



ELECTRICAL INSTALLATION ENGINEER

NEWS LETTER

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

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ELECTRICAL ENGINEERING EXPO

February 28 - March 03

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EDITORIAL

Dear Members, Fellow Professionals and Friends

Seasons Greetings to One and All!

Science and Engineering and Technologies and the Practices form the core of our Profession and February is the month when National Science Day is celebrated on the 28th of this month. Looking at the very basics of Science and its importance we find that - **Science** is about a whole lot of things and to sum it up we believe that **science** is a way of helping the brain grow in finding new knowledge and helps us defeat our curiosity of how the world develops and works today. **Science** is **important** because it has helped form the world that we live in today. We are the oldest civilization of the World and it is History that India possessed sound knowledge of Science in the areas of Mathematics, Astronomy, Ship Building, and Navigation and so on. We have at present, certainly caught up with the latest in various areas of Science, Engineering and Technology including Space and Nuclear and Electronics and Computers and so on. We have had a remarkable progress in the last 50/60 years and the Brand India has become popular the World over. We have built up Cost, Technology, Manpower and Skill advantages for speeding up the Economic growth. We can also feel proud that Indians play key roles in all parts of the World in development and management of Science and Technology. It is noteworthy that in the areas of Energy and Computing and Communication the advancements and growth have been phenomenal impacting all areas of Business and Manufacturing.

It is relevant for India as a leading Agriculture oriented Country that the World 'Wetlands' Day is observed this month. As we are all aware that Well Irrigated Wetlands influence the production of Food Grains, Sugarcane and various other Agricultural products and the potentials are huge in our country, as at present, based on an all India average, we are only having 'one crop' per year and with equitable distribution of all available waters in the country, there can be 'three crops' increasing outputs in very large measure providing opportunities for large exports. There are continuous efforts in this regard by the Government and even recently there was announcement about Godhavari – Cauvery linking project to completely solve the problems of Cauvery Delta and more. A National approach with the cooperation of all states with regard to equitable distribution of all waters can certainly help in this important areas of our Economy and Self-sufficiency.

February is also month of Budget Presentation, but due to the forthcoming elections it will be an interim budget this year, but with vastly increased and steady revenues through direct and indirect taxes, we can probably look for lot of proposals for growth and prosperity in the coming years and Budgets.

We thank all those members who have helped us by participating in the advertisement appearing for the issue January 2019 – Dehn India Pvt. Ltd., Electro World - 2019, Elecexpo, Galaxy Earthing Electrodes Pvt. Ltd., Pentagon Switchgear Pvt. Ltd., Power Cable Corporation, Power Square Engineers, Supreme Power Equipment Pvt. Ltd., Visewham Electricals.

EDITOR

Recreation and good physical health appear to be the only ambivalent benefits of the technological revolution."

– WALKER PERCY, Lost in the Cosmos: The Last Self-Help Book

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KNOW THY POWER NETWORK - 137

In the last article, we have addressed the protection aspects of HV Networks. Now let us turn our focus on LT Networks.

The main equipment and devices that are employed for the short circuit and over current Protection in the LT Networks are Current Transformers, Circuit Breakers, Relays and fuses (both HRC fuses and Rewirable fuses). Thus selection, ratings and settings are the important factors that need attention.

The operating time of these devices are in the order of milli seconds (10^{-3} sec); in the case over voltage protection, this time is in the range of micro seconds. (10^{-6} seconds). Further the short circuit protective devices require atleast two cycles (40 milliseconds for the initiation of their effective operation; any duration less than this minimum time will not bring their desired operation. Transient performance of Current Transformers, Relays, Circuit Breakers and Fuses is the main reason for this minimum time requirement.

We all know that in respect of HV networks, Current Transformers, Potential Transformers, Relays, Storage Batteries and Circuit Breakers are essentially required. As regards the LT Circuits, the required details have already been outlined in the beginning of this article.

As per existing standards, Rewirable Fuses should not be employed in the circuits, where the current involved is more than 100 Amps and above. The limited Rupturing capacity of these Fuses and the harmful impacts that are brought by their fusing is the reason cited for this measure.

The data/factors that require attention while arranging protection for LT Networks are enumerated as

- prospective short circuit fault currents.
- Let through currents (I^2t currents—both Irms and Ipeak)
- Withstand current ratings of the protected equipment, Cables, Circuit Breakers, Protective devices and all other equipment and devices that are existing in the circuit - (i.e.) their I^2t withstand capacity.
- Speed of operation of all the protective devices (i.e.) time taken by the protective devices to clear the faults.
- Permissible short time overloads brought by the energisation of the Transformers, Capacitors and motors. Generally it is in the order of 175 percent of its full load rating. It is desirable to know the duration of this delayed operation of Protective Circuit.
- Voltage rating of the Protective Devices.
- Current rating (Ampere rating) of the Protective devices.
- Interrupting rating (Rupturing Current) of the Protective devices.
- (Continuous or sustained) load currents anticipated in the circuit in point
- Time -Current characteristics of the Protective devices like Fuses and Relays (i.e.) speed of operation of the protective devices. Normally IDMT characteristics are adopted. (i.e.) Higher the fault current, lower will be the operating time.
- Fusing factor in case of Fuses, (Both HRC and Rewirable Fuses).

In this context, it may be noted that under any circumstance, the let-through currents of the Fuses and Circuit Breakers should not exceed the corresponding withstand level/capability of the protected equipment/devices in the circuit in point. If it happens it will expose the protected equipment/ devices to severe damages and the attendant fires. Why this point is stressed is that on many occasions, copper wire strands are commonly employed as Fuse Wires to avoid fuse blowing or loss of supply. This results not only severe damages to the assets but also led to electrical fires. I think by now you understand the reason.

Why?

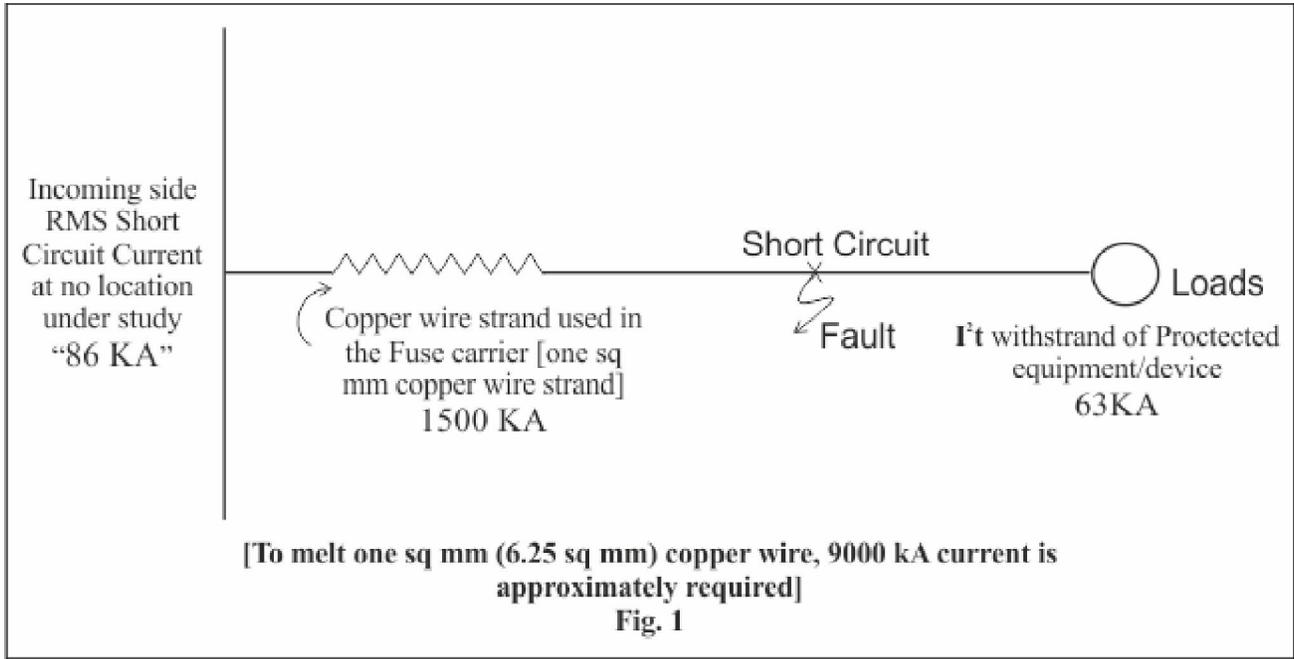
It is illustrated as follows.

It is difficult to understand all these parameters except the term “Fusing Factor”

$$\text{Fusing Factor} = \frac{\text{IRMS at which the fuse blows off}}{\text{Rated current of the Fuse}} \quad \text{--- (1)}$$

The Fusing Factors in case of HRC Fuses and (Rewirable) thinned copper Fuse Wires are in the range of 1-7 and 2-0 respectively. The proper co-ordination of the upstream and downstream side protection device is

essentially required to ensure effective isolation of faults without the loss of selectivity, sensitivity and reliability factors of the protection under focus.



Contrast between Fuse and Circuit Breaker.

Both fuse and Circuit Breakers are short circuit protective devices. Except this common feature, there are many differences between them.

Fuses are segregated as High Rupturing capacity Fuses and Rewirable Thinned copper Fuse Wires. In the case of Circuit Breakers, it can be stated as Miniature Circuit Breakers and Moulded Case Circuit Breakers with Arc Chutes and attached auxiliary relays when need arises. Both these devices have normal current rating and Rupturing Current rating. These current ratings should be properly selected so as to avert undesirable nuisance trippings. HRC fuse operate very fast under short circuit conditions but operate slowly when it encounters currents which are less than three times of its rated value. This makes it ineffective while it is employed for the protection of Transformer; Under this condition at best it serves only to protect the system by disconnecting the faulty transformer only when the fault reaches an advanced stage rather than rescuing the transformer from the fault quickly. Short Circuit and overload protection should be provided to all electrical equipment/device. In most of the cases, both the protections are provided by a single device either a fuse or a Circuit Breaker.

CONTRAST BETWEEN FUSES AND CIRCUIT BREAKERS

| Fuses | Circuit Breakers (MCCBs and MCBs) |
|---|---|
| Merit | Merit |
| (i) It offers protection at lower cut off current. Hence it permits comparatively less I^2t (let through energy) in the Circuit during short Circuit faults. (ii) Its time of operation is comparatively fast. | (i) It can be reset after clearing the fault. Hence supply can be restored to the affected circuit quickly ie. with less down time. (ii) This feature is considered as an advantage for the Circuits where less or no down time is permitted. (iii) It is easier to note the operating status of the CB ie. closed/open |
| DeMerit | DeMerit |
| (i) To continue supply in the circuit under focus the replacement of blown fuse and the causes for its operation are required. This step leads to higher down time | (i) It permits a higher let through energy than a fuse. So when it is used in conjunction with motor starters or feeder cables, a larger contractor/cables with higher withstand capabilities are required. This adds to the cost of installation. This protection is not preferred where current withstand capability of the associated equipment is critical. |

Further in the case of motor starters, thermal overload elements are provided to trip the circuit, when the overload, experienced by the motor persists for a period longer than the one set for meeting the motors starting current surges (Shorttime overload). In the case of other equipment like transformers, the withstand capability of the connecting cables and other devices on the down stream, required to withstand such shorttime overloads. This makes it difficult for taking a decision, while arranging short circuit and overload protection of various equipment and devices in a building/plant. (i.e.) It becomes critical whether to go for fuse or Circuit Breakers.

The main point to be considered in this regard is how costly would be the down time in a particular circuit or application and also the let through energy withstand capability of the connected equipment (e.g.) computer and all Electronic devices like Television & Music Systems require fuses only for its protection. Circuit Breakers should not be employed for such devices under any circumstances.

To add further while arranging protection for motors, care should be taken to ensure the integrity of both motor, its starter and its feeding cables. This condition warrants a close coordination between the overload protective device and the short circuit protection of the motor. This condition could be met only when the energy let through in the circuit through the short circuit protective device. (Fuse/CB) is not exceeding the withstand level afforded by the overload protective device of the motor viz. Thermal Overload relay. Now you may be eager to learn how to determine the prospective short current at any location with a reasonable degree of accuracy when data like Fault level at that location conductor/cable length are not readily available. In such condition, the method given below may be adopted.

