveway and drive in a parkway

MOHANDAS KARAMCHAND GANDHI

Date of Birth : Oct 2, 1869 **Date of Death :** Jan 30, 1948



Mahatma Gandhi (Mohandas Karamchand Gandhi) was born into a Hindu Modh family in Porbandar, Gujarat, India in 1869. He was the son of Karamchand Gandhi, the diwan (Chief Minister) of Porbandar, and Putlibai, Karamchand's fourth wife (his previous three wives had died in childbirth), a Hindu of the Pranami Vaishnava order. Growing up with a devout mother and surrounded by the Jain influences of Gujarat, Gandhi learned from an early age the tenets of non-injury to living beings, vegetarianism, fasting for self-purification, and mutual tolerance between members of various creeds and sects. He was born into the vaishya or business, caste.

In May 1883, at the age of 13, Gandhi was married through his parents' arrangement to Kasturba Makhanji (also spelled "Kasturbai" or known as "Ba"), who was the same age as he. They had four sons: Harilal Gandhi, born in 1888; Manilal Gandhi, born in 1892; Ramdas Gandhi, born in 1897; and Devdas Gandhi, born in 1900. Gandhi was a mediocre student in his youth at Porbandar and later Rajkot. He barely passed the matriculation exam for the University of Bombay in 1887, where he joined Samaldas College. He was also unhappy at the college, because his family wanted him to become a barrister. He leapt at the opportunity to study in England, which he viewed as "a land of philosophers and poets, the very centre of civilization." Mohandas Karamchand Gandhi was a major political and spiritual leader of India, and the Indian independence movement. He was the pioneer and perfector of Satyagraha – the resistance of tyranny through mass civil disobedience strongly founded upon ahimsa (total non-violence) – which led India to independence, and has inspired movements for civil rights and freedom across the world.

Gandhi is commonly known and addressed in India and across the world as Mahatma Gandhi and as Bapu. Though his elders objected, Gandhi could not be prevented from leaving; and it is said that his mother, a devout woman, made him promise that he would keep away from wine, women, and meat during his stay abroad. Gandhi left behind his son Harilal, then a few months old. In London, Gandhi encountered theosophists, vegetarians, and others who were disenchanted not only with industrialism, but with the legacy of Enlightenment thought. They themselves represented the fringe elements of English society. Gandhi was powerfully attracted to them, as he was to the texts of the major religious traditions; and ironically it is in London that he was introduced to the Bhagavad Gita. Here, too, Gandhi showed determination and single-minded pursuit of his purpose, and accomplished his objective of finishing his degree from the Inner Temple.

Science is about knowing; Engineering is about doing.
— HENRY PETROSKI, American Engineer

He was called to the bar in 1891, and even enrolled in the High Court of London; but later that year he left for India. After one year of a none too successful law practice, Gandhi decided to accept an offer from an Indian businessman in South Africa, Dada Abdulla, to join him as a legal adviser. Unbeknown to him, this was to become an exceedingly lengthy stay, and altogether Gandhi was to stay in South Africa for over twenty years. The Indians who had been living in South Africa were without political rights, and were generally known by the derogatory name of 'coolies'. Gandhi himself came to an awareness of the frightening force and fury of European racism, and how far Indians were from being considered full human beings, when he thrown out of a first-class railway compartment car, though he held a first-class ticket, at Pietermaritzburg. From this political awakening Gandhi was to emerge as the leader of the Indian community, and it is in South Africa that he first coined the term satyagraha to signify his theory and practice of non-violent resistance. Gandhi was to describe himself preeminently as a votary or seeker of satya (truth), which could not be attained other than through ahimsa (non-violence, love) and brahmacharya (celibacy, striving towards God). Gandhi conceived of his own life as a series of experiments to forge the use of satyagraha in such a manner as to make the oppressor and the oppressed alike recognize their common bonding and humanity: as he recognized, freedom is only freedom when it is indivisible. In his book 'Satyagraha in South Africa' he was to detail the struggles of the Indians to claim their rights and their resistance to oppressive legislation and executive measures, such as the imposition of a poll tax on them or the declaration by the government that all non-Christian marriages were to be construed as invalid. In 1909, on a trip back to India, Gandhi authored a short treatise entitled 'Hind Swaraj' or Indian Home Rule, where he all but initiated the critique, not only of industrial civilization, but of modernity in all its aspects.

