ELECTRICAL INSTALLATION ENGINEER

NEWS LETTER

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EDITORIAL

Dear Members, Fellow Professionals and Friends,

Greetings To All!

We are happy that there are Good News about Businesses, Economy, Technology and growth in many areas. But the concerns about the neighbours, borders and environment continue. The Ukraine war and the changing 'Geo Political' situations bring in both good and bad effects, but we can feel calm that the good is in excess of bad and it has resulted in lot of good for our country's pride as well. Let us look at some of them in little more detail.

We just had the National Technology Day on May 11th. and in the Technology area, the important initiatives to work fast on 'Chip' Technology and to establish sizable manufacturing facilities in our country to meet our own increasing requirements and to meet a good portion of global requirements as well, are very good developments. We are also working hard to improve on our manufacturing and other technologies to become globally competitive and to increase our share of businesses. It is indeed very good to realize that we have natural capabilities to become a part of all kinds of 'High Tech' activities all over the world, and lead the activities as well in many fields. We are also taking lot of steps to increase R & D and Innovation activities in our country itself through steps like training and skill improvement and so on. In the area of defense too, lot of activities are initiated to increase local manufacture, cutting down imports and our ambitions are to become a global defense suppliers; we have seen in papers that some of the Missiles developed in our country are being exported. We can see that this is the beginning. The Covid Vaccine manufacture in our country, achieving vaccinations of nearly 200 Crores already with exports as well, speaks volumes of our agility, capabilities and economic strength and infrastructure,

We have World Environment Day and National Environment Week in the month of June, signifying the need and urgency of Global and National actions and initiatives to be speeded up. Carbon reduction, Net'0' emission levels, Global Warming to be arrested and Environmental Safety are all interlinked and the Global Safety can only be ensured with commitments and actions by all Nations and people of the World without exception. The Industrial Revolution of the 19th and 20th centuries assisted by the exploitation of coal and petroleum made the use of energies and developments gallop, resulting in the form of all kinds of environmental and global problems and threats. The important solution, though difficult but not impossible, is to switch over largely and mostly to renewable sources of energy in place of "Fossils". It is satisfying that almost all countries of the world met at CoP26 and agreed upon plans of actions to save the environment and the planet. India has a large focus and progress in areas of Solar, Wind and Hydel energies with some recent initiatives in the Bio Energy area. Bio Energy has substantial potentials to be exploited, helped by technologies and finances, more and more in the years to come.

We thank all those members who have helped us by participating in the advertisement appearing for the issue April 2022 – 3SI Eco Power LLP, Asias Electricals, BCH Electric Ltd., Deepak Electric Corporation, E-Focus Instruments India Pvt. Ltd., E Power Engineering, Gravin Earthing & Lightning Protection System (P) Ltd., Pentagon Switchgear Pvt. Ltd., Power Cable Corporation, Sri Bhoomidurga Marketing (P) Ltd., Supreme Power Equipment (P) Ltd., Visewham Electricals.

Editor

CONSCIOUS IMPROVEMENT OF ONE'S BUSINESS AND MAINTAINING PROFITABILITY BY PREVENTING MISTAKES AND RECTIFYING THEM ONCE THEY OCCUR

It is well known that nowadays no business gives more than 10 to 15% margin. And if one mistake is done in a project, not only the profitability of that project may be at stake but many a times, the survival of the organization itself may be at stake.

Many examples are known to all and one amongst them was the necessity of Bridgestone – the owner of the Firestone brand to issue recalls of about 14.4 million tires in the United States by August 2000, and more in international markets due to the unusually high failures of Firestone P235/75R15 ATX, ATX II, and Wilderness AT tires installed on the Ford Explorer and other similar vehicles.

It is said that there were number of complaints received from users in USA but also in Saudi Arabia, Qatar, Malaysia, Venezuela etc. The complaints were covered up or ignored until the problem became so high that it resulted in expenses to attend to lawsuits, facilitate major recalls and overall nosedive the profitability and credibility of the company.

We see a big company suddenly going bankrupt due to a gross mistake, sometimes repeated time and again.

Hence the important lessons is summed up by one proverb "if a foolish man throws a stone into the sea, not even hundred intelligent people can retrieve the stone".

The above example and proverb shows that one should take all efforts to prevent a mistake from happening in the first place.

It is being said that within the Firestone organization, there were some employees who had suggested about the possible deficiencies of this model of tyre for this application, but it was overlooked.

In the context of our engineering profession and our personnel lives, how can we prevent mistakes from happening in the first place?

1. If any mistake is going to happen, your inner sense will tell it. Your subconscious mind will tell it. Listen to the signals.
2. Use standard procedures – standard procedures prevent one from deviating from the acceptable path – If one is going to provide spacing around a transformer, no need to guess – look at the standards – it indicates the spacing around the transformer for fire safe and non-fire safe oiled transformers.
3. ISO and formal management procedures work.
4. Listen to your colleagues and families – take a eclectic decision.
5. There was a earlier thought process that **'technology supports change'**. Now the thought process is **'technology drives change'**. Click on the web and seek suggestions. (Recently I wanted to drive up and down KOLLI HILLS. I perused the web and got a good website which suggested one should learn to keep his car within one feet of the left hand side edge and for this adjust one's rear view mirror and keep adjusting the driving – believe it, it was one of the best suggestions I had ever received and driving through KOLLI HILLS was breeze.
6. Don't take hasty decisions – write down all the possible options and pray or be pensive the way you like – the best solution will evolve.
7. Electrical systems, fire systems, road safety systems, our accounting system, our taxation system – all speak of safety. **Keep safety as your mantra in your words, actions and deeds.**

If a mistake has happened how to quickly control the situation (so that the issue like FIRESTONE tyre can be avoided).

1. **First of all, make a plan what you wish to achieve in your life, with your family, with your organization – if the objective is higher, your acceptance to receive mistakes openly and sort them out quickly will happen. This is a point which one would not find in ISO courses.**
2. Accept the mistake as it is being explained. Do not constrict the method or from whom the comment can be received.

   For example, now-a-days we see car dealers indicate that within a rating of 1 to 10, rating of 8 is 'bad', rating of 9 is 'good' and rating of 10 is 'excellent'. A patron is pressurized that if he gives a rating of 8, then the supervisor supporting us or the mechanic repairing our automobile will lose his job. Then the patron due to personal affinity with the supervisor or mechanic is not able to give a rating of 8 or below, but then the truth is not told to effect betterment.
3. Adopt a proper 'Customer Complaint Form' – even if your organization is a Small or Medium Scale Business as well. 'Customer Complaint Form" are not limited to Large Scale Businesses. **(My own organization is a Medium Scale Organization which has suffered from the same problem that a formal complaint receival and rectification procedure has not been present – until now)**
4. Have complaint acceptance and rectification as a 'line function'.
5. Accept a Complaint from whom ever it has come or whichever medium of communication. Do not ask about the prior experience of a person to give suggestion or a complaint. In personal lives do not show ego so that one's servant maid or car chauffeur will be not be hesitant to advice.
6. Prepare a Customer Complaint Form' for your own company – many sample formats are available in the web. A sample format will consist of the following:

   Date.

   Name of the Client

   Contact particulars of the Client

   Nature of the complaint

   Item on which the complaint has been made

   <u>Stage -1:</u>

   Establish the team who can review the complaint.