Step 1 – Determine the Transformer Full load Current.

$$(a) \text{ 3 phase Transformer } = I_f = \frac{(\text{Transformer kVA Rating}) \times 1000}{\sqrt{3} \times \text{L-L voltage}}$$

$$(b) \text{ 1 phase Transformer } = I_f = \frac{\text{Transformer Rating in kVA} \times 1000}{\text{phase Voltage}}$$

Step 2 – Determine at the Multiplier

$$M = \frac{100}{\% \text{ age impedance of the Transformer is point}}$$

Worst case

$$M = \frac{100}{0.9 \times \text{Percentage Impedance of the Transformer}}$$

Step 3 – Short Circuit Current = Transformer I_f X Multiplier

THUMB RULE:

When no data is available, the fault level at any location can be treated as 2 MVA or 1 MVA as the case may be.

The essence of this presentation is that there should be proper selection of short circuit protective device and overload protective device (Thermal Relay/single Phasing preventer) and there should be proper co-ordination between them, whether they may be circuit Breakers or Fuses.

The next topic in line for our discussion is how we can safeguard ourselves and our equipment/ devices from the “faulty circuits” which has very potential for causing shocks, burns, deaths and electrical fires accompanied with damages to electrical installations, equipment and devices. (i.e.) how to ensure electrical safety when we permit electricity to behave as a “Master” and not as a humble servant.

It is nothing back Earth Fault/Leakage protection. This topic will be addressed in my next article.

Now it is time for me to sign off. Kindly stay tuned.

(To be continued...)



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CROSS-LINKING OF WIRES & CABLES WITH ELECTRON BEAM (EB) – A NEW TECHNOLOGY OF FUTURE

Introduction

The industrial applications of radiation processing in polymers, utilizing electron beam cross-linking, for modification and enhancement of polymeric properties has been well established over the past 80 years. Modification in polymeric structure of materials can be brought about either by conventional chemical means, usually involving silane or per-oxide or by exposure to ionizing radiation from energetic electrons from electron accelerators. The electron beam processing in wires and cables helps to improve thermal, chemical, barrier, impact wear and other mechanical properties to meet the demanding applications of the customers in wires and cables. This is evident from the large number (>2500) of EB machines presently working in India and abroad. The growth of EB technology in last two decades in China and other countries including India establishes the process of cross-linking in wires and cables with the advantages of increased life, higher temperature withstand capability, higher current carrying capacity, improved physical properties with reduced thicknesses in these cables. Because of being superior in life and performance compared to conventional cables, cross-linked cables have already been adopted in all critical applications such as railways, defense, solar power, wind energy and nuclear power. Even PVC being used in building wires and power cables can be cross-linked with EB technology only. The EB cross-linking technology in PVC building wires and power cables not only increases life and the current carrying capacity to more than double, but also prevents fires due to overload short circuits and thus saves precious lives and property.

Electron Accelerator (EB) Facility

The manufacture of the new generation, EB cross-linked cables requires special polymeric compounds, its extrusion on to the cable and EB irradiation cross-linking. To cross-link these specialty power cables requires an accelerator of variable energy 1 to 3 MeV with power of 100 KW. The suitable handling systems are an essential requirement to uniform cross-link cables from small size 0.5 sq mm to 500 sq mm having max diameter up to 60 mm with sector shaped or circular conductors. Fig. 1 shows typically the layout of EB machine with suitable handling systems, irradiating small size wires.

Specialty Power Cables

Fig.2 gives the cross-sectional area drawing of specialty power cables cross-linked with EB irradiation. The conductor is stranded sector shaped and is insulated with specially modified polyethylene base insulation. The insulation (XLPE) is cross-linked with EB irradiation and is suitable for continuous operation at 120°C. The inner and outer sheaths are specially formulated PVC suitable for 105°C, which can be cross-linked using e-beam up to a diameter of 35mm. The cable can be armored or unarmored. The EB cross-linking helps in improving the life of these power cables besides increasing the continuous current carrying capacity to 105°C of conductor temperature. Table 1 summarizes the technical characteristics of these *e-beam cross-linked XLPE insulated* vs. conventional chemical cross-linked



FIG. 1 - Wires being Irradiated

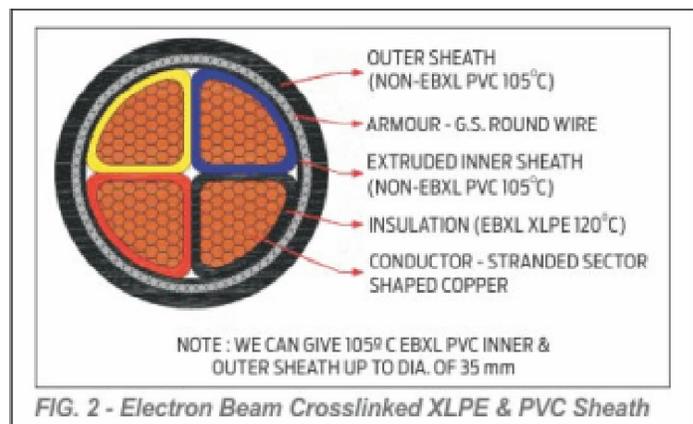


FIG. 2 - Electron Beam Crosslinked XLPE & PVC Sheath

XLPE insulated cables. The current rating for 105°C continuous operation of conductor temperature has been deduced from National Electricity code, USA, table 310.71, 310.73 & 310.75. The advantages of e-beam cross-linked XLPE is evident from increased life (double), temperature rating 120°C vs. 90°C, current carrying capacity about 11 percent more in spite of reducing conductor size smaller by one size. In addition, it withstands the stringent flammability test to IEC 332 (III) Category A compared to category C being met by chemically cross-linked XLPE insulated cable.

Table 1 – Comparative Report of E.B. Vs. Chemically crosslinked XLPE & Thermo Plastic / EBXL PVC Sheath

| Sr. No. | TESTS | CU/XLPE/PVC/ WIRE ARMOUR/ PVC | CU/EBXL XLPE 120° C/ NON-EBXL PVC 105° C/ WIRE ARMOUR/ NON-EBXL PVC 105° C |
|---------|--|-------------------------------------|---|
| | | 4 x 35 sq.mm. | 4 x 25 sq.mm. |
| 1 | Approx. Diameter of cable in mm | 27.0 | 24.5 |
| 2 | Approx. Overall weight of cable in Kg/Km | 1270 | 1075 |
| 3 | Life of cable (Arrhenius Plot) | 20 years | 40 years |
| 4 | Continuous operating temp. for insulation (XLPE) | 90° C | 120° C |
| 5 | Current carrying capacity | 146 Amps | 160 Amps |
| 6 | Continuous operating temperature of IS/OS | 70° C | 105° C |
| 7 | Accelerate Ageing | 100° C for 7 days | 135° C for 7 days |
| | Retention | +30% | +30% |
| 8 | Cold Bend | -10° C | -25° C |
| 9 | Oxygen Index (O/S) at Room Temp. | 29 | 34 |
| 10 | Flammability test IEC:332(III) | Category-"C" | Category-"A" |
| | | 1.5 l/m-20 min. | 7 l/m-40 min. |

Table 2 – HOUSE BUILDING CABLE WITH DIFFERENT COMPOUNDS

| Sr. | Properties | Specified | FR HBC | FRLS HBC | FR RB XL | ZHLS | XL ZHLS |
|-----|---|------------------------------|-------------------------|-------------------------|-------------------------|-----------------------------|-------------------------|
| 1 | Operating Temperature | 70° C | 70° C | 70° C | 105° C | 70° C | 120° C |
| 2 | Tensile Strength | Min. 12.50 N/mm ² | 14-16 N/mm ² | 13-14 N/mm ² | 14-17 N/mm ² | 12.5-14.0 N/mm ² | 13-15 N/mm ² |
| 3 | Elongation at break | Min. 125% | 200-250% | 175-200% | 200-225% | 175-225% | 200-225% |
| 4 | Thermal Stability | 80 Minutes | 110-130 Minutes | 100-130 Minutes | 90-110 Minutes | - | - |
| | a. Hot Set test 150° C Load 20 N/cm ² | Not Specified | Failed | Failed | Passed | Failed | Passed |
| | b. Hot Set test 150° C Load 20 N/cm ² | Not Specified | Failed | Failed | Failed | Failed | Passed |
| 5 | V.R. at room Temperature (ohm-cm) | 1.0x10 ¹³ | 5.0x10 ¹³ | 3.0x10 ¹³ | 1.0x10 ¹⁴ | 2.0x10 ¹⁴ | 3.0x10 ¹⁴ |
| 6 | Ageing in Air oven (80° C for 7 days) (T S & ER) | Max. +20% | Passed | Passed | Passed | Passed | Passed |
| 7 | Ageing in Air oven (135° C for 7 days) (T S & EB) | Not Specified | Failed | Failed | Passed | Failed | Passed |
| 8 | Ageing in Air oven (150° C for 7 days) (T S & EB) | Not Specified | - | - | - | Failed | Passed |
| 9 | Ampeare (Load) | Not Specified | 11 | 11 | 16 | 11 | 18 |

| | | | | | | | |
|----|---|------------------|-------------|-------------|-------------|-------------|-------------|
| 10 | Current carrying at 80 Amps | Not Specified | Burned | Burned | Not Burned | Burned | Not Burned |
| 11 | Solder Iron Resistance | Not Specified | Melted | Melted | Not Melted | Melted | Not Melted |
| 12 | Hot deformation Test ($95 \pm 2^\circ \text{C}$ for 6 Hrs) | | | | | | |
| | a. Depth of indentation | Max. 50% | 20 | 20 | 10 | 20 | 8 |
| 13 | Shrinkage Test ($150 \pm 2^\circ \text{C}$ for 15 Minutes) | Max. 4% | 1.5 | 1.5 | 0.5 | 1 | 0.5 |
| 14 | Heat Shock Test ($150 \pm 2^\circ \text{C}$ for 1 Hr.) | Shall not cracks | No Cracks | No Cracks | No Cracks | Cracks | No Cracks |
| | a. Visual Examination | | | | | | |
| 15 | Cold bend Test (-15°C for 3 Hr.) | Shall not cracks | No Cracks | No Cracks | No Cracks | No Cracks | No Cracks |
| 16 | Oxygen Index Test | Min. 29% | 29-30% | 30-32% | 30-31% | 20-31% | 32-33% |
| 17 | SDR | Not Specified | 99% | 60% | 80% | 10% | 8% |
| 18 | Service Life | Not Specified | 30-35 Years | 25-30 Years | 60-70 Years | 15-20 Years | 45-50 Years |
| 19 | Toxicity | Not Specified | Very Toxic | Very Toxic | Very Toxic | No Toxic | No Toxic |
| 20 | HCL | Not Specified | 30 | 18 | 0 | 0 | 0 |

Cross-linked Building Wires & Flexibles

Table 2 summarizes the various types of building wires being manufactured in India and gives the comparison of its technical properties. The wires are FR HBC (flame retardant house building wires), FRLS HBC (flame retardant low-smoke and low-halogen), FR EBXL (flame retardant but e-beam cross-linked PVC), ZHLS (zero-halogen low-smoke) and XL ZHLS (EB cross-linked zero-halogen and low-smoke). The superiority of EB cross-linked PVC building wire over normal PVC building wire is evident with regards to superior electrical (volume resistivity), 50 percent more current carrying capacity in same size wire (1 sq.mm 16 A in place of 11 A), improved life (double) as it passes again at much higher temperature, i.e. 135°C instead of 80°C for normal PVC wires. In addition, it gives excellent resistance to the flammability and emits reduced smoke and acid compared to normal PVC wires. Most of the fires in buildings originate due to overloading, leading to overheating and thus melting the PVC insulation. Once wire becomes bare, it may short circuit between the wires or with ground and may catch fire and propagate all along the cables spreading the fire. The EBXL HBC is the only wire which prevents this overload short-circuiting fire as it does not melt being cross-linked.

Fig.3 to 5 Shows the behavior of normal PVC Buildings wire, viz. EBXL HBC under overload condition.

Normal wire (conventional) and EB cross-linked PVC wires are connected in series and are connected to a current loading transformer (fig.3). As we start increasing the current, within one minute, the normal wire starts smoking and melting (fig.4), whereas EBXL wires remains unaffected.

<http://www.wirecable.in/2017/01/cross-linking-of-wires-cables-with-electron-beam-eb-%E2%80%93-a-new-technology-of-future/>

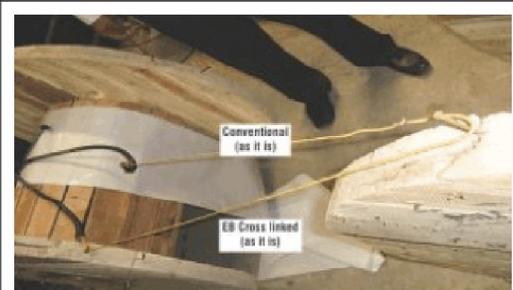


Fig. 3 - Testing/Performance of EBXL Wires



Fig. 4 - Testing/Performance of EBXL Wires



Fig. 5 - Testing/Performance of EBXL Wires

GOVT CLARIFIES GST CONFUSION ON SOLAR, 70% PROJECT COST UNDER 5% RATE

The GST council issued clarity on the confusion over the rates for solar power projects. While solar panels were classified under 5 per cent tax slab, industry had contested saying other equipments such as metals, electrical material etc are under different and higher tax slabs which would increase the cost of power project.