Gandhi returned to India in early 1915 and was never to leave the country again except for a short trip that took him to Europe in 1931. Though he was not completely unknown in India, Gandhi followed the advice of his political mentor, Gokhale, and took it upon himself to acquire a familiarity with Indian conditions. He traveled widely for one year. Over the next few years, he was to become involved in numerous local struggles, such as at Champaran in Bihar, where workers on indigo plantations complained of oppressive working conditions and at Ahmedabad, where a dispute had broken out between management and workers at textile mills. His interventions earned Gandhi a considerable reputation and his rapid ascendancy to the helm of nationalist politics is signified by his leadership of the opposition to repressive legislation (known as the "Rowlatt Acts") in 1919.

His saintliness was not uncommon, except in someone like him who immersed himself in politics and by this time he had earned from no less a person than Rabindranath Tagore, India's most well-known writer, the title of Mahatma or 'Great Soul'. When 'disturbances' broke out in the Punjab, leading to the massacre of a large crowd of unarmed Indians at the Jallianwala Bagh in Amritsar and other atrocities, Gandhi wrote the report of the Punjab Congress Inquiry Committee. Over the next two years, Gandhi initiated the non-cooperation movement, which called upon Indians to withdraw from British institutions, to return honours conferred by the British and to learn the art of self-reliance; though the British administration was at places paralyzed, the movement was suspended in February 1922 when a score of Indian policemen were brutally killed by a large crowd at Chauri Chaura, a small market town in the United Provinces.

Gandhi himself was arrested shortly thereafter, tried on charges of sedition and sentenced to imprisonment for six years. At The Great Trial, as it is known to his biographers, Gandhi delivered a masterful indictment of British rule. Owing to his poor health, Gandhi was released from prison in 1925. Over the following years, he worked hard to preserve Hindu-Muslim relations and in 1924 he observed, from his prison cell, a 21-day fast when Hindu-Muslim riots broke out at Kohat, a military barracks on the Northwest Frontier. This was to be of his many major public fasts and in 1932 he was to commence the so-called Epic Fast unto death, since he thought of "separate electorates" for the oppressed class of what were then called untouchables (or Harijans in

Gandhi's vocabulary, and dalits in today's language) as a retrograde measure meant to produce permanent divisions within Hindu society. Gandhi earned the hostility of Ambedkar, the leader of the untouchables, but few doubted that Gandhi was genuinely interested in removing the serious disabilities from which they suffered, just as no one doubt that Gandhi never accepted the argument that Hindus and Muslims constituted two separate elements in Indian society.

These were some of the concerns most prominent in Gandhi's mind, but he was also to initiate a constructive programme for social reform. Gandhi had ideas — mostly sound — on every subject, from hygiene and nutrition to education and labour, and he relentlessly pursued his ideas in one of the many newspapers which he founded. Indeed, were Gandhi known for nothing else in India, he would still be remembered as one of the principal figures in the history of Indian journalism. In early 1930, as the nationalist movement was revived, the Indian National Congress, the preeminent body of nationalist opinion, declared that it would now be satisfied with nothing short of complete independence (purna swaraj). Once the clarion call had been issued, it was perforce necessary to launch a movement of resistance against British rule. On March 2, Gandhi addressed a letter to the Viceroy, Lord Irwin, informing him that unless Indian demands were met, he would be compelled to break the "salt laws".

Predictably, his letter was received with bewildered amusement, and accordingly Gandhi set off, on the early morning of March 12, with a small group of followers towards Dandi on the sea. They arrived there on April 5th: Gandhi picked up a small lump of natural salt, and so gave the signal to hundreds of thousands of people to similarly defy the law, since the British exercised a monopoly on the production and sale of salt. This was the beginning of the civil disobedience movement: Gandhi himself was arrested and thousands of others were also hauled into jail. It is to break this deadlock that Irwin agreed to hold talks with Gandhi, and subsequently the British agreed to hold a Round Table Conference in London to negotiate the possible terms of Indian independence. Gandhi went to London in 1931 and met some of his admirers in Europe, but the negotiations proved inconclusive. On his return to India, he was once again arrested. For the next few years, Gandhi would be engaged mainly in the constructive reform of Indian society.