   Internally describe the problem in greater detail.

   <u>Stage -2:</u>

   Make a detailed data collection of the complaint:

   For example:

   1. If a design fault can be expected, the analysis should be as follows:

Drawing No.	Description	Date and Time	Revision of the drawing	Number of times this problem has occurred in this drawing	Name of the designer	Name of the supervisor (he or she also is equally responsible)	Remarks

2. If a design fault can be expected, the analysis should be as follows:

Invoice No. / Client No.	Sl. No. of product	Date and Time	Model No. of the product	Number of times this problem has occurred in this drawing	Name of the technician	Name of the supervisor (he or she also is equally responsible)	Remarks

Stage -3:

Incorporate the full technical particulars of the engineering design / product manufactured.

Stage -4:

Identify the root cause with minimum 5 whys, fish bone analysis etc.

Stage -5:

Find out escape root cause corrective action.

Stage -6:

Identify method to prevent re-occurrence.

Stage -7:

Identify whether the same mistake can happen in some other design or product manufactured or service provided. **(Only this step helps to take the learning forward)**

Stage -8:

Plan disciplinary action if any.

Stage -9:

Thank the team within who have participated in the effort.

Note:

1. Thank the person who has indicated the fault for his / her concern and time. Give a small return gift if possible.
2. Don't make the complaint rectification mission a 10 day program or a vendetta ride.
3. **In my personal experience abroad with developed countries, one distinguishing factor that could be noticed was that fault minimization, lesson learning and fault rectification were given very high importance.**

FAILURES ARE STEPPING STONES TO SUCCESS – LET US TAKE A CONCRETE STEP TO GO UP THE STEPS.

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Author of the Engineering Cum Management Book – "Learning Management Back from Machines"

"To ensure good health: eat lightly, breathe deeply, live moderately, cultivate cheerfulness, and maintain an interest in life." – WILLIAM LONDEN

KNOW THY POWER NETWORK - 165

"Understand the adverse effects of Power Quality Issues".

I. General View

Is there any doubt about the main role played by electricity in transporting energy from one end to the another? It functions like a "Courier or Transport Agent". It transports / carries all kinds of energy forms from their sources of generation / production to the end users very promptly (at the speed of 3 x 10^8 Meters / Sec) with minimum losses. Just like any transport agent, it simply returns after delivering the energy it carries. To get the energy form of our need, we have to employ the required energy converting equipment like motors for mechanical energy, Heaters for heat energy, lighting fixtures for light energy, batteries for chemical energy and so on.

Among the challenges faced by the electrical energy during its journey from the generating sources to the end consumers is the 'Contaminations' brought by various agencies. Such pollutions simply impact its quality. So the moot questions raised are,

(i) How its quali y aberrations occur?

(ii) How such quality issues impact the equipment / devices of the T&D companies on the way and the end users as well?

The possible answers to these questions are brought out.

II. Electrical Energy in Wave Form

Electricity behaves like a wave; so amplitude, frequency, continuity and wave shape constitute its basic features. These parameters are well defined and are required to be maintained well within the limits set by relevant standards. All these demand awareness and minimum understanding of related PQ issues from the end consumers i.e. the end users should have a feel of these set limits and what would occur of the fixed tolerance levels are over stepped / exceeded.

III. Power Quality Standards

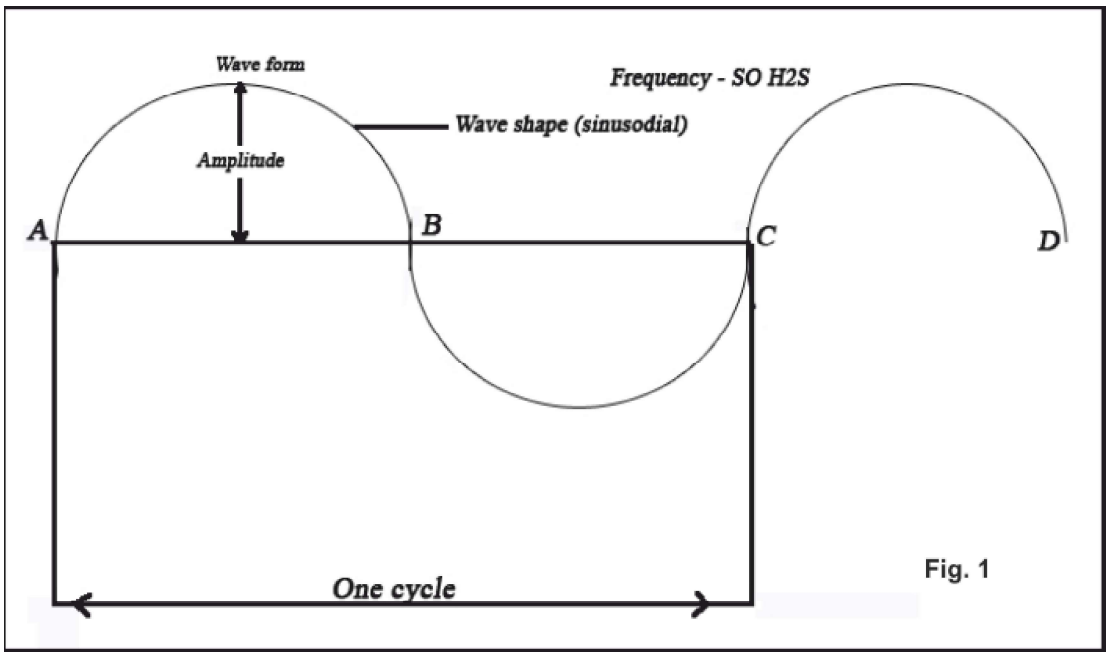


Fig. 1

Unlike "Art Works", which defies definitions / standards, the electric power has to conform to the standards set by "Indian Electricity Rules – 1956". i.e it has to conform to the standards / limits set by the government. When it crosses the prescribed limits, the end consequences / impacts, will be severe, especially for the

equipment / devices of the end – users. So this warrants in urgent demand for the awareness of prescribed standards and the adverse effects especially of long term impacts the equipment suffer by when any breach occurs. This alone propels / compiles the end - consumers to get the picture of power quality standards and get the required understanding knowledge / information. In short, it can be simply stated that the quality of the power received at our premises decides the actual performance and life span of the equipment / devices in our-site and also the end quality of the converted energy forms like compressed air and light, in our work sites. Power quality standards / tolerance limits are mainly prescribed to ensure that the base / ground on which our equipment / devices stand is not "Shaken" by the "Disturbing Contaminants" suffered by the electrical energy before it reaches our premises. It is more or loss the reflection of the life – threatening threats, if any, brought in its wings.

Being a wave, electricity has four key parameters as shown below (fig 1); it is applicable both for "Current and Voltage"

IV. Prescribed Standards for Power Quality

Parameter	**Tolerance Limits**
(1) Wave shape	Pure Sinusoidal: (Harmonics / Distorting agencies are to be averted); Spikes, Surges, Sags are also to be avoided
Amplitude	
(2) Voltage	± 10%
(3) Current	± 30%
(4) Continuity	No disruptions
(5) Frequency (50 Hzs)	± 5%

Presently no international standard exists for power quality. All that available is the standards adopted in earlier years. It is mainly because of the fact that till date that no agreement has been reached on the issue whether power system reliability supplements or complements power quality. As a result, we do not have a reliable international power quality standard. Added to this the need for quality power varies from equipment to equipment. To cite an example, "What is good power quality for a refrigeration motor may not be good / acceptable for today's personal computers and other sensitive electronic loads. A short / momentary outage may not impact motors, lights but would cause a major nuisance / damage to digital clocks and computers.