The Council on Saturday said certain disputes have arisen regarding GST rates where specified goods attracting 5% GST are supplied along with services of construction etc and other goods for solar power plant.

It, therefore, said, “70 per cent of the gross value of project shall be deemed as the value of supply of said goods attracting 5 per cent rate.” The remaining portion (30%) of the aggregate value of such EPC contract shall be deemed as the value of supply of taxable service attracting standard GST rate, it said.



KUSUM SCHEME: HARNESSING SOLAR POWER FOR RURAL INDIA

Government is in the process of formulating a Scheme 'Kisan Urja Suraksha evam Uththan Mahabhayan (KUSUM)' which, inter alia, provides for:

- (i) Installation of grid-connected solar power plants each of capacity up to 2 MW in the rural areas;
- (ii) Installation of standalone off-grid solar water pumps to fulfill irrigation needs of farmers not connected to the grid;
- (iii) Solarisation of existing grid-connected agriculture pumps to make farmers independent of grid supply and also enable them to sell surplus solar power generated to DISCOM and get extra income; and
- (iv) Solarization of tube-wells and lift irrigation projects of the Government sector.

KUSUM Scheme (solar agriculture pumps for farmers)

- > KISAN URJA SURKHYA EVAM UTHHAAN MAHAABHIYAN
- > Government will provide subsidy on setting up of solar power plants on the barren land.
- > Government allocated 48000 crore in budget 2018-19 for upcoming 5 years.

Kusum Yojana- Titbits

📍 THE AIM OF THE SCHEME – TO INTRODUCE SOLAR PUMPS FOR IRRIGATION PURPOSES.



📍 TOTAL AMOUNT TO BE SPENT – 1.40 LAKH CRORE (CENTRAL GOVT. WILL CONTRIBUTE 48 THOUSAND CRORE, FARMER WILL PAY ONLY 10% AND REMAINING 45 CRORE WILL BE ARRANGED VIA BANK LOAN)

📍 TOTAL NUMBER OF SOLAR PUMPS TO BE INSTALLED – AROUND 3 CRORE

Several projects including Central government-sponsored KUSUM scheme for solar run agriculture pumps ran into trouble due to high-cost after GST. Lack of clarity over GST rate on solar run systems coupled with increasing cost, it was feared farmers would become wary of adopting cleaner irrigation systems.

Industry heaved a sigh of relief with this decision. Executives said this would bring down the cost of solar 'Engineering, Procurement and Construction (EPC)' projects.

“As we under, **now 70 per cent cost can have duty of 5% and balance will be at 18%. This is a positive outcome for the industry,**” said CEO of a leading renewable company.

GST rate for several renewable energy devices & parts for their manufacture (bio gas plant/solar power based devices, solar power generating system (SGPS) etc) [falling under chapter 84, 85 or 94 of the Tariff] would continue to be 5 per cent.

INDIA TO INSTALL 304,500 SOLAR STREET LIGHTS UNDER SECOND PHASE OF ATAL JYOTI YOJNA

The Ministry of New and Renewable Energy (MNRE) has received approval to launch phase II of Atal Jyoti Yojna (AJAY) during the financial year 2018-19 and 2019-20.

The ministry has also received Rs.500 million (~\$7.13 million) to meet the pending liabilities of phase I of the program. Under the phase II of AJAY, 304,500 solar street lights are expected to be installed in Uttar Pradesh, Bihar, Jharkhand, Odisha, Assam, Jammu and Kashmir, Himachal Pradesh, Uttarakhand, North Eastern states including Sikkim, Andaman & Nicobar, Lakshadweep, and parliamentary constituencies covering 48 aspirational districts.

The estimated cost per light is Rs.25,000 (~\$356) and the MNRE will provide Rs.5.71 billion (~\$81.41 million), which is 75 percent of the total cost of solar street lights to be installed in phase II. The remaining 25 percent will come from

Members of Parliament Local Area Development Scheme (MPLADS) fund of respective constituencies. The Energy Efficiency Services Limited (EESL) is the implementing agency for the phase II of the AJAY scheme.

The project needs to be implemented within one year from the date of notification.

The MNRE had launched the Atal Jyoti Yojna in 2016. By March 2018, 1.45 lakh solar street lights were installed in 96 parliamentary constituencies.

In June 2018, the Union Cabinet approved phase three of the Off-grid and Decentralized Solar PV Application Program. Under the program, a total of 3,00,000 solar street

lights would be installed across the country and areas devoid of grid connectivity with no facility of street lighting solution would get precedence over other areas. The program also aims to distribute 25,00,000 solar study lamps in northeastern states and left wing extremism affected districts.

Earlier, Mercom reported that about 250.1 million smart and energy efficient LED bulbs were distributed under the Unnat Jyoti by Affordable LEDs for All (UJALA) program by the government, as of July 12, 2017.

Courtesy Mr.Nitin Kabeer, MERCOM



THERMOGRAPHY AUDIT

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INDIA ATTAINS GLOBAL 4TH AND 5TH POSITIONS IN WIND AND SOLAR POWER INSTALLED CAPACITIES; INDIA NOW AT 5TH GLOBAL POSITION FOR OVERALL INSTALLED RENEWABLE ENERGY CAPACITY

A total of 101.83 billion units of power were generated in the country during the year 2017-18 from renewable energy

The Government has declared the trajectory of bidding 60 GW capacity of solar energy and 20 GW capacity of wind energy by March 2020, leaving two years' time for execution of projects.

Keeping in view our commitment to a healthy planet and our Nationally Determined Contributions as per the Paris Accord on Climate Change, India made a pledge that by 2030, 40% of installed power generation capacity shall be based on clean sources, it was determined that 175 GW of renewable energy capacity will be installed by 2022. This includes 100 GW from solar, 60 GW from wind, 10 GW from bio-power and 5 GW from small hydro power.

The substantial higher capacity target will ensure greater energy security, improved energy access and enhanced employment opportunities. With the accomplishment of this ambitious target, India will become one of the largest Green Energy producers in the world, even surpassing several developed countries. The Share of Renewable Energy in overall installed capacity in the country as on 31.10.2018 is given below:

| Source | Installed Capacity (GW) | Percentage |
|--------------|-------------------------|---------------|
| Thermal | 221.76 GW | (63.84%) |
| Nuclear | 6.78 GW | (1.95%) |
| Hydro | 45.48 GW | (13.09%) |
| Renewable | 73.35 GW | (21.12%) |
| Total | 347.37 GW | (100%) |

- A total of around 73.35 GW of renewable energy capacity has been installed in the country as on October, 2018 from all renewable energy sources which includes around 34.98 GW from Wind, 24.33 GW from solar, 4.5 GW from Small Hydro Power and 9.54 GW from Bio-power. Further, projects worth 46.75 GW capacity have been bid out/under installation. The Government has declared the trajectory of bidding 60 GW capacity of solar energy and 20 GW capacity of wind energy till 31.03.2020. Projects worth each 30 GW solar power and 10 GW wind power capacity would be bid out each in the year 2018-19 & 2019-20.
- This has given assurance to the renewable energy developers & investors community about long term commitment & planning of the Government in the RE sector encouraging them to make risk free investments in the country. Status of projects as on October, 2018 is given below:

| Sector | Target (GW) | Installed capacity (GW) as on 31.10.2018 | Under Implementation (GW) | Tendered (GW) | Total Installed/ Pipeline (GW) |
|--------------|-------------|--|---------------------------|---------------|--------------------------------|
| Solar Power | 100 | 24.33 | 13.8 | 22.8 | 60.93 |
| Wind Power | 60 | 34.98 | 7.02 | 2.4 | 44.4 |
| Bio Energy | 10 | 9.54 | 0 | 0 | 9.54 |
| Small Hydro | 5 | 4.5 | 0.73 | 0 | 5.23 |
| Total | 175 | 73.35 | 21.55 | 25.2 | 120.1 |

- India has 5th Global position for overall installed renewable energy capacity, 4th position for wind power and 5th position for solar power.

- Registered lowest ever solar tariffs in India of Rs.2.44 per unit in reverse auctions carried out by Solar Energy Corporation of India (SECI) in May 2017, for 200 MW and again in July, 2018, for 600 MW. Registered lowest ever wind tariff of Rs.2.43 per unit in a tender of 500 MW project by Gujarat Government in the month of December 2017.
- The cumulative renewable energy installed capacity has increased from 35.51 GW as on 31.03.2014 to 73.35 GW as on 31.10.2018 (increase of around 106% during last four & a half years). The capacity addition of over 37.84 GW grid connected renewable power has been achieved during last four & half years (2014-15 to 2018-19) which includes 21.7 GW from Solar Power, 13.98 GW from Wind Power, 0.7 GW from Small Hydro Power and 1.5 GW from Bio-power. The year wise capacity addition is given below-

[A] GRID CONNECTED POWER

Progress of Renewables in India during the last four and Half years (2014-15 to 2018-19 as on 31.10.2018)

| Sector | Cumulative Ach. in MW (as on 31.03.2014) | Capacity Addition in MW | | | | | Cumulative Achievement in MW (as on 31.10.2018) |
|-------------------|--|-------------------------|----------------|-----------------|-----------------|----------------|---|
| | | 2014-15 | 2015-16 | 2016-17 | 2017-18 | 2018-19 | |
| Wind Power | 21042.57 | 2311.78 | 3423.05 | 5502.37 | 1865.23 | 841.35 | 34986.35 |
| Small Hydro Power | 3803.74 | 251.61 | 218.60 | 105.9 | 105.95 | 21.15 | 4506.95 |
| Bio Power | 8041.63 | 355.72 | 364.09 | 187.65 | 552.82 | 44.00 | 9545.91 |
| Solar Power | 2631.90 | 1112.08 | 3018.9 | 5526 | 9362.64 | 2661.12 | 24312.58 |
| Total | 35519.84 | 4031.19 | 7024.64 | 11321.92 | 11886.64 | 3567.62 | 73351.79 |

[B] OFF-GRID/CAPTIVE POWER (in MWeq)

| S. No. | Sector | 2014-15 | 2015-16 | 2016-17 | 2017-18 | 2018-19 | Cumulative installed Capacity (as on 31.10.2018) |
|--------|-------------------|---------|---------|---------|---------|---------|--|
| 1. | Waste to Energy | 12.00 | 14.13 | 12.21 | 5.50 | 3.13 | 175.28 |
| 2. | Biomass Gasifiers | 6.76 | 12.54 | 4.30 | 0.92 | 0.00 | 163.37 |
| 3. | SPV Systems | 60.00 | 87.67 | 115.50 | 216.63 | 96.11 | 767.51 |

- A total of 101.83 billion units of power were generated in the country during the year 2017-18 from all renewable energy sources as compared to 61.78 billion units generated in 2014-15 (increase of around 65% during last four years). Share of renewable energy in terms of overall power generation has reached to around 8% from 5.5% in 2014-15.

Further, 62.66 BU of energy is generated during 2018-19 upto August 2018. Year wise details of renewable energy generation are given in following table:-

| Year | Overall Generation (in BU) | Renewable Generation (in BU) | % share of RE |
|---------------------------------|----------------------------|------------------------------|---------------|
| 2014-15 | 1110.18 | 61.78 | 5.56 |
| 2015-16 | 1172.98 | 65.78 | 5.60 |
| 2016-17 | 1241.38 | 81.54 | 6.56 |
| 2017-18 | 1303.37 | 101.83 | 7.81 |
| 2018-19 (up to Aug 2018) | 590.04 | 62.66 | 10.62 |

- On 14th June, 2018, the Ministry of Power has notified the long term RPO trajectory from 2019-20 to 2021-22. The year-wise RPO levels are as under:

| Long term RPO trajectory | 2019-20 | 2020-21 | 2021-22 |
|--------------------------|---------|---------|---------|
| Non-solar | 10.25% | 10.25% | 10.50% |
| Solar | 7.25% | 8.75% | 10.50% |
| Total | 17.50% | 19.00% | 21.00% |

Issued guidelines for procurement of solar and wind power through tariff based competitive bidding process involving reverse e-auction.

- Issued order on waiving the Inter State Transmission Systems charges and losses for inter-state sale of solar and wind power for projects to be commissioned by March 2022.
- Notified standards for deployment of solar photovoltaic systems/devices.