He had vowed upon undertaking the salt march that he would not return to Sabarmati Ashram in Ahmedabad, where he had made his home, if India did not attain its independence, and in the mid-1930s he established himself in a remote village, in the dead center of India, by the name of Segaon (known as Sevagram). It is to this obscure village, which was without electricity or running water, that India's political leaders made their way to engage in discussions with Gandhi about the future of the independence movement, and it is here that he received visitors such as Margaret Sanger, the well-known American proponent of birth-control. Gandhi also continued to travel throughout the country, taking him wherever his services were required. One such visit was to the Northwest Frontier, where he had in the imposing Pathan, Khan Abdul Ghaffar Khan (known by the endearing term of "Frontier Gandhi", and at other times as Badshah Khan), a fervent disciple. At the outset of World War II, Gandhi and the Congress leadership assumed a position of neutrality: while clearly critical of fascism, they could not find it in themselves to support British imperialism. Gandhi was opposed by Subhas Chandra Bose, who had served as President of the Congress, and who took to the view that Britain's moment of weakness was India's moment of opportunity. When Bose ran for President of the Congress against Gandhi's wishes and triumphed against Gandhi's own candidate, he found that Gandhi still exercised influence over the Congress Working Committee, and that it was near impossible to run the Congress if the cooperation of Gandhi and his followers could not be procured. Bose tendered his resignation, and shortly thereafter was to make a dramatic escape from India to find support among the Japanese and the Nazis for his plans to liberate India. In 1942, Gandhi issued the last call for independence from British rule. On the grounds of what is now known as August Kranti Maidan, he delivered a stirring speech, asking every Indian to lay down their life, if necessary, in the cause of freedom.

He gave them this mantra: "Do or Die"; at the same time, he asked the British to 'Quit India'. The response of the British government was to place Gandhi under arrest, and virtually the entire Congress leadership was to find itself behind bars, not to be released until after the conclusion of the war. A few months after Gandhi and Kasturba had been placed in confinement in the Aga Khan's Palace in Pune, Kasturba passed away: this was a terrible blow to Gandhi, following closely on the heels of the death of his private secretary of many years, the gifted Mahadev Desai. In the period from 1942 to 1945, the Muslim League, which represented the interest of certain Muslims and by now advocated the creation of a separate homeland for Muslims, increasingly gained the attention of the British, and supported them in their war effort. The new government that came to power in Britain under Clement Atlee was committed to the independence of India and negotiations for India's future began in earnest. Sensing that the political leaders were now craving for power, Gandhi largely distanced himself from the negotiations. He declared his opposition to the vivisection of India.

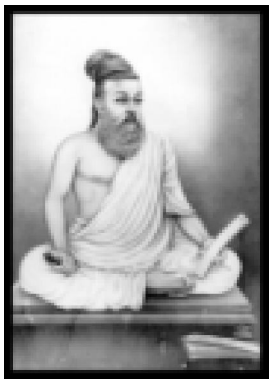
It is generally conceded, even by his detractors, that the last years of his life were in some respects his finest. He walked from village to village in riot-torn Noakhali, where Hindus were being killed in retaliation for the killing of Muslims in Bihar, and nursed the wounded and consoled the widowed; and in Calcutta he came to constitute, in the famous words of the last viceroy, Mountbatten, a "one-man boundary force" between Hindus and Muslims. The ferocious fighting in Calcutta came to a halt, almost entirely on account of Gandhi's efforts, and even his critics were wont to speak of the Gandhi's 'miracle of Calcutta'. When the moment of freedom came, on 15 August 1947, Gandhi was nowhere to be seen in the capital, though Nehru and the entire Constituent Assembly were to salute him as the architect of Indian independence, as the 'father of the nation'. The last few months of Gandhi's life were to be spent mainly in the capital city of Delhi. There he divided his time between the 'Bhangi colony', where the sweepers and the lowest of the low stayed, and Birla House, the residence of one of the wealthiest men in India and one of the benefactors of Gandhi's ashrams. Hindu and Sikh refugees had streamed into the capital from what had become Pakistan, and there was much resentment, which easily translated into violence, against Muslims. It was partly in an attempt to put an end to the killings in Delhi, and more generally to the bloodshed following the partition, which may have taken the lives of as many as 1 million people, besides causing the dislocation of no fewer than 11 million, that Gandhi was to commence the last fast unto death of his life. The fast was terminated when representatives of all the communities signed a statement that they were prepared to live in "perfect amity", and that the lives, property, and faith of the Muslims would be safeguarded.