To make a simple definition for power quality we can state that it is nothing but *"deviations of voltage / current wave forms from its assigned / specified magnitude frequency and wave shapes".* The duration of such isolations is either ignored or consider separately. Now the more relevant term adopted for electrical energy flow is its "Security'.

Security of Electric Power supply is defined as the ability of electric power system to provide electricity to end users with a specified level of continuity and quality in a sustainable manner, relating to the existing standards and contractual agreements at the points of supply.

V. Common Power Quality Problems

It is separated into two categories,

i) A transient or (ii) A steady state problem. Transient problems need time-domain analysis whereas steady state issues require phasor model of the system

Power Quality Disturbances – In brief (IEEE Standard 1159). Table 1 lists the various types of Power Quality Disturbances

Table 1: Power Quality Disturbances

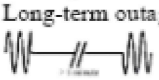
Categories and Characteristics of Power System Electromagnetic Phenomena

Categories	Typical Spectral Content	Typical Duration	Typical Voltage Magnitude
1. Transients			
1.1 Impulsive			
1.1.1. Nanosecond	5 – ns rise	< 50 ns	
1.1.2. Microsecond	1 - µs rise	50 ns – 1 ms	
1.1.3. Millisecond	0.1 – ms rise	>1 ms	
1.2 Oscillatory			
1.2.1 Low Frequency	<5 kHz	0.3 – 50 ms	0 – 4 pu
1.2.2 Medium Frequency	5 – 500 kHz	20 µs	0 – 8 pu
1.2.3 High Frequency	0.5 – 5 MHz	5 µs	0 – 4 pu
2. Short-duration variations			
2.1 Instantaneous			
2.1.1 Interruption		0.5 – 30 cycles	< 0.1 pu
2.1.2 Sag (dip)		0.5 – 30 cycles	0.1 – 0.9 pu
2.1.3 Swell		0.5 – 30 cycles	1.1 – 1.8 pu
2.2 Momentary			
2.2.1 Interruption		30 cycles – 3 s	< 0.1 pu
2.2.2 Sag (dip)		30 cycles – 3 s	0.1 – 0.9 pu
2.2.3 Swell		30 cycles – 3 s	1.1 – 1.4 pu
2.3 Temporary			
2.3.1 Interruption		3 s – 1 min	< 0.1 pu
2.3.2 Sag (dip)		3 s – 1 min	0.1 – 0.9 pu
2.3.3 Swell		3 s – 1 min	1.1 – 1.2 pu
3. Long-duration variations			
3.1 Interruption, sustained		> 1Min	0.0 pu
3.2 Under voltage		> 1Min	0.8 – 0.9 pu
3.3 Overvoltage		> 1Min	1.1 – 1.2 pu
4. Voltage unbalance		Steady state	0.5 – 2%
5. Waveform distortion			
5.1 DC offset		Steady state	0 – 0.1%
5.2 Harmonics	0 – 100th harmonic	Steady state	0 – 20%
5.3 Interharmonics	0 – 6 kHz	Steady state	0 – 2%
5.4 Notching		Steady state	
5.5 Noise	Broadband	Steady state	0 – 1%
6. Voltage fluctuations	< 25 Hz	Intermittent	0.1 – 7% 0.2 – 2 Pst
7.0 Power frequency variations		< 10 s	

Note: s = second, ns = nanosecond, µs = microsecond, ms = millisecond, kHz = kilohertz, MHz = megahertz, min = minute, pu = per unit

Table 2 lists some typical power system problem and their causes with possible mitigating solutions

Table 2: Electrical Power System problems and Solutions

Problem	Description	Duration	Cause	Effect	Possible Solution
Momentary Interruption 	Very short planned or accidental power loss	0.5 cycles to 3 sec	Switching Operations Interrupting to locate electrical problem and maintain power to your area	➢ Equipment trips off ➢ Programming is lost ➢ Disk drive crashes	UPS or standby power supply (SPS) for critical loads
Temporary Interruption / Long-term outage 	Planned or accidental total loss of power in a localized area of the service area	➢ Temporary (3 sec-1min) ➢ Long-term (over 1 min)	➢ Equipment failure ➢ Contractors digging into underground conductor wires ➢ Vehicle hitting pole ➢ Storms	System shuts down	Uninterruptible power supply (UPS) for critical loads
Sag / Swell 	Brief reductions or increases in voltage	0.5 cycles to 1 minute. Sags or swell longer than 1 minute are called under voltages or over voltages	➢ Major equipment startup or shut-down ➢ Short circuits (faults) ➢ Undersized electrical wiring	➢ Memory loss ➢ Data errors ➢ Dim or bright lights ➢ shrinking display screens ➢ Equipment shutdown	➢ Relocate equipment to different electrical circuit within facility ➢ Power conditioners or UPS Systems for Critical Loads
Surge 	Sudden change in voltage up to several thousand volts (also called impulse, spike, or transient)	< 1msec	➢ Lightning ➢ Turning major equipment on or off ➢ Utility switching	➢ Processing Errors ➢ Data loss ➢ Burned circuit boards	Install surge suppressor at main panel (best when used in combination with branch circuit surge suppressor)
Noise / Harmonic Distortion 	Continuous distortion of normal voltage	Steady State	➢ Electromagnetic interference from appliances, machines, radio, and TV broadcasts ➢ Harmonic distortion from nonlinear loads (computers, lights)	➢ Continuous distortion of normal voltage ➢ Random data errors	➢ Use a noise filter designed for application (sometimes incorporated with surge suppressors) ➢ Power conditioner

VI. Impacts of Deficient Power Quality

These impacts defy generalization since adequate power quality requirement differs for different situations. However a general picture can be provided

(i) Harmonic current flowing in the system can increase energy losses and cause lower motor torques

(ii) Voltage dips / sags can lead to brown outs and black outs in plants with the attendant plant shut downs and financial losses

(iii) Metering: Poor power quality can affect the accuracy of utility metering

(iv) Protective relays: Poor power quality can cause protective relays to malfunction

(v) Downtime: poor power quality can result in equipment downtime and / or damage, resulting in loss of productivity.

(vi) Cost: Poor power quality can result in increased costs due to the effects mentioned above.

(vii) Electromagnetic compatibility: Poor power quality can result in problems related to electromagnetic compatibility and noise.

(viii) Motors - Maintain good power quality: Motors are designed to operate using power with a frequency of 50hertz and sinusoidal wave form. Using power with distorted wave forms will degrade motor efficiency.