SOLAR ENERGY

- The Government has revised the target of Grid Connected Solar Power Projects from 20,000 MW by the year 2021-22 to 100,000 MW by the year 2021-22 under the National Solar Mission.
- The country currently has the fifth highest solar installed capacity in the world with total installed capacity of 24.33 GW as on October, 2018 against a target of 100 GW by 2022. Further, 22.8 GW capacity is under implementation or have been tendered out.



The Ministry plans to bid out remaining solar power capacity in 2018-19 and 2019-20, so that bidding gets completed for entire 100 GW capacity additions by March 2020, leaving two years' time for execution of projects.

- The tariff for grid-connected solar power projects is determined through competitive bidding process involving reverse e-auction. This has helped in bringing down the tariff significantly. The lowest solar tariff discovered as on date is Rs. 2.44/kWh in July 2018 in ISTS based bidding of solar projects in India. The solar tariff has come down from around Rs 18/kWh in 2010 to Rs. 2.44/kWh in 2018 due to various factors like economies of scale, assured availability of land and power evacuation systems etc.
- Solar Parks are being set up in the country. 47 solar parks of aggregate



capacity 26,694 MW has been approved in 21 States up to November, 2018. Over 1,00,000 lakh acres of land identified for various solar parks out of which over 75,000 acres have been acquired. Solar projects of aggregate capacity 4195 MW have been commissioned inside various solar parks.

- The Ministry is also taking up projects for new emerging technologies such as floating solar power.

WIND ENERGY

- The country currently has the fourth highest wind installed capacity in the world with total installed capacity of 34.98 GW as on October, 2018 against a target of 60 GW by 2022. Further, around 9.4 GW capacity is under implementation or have been tendered out.
- The Ministry plans to bid out 10 GW wind power capacity each year for 2018-19 and 2019-20, so that bidding gets completed for entire 60 GW capacity additions by March 2020, leaving two years' time for execution of projects.
- The recent assessment conducted by National Institute of Wind Energy (NIWE) indicates a gross wind power potential of 302 GW in the country at 100 meter above ground level.
- The capacity additions till 2017 were through Feed in Tariff (FiT) mechanism. Subsequently, the tariff regime has been shifted from Feed-in-Tariff (FiT) to bidding route.
- The Government has issued 'Guidelines for Tariff Based Competitive Bidding Process for Procurement of Power from Grid Connected Wind Power Projects', vide Resolution notified on 8th December, 2017, with an objective to provide a framework for procurement of wind power through a transparent process of bidding. This has resulted in discovery of lowest ever tariff for wind power.
- The National Wind-Solar Hybrid Policy was issued in May 2018. The main objective of the policy is to provide a framework for promotion of large grid connected wind-solar PV hybrid system for optimal and efficient utilization of wind and solar resources, transmission infrastructure and land. The wind - solar PV hybrid systems will help in reducing the variability in renewable power generation and achieving better grid stability.
- A bid for setting up of first 1200 MW Greenfield wind solar hybrid project was floated by SECI.
- The National Offshore wind energy policy was notified in October 2015 with an objective to develop the offshore wind energy in the Indian Exclusive Economic Zone (EEZ) along the Indian coastline.
- Initial studies carried out by NIWE indicate offshore wind energy potential off the coasts Gujarat and Tamil Nadu.
- LiDAR was commissioned on the monopile platform in November 2017 at Gulf of Khambhat, off Gujarat coast for wind resource assessment.
- NIWE floated Expression of Interest (EoI) for establishment of 1 GW offshore wind farm in Gulf of Khambhat region off Gujarat coast. 35 parties (both national and international) showed interest.
- National targets for offshore wind capacity additions of 5 GW by 2022 and 30 by 2030 declared.
- The expansion of the wind industry has resulted in a strong ecosystem, project operation capabilities and a manufacturing base. State-of-the-art technologies are now available in the country for the manufacture of wind turbines. All the major global players in this field have their presence in the country. Over 24 different models of wind turbines are being manufactured by more than 12 different companies in India. Wind turbines and components are being exported to the US, Australia, Europe, Brazil and other Asian countries. Around 70-80% indigenization has been achieved with strong domestic manufacturing in the wind sector.

BIO POWER

- Ministry of New and Renewable Energy has been promoting programmes to promote Biomass Power and Bagasse Cogeneration in the country with an objective to utilize country's available biomass resources like bagasse, rice husk, straw, cotton stalk, coconut shells etc. for power generation.
- Waste to Energy projects are also being set up for generation of Energy from Urban, Industrial and Agricultural Waste / Residues such as municipal solid wastes, vegetable and other market wastes, slaughterhouse waste, agricultural residues and industrial wastes & effluents.

- A total capacity of 9.54 GW of grid connected bio-power has been installed in the country as on October 2018 against a target of 10 GW bio-power by 2022. This includes 8.73 GW from bagasse cogeneration, 0.68 GW from non-bagasse cogeneration and 0.13 GW from waste to energy.

SMALL HYDRO POWER

- A total capacity of 4.5 GW of grid connected small hydro power has been installed in the country as on October 2018 against a target of 5 GW small hydro power by 2022. Further, 126 no. of projects of capacity 0.73 GW are under various stages of implementation.

ENERGY STORAGE

- Energy Storage is one of the crucial & critical components of India's energy infrastructure strategy and also for supporting India's sustained thrust to renewables and electric mobility. With an objective to strive towards leadership in the energy storage sector by creating an enabling policy and regulatory framework, a comprehensive National Energy Storage Mission (NESM) has been developed. The Mission focuses on demand creation, indigenous manufacturing, innovation and necessary policy support for proliferation of Energy Storage in the country.

OFF-GRID RENEWABLES

The Ministry is implementing off grid and Decentralized renewables programme for meeting energy demand for cooking, lighting, motive power, space heating, hot water generation, etc. The Ministry also supports deployment of decentralized solar applications like solar lanterns, solar street lights, solar home lights, solar pumps, etc. in the country. As on October, 2018, over 40 Lakhs no. of Lantern & Lamps, 16.72 lakhs no. of Home Lights, 6.40 lakhs no. of Street Lights, 1.96 lakhs no. of solar pumps and 187.99MWp Stand Alone has been installed in the country.

RESEARCH & DEVELOPMENT

The MNRE has decided to scale-up its RD&D effort to Technology Development and Innovation Programme. The focus is on promoting application oriented innovation, integrated with research and development for commercial applications and testing and standardization for quality and reliability assurance in renewable energy sector. A Technology Development and Innovation Policy (TDIP) is also being finalised. It is based on a robust ecosystem for support for research, innovation and validation for technology development and demonstration, testing and standardization, awards for innovation linked with start-ups.

HUMAN RESOURCE DEVELOPMENT

As part of HRD programme of the Ministry, a robust RE education and training system is developed. SPV lighting systems, Solar Thermal systems, SHP have been incorporated in the regular syllabus of 2 years certificate programme for seven trades i.e Electronics, Electrician, Machinist, Welder, Carpenter, Fitter and Plumber. Course modules and Modular Employable Skilling programme (MES) of NCVT have been developed. Parallely, through Sector Skill Council of Green Jobs NOSs/QPs have been developed for various job roles in Renewable Energy sectors and regular training programmes are being organised for these job roles with the support of MNRE or MSDE as per National Skill Development Policy 2015.

GENERAL THINGS

Answer the Phone by left Ears.
 Don't take medicine with cold water.
 Don't have heavy meals after 5 PM.
 Drink more water in morning, less at night.
 Best sleeping time is from 10 PM - 4 AM.
 Don't lie down immediately after taking medicines.
 When battery is down to last bar don't answer the phone, as the radiation is 1000 time stronger.

Daily 1 Apple - No Doctor
Daily 5 almonds - No Cancer
Daily 1 lemon - No fat
Daily 1 Glass Milk - No Bone Problem
Daily 4 dates - No Weakness
Daily 3 times Pray - No Tension
Daily 8 hours Sleep
TO LIVE A HAPPY LIVE (DAY)

CENTRE TELLS STATES TO FOLLOW AP IN ENERGY EFFICIENCY

The Union Ministry of Power in a letter advised the States to establish stand-alone State Designated Agencies (SDAs) on the lines of Andhra Pradesh for promotion of efficient use of energy and its conservation as the government has embarked upon achieving reduction of around 550 million tonnes of CO₂ by 2030 through a number of energy efficiency measures, besides saving of 500 billion units of electricity.



AP State Energy Efficiency Corporation (APSEEDCO) has been set up by the state government for energy efficiency and conservation in the State. In a teleconference on Sunday, principal secretary for energy and APCRDAAjay Jain briefed the Chief Minister N Chandrababu Naidu that as per the letter of the Centre, only AP and Kerala established dedicated stand-alone State Designated Agencies (SDAs) out of the 35 states/Union Territories in the country so far. The successful efforts of AP in implementing energy efficiency programmes came in for appreciation by the Union ministry and it has also advised other states (other than Kerala) to fall in line of AP,” Ajay Jain said. In another significant development, he said the Paris-based International Energy Agency (IEA) has specially mentioned the AP government in its special bulletin on the eve of an international summit on Energy Efficiency in Emerging Economies in New Delhi.

He also said the IEA, during an international event in Paris in 2015, had already evinced interest in sharing best practices in energy efficiency with Andhra Pradesh. The State had also received big applause from the IEA for its endeavour, including retrofitting of LED streetlighting with conventional lights and distribution of LED bulbs to one crore families.

The World Bank ranked AP No 1 energy efficiency implementation readiness, Ajay Jain said. Responding to this, Naidu advised the energy department to study the best global practices in energy efficiency and strive to make the AP the best state in energy efficiency in the world. “As I had already told the officials during the recent Collectors’ Conference, special efforts should be laid to strengthen the AP State Energy Efficiency Corporation for vigorous implementation of energy efficiency measures in the state. I want to remind all the government departments again to take serious note of energy efficiency activities in their respective departments to become role model for the common people.”

ELECTRIC VEHICLES - A GOVT INITIATIVE

A government appointed panel led by cabinet secretary Pradeep Kumar Sinha has proposed a bouquet of incentives for makers as well as buyers of electric vehicles in an effort to push e-mobility in the country. The panel has recommended a lower basic customs duty on components besides a lower GST rate to encourage manufacturers to take up large-scale production of e-vehicles.



For the buyers, it has called for differential registration rates and exemption from road tax and parking charges. “A final decision would be taken at the next round of high level meeting in the Prime Minister’s Office shortly” reliable source commented. Once a decision is taken, the department of revenue, the department of heavy industries and the ministry of road transport and highways will be asked to take necessary action, this person said.

The blueprint was drawn up by over two dozen top bureaucrats across all stakeholder ministries that attended the committee of secretaries meeting on total mobility chaired by Sinha last month. The NITI Aayog is acting as a nodal agency to coordinate the roll-out of the mega plan. The government is seized of the fact that India needs to adopt effective strategies to place itself as a key driver in the global mobility revolution, and this can be done only by large-scale domestic manufacturing of electric vehicles with all its components including batteries. Prime Minister Narendra Modi had in September last year assured the country of a stable policy regime for e-vehicles. “We want to drive investments across the value chain from batteries to smart charging to electric vehicle manufacturing,” he had said at the Aayog’s mobility summit. “We will soon put in place a stable policy framework for electric and alternate fuel-powered vehicles. Policies will be designed as a win-win for all and will enable huge opportunities in the automotive sector.”

India wants to create a robust and affordable electric mobility ecosystem comprising production facilities and a large network of charging points to achieve three key strategic goals— cutting down carbon emissions, creating new job opportunities and reducing the use of crude oil, about 80% of the requirement of which is met through imports. Though never articulated as a formal policy statement, India originally had the ambition of having all new vehicles on Indian roads powered by electricity by 2030. This, however, has been scaled down to 15% of total vehicle sales in the next five years.

China's participation in India's ambitious plans to go for full electric mobility

India plans to achieve electric mobility by 2030 and welcomes Chinese industries participation and investment in the expansion of Indian Electric Vehicles (EV) Market, NITI Aayog Principal Advisor Anil Srivastava has said. Srivastava, who led an industry delegation from India and addressed summit forum 'Global Zero Emission and All Electric Vehicle' held from January 11-13, met Chen Qingtai, President of China EV100, and invited China's participation in India's ambitious plans to go for full electric mobility.



"He mentioned that for India's ambitious objective of achieving electric mobility by 2030, we see very substantive role for the Chinese EV players," a press release from the Indian Embassy here said on Sunday.