A few days later, a bomb exploded in Birla House where Gandhi was holding his evening prayers, but it caused no injuries. However, his assassin, a Marathi Chitpavan Brahmin by the name of Nathuram Godse, was not so easily deterred. Gandhi, quite characteristically, refused additional security, and no one could defy his wish to be allowed to move around unhindered. In the early evening hours of 30 January 1948, Gandhi met with India's Deputy Prime Minister and his close associate in the freedom struggle, Vallabhai Patel, and then proceeded to his prayers. That evening, as Gandhi's time-piece, which hung from one of the folds of his dhoti (loin-cloth), was to reveal to him, he was uncharacteristically late to his prayers, and he fretted about his inability to be punctual. At 10 minutes past 5 o'clock, with one hand each on the shoulders of Abha and Manu, who were known as his 'walking sticks', Gandhi commenced his walk towards the garden where the prayer meeting was held. As he was about to mount the steps of the podium, Gandhi folded his hands and greeted his audience with a namaskar; at that moment, a young man came up to him and roughly pushed aside Manu. Nathuram Godse bent down in the gesture of an obeisance, took a revolver out of his pocket, and shot Gandhi three times in his chest. Bloodstains appeared over Gandhi's white woolen shawl; his hands still folded in a greeting, Gandhi blessed his assassin: He Ram! He Ram! As Gandhi fell, his faithful time-piece struck the ground, and the hands of the watch came to a standstill. They showed, as they had done before, the precise time: 5:12 P.M.

Architecture begins where Engineering ends.

— WALTER GROPIUS, German Architect

TIRUKKURAL AND FAIR AND ETHICAL MANAGEMENT - 8



In the process of decision making which is a core activity of management, application of commonsense along with consideration of various other aspects is very important. The process of analysis for decision making must be directed by absolute sense of fairness and "Aram", and there must be a strong conviction that this will only result in stable all round benefits in the long run for the organization and all the stake holders. This in fact, is the current trend in all worthy, stable and long standing organizations and Brands world over.

The Kurals chosen below illustrate this point to develop an unshakable faith in righteousness in all decision making rather than maximization of profits and agreeing to make a small compromise in the level of profits.

Andrarivam Ennathu Aramseiga; Matrathu Pondrungal Pontrath Thunai ***Kural 36***

அன்றறிவாம் என்னாது அறஞ்செய்க மற்றது பொன்றுங்கால் பொன்றாத் துணை. குறள் 36

"Say not in thy heart that I will be righteous by and by, but begin to do good work without delaying, for it will be the righteousness your companion at the time of difficulties (to help you withstand and reach back to top)"

The essence to understand from this Kural is that the complex and competitive business situations and changing economic conditions may bring in difficult times when question arises who survives; it is certainly the organizations with core of righteousness that swim through.

Araththaru Ithuvena Venda; Sivigai Poruththanodu Oornthan Idai ***Kural 37***

அறத்தாறு இதுவென வேண்டா சிவிகை பொறுத்தானோடு ஊர்ந்தான் இடை. குறள் 37

"Ask me not what will it profit a man if he he is righteous? Look at the bearer of the palanquin and him that rideth on it"

The important thing to understand from the above Kural is that in the long run, the organization or the Brand that follows righteousness in all its activities and decision making, will be the leading name whereas the others will be just poor followers and striving to survive.

HOME FESTIVALS - 10

ஐப்பசி – Aippasi (October/November)

Skanda shasti is the first festival of this month(right), commemorating the victory of Lord Murugan over the demon Sura, of the higher, spiritual self over the lower nature. **Dipavali is the major event of Aippasi**, celebrated everywhere Hindus live and by Buddhists and Jains, too. In one story of its origins, Vamana, the dwarf avatar of Lord Vishnu, requests the amount of land from King Bali that he can cover in three steps. Granted the request, Vamana covers with his first step all of the Earth, with the second all of the sky, and then asks the king where to take the third step. The king offers his own head (lower left), and in commemoration of the king's humility, the day was established. In another story, Lord Vishnu (center) kills the demon Nagagasvaran with His discus. The various observances (lower right) of Dipavali include an oil bath, gifts of new clothes, fireworks (sufficiently indulged in Chennai to rattle dishes off the kitchen shelves), oil lamps for display and abundant pots of delicious food. The early morning bath is always considered to be in the Ganga itself, so one greeting of the day is, "Did you have the Ganga bath?"