Table - 3 Shows the Effect of Voltage and Frequency Variations on the Performance of Electric Motors

Table 3: General Effect of Voltage an Frequency Variation on A.C. Induction Motors Characteristics

Characteristics	Voltage		Frequency	
	110%	90%	105%	95%
Torque Starting & Max. Running	Increase 21%	Decrease 19%	Decrease 10%	Increase 11%
Speed Sync.Full Load Percent Slip	NC Increase 1% Decrease 17%	NC Decrease 1.5% Increase 23%	Increase 5% Increase 5% Little change	Decrease 5% Decrease 5% Little Change
Efficiency Full Load Half Load	Increase 0.5/1 Pt. Decrease 1 to 2 Pts.	Decrease 2 Pts. Increase 1 to 2 Pts.	Slight Increase Slight Increase	Slight Decrease Slight Decrease
Power Factor Full Load Half Load	Decrease 3 Pts Decrease 5 to 6 Pts.	Increase 1 Pt. Increase 4 to 5 Pts.	Slight Increase Slight Increase	Slight Decrease Slight Decrease
Current Starting Full Load	Increase 10/12% Decrease 7%	Decrease 10/12% Decrease 11%	Decrease 5/6% Slight Decrease	Increase 5/6% Slight Increase
Temp. Rise	Decrease ¾ Deg.	Increase 6/7 Deg.	Slight Decrease	Slight Increase
Max. O/L capacity	Increase 21%	Decrease 19%	Slight Decrease	Slight Increase
Mag. Noise	Slight Increase	Slight Decrease	Slight Decrease	Slight Increase

Though motors are designed to operate within the ±10% of its name plate voltage, still they suffer much during the large variation of voltage and frequencies. These significantly reduce impact their efficiency, power factor and service life. With 95% of service voltage, it loses 2-4 points of efficiency, its operating temperature rises by 20°F. This impact greatly reduces its insulation life. Applied higher voltages (more than its rated voltage) can also reduce its efficiency and power factor. Phase unbalance experience by motors should be within one percent (1%) to avoid derating of motor. With measured 3 phase voltages of 431, 438 and 427 for a motor the voltage unbalance is given by $\left(\frac{432-4}{432}\right) x\ 1000,$ 1.1% where the average of the measured voltages is 432 volts voltage unbalance experienced by a motor more than the permitted level of 1% can lead to

(i) Higher temperature use (Additional temperature rise) = 2 x % voltage unbalance (e.g) with 2% voltage unbalance and Motor temp - 100°C the motor will experience the temperature by 8ÚC and its temperature shoots up to 108°C. Then its winding insulation life is reduced by one half for each 10°C increase in its operating temperature.

Common causes of such voltage unbalance in the input voltage.

- Faulty operation of PF conversion equipment
- Unbalanced or unstable utility supply
- Unbalance transformer bank supplying a three phase load that is too large for the bank
- Unevenly distributed single phase loads on the same power system.

VII. Power Quality Monitoring

After understanding the issues caused by power quality and the solutions needed for its mitigation, it can be easily seen that extensive monitoring and recording of electrical parameters (quantities) is must for the sensitive end users. It not only helps to trace the source of PQ problems but also to design suitable mitigation solutions.

VIII. Improvement of Power Quality Measures

With modern equipment and devices, it is not difficult to mitigate or completely remove the PQ problems in the system. However the cost involves is very high. It varies from Rs. 2500 to a few lakhs of rupees per KVA. The question is whether the ordinary electricity consumers can bear this cost. Among the possible measures are,

- Harmonics are eliminated at their source itself and prevented from entering in to the main supply grid through the precise use of Active and Passive filters
- Use of dynamic voltage regulators can help the sensitive equipment to ride through the voltage sags of longer duration
- Application of live conditioners can ensure the required quality of power supply to any consumer equipment.
- Back up supply methods or use the user of dedicated lines and transformers can ensure clean uninterrupted quality power supply
- Finally fast transients are removed from the system with the aid of reliable surge suppressors

IX. Greening Power Quality

Instead of going for / arranging corrective solutions, it is preferable to take steps to nip off the PQ problem at their main source itself. Such measures can address the environmental concerns also.

1. To start with, the environmental factors like efficiency, heating, reuse, recycling and waste disposal can be factored in the design of the equipment related to house-hold, commercial, Industrial and agricultural applications. In short, energy conservation efforts need to be taken to counter act power quality issues.
2. Stand-by power supplies need to be properly designed by taking into account the related environmental factors and clean power demand.
3. By adopting various reliable mitigating measures, the entry of PQ issues like Harmonics Voltage sags and surges and Transients can be effectively arrested.
4. Steps are to be taken to ensure the enforcement of PQ standards as stipulated in Electricity Act – 2003 and Indian Electricity Rules – 1956 with this.

Let me sign off.

Ref: (1) Power Quality Management journal – 2013
(2) Electrical Installation Engineers journal February 2007

(To be continued)

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"Health is a state of complete harmony of the body, mind and spirit. When one is free from physical disabilities and mental distractions, the gates of the soul open." – B.K.S. IYENGAR

GRIDSPERTISE PRESENTS ITS CUTTING-EDGE SUSTAINABLE SOLUTIONS FOR THE INDIAN POWER DISTRIBUTION GRIDS

The energy transition and power grid modernization

The next ten years will be decisive to taking on the challenges posed by climate change and maintaining global temperatures within the limits set by the Paris Agreement. Thanks to the acceleration of decarbonization of energy production and the electrification of end uses, the path towards a net-zero emission future is becoming increasingly shorter.

As the fifth largest economy in the world and with a population of over 1.3 billion people, India's climate adaptation and mitigation ambitions are not just transformational for the Country itself, but for the whole world.

Among its ambitious targets, India aims to meet 50% percent of its electricity requirements with renewables by 2030, reducing its economy's emissions intensity by 45% and cutting emissions by one billion tons of CO_2.

In this scenario, distribution grids will be the main enablers for the management of a growing renewable energy generation portfolio and to guarantee the highest quality of service for the electricity supply.

However, current Indian power grid infrastructure experiences high Aggregate Technical and Commercial (AT&C) losses, drastically cutting utilities' finances and limiting their ability to invest in critical infrastructure. Furthermore, low resilience to climate change events causes frequent power interruptions, impacting households and business operations, reducing sales as well as delaying the supply of goods. At the same time, the technologies currently implemented are unable to communicate problems in real time, exacerbating the situation.

For this reason, distribution networks will be a top priority for the sector, requiring huge investments for their renewal and expansion.

Smart meters: a first step in grid modernization

India plans to install 250 million smart meters in the next four years across all of its states, with the aim of reducing AT&C losses to 12-15% and cancelling the gap between the Average Cost of Supply and the Average Revenue Realized.

Smart meters can help to stabilize the grid with granular information on consumption, allowing for real-time monitoring of electricity use, advanced management of the grid's technical parameters and detecting in near

real-time critical events, such as blackouts. They also improve billing and collection efficiency, while supporting the introduction of customized tariffs and the integration of distributed renewable energy.

Furthermore, Meter data management systems (MDMSs) help in the consolidation of data from meters, analyze data trends from readings and resolve issues of meter tampering, outages, theft, etc.

Smart meters are just the first step towards grids digitalization, enabling the increase in network resilience, efficiency and sustainability.

Gridspertise – born to accelerate the future of grids

Gridspertise, a new company fully owned by Enel, the world's largest privately owned networks operator and a global leader in advanced digital metering with more than 20 years of expertise in the field, is ready to contribute significantly to this plan.