China EV100, a private electric vehicle association of over 200 leading Chinese electric mobility industries, is organising the 5th China EV100 Forum in Beijing. The government as well as industry representatives from all over the world attended the event. China is both the biggest manufacturer and the biggest market for cars globally. But the car sales fell in 2018 by about six per cent to 22.7 million units for the first time in 20 years, sending shock waves across the industry. The drop is largely attributed to the continued slowdown of the Chinese economy, stringent measures to restrict new car sales to cut automobile pollution and the ongoing trade war with the US.



The most recent figures show that New Energy Vehicles (NEVs), a category which includes electric and hybrid models, has defied trend of slowdown, growing substantially over the past year, a recent BBC report said.

China's NEV market made a major gain this month with Elon Musk, the CEO of US electric carmaker Tesla, on Monday laying foundation to set up USD seven billion plant in Shanghai. Tesla became the first to benefit from a new C policy allowing foreign carmakers to set up wholly-owned subsidiaries in China. The new plant, Tesla's first outside the US, is located at a high-end manufacturing park in the southeast harbour of Shanghai. It is designed with an annual capacity of five lakh electric cars. In his meeting with Chen, Srivatsava said that given the market size of India and China together, there is huge cooperation potential for EV industries of both countries.

He said EV industries of both countries should have more interaction and proposed to establish a formal interaction mechanism between an Indian EV Industry association, supported by NITI Aayog, and China EV100, which can meet periodically.

He proposed to organise an industry meet of players of two sides in the first half of this year in Beijing or a suitable venue to explore cooperation possibilities between EV Industries of two countries, the release said. "Chen mentioned that India is an important country for Chinese EV players and he welcomes Chinese industries participation and investment in Indian EV market," it said.

Earlier, Srivastava spoke about the Indian government's policy for promotion of electric mobility, current state of play and future roadmap. Addressing the forum, he said EV sales were expected to be 30 per cent of total sales in 2030 with 25.36 million EVs and 59.17 million (Internal Combustion Engines) ICEs. The total automobile sales in India were expected to 84.53 million in 2030.

He mentioned that India is committed to global environmental commitments, and will encourage development and adoption of clean energy and new energy transportation. Leading Indian auto-makers such as Maruti Suzuki, Tata, TVS, and industry associations such as Society of Indian Automobile Manufacturers (SIAM) and Automotive Component Manufacturers Association of India (ACMA) took part in the event.

The Indian industry is looking for technologies related to DC motor, motor control systems, EV battery cells, the release added.

AUSTRALIAN BATTERY SAVES \$40 MILLION IN ITS FIRST YEAR

Located near Jamestown, South Australia, HPR, the world's largest lithium-ion battery energy storage system is owned and operated by Neoen, with the support of the supplier Tesla. The initiative of this 100 MW lithium-ion battery energy storage was driven by the South Australian Government to stabilise the electricity grid, facilitate integration of renewable energy in the state and avoid load-shedding (i.e. blackout) events. The fully operational site has a discharge capacity of 100 MW and energy storage capacity of 129 MWh and shares the same 275 kV network connection point as the 317 MW Hornsdale windfarm. A report by global engineering and infrastructure advisory company Aurecon has outlined the HPR's achievements in meeting these key objectives. It also recognises the HPR as a core element of South Australia's pioneering renewable energy initiative, paving the way for new battery projects across the country. Aurecon's energy leader, Paul Gleeson, said: "reviewing the data from Hornsdale Power Reserve's first year of operation has given us real insights into the capabilities of this new technology, including how these fast response systems can help improve stability, reduce the likelihood of load-shedding events, and contribute to the reduction in wholesale prices. The data is telling us that these fast response systems can help us optimise the way Australian's energy system works".

The key findings from the report are that the Hornsdale Power Reserve: Has contributed to the removal of the requirement for a 35 MW local Frequency Control Ancillary Service (FCAS), saving nearly \$40 million per year in typical annual costs Has reduced the South Australian regulation FCAS price by 75% while also providing these services for other regions Provides a premium contingency service with response time of less than 100 milliseconds Helps protect South Australia from being separated from the National Electricity Market Is key to the Australian Energy Market Operator's (AEMO) and ElectraNet's System Integrity Protection Scheme (SIPS) which protects the SA-VIC Heywood Interconnector from overload The HPR has responded

thousands of times to frequency outside the normal operating band. Around one hundred of those events were serious, such as the trip of a large coal plant and one critical event in which two transmission lines were lost. South Australia, although cut off from the grid, didn't lose power as HPR provided frequency support to steady the grid.



About Hornsdale Power Reserve

The aim of this project is to provide a world-leading battery storage facility to stabilise the South Australian electricity grid, facilitate integration of renewable energy in the State and assist in preventing load-shedding events. The wind farm is a 315MW renewable electricity project and consists of 99 wind turbines. The whole purpose for Tesla's big battery was to run at all times providing stability services for renewable energy while being available to provide emergency backup power if a shortfall in energy comes to pass.

Tesla Powerpack fast ramping capability means that it can dispatch large amounts of power quickly and reliably. This means it can support the South Australian electricity grid by providing frequency control and short-term network security services. A portion of the battery will also be dedicated to trading on the electricity market. This capacity will be used to store power from the Hornsdale Wind Farm when demand is low and dispatch it when demand is high, reducing the need for expensive gas 'peaking plants' and placing downward pressure on power prices for South Australian consumers. At 100MW/129MWh, the Hornsdale Power Reserve is the largest lithium-ion battery in the world. When dispatching at peak output, the battery provides enough electricity to power the equivalent of 30,000 homes. The electricity dispatched from the Hornsdale Power Reserve will be transmitted via underground cabling to the Mount Lock Substation, located only 100 meters from the battery equipment. Electrical infrastructure works will be performed by South Australian contractor Consolidated Power Projects (CPP), who also carried out the electrical works on the Hornsdale Wind Farm and was thus highly familiar with the site and substation. Once power reaches the substation, it is dispatched into the South Australian grid (and the National Electricity Market, or NEM) via the existing 275kV transmission line.

On numerous occasions in recent times, particularly during hot weather, coal-fired power stations suddenly and unexpectedly tripped, causing the Tesla battery to step in and stabilize the grid. The latest incident occurred last month, when two lines connecting Queensland and New South Wales tripped simultaneously after twin lightning strikes, causing widespread outages in three states, and the grids in Queensland and South Australia ended up being islanded, or cut off. **In South Australia, AEMO acknowledged that the Tesla big battery kept the lights on and no generators were tripped and no load was lost by sudden swings in frequency. South Australia was the only state to emerge from the "emergency event" unscathed.**

The efficiency and success of the Tesla battery has created a surge in new battery projects in Australia. There is Tesla's Ganawarra battery, directly tied to a massive solar farm, And next to the Wattle Point wind farm, the Dalrymple North battery will be coming online soon.

Read more at: <https://www.offgridenergyindependence.com/articles/16181/australian-battery-saves-40-million-in-its-first-year>

MICROPLASTICS: SMALL PLASTICS, BIG PROBLEM

Almost everything we own and buy contains plastics. Look around. If it's not the chair you're sitting on, or that part of a pen in your drawer, that bottle in your refrigerator, it may be this thing you're holding your smartphone, or a keyboard, or a tablet. They are everywhere. But before you blame plastic water bottles and candy wrappers solely for climate change or marine plastic pollution, think again. It turns out, as with many other relationships, sometimes it's the small things that create the biggest impacts. And in this case, it's the plastics that we don't see, the microplastics, that are about to damage the world we are living in.

The United Nations Environmental Programme (UNEP) identified microplastics as one of the alarming issues that we should keep an eye on as plastic pollution remains the biggest threat to marine biodiversity today. But are we already many years too late? Based on current rates of plastic pollution, the World Economic Forum predicts that by 2050 there will be more plastic than fish in our oceans.

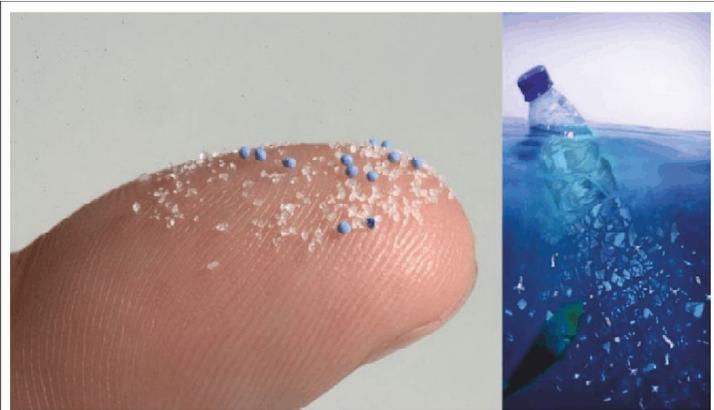
Microplastics, whilst tiny, pack a big punch. They have been around for more than five decades as microbeads and microfibres ranging in size from 0.5 to 5mm in length. And we have unknowingly let them into our homes and closets, as they have replaced the natural ingredients of our personal care products, and cosmetics such as toothpaste, facial and body scrubs, and have been manufactured into some of the clothes we love to wear.

However, it's not actually the products that directly harm us, but rather what happens to them after they go down the drain. These synthetic fabrics (polyesters, acrylics) that we love to wear have been found to release more than 700 000 particles to the environment after just one cycle in the washing machine.

In a study titled 'Plastic Pollution in the World's Oceans', oceanographer Dr Marcus Eriksen and his team went on several expeditions to investigate which kinds of plastic were most polluting the oceans. To their surprise, significantly outnumbering bigger plastic items such as toothbrushes and the balls in deodorant roll-ons were confetti-sized and smaller shreds of plastics.

Because here's something that not all people know: plastics rarely degrade. Once these microplastics enter our water system, treatment facilities cannot break them down or filter them out, and they end up in the ocean, mistaken for food by fish and other sea creatures – ultimately infiltrating our lives via our food chain.

“Plastic pollution is surfing onto Indonesian beaches, settling onto the ocean floor at the North Pole, and rising through the food chain onto our dinner tables,” says United Nations Environment Programme (UNEP) Executive Director Erik Solheim. “We've stood by too long as the problem has gotten worse. It must stop.”



True enough, not only have microplastics been found in fish and shellfish, they have also been found in beer, honey, tap water, sugar and even air. We just didn't know it! And, contrary to popular belief, when it comes to microplastics, what we don't know can actually hurt us.

One Health, One Environment

When it comes to microplastics, what we don't know can actually hurt us. Now, here's where it gets scarier... While the studies about the effects of microplastics are still at a relatively early stage, initial researches published by UNEP and in the Proceedings of the National Academy of Sciences (PNAS) have discovered that eating plastic particles may cause reduced activity rates, reproductive disruption, weakened schooling behaviour, and altered feeding behaviour among sea creatures. How does this affect humans?

According to the One Health approach, the health of all living things (humans, animals and plants) and everything that surrounds us are interconnected. If something is wrong with the animals and plants around us, then something is likely to go wrong with us, unless we do something about it.

"Microplastic may not only affect species at the organism level; they may also have the capacity to modify population structure with potential impacts on ecosystem dynamics, including bacteria and viruses. Negative effects on the photosynthesis of primary producers and on the growth of secondary producers, potentially result in a reduced productivity of the whole ecosystem and represent a primary concern," according to a report by the joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP).

"Our understanding of the fate and toxicity of microplastics in humans constitutes a major knowledge gap that deserves special attention," it adds.

So, if we ignore this issue now, it is probable that the 'plastic soup' will no longer be metaphorical in the next 20 or 50 years. It will be a reality – and one at a scale we simply can't ignore.

Can we survive without plastics?

The journey to a plastic-free world may be unimaginable to think about now. The truth is, if almost everything around us is made up of plastic, it's going to be hard to live without them – especially if they are cheaper, durable and more convenient to use. There are, however, many things that we can do on a personal level to reduce our consumption of plastic – such as using reusable bags for groceries, buying cotton and wool clothing, and using stainless steel water bottles and compostable rubbish bin liners.

In 2017, the US and UK legally banned the use of microbeads. But what if banning plastics entirely is not the answer? "Shifting to a genuine circular economy for plastics is a massive opportunity to close the loop, save billions of dollars, and decouple plastics production from fossil fuel consumption," says Dame Ellen MacArthur.

According to a report by her foundation, "Manufacturers could redesign plastic items so they could be reused better, and rethink their production methods to make recycling easier. More products could be made out of materials which can be composted on an industrial scale, including rubbish bags for organic waste and food packaging for outdoor events, canteens and fast food outlets."

In December 2017, the French Government reaffirmed an important commitment towards tackling plastic pollution, by pledging to recycle 100 per cent of plastics by 2025.

A number of large manufacturers such as Nestlé, Adidas, Unilever, and HP Hewlett-Packard have recently started initiatives looking for alternatives to make their products and their packaging sustainable and environment-friendly.