(To be continued)

VOLKSWAGEN DESIGNS "MICROMOBILES" FOR LIFE AFTER TRAFFIC COLLAPSE

Steve Jobs once said "If you don't cannibalize yourself, someone else will." So even though the iPod was 50 percent of Apple's revenue in 2006, he introduced the iPhone, which soon ate its predecessor.

The Volkswagen Group seems to be doing a little bit of self-cannibalization, recognizing that cities are getting big and crowded, noting that "answers are needed to avoid the threat of traffic collapse on the one hand and to meet the changing demands of modern mobility on the other." People will still have cars, but use them differently.

VW has developed a range of "innovative micromobiles" starting with the three-wheeled Cityskater. It has a 350 watt (.46 horsepower) motor and a 200 Wh (682 BTU) battery, pushing it up to 15km (9.3 mi) at up to 20km/h. (12.42 mph) This makes a lot of sense if you are using it for that last mile or two after parking your car, because it is designed to fit in the trunk.

The Streetmate makes less sense to me; this thing is big and heavy at 70kg (150 lbs), fast at 45 km/h. (28 MPH) With a range of 60 km, it seems more like a car replacement.

Then there is the Cargo e-bike; now this makes sense. It's a pedelec (no throttle, 250 watt motor) so that it can go where a bike can go, without licences required. Or is is it a realization that the age of the car is truly coming to an end in cities, and that they should be prepared. Their own chart demonstrates how much space cars take up and how much they cost, in comparison to micromobiles or buses.

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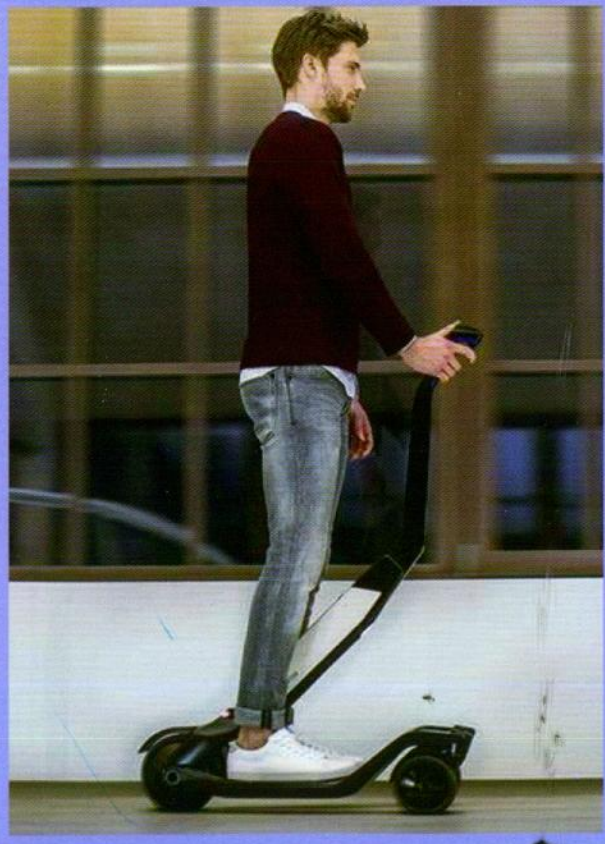

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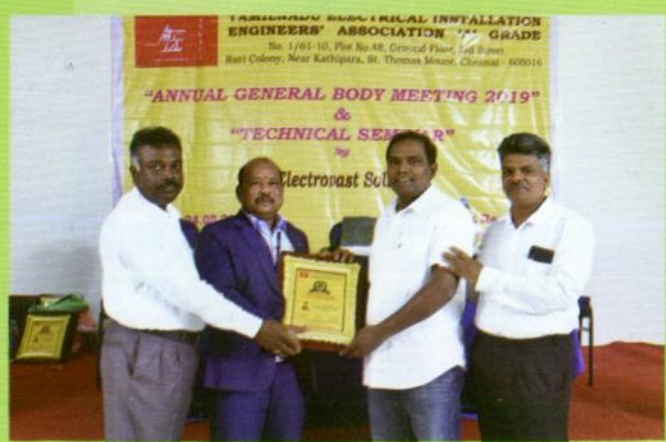
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