The NewCo offers innovative, flexible, sustainable and integrated solutions and services, in three main areas of transformation:

- **Metering and grid edge digitalization:** Reliable, advanced and interactive metering solutions such as smart meters, software for meter data management, low voltage grid analytics, and AMI Service to Cash.
- **Network infrastructure digitalization:** Smart grid solutions to enhance network resilience, efficiency, and sustainability as well as to boost the quality of service. These integrated solutions are intended for grid operations, from grid monitoring to remote control, automation, electrical flow and flexibility management of distributed resources as well as disruptive technologies such as the Quantum Edge Device.
- **Field Operations Digitalization:** Solutions to streamline field operations, reduce response time and increase worker safety, including the Network Digital Twin for cost-efficient vegetation management.

These solutions address the needs of DSOs through cloud and edge platform technologies and provide benefits for the entire Indian electric ecosystem:

- **For DSOs**: to improve collection efficiency, reduce losses and enhance overall financial health, increasing resilience and quality of service.
- **For grid stakeholders**: to facilitate the development of the energy service market, including flexibility, and electrification of end uses.

- **For end customers**: to increase the reliability of electricity supply, facilitate electrification, foster energy efficiency and time-of-the-day tariffs

In the last few months, Gridspertise announced the accomplishment of thirteen agreements for more than 670,000 smart meters and over 150,000 field devices and accessories in 4 EU countries. These customers trusted the company as a strategic partner to accelerate the transformation of their networks with Metering and Grid Edge Digitalization solutions.

Meet Gridspertise at India Smart Utility Week

Gridspertise combines the agility of a startup with a distinctive expertise in the field of smart grids, making it uniquely positioned to understand DSO requirements in different regions around the world.

It offers up to date solutions, also exploring new sustainable options to remove capital barriers, with pay-as-you-save business models.

It currently operates in Italy, Spain, Brazil and Romania, aiming to reach around 30 countries by 2030. The company is looking to focus on Asia-Pacific, starting from the Indian market where investing in smart grids and the technological innovation of the infrastructure is of great importance economically and politically.

India is living through accelerated momentum for the digitalization of power systems, as policies, sustainability commitments and developing trends are going in the direction of reforming electricity distribution in the country.

Next week, Gridspertise will participate in India Smart Utility Week (ISUW) where CEO, Robert Denda, will speak about the digitalization of utilities and digitalization roadmaps at the first conference session of the event.

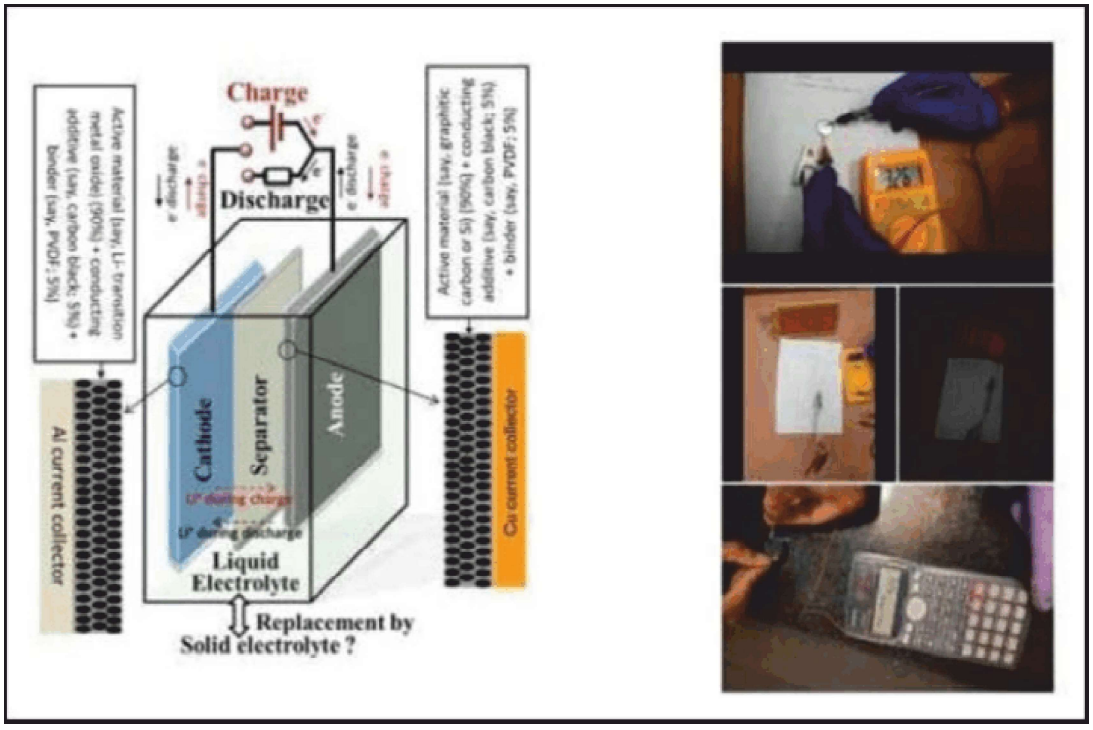
ISUW will introduce Gridspertise to the Indian utility market for the first time and the company is already working on new, affordable solutions and sustainable business models to support the digitalization of the country's networks in order to boost the energy transition.

"Physical fitness is the first requisite of happiness." – Joseph Pilates

PROF. A. MUKHOPADHYAY RECEIVES THE SWARNAJAYANTI FELLOWSHIP FOR 2021

Prof. Amartya Mukhopadhyay

Prof Amartya Mukhopadhyay from the Department of Metallurgical Engineering and Materials Science, Indian Institute of Technology Bombay (IIT Bombay), Mumbai, has received the prestigious fellowship for the year 2021, for his contribution to the field of Engineering Science. The Swarnajayanti fellowship comes with Rs. 25,000/- monthly stipend along with a research grant for five years. He is also the recipient of several other awards and recognitions, notably, recognised by the Royal Society of Chemistry (United Kingdom) journals as one of the '2019 Emerging Investigators' and conferred with the Young Engineer Award from the Indian National Academy of Engineering (INAE). Also, he has co-authored a textbook – Interdisciplinary Engineering Sciences: Concepts and Applications to Materials Science.



Overview of the research work…

Prof Mukhopadhyay heads the High Temperature and Energy Materials Laboratory at IIT Bombay. He has been instrumental in the pioneering research in finding new reactive alloys for designing anodes for Lithium-ion and Sodium-ion batteries. He says, "We aim to build better, robust, long-lasting rechargeable batteries for advanced applications, such as batteries for electric vehicles and for storage of energy harvested from renewable sources."

Prof Mukhopadhyay's group is actively researching novel solutions, one of them being focusing on designing new alloy materials that will reduce lithium-plating and 'dendrite' formation in the lithium-ion battery systems, thus improving the battery's safety aspects. In addition, they endeavour to improve the battery's energy storage capacity, the possibility of rapidly charging the battery (in a few minutes) and battery longevity.

MOP PROMULGATES THE REVISED CONSOLIDATED GUIDELINES & STANDARDS FOR CHARGING INFRASTRUCTURE FOR EVS

Tariff for power supply to Public EV Charging Stations shall be a single part tariff and shall not exceed the 'Average Cost of Supply' till 31.03.2025….