To tackle this crisis, there is an urgent need for governments, industry and entrepreneurs to develop systemic, more innovative, and more audacious solutions that prevent plastic from becoming waste in the first place.

Turning oil to plastic and back again

Priyanka Bakaya is one entrepreneur who has discovered the power of plastic waste – quite literally. Bakaya is an Australian-American entrepreneur and founder of a clean energy company which converts plastic waste into fuel. Her company, Renewlogy, makes diesel, kerosene, light fuels in a process that chemically takes the plastics back down into their basic building blocks without creating toxic emissions in the process. Investors are watching closely.

Meanwhile, China has done the world a favour. In January, China stopped taking the world's plastics back for recycling for environmental reasons. Recyclers worldwide were left scrambling for alternatives. This is a good thing. What if every country closed its doors to others waste? This could drive greater innovation and new business opportunities that benefit local communities.

In the UK, scientists and engineers from the University of Bath have developed a way of making microbeads from cellulose, which is not only from a renewable source, but also biodegrades into harmless sugars. Work is underway to scale this process for manufacturing. If offered a choice, consumers will prefer not to rub plastic into their skins when they exfoliate – brands that are earlier adopters of these alternative 'ingredients' can create competitive advantage.

So, how might we get products to people without generating plastic waste and mitigate a potential eco-genocide? We're not sure yet but some smart people and organisations are working on finding solutions.

If nothing else, microplastics have taught us that sometimes the smallest things can make the biggest impact .

MNRE TELLS LENDERS TO FAVOUR BIS-COMPLIANT SOLAR PROJECTS

The ministry of new and renewable energy (MNRE) has asked lending institutions to give preference to Indian standards to ensure quality while financing solar power projects, having noted that the current procedure favours Chinese suppliers at the cost of Indian players.

In a recent communication to the finance ministry, MNRE said lenders should prefer manufacturers complying with standards laid down by the Bureau of Indian Standards (BIS) while financing solar projects instead of following the Bloomberg Tier-I list, which mostly includes foreign players, or large Indian manufacturers such as Tatas and Adani Solar.

“Even Chinese companies can have BIS certification. We are saying, don't give preferential treatment to Chinese by following Bloomberg Tier-I list, which mostly has foreign players and only a couple of Indian players,” an official told ET on condition of anonymity.

Last year, MNRE made it mandatory for manufacturers or sellers of PV modules in India to obtain BIS registration. Following several extensions, the order will be effective January 1, 2019, the official quoted above said. Prior to implementation of BIS certification as a compulsory requirement, there was no uniform means to ascertain quality of modules supplied in India, the ministry noted.

“The fact that supply is from a tier-I company does not ensure quality of the module. It only ensures that the module manufacturer is recognised as a tier-I manufacturer by Bloomberg based on its financial strength,” the letter to the finance ministry said.

Such a condition automatically leads to a preference being given to foreign, including Chinese, manufacturers at the cost of Indian ones, the letter added.

Industry experts say that while tier-I certification looks at bankability of solar projects, the BIS certification focuses on the compliance to norms related to raw material used in developing solar modules.

“It would be an ideal combination for a manufacturer to possess both certifications as they add credibility and help build the market in India and globally, as well as boost stakeholder confidence. To assure attractive returns for our investors, it is advisable to consider both certifications in tandem,” said Sunil Rathi, director at Waaree Energies, which has also been recognised with tier-I certification.

“The tier-I list is a more holistic approach; more suited to lenders as a guidance to tell them what has been acceptable to different lenders in the past. MNRE is insisting on use of BIS standards, which is more like technical specification. For lenders, that alone is not sufficient,” said Vinay Rustagi, managing director at renewable energy consultancy Bridge to India.

Rustagi said lenders are more likely to continue relying on multiple approaches and not BIS certification alone to ascertain quality parameters in any project.

***Nearly all men can stand adversity, but if you want to test a man's character,
give him power. – ABRAHAM LINCOLN***

ENERGY, ELECTRICAL ENERGY AND RENEWABLE ENERGY – 17

Sustainable Growth, Sustainable Electrical Energy and Renewable Energy

A midway Review of the theme and the coverage:

Energy is a vast area and Renewable Energy too is a vast and ever growing area with more and more technologies and solutions being developed for obtaining all the secondary forms of energy, the most predominant being Electricity, Fuel and Heat. Within them Electricity, which is about 60% at present, is fast increasing in the overall percentage due to more and more uses like transportation etc becoming Electricity dependent. This is the reason for naming the series focusing on Electrical Energy.

Primary sources of Energy like Coal and Petroleum, which are ‘Fossil’ and are the causes for all global and environmental problems, continue to play predominant role even now in providing all the secondary forms of energy including electricity. Efforts are on, all over the world including India for over five decades now in replacing fossils with Renewable Sources of Energy like Solar, Wind, Water and Biomass in large measure, with Ocean and Geo Thermal too coming in. There are successes and steady progresses in many countries of the world and in our country too we have been progressing very rapidly in the present decades. India’s potentials are huge in all renewable energy sources and we have made some good progress utilizing Solar, Wind and Water potentials, with lot more to follow. India’s Central Electricity Authority (CEA) has reported that in the nine months to December 2018 a net 120 megawatts (MW) of thermal power capacity was added to the Indian on-grid system. (See Figure 1) This is the lowest level of net thermal additions during any nine-month period in India over the last decade.

In contrast, total renewable energy installs were 5,060 MW for the first nine months, taking India to a cumulative total of 74,080 MW by December 2018. This represents a doubling of installed renewable capacity in less than three years. In addition, there is another 3.3 gigawatt (GW) of rooftop solar behind the meter (off-grid) which has more than doubled in the past 18 months.

Doubling of installed renewable capacity in less than three years is a historical moment

It is unprecedented that India year-to-date has seen renewable energy installs running at 40 times net thermal capacity adds (5,060 MW vs 120 MW). This is a historic moment.

Biomass or Bio Energy has huge potential in our country where the progress so far has been very little. Serious and concentrated efforts and measures are in sight with plans of Bio Energy Mission and the announcement of large scale CBG (Compressed Bio Gas) plans, which can address to replace a sizable portion of Petroleum. Bio Energy in general and ‘Waste to Energy’ in particular can address both the issues of Energy and Waste Management and Environment protection and Resources conservation as well. This series chose to deal with Bio Energy technologies to address Renewable Energy sources.

In the scheme of things with regard to Electricity Generation, Diesel Gensets of ratings from KWs to MWs ranges are used for centralized, de centralized and captive power generation. There are also cases of very large numbers of de centralized applications of Diesel Gensets like powering of lakhs ‘Communication Towers’ in our country and with massive plans for EV (Electric Vehicles) in our country, millions of charging stations would be needed and they could be using Diesel Gensets to make electricity available.

An energy crisis is a great bottleneck (or price rise) in the supply of energy resources to a economy. It usually refers to the shortage of oil and additionally to electricity or other natural resources. Energy crisis may be referred to as an oil crisis, petroleum crisis, energy shortage, electricity shortage or electricity crisis.

Diesel engines are used in transport Generating Set applications, because of higher thermal efficiency and lower specific fuel consumption. But they pollute the environment by their exhaust Combustion Products.

Biofuels are renewable liquid fuels coming from biological raw material and have been proved to be good substitutes for oil in the transportation sector. As such biofuels – Bio Oil, Ethanol and Biodiesel- are gaining worldwide acceptance

Figure 1: India’s Installed Electricity Capacity (GW)

| Source | Mar-18 | Dec-18 | Change (GW) |
|------------------------------|---------------|---------------|-------------|
| Renewables | 69.02 | 74.08 | 5.06 |
| Large Hydro | 45.29 | 45.40 | 0.11 |
| Nuclear | 6.78 | 6.78 | 0.00 |
| Thermal | 222.91 | 223.03 | 0.12 |
| Total Ongrid Capacity | 344.00 | 349.29 | 5.29 |

Source: CEA, MNRE, IEEFA calculations

as a solution to environmental problems, energy security, reducing imports, rural employment and improving agricultural economy.

Production of Bio Oil and Bio Diesel from Bio Mass are important technologies to adopt, to address replacement of Petroleum in a big way. In the coming issues, we will be dealing with Bio Diesel and Bio Oil/ Bio Crude Technologies, Potentials and Production. In brief, here again, India's potentials are huge and we can certainly work to replace the entire petroleum products with Bio Diesel and Bio Oil.

Bio Diesel:

Diesel Engine, named after its German inventor, was originally invented with use of Vegetable oils only and later has been perfected with the use of derived Diesel oil.

Comparative properties of Vegetable Oil, Bio Diesel and Petroleum Diesel Oils

| VEGETABLE OIL | BIODIESEL | DIESEL FUEL |
|---|---|---|
| Triglyceride of fatty acid (Molecular Wt 700-1000) | Alkyl esters of Fatty acid Molecular Wt~260 to 300 | Saturated Hydrocarbon (C ₁₂ -C ₁₄) Molecular Wt~200 |
| 10% less heating value than diesel because it contains Oxygen | 10-12 % less heating value than diesel | Major hydrogen and carbon (SO _x , NO _x , PAH) |
| Kinematic viscosity is higher (35-45 cSt at 40 °C) | Kinematic viscosity is in same range of that of diesel | Kinematic viscosity is lower (3.8-5 cSt at 40°C) |
| Less volatility | Less volatile than diesel | High volatility |

Vegetable oils have almost similar energy density, cetane number, heat of vaporization, and stoichiometric air/fuel ratio compared to mineral diesel fuel. However, straight vegetable oils cannot be used directly in engines. Thus the need and development of Bio Diesel technology to convert / derive Bio Diesel from any vegetable oil (both edible and nonedible). Most of the Indian efforts for large scale production of BIO DIESEL are focused on nonedible vegetable oils like Jatropa, Karanjia etc, but at present Bio Diesel is produced in India mostly from locally produced and imported Palm oil.

PROBLEMS OCCURRING IN VEGETABLE OIL USED AS FUEL

- Poor fuel atomization
- Piston ring-sticking
- Fuel injector coking and deposits
- Fuel pump failure and
- Lubricating oil dilution

The properties of vegetable oils responsible for these problems are high viscosity, low volatility, and polyunsaturated character.

In order to reduce the Viscosity of Vegetable oils, the following processes have been developed.

Blending - Heating and blending of vegetable oil

Pyrolysis - Pyrolysis is the conversion of one substance into another by means of heat or by heat in presence of a catalyst.

Micro-emulsion - A micro-emulsion is defined as a colloidal equilibrium dispersion of optically isotropic fluid microstructures with dimension generally in the 1–150 nm range, formed spontaneously from two normally immiscible liquids. (methanol, ethanol and 1-butanol)

Transesterification - Transesterification is the process of exchanging the alkoxy group of an ester compound by another alcohol. The reactions are often catalyzed by an acid or a base.

General Definition of Biodiesel:

Biodiesel is not the raw vegetable oil

Biodiesel is a renewable fuel for diesel engines derived from natural vegetable/animal oils, and which meets the standard specification

Technical Definition for Biodiesel and Biodiesel Blend:

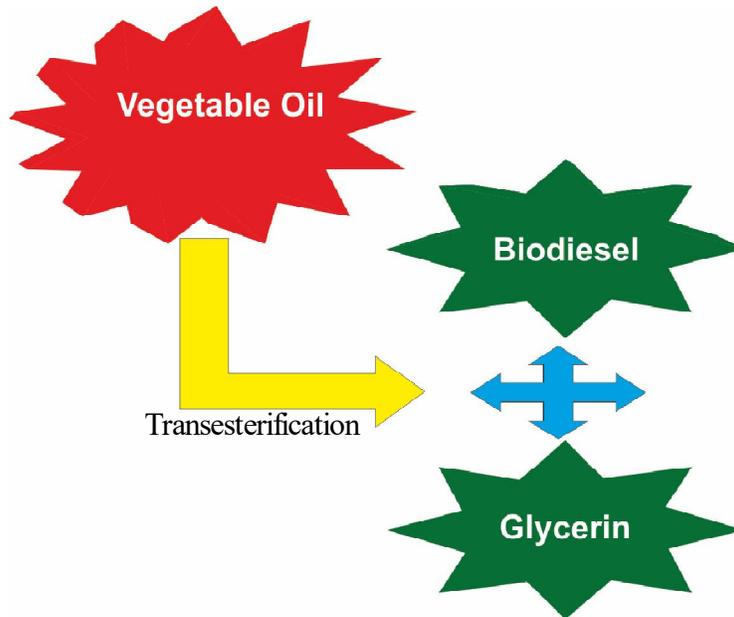
Biodiesel is a fuel comprised of mono-alkyl esters of long chain fatty acids derived from vegetable oils or animals fats, and meeting the requirements of standard specifications.

Preparation of Bio Diesel

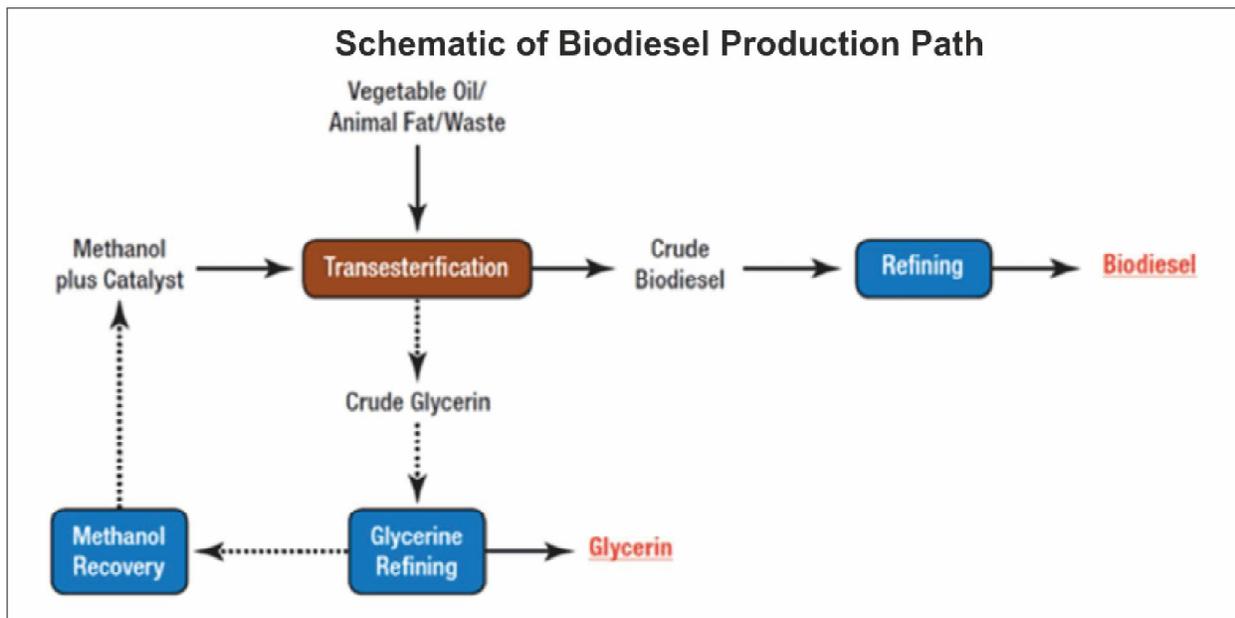
The problems associated with SVOs can overcome by converting them into alkyl esters of fatty acids (biodiesel) through a process known as trans-esterification

Transesterification also called alcoholysis, is the displacement of alcohol from an ester by another alcohol in a process similar to hydrolysis. This process has been widely used to reduce the viscosity of triglycerides. The transesterification reaction is represented by the general equation

Technology for Biodiesel Production



Transesterification was eventually successful in bringing about the viscosity close to petro-diesel.



(To be continued)
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V K ARORA
L T Foods



Starting From A Sleepy Hamlet In Punjab To Creating One Of The Biggest Packaged Rice Companies In India, V K. Arora, Chairman Of LT Overseas, Is The Perfect Example of Perseverance Blended With Vision.

Here is the story of the man who introduced basmati rice to global palates. Prof. C.K. Prahalad, the father of the management concept of core competence, which represents a bundle of skills that are not widely

available in the industry is what VK implemented in his family business of a trading company when he joined it in 1978.

VK an alumnus of Administrative Staff College, Hyderabad, soon developed a clear global vision about his core Competence of rice. Sensing opportunity in the Government's decision in 1980 to allow exports for selected premium rice, he started his first basmati rice-processing unit in Sonapat in 1984 and two years later Daawat was born. Daawat was introduced in 1986 when the market was crowded with poor and inconsistent quality products. VK's Daawat brand caters to Retail, Institutional and Economy segments exceedingly well. It has 19 brands. Successful companies become successful because they find better ways to solve their problems which come their way. He is very ably assisted by his brothers Ashok Arora, Surinder Arora and Ashwin Arora.

VK's plan to launch branded and packaged food products at a time when rice was being treated as a commodity resulted in swift growth of the company. He made his first million dollars between 1993 and 1997 the company's revenue grew 100-fold to Rs 300 crore. With 50:50 domestic has grown to Rs 1500 crore now. The company has a global footprint in over 50 countries. In 2007, LT Overseas acquired US-based company Kusha Inc for Rs 200 crore. Kusha had a share of 42% in the US rice market. This acquisition increased LTs business to 52% in the US. Company's CSR initiatives: Today any company to become a great corporate citizen chooses an area where it can contribute to say "Thank You" to Society for its success. Its Karambhoomi naturally is our farmers to whom LT Foods gives education and technical inputs on agriculture and related activities.

HUMOUR

Lost at Sea?

Yossi and Janine, an elderly Jewish couple, are sitting together on an aeroplane flying to the Far East. Suddenly, over the public address system, the Captain announces, "Ladies and Gentlemen, I am afraid I have some very bad news. Our engines have ceased functioning, and this plane will be going down in a few minutes time. The good news is that I can see an island below us that should be able to accommodate our landing. The bad news is that this island appears to be uncharted - I am unable to find it on our maps. So the odds are that we will never be rescued and will have to live on the island for a very long time, if not for the rest of our lives.

Yossi turns to Janine and asks, "Janine, dear, did we turn off the oven?" and Janine replies, "Of course."

"Janine, are our life insurance policies paid up?"

"Of course."

"Janine, did we pay our pledge for the synagogue appeal?"

"Oh my God, I forgot to send off the cheque."

"Thank Heaven! They'll find us for sure!"

10 REASONS YOU KNOW YOU BOUGHT A BAD COMPUTER

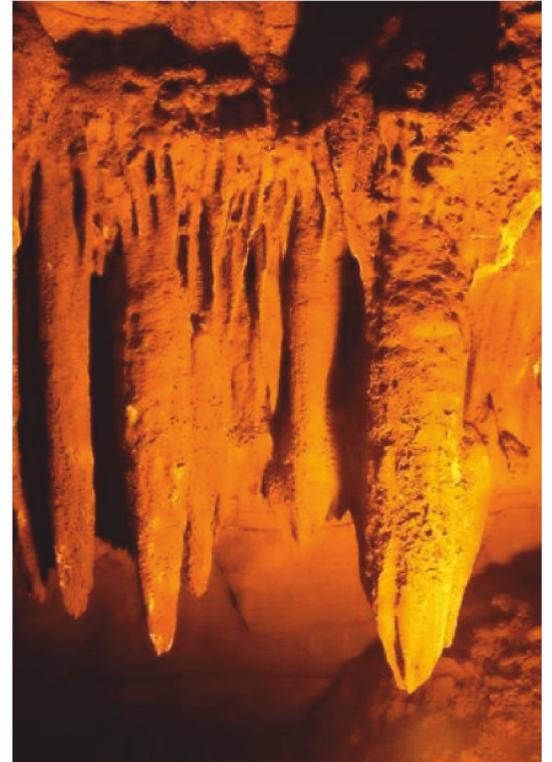
1. Lower corner of screen has the words "Etch-a-sketch" on it.
2. It's celebrity spokesman is that "Hey Vern!" guy.
3. In order to start it you need some jumper cables and a friend's car.
4. It's slogan is "Pentium: redefining mathematics".
5. The "quick reference" manual is 120 pages long.
6. Whenever you turn it on, all the dogs in your neighborhood start howling.
7. The screen often displays the message, "Ain't it break time yet?"
8. The manual contains only one sentence: "Good Luck!"
9. The only chip inside is a Dorito.
10. You've decided that your computer is an excellent addition to your fabulous paperweight collection.



ஆதி மனிதர்கள் மழை, விலங்குகள், இருட்டு போன்றவற்றிடமிருந்து தங்களைப் பாதுகாத்துக்கொள்ள குகைகளில் வாழ்ந்திருக்கிறார்கள். அதற்கான சான்றுகள் குகைகளில் உள்ள ஓவியங்களில் இருந்தும், அவர்கள் பயன்படுத்திய பொருட்களிலிருந்து அறிந்து கொள்ள முடிகிறது. இந்தியாவில் சுமார் 6 ஆயிரம் ஆண்டுகளுக்கு முன்பே மனிதர்கள் குகைகளில் வாழ்ந்ததற்கான சான்றுகள் உள்ளன. நூற்றுக்கணக்கான குகை வாழ் இடங்கள் இந்தியாவில் இருந்தாலும் சில குகைகள் அவற்றின் காலத்தாலும், அமைப்பாலும் குறிப்பிடத்தக்கவை. அவற்றில் ஆந்திராவின் கர்னூல் மாவட்டத்தில் உள்ள பேலும் குகை முக்கியமானது.

இந்தியத் துணைக்கண்டத்திலேயே இரண்டாவது மிகப் பெரிய குகையும் சமவெளியில் அமைந்துள்ள மிக நீளமான குகையும் இதுதான்! இது நிலத்தடி நீரோட்டங்களால் அமைந்த இயற்கையான குகை. குவார்ட்ஸ் மற்றும் கறுப்பு சுண்ணாம்புக்கல்லால் ஆனது. குகையின் கூரைகளில் கூம்பு வடிவ அமைப்புகள் காணப்படுகின்றன.

கி.மு. 4500-ல் பயன்படுத்தப்பட்ட பாத்திரங்களை இங்கிருந்து கண்டெடுத்துள்ளனர். மிகப் பழமையான குகையாக இருந்தாலும் வெளி உலகத்துக்கு நீண்ட காலம் தெரியவில்லை. உள்ளூர் மக்களுக்கு மட்டும் இதைப் பற்றித் தெரிந்திருக்கிறது.



கி.பி 1884-ல் பிரிட்டிஷ் நிலவியல் ஆய்வாளர் ராபர்ட் ப்ரூஸ் ஃபூட், பேலும் குகையைக் கண்டறிந்தார். அதற்குப் பிறகும் மக்கள் முக்கியத்துவம் கொடுக்கவில்லை. குப்பைகளையும், கழிவுகளையும் கொட்டும் இடமாகப் பயன்படுத்தினர்.

1992-ல் டேனியல் கெபார் என்ற ஜெர்மனியர் தலைமையிலான குழுவினர், இந்தக் குகையைப் பற்றி நீண்ட ஆராய்ச்சி செய்து, இதன் மகத்துவத்தை உலகறியச் செய்தனர். நாராயண ரெட்டி, சலபதி ரெட்டி ஆகியோர் எடுத்த தொடர் முயற்சியின் பலனாக, 1999-ல் ஆந்திர அரசு இதைப் பாதுகாக்கப்பட்ட பகுதியாக அறிவித்தது.

2002-ம் ஆண்டிலிருந்து ஆந்திராவின் முக்கியமான சுற்றுலாத் தலமானது. 3.5 கி.மீ நீளம் கொண்ட பேலும் குகையில் 1.5 கி.மீ. நீளம் வரையே பார்வையாளர்கள் அனுமதிக்கப்படுகிறார்கள்.

2000 ஆண்டுகளுக்கு முன்புத்த, ஜைன துறவிகள் தங்கவும் தியானம் செய்யவும் உதவியாக இருந்திருக்கிறது இந்தக் குகை. புத்தத் துறவிகள் பயன்படுத்திய பொருட்களை இங்கிருந்து எடுத்து அருகில் உள்ள அனந்தபூர் அருங்காட்சியகத்தில் வைத்துள்ளனர். 150 அடி ஆழத்தில் சிறிய நீர்வீழ்ச்சி இங்கே இருக்கிறது.

இதைப் பாதாள கங்கை என்கிறார்கள். குகைக்குள் சில இடங்கள் சமதரையாக உள்ளன. சில இடங்களைக் கடக்க மிக குறுகிய வழியே உள்ளது. வெளியிலிருந்து பார்க்கும் போது சிறிய குகையாகக் காட்சியளித்தாலும், 90 அடி இறங்கியவுடன் மிகப் பிரம்மாண்டமாகக் காட்சியளிக்கிறது.

குகைக்குள் ஒளி விளக்குகளும் மின் விசிறிகளும் பொருத்தப்பட்டிருக்கின்றன. குகை முழுவதும் இயற்கையாக பலவித உருவங்கள் கண்களுக்கு விருந்தாக அமைந்துள்ளன.