Representative image from freepik

The Union Ministry of Power (MoP) has promulgated the revised consolidated Guidelines & Standards for Charging Infrastructure for Electric Vehicles (EV) on 14th January, 2022. The objective is to enable a faster adoption of electric vehicles in India by ensuring safe, reliable, accessible and affordable Charging Infrastructure and eco-system. This would also promote energy security and reduction of emission intensity of the country by promotion of entire EV ecosystem.

These guidelines are exhaustive and include provisions for individual owners of Electric Vehicles and for Public Charging Stations (PCS). Owners may charge their Electric Vehicles at their residence/offices using their existing electricity connections.

Any individual/entity is free to set up public charging stations without the requirement of a license provided that, such stations meet the technical, safety as well as performance standards and protocols laid down under the guidelines as well as norms/ standards/ specifications laid down by Ministry of Power, Bureau of Energy Efficiency (BEE) and Central Electricity Authority (CEA) from time to time. An exhaustive list of compliance requirements for Public Charging Station (PCS) have also been outlined. These include norms for 'appropriate' infrastructure for civil, electricity and safety requirements.

The BEE shall be the Central Nodal Agency for rollout of EV Public Charging Infrastructure. All relevant agencies including CEA shall provide necessary support to Central Nodal Agency. Every State Government shall nominate a Nodal Agency for that State for setting up charging infrastructure.

ELECTRIC POWER GENERATION, TRANSMISSION, AND DISTRIBUTION GLOBAL MARKET REPORT 2022

Electric Power Generation, Transmission, And Distribution Global Market Report 2022 - By Type (Electric Power Transmission, Control, And Distribution, Power Generation), By End-User (Residential, Commercial, Industrial), By Type Of Operator (Public Operator, Private Operator) - Market Size, Trends, And Global Forecast 2022 – 2026

The electric power generation, transmission, and distribution market consists of sales of electric power by entities (organizations, sole traders and partnerships) that generate, transmit, and/or distribute electric power. Establishments in this market are engaged in operating generation facilities that produce electric energy; operating transmission systems that convey the electricity from the generation facility to the distribution system; or operating distribution systems that convey electric power received from the generation facility or the transmission system to the final consumer.

The main types of electric power generation, transmission, and distribution are electric power transmission, control, and distribution, and power generation. Power generation is referred to the process of producing electric energy or the amount of electric energy created by converting other sources of energy into electrical energy. The different types of operators include public operators and private operators and the services are used by residential, commercial, and industrial users.

The global electric power generation, transmission, and distribution market size is expected to grow from $4,091.77 billion in 2021 to $4,433.15 billion in 2022 at a compound annual growth rate (CAGR) of 8.3%. The growth in the electric power generation, transmission, and distribution market is mainly due to the companies rearranging their operations and recovering from the COVID-19 impact, which had earlier led to restrictive containment measures involving social distancing, remote working, and the closure of commercial activities that resulted in operational challenges. The electric power generation, transmission, and distribution market is expected to reach $5,932.43 billion in 2026 at a CAGR of 7.6%.

The power generation industry is expected to see increased investment activity in the forecast period. Investments in microgrid technology, renewables and other advanced technologies are expected to drive the market. According to Global Innovation Report, the total capacity of microgrid is expected to reach 1.2 GW by 2024 in North America with an annual revenue of $4.2 billion. The United States Senate enacted a $1.2 trillion infrastructure bill in August 2021, which includes financing to accelerate clean energy initiatives. The growing investment in the power generation will drive the growth of electric power generation, transmission, and distribution market.

The outbreak of Coronavirus disease (COVID-19) has acted as a significant restraint on the electric power generation, transmission, and distribution market in 2020 as demand for utility services from industrial and commercial establishments decreased due to trade restrictions and lockdowns imposed by governments globally. Many manufacturing facilities globally halted operations to contain the spread of virus among its workforce, thereby limiting the need for utility services such as electricity and wastewater treatment. COVID-19 is an infectious disease with flu-like symptoms including fever, cough, and difficulty in breathing. The virus was first identified in 2019 in Wuhan, Hubei province of the People's Republic of China and spread globally including Western Europe, North America and Asia. Steps by national governments to contain the transmission have resulted in a decline in economic activity with countries entering a state of lockdown and the outbreak had a negative impact on businesses throughout 2020 and into 2021. However, it is expected that the electric power generation, transmission, and distribution market will recover from the shock across the forecast period as it is a 'black swan' event and not related to ongoing or fundamental weaknesses in the market or the global economy.

Electric power generation companies are increasingly using batteries to store solar energy during daylight hours. These energy-storage sites consist of large lithium-ion batteries. These batteries store enough energy to serve as a back-up in case of fuel shortages. They are designed to absorb solar power and feed it back to the grid. These systems minimize the need for capital intensive power generation plants, thereby enhancing transmission and distribution efficiencies and thus reduce operational costs. For instance, by 2025, the World Bank Group aims to fund 17.5 gigawatt hours (GWh) of battery storage, more than tripling the current 4-5 GWh installed across all developing nations.

Major companies in the electric power generation, transmission, and distribution market include Electricite De France SA, Enel SpA, Tokyo Electric Power Co Holdings Incorporated, E.ON SE, Korea Electric Power Corporation, State Power Investment Corporation, Iberdrola, Exelon Corp, Engie, and Duke Energy Corp.

Asia Pacific was the largest region in the electric power generation, transmission, and distribution market in 2021. Western Europe was the second largest region in the electric power generation, transmission, and distribution market. The regions covered in the electric power generation, transmission, and distribution market report are Asia-Pacific, Western Europe, Eastern Europe, North America, South America, Middle East and Africa.

The countries covered in the electric power generation, transmission, and distribution market report are Argentina, Australia, Austria, Belgium, Brazil, Canada, Chile, China, Colombia, Czech Republic, Denmark, Egypt, Finland, France, Germany, Hong Kong, India, Indonesia, Ireland, Israel, Italy, Japan, Malaysia, Mexico, Netherlands, New Zealand, Nigeria, Norway, Peru, Philippines, Poland, Portugal, Romania, Russia, Saudi Arabia, Singapore, South Africa, South Korea, Spain, Sweden, Switzerland, Thailand, Turkey, UAE, UK, USA, Venezuela, and Vietnam.

The global electric power generation, transmission, and distribution market is segmented -

1) By Type: Electric Power Transmission, Control and Distribution, Power Generation

2) By End-User: Residential, Commercial, Industrial

3) By Type of Operator: Public Operator, Private Operator

Sub-segments Covered: Electric Power Distribution, Electric Bulk Power Transmission and Control, Hydro Electricity, Fossil Fuel Electricity, Nuclear Electricity, Solar Electricity, Wind Electricity, Geothermal Electricity, Biomass Electricity, Other Electricity.

NUMERICAL ANALYSES OF POWER LOSSES AND TEMPERATURE RISE OF GAS INSULATED SWITCHGEAR (GIS) MODULES - 1

Thermal design of gas insulated switchgear (GIS) is important as localized overheating can lead to weakening of insulation and in turn may result to insulation breakdown. The increase in the resistance of conductor in gas insulated switchgear due to increase in temperature must be considered for accurate estimation of thermal equilibrium. The heat transfer coefficient is also temperature dependent and it increases with the increase in the temperature. In order to estimate the temperature rise of conductor and enclosure accurately, the variation of heat transfer coefficient with respect to temperature must also be considered for various materials.