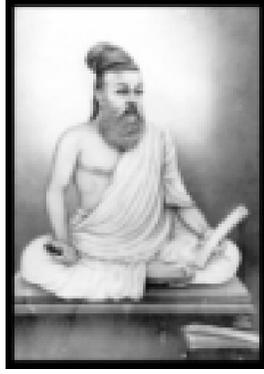
தொடர்புக்கு: ஆம்பூர் மங்கையர்க்கரசி, mangai.teach@gmail.com

Courtesy: தி இந்து, தேதி: 17.01.2018



TIRUKKURAL AND FAIR AND ETHICAL MANAGEMENT - 1

Practicing Professionals in various levels in organizations require both qualities of Management and Leadership dealing squarely with both Effectiveness and Efficiency with clarity of both mind and deed and a clear conscience.



It is not just IQ (intelligence quotient – Knowledge) that business Professionals need. They must cultivate EQ (emotional quotient - Relationships) and SQ (spiritual quotient - Values) to emerge as better leadersWestern business houses are increasingly emphasizing on SQ to add value to leadershipFuture leaders should achieve a balance of the three Qs.... These are some of the important thoughts in the area of Management and Leadership. SQ broadly revolves around Values, Ethics, Fairness, Win – Win approach and many more such, and most importantly, the Manager or the Leader must have a clear and stable mind dealing with the above.

EQUANIMITY is considered to be one of the important dimensions of SQ and one Quote is:-

“Once we are able to meet each moment with Equanimity, we can stop our painful struggle with reality”

Equanimity is the ability to be with what is happening—whether it is pleasurable, unpleasurable or neutral—without reacting to it one way or another, along with loving kindness, compassion, and empathetic joy.

Proper understanding and interpretation many “Kurals” can easily help us to practice and improve on the Equanimity and the SQ.

*Inbaththul Inbam Vizhayathan Thunbaththul
Thunbam Uruthal Ilan Kural 629*

*இன்பத்துள் இன்பம் விழையாதான் துன்பத்துள்
துன்பம் உறுதல் இலன். குறள் 629*

“The man who runneth not after pleasure in the day of success, suffereth not pain in the day of failure”

As we can see the deeper meaning, the message or the guidance is to look at all events equally without any variation in our state of mind so that we are always ready with the stable mind to ensure sharpness of thinking and planning ahead.

(To be continued)

HOME FESTIVALS - 3

பங்குனி - Panguni (March/April)



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

(To be continued)

When you wish good for others, good things come back to you, this is the law of nature.

PRAYAGRAJ - KUMBH 2019

In Prayagraj, as the word Kumbh enters ones ears the picturesque vision of Triveni Sangam, the sacred confluence of the Ganga, the Yamuna and the mystical Saraswati flashes in the minds of people. At the sacred confluence huge multitudes move like waves in the ocean filled with sense of devotion. 'Shahi Snaan' of Akharas, chanting of vedic mantras and elucidations of religious hymns in the Saint pandals, proclamations of knowledge, tatvamimansa and truth by rishis, charming music, mesmerising sound of multitudes of instruments, holy dip in sangam with utmost devotion fills the heart of devotees with immense joy and offering prayers at many divine temples exhibits the greatness of Prayagraj Kumbh.

The Kumbh Mela at Prayag takes place for approximately 55 days, spread over thousands of hectares around the sangam area, and becomes the greatest of ephemeral city in the world. Regularity of this celebration continuing since ancient times is unique in itself. Ever increasing pressure of populace and expanding cities tend to engulf the rivers and events like Kumbh, graces the rivers with the profound status of creators of the world. There is a deeply enrooted feeling of devotion and faith flowing in the veins of every Indian since eternity.

To ensure safety of pilgrims measures have been taken up to fight against emergencies.

Fire service - Forty fire stations have been set up along with 15 fire outposts well equipped with the following:-

Medium and large capacity fire trucks, Water mist bikes and jeeps Rescue, foam tender Fire extinguishers, Fire ambulance, Breathing apparatus sets.

Police and emergency service manpower - A huge manpower has been deployed for the security of Kumbh Mela 2019. Forces such as civil police, traffic police, armed police, coy of central paramilitary force, Jal police, watchman and home guards have been deployed. To closely monitor crowd and events for emergency hazards, 40 watch towers have been installed in the vicinity of Kumbh Mela.

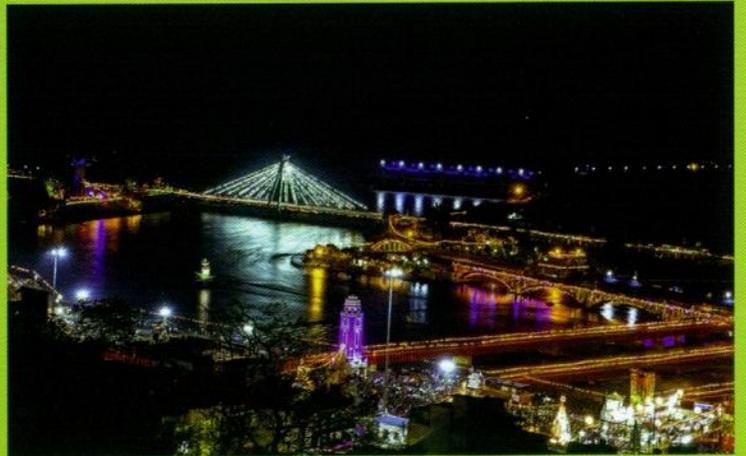
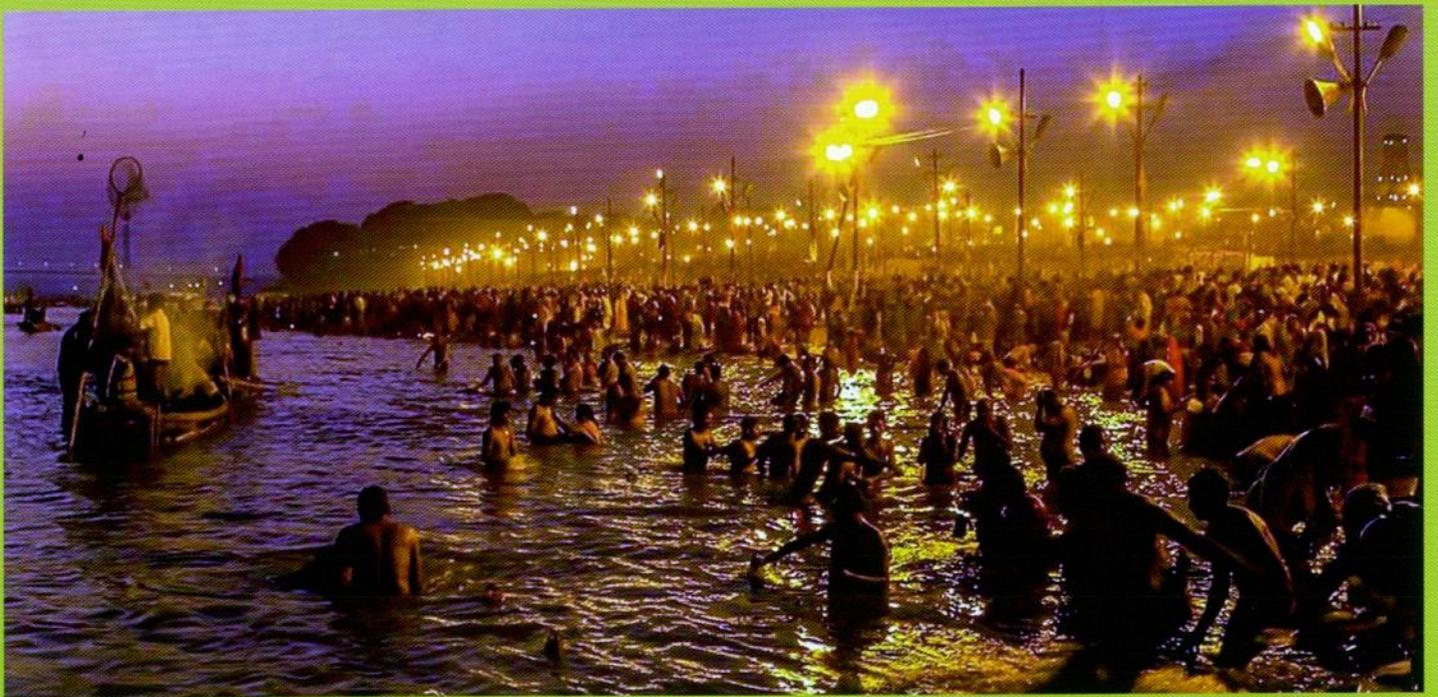
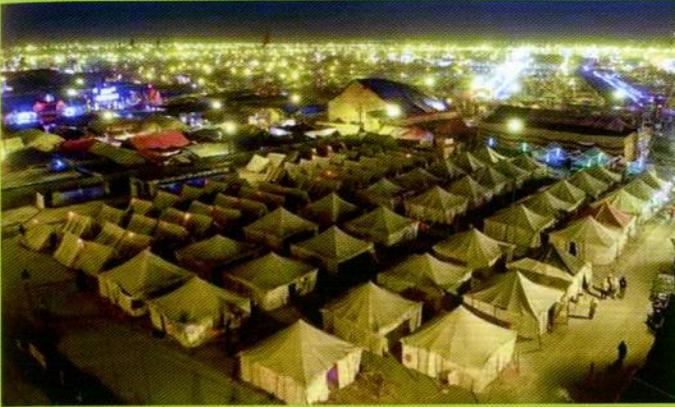
Evacuation - In case of emergencies, special evacuation plans have been integrated with the design for each ghat.

Integrated command and control centres (ICCC) - This system is used to integrate multiple departments to provide a monitoring platform. In case of emergencies, the information can be disseminated to all the concerned departments with the help of 2 established ICCCs.

Places To See

Shankar Viman Mandapam, The revered temple of Veni Madhav, `Sankatmochan Hanuman Temple, Mankameshwar Temple, Bharadwaj Ashram, Victoria Memorial, Prayag Sangeet Samiti, Allahabad University, Public Library, Ganga Gallery, Shree Akhileshwar Mahadev, Dashashwamedha Temple, Takshakeshwar Nath Temple.

PRAYAGRAJ - KUMBH 2019



ENERGY CONSERVATION DAY - SEMINAR PHOTOS



P Manohar, CEIG welcomes the Hon Electricity Minister, Mr.P.Thangamani



Chief Guest Md Nazimuddin IAS, Principal Secretary, Energy, lights the Kuthuvilakku



Tamilthai Vazhthu



P Manohar, CEIG, in his speech



Md Nazimuddin IAS, Principal Secretary, Energy Dept



Hon Electricity Minister, Mr.P.Thangamani



P Manohar, CEIG Presents shield to the Hon Electricity Minister, Mr. P. Thangamani



Md Nazimuddin IAS, Principal Secretary, Energy Dept honoured



Cultural Event



Short play emphasizing Energy Conservation



P. Manohar, CEIG with Guests



SPEL



SUPREME POWER EQUIPMENT PRIVATE LIMITED

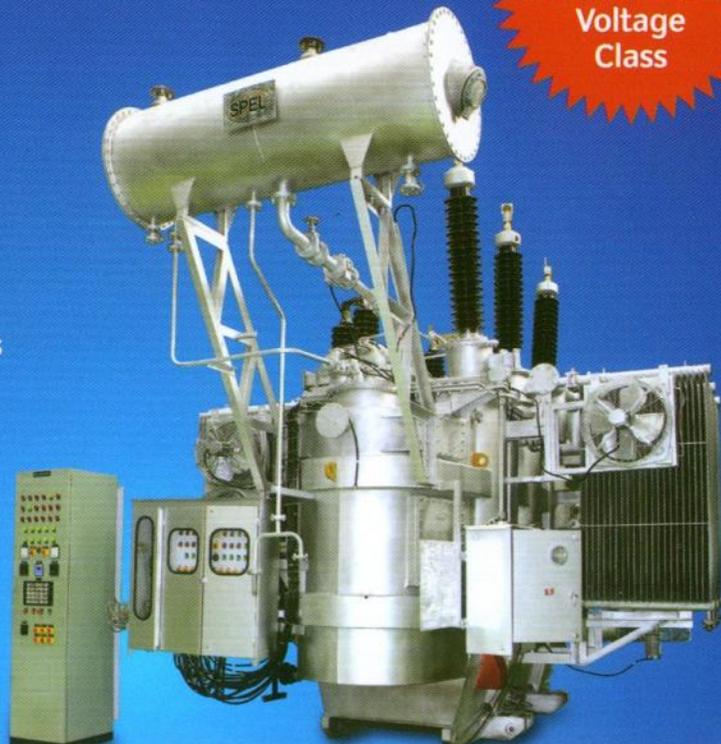
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OHSAS 18001 - Certified

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25 MVA / 110 kV
Voltage
Class



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