In the present study, a numerical program has been developed to calculate power losses by considering different configurations of GIS. The power losses shall be used as input for estimating the temperature rise of GIS modules. The coupled analysis is considered in the present study wherein the losses and heat transfer coefficient shall be updated in each iteration. The variation in steady state temperatures and resistive losses have been calculated for various voltage class GIS, conductor currents, type of materials, ambient temperatures and enclosure currents. Finally, suitability of Aluminium alloy material as conductor and enclosure of GIS for various voltage class GIS is analyzed.

Introduction

In recent years, most of the utilities are installing power equipment with higher rated currents and fault currents. The dimensions of the conductor are mainly decided by the rated voltage for extra high voltage (EHV) I ultra-high voltage (UHV) class systems and rated current in case of medium voltage (MV) / high voltage (HV) class gas insulated switchgear (GIS). The GIS bay configuration are decided basically by dimensions of conductor and enclosure. It is important to finalize these dimensions prior to design of various modules of GIS. The profile of conductor and enclosure depends on rated voltage and current of GIS. Wall thickness of conductor decides temperature rise of conductor for a particular tube dimensions (mainly decided by basic insulation level of GIS). Similarly, wall thickness of enclosure is based on operating gas pressure, type of material and internal arc fault current duty requirements.

Power losses in GIS are mainly two parts: one is conductor losses and the other one is grounded enclosure losses. These losses depend on type of material used for conductor and enclosure, rated current, length of GIS circuit, rated voltage of substation and most importantly on design of GIS. The contribution of losses due to enclosure shall be more in case it is made up of high resistivity material. Hence, the losses are strongly influenced by enclosure return current also. The enclosure current mainly depends on type of grounding circuit, number of grounding rods, grounding grid design. inter-phase bonding between phases of GIS etc. In practice this current is possible in the order of 70 to 95% of main conductor current. The selection of material for bus bars (conductors) and enclosures is usually based on a balance of mechanical and electrical characteristics, economics and availability. High conductivity copper has been in use as bus conductor for many years due to excellent electrical and mechanical characteristics. However, there is a change in the trend towards Aluminum alloy due to advantageous like reduced cost, weight etc. in recent times. The power losses mainly depend on resistance of the HT conductor and enclosure. Based on current rating of GIS, the enclosure can be steel or aluminium-alloy (to reduce induced current losses) in various configurations like straight section, elbows, three-way, four-way, angled elbows etc.

Aluminum tubular conductors are located within the enclosures supported by insulators made of epoxy resin or similar material. Joints in the conductor with proper allowance for thermal expansion are designed for GIS application. To allow for thermal expansion of the chambers/enclosures and to permit some variation of

dimensions due to civil and manufacturing tolerances, stainless-steel bellows are interposed on long runs of chambers/enclosures and where transformers are directly connected to GIS.

Three dimensional coupled electromagnetic field analysis is used to estimate the power losses. Thermal analysis to estimate the temperature rise has been carried out using Finite Element Method (FEM) based software. The output of electromagnetic analysis acts as input to the thermal analysis. The magnetic field analysis due to main current in conductor and eddy current in enclosed tube has been carried out using ANSYS/EMAG. The power losses have been estimated for different conditions like symmetric currents and asymmetric currents. Temperature field analysis has been carried out in FLUID142 element of ANSYS using estimated power losses as input. When there are overheating zones in the GIS conductor, heat gets transferred to the enclosure through SF6 gas and a local overheating area may be extended to the enclosure surface. The overheating zones can successfully be found using the infrared thermometer by sensing the temperature of the tube/enclosure surface. 3-D multi-physics coupled model was established to analyze the electromagnetic field, temperature field and gas flow field of 252 kV GIS bus. Then, the temperature rise characteristics in GIS and the influence of load current and ambient temperature have been reported.

Rayleigh number suggests whether the fluid flow is laminar or turbulent. If the Rayleigh number increases beyond the critical number, the flow converts from laminar to turbulent. Heat transfer and temperature rise of GIS bus bar have been determined using CFD software. Experimental verification has also been carried out for verification of Rayleigh number transition region.[4] Temperature distribution plots of 220kV GIS have been plotted through simulation. Various conditions like eddy current loss, SF6 gas convection heat transfer and load currents have been considered for simulating temperature field distribution of different parts of GlS. The model of GIS has been developed using COMSOL Multi-physics platform. SF6 gas usually used for insulation between conductor and enclosure of GIS. Temperature field analysis of GIS has been carried out through simulations for different insulating gases like SF6, nitrogen. Carbon-dioxide, pressurized air etc.. The analysis has also been carried out with mixture of SF6 and nitrogen. The suitable substitute for SF6 gas can be selected from the results presented in this paper.

A new magneto-thermal finite element analysis to estimate the temperature rise of the GIS bus bar has been presented. The power losses of a bus bar calculated by the magnetic field analysis have been used as the input data for the thermal analysis to estimate the temperature rise.

In the present study, a numerical program has been developed to calculate power losses by considering different configurations of GIS. The normal current rating of GIS varies from few hundreds of Amperes to few thousands of Amperes. The power losses are in the order of hundreds of watts depending on the material of conductor and enclosure. Thermal design of gas insulated switchgear is also important as localized overheating may lead to weakening of insulation and in turn result to insulation breakdown. The increase in resistance of conductor in GIS due to increase in temperature must be considered for accurate estimation of thermal equilibrium. The main design parameters are insulation and current-carrying capacity. The current carrying capacity of gas insulated switchgear is limited by the maximum temperature rise of switchgear module. In view of above, the numerical program is developed to estimate the variation of power loss of conductor and enclosure and also the variation of temperature of conductor and enclosure for different specifications of GIS designs. Finally, suitability of Aluminium alloy material as conductor and enclosure of GIS for various voltage class GIS is analyzed.

GIS Temperature Rise Analysis

The heat transfer through convection from enclosure is given by equation (1)

$$Q_{ce} = h_e A_e (T_e - T_o) \qquad \text{--- (1)}$$

where Q_{ce} is convective heat transfer of enclosure in W. h_e is heat transfer coefficient of enclosure in W/m2-K, T_e is enclosure temperature in K, To is outer temperature in K and A_e is area of enclosure surface in m2.

The heat transfer through radiation from enclosure is given by equation (2)

$$Q_{re} = \in \sigma A_e (T_e^4 - T_o^4) \qquad \text{--- (2)}$$

where Q_{re} is heat radiative transfer of enclosure in W. $\in$ is emissivity of material, σ is Stefan-Boltzmanns constant, T_e is enclosure temperature in K, T_o is outer temperature in K and A_e is area of enclosure surface in m2.

The heat dissipated by enclosure is sum of resistive losses of enclosure and resistive losses of conductor as given by equation (3).

$$Q_{de} = 1_e^2 R_{eo}\left(1 + \propto_e (T_e - 293)\right) + 1_c^2 R_{co}\left(1 + \propto_c (T_c - 293)\right) \qquad \text{---- (3)}$$

where Q_{de} is heat dissipated by enclosure in W, l_e is enclosure current in A. 1_c is conductor current in A. R_{eo} is resistance of enclosure in ohm at 20ÚC, R_{eo} is resistance of conductor in ohm at 20ÚC is coefficient of thermal expansion of enclosure and $\propto_c$ is coefficient of thermal expansion of conductor.

Now the heat balance equation for enclosure is given by (4)

$$Q_{ce} + Q_{re} - Q_{de} = 0$$

$$h_e A_e (T_e - T_o) + \in \sigma A_e (T_e^4 - T_o^4) - 1_e^2 R_{eo}\left(1 + \propto_e (T_e - 293)\right) - 1_c^2 R_{co}\left(1 + \propto_c (T_c - 293)\right) = 0 \qquad \text{----- (4)}$$

Similarly, the heat balance equation for conductor is given by (5)

$$h_c A_c (T_c - T_e) + \in \sigma A_c (T_c^4 - T_e^4) - 1_c^2 R_{co}\left(1 + \propto_c (T_c - 293)\right) = 0 \qquad \text{----- (5)}$$

Where T_c is conductor temperature in K and A_c is area of conductor surface in m2.

The fourth degree equations given by (4) and (5) can be solved using any numerical method. For instance, it can be solved by using Newton-Raphson method given by equation (6)

$$x(n+1) = x(n) - \frac{f(x)}{f^1(x)} \qquad \text{----- (6)}$$

The relative error between *x(n + 1)* and *x(n)* is given by equation (7). If the relative error is less than the desired value then the solution converges and displays the final value *x(n +1).*

$$E = \frac{x(n+1) = x(n)}{x(n+1)} \qquad \text{----- (7)}$$

(To be Continued)

Courtesy: Ieema Journal, February 2022

"The cheerful mind perseveres, and the strong mind hews its way through a thousand difficulties." – SWAMI VIVEKANANDA

POWER MINISTER INTERACTS WITH STAKE HOLDERS ON THE DRAFT POLICY ON ESS

ESSs will benefit Gencos, Discoms, Grid Operators, and other players…

The Union Minister of Power and New and Renewable Energy, R.K. Singh recently interacted with Renewable Energy developers, industry and various government representatives to discuss the elements of the draft Policy on Energy Storage System (ESS) to promote the creation of storage systems on a large scale across the country. The policy aims at the creation of technology-agnostic storage system across the value chain of the electricity sector viz. at generation, transmission, and distribution levels.

In the meeting held on 25th January 2022 with representatives of the industry, Singh galvanized the industry representatives and called for their active participation in establishing storage systems and associated manufacturing industries domestically within the country.

On a later date, the minister also took a subsequent meeting with Principal Secretaries and CMDs of Renewable Energy Rich States viz. Punjab, Rajasthan, Maharashtra, Andhra Pradesh, Karnataka, Telangana, Kerala, Tamil Nadu, Gujarat & Madhya Pradesh. The states welcomed the policy initiative taken by the Government of India for promotion of Storage Systems in the country. They also highlighted the efforts being taken on their side to promote pumped storage projects and Battery Energy Storage Systems.

Singh stressed on the need to establish storage systems on a wide scale in the country. He informed that Energy Storage System (ESS) shall be an integral part of the power system under the Electricity Act and that setting up of standalone ESS may be made as a delicensed activity.

"Keeping your body healthy is an expression of gratitude to the whole cosmos- the trees, the clouds, everything." – ***THICH NHAT HANH***

CHENNAI THAT WAS MADRAS

A new book touches on everything significant to the city — history, art, food, the people, language, architecture, cinema, politics, and also the Cooum, its most infamous river.

Every city deserves to have its stories told, ideally, by a fine raconteur. Chennai, or Madras to some, has been lucky on this count — for decades now, people in love with the city have been telling tales of the city, unearthing nuggets of information, from time to time, regaling other lovers of the city with their discoveries. As we live on in the present, the past wafts by gently, keeping alive nostalgia, even intrigue, and contributes greatly to the pride that keeps a people anchored to a city, no matter where in the world they actually live.

V. Sriram's recent book *Chennai: A Biography* ticks all the right boxes, and then some. An exhaustive account of all things Madras right through to its Chennai avatar, though some might argue that they are the same. But they are not quite the same, are they? Cities are not immutable; a vibrant city is a breathing, pulsating, nonlinear shape shifting crucible for the people in it. Sometimes, a road sign, a few bridges here, a few pavements there tell you how it has changed, and at other times, it's just a perception, palpable and yet not exhibitable, for how the city you know has changed.

Outing Picture taken in 1973 shows a family enjoying a boat ride on the Cooum.

Sriram's work captures this mutability and for a city that is officially 380 years old, but possibly truly over 650 years in the making, very well indeed. While he clearly loves the city, he has no compulsion to judge, allowing its acknowledged flaws to rise in the narrative, tackling it with his tongue firmly tucked in his cheek. In manner and form, Sriram's narrative is not very distant from the style of his guru — the father of Madras history, S. Muthiah. It's easy to see other similarities too — in his devotion to history, telling the stories of the past that seem to help you make sense of the future, the diligence with which he teases out a mere nugget from history, the green room gossip tales he seems to know of. But make no mistake, Sriram is striking his own path

too, through this book, but also with his involvement with the city through social media, the history walks and the videos.

Extensive research

At every turn of the page, scholarship glances off the paper, the volume of research and the effort that went into this book are to be acknowledged and feted. From legging it to temples for the fading inscriptions on their walls, digging up old dusty archives, newspaper articles, plucking out references from old poems, historians' accounts, other books, peering intently at the cupolas of the Indo Saracenic-style buildings that dot this landscape, clearly, Sriram has gone that extra mile to deliver content that is enjoyable, even while maintaining the rigours of academic research.

Nothing left out

This book touches on everything significant to the city — its history, yes, but also art, food, aromas, the people, the civic administration, architecture, cinema, its politics, its language, temples, music, traffic, its constant aspiration to become Singapore but never quite getting there, Margazhi, theatre, hospitals and education, its gutters, slums, beaches, housing complexes, and of course, the Cooum, Chennai's most infamous river. Most of these come with interesting anecdotes, like the nugget about how the famous muster roll scam interestingly came to light, or even more fascinating, the story of how underground sewers came to be in the world's second oldest Corporation.

He reached into the folds of this reputably 'conservative' city to discover its fun aspects, its language (the etymology of the quintessential Madras Bashai, the lingo of Chennai), its tendency to make politicians of film stars.

There is no doubt that this well-indexed volume should be counted among the reference books on Chennai. It will be worth its value and more for schools, universities, students, researchers and even journalists scouting to authenticate references from past history. It's also a good book to have on your shelves, if you consider Chennai your own, for a casual read at tea time, or to pick stories from to regale dinner guests. There's a veritable smorgasbord of content available in this book, depending on the profession of your guests, or their political inclination even, a range that will sustain several dinners over.

Missing some pictures

And yet, with this book, one wonders if a few, well laid-out pictures of the city would not have been out of place. People who love to read about the past also love to dip their noses into sepia frames, or fading black and white ones, on glossy news print, perfect accompaniments to the ink on the pages.

One would assume personal and public collections might have plenty of authenticated photos that are within reach. Sriram has served what a resident of this city would have called a 'top class breakfast' of steaming hot idlis, but where are the mandatory accoutrements of sambar, chutney or even filter coffee? Maybe subsequent editions of Chennai will ladle out the sambar and coffee too, because somehow pictures are like the aroma of good filter coffee. They are touchstones that transport you instantly to a nostalgic past, even as Sriram's well-crafted words do much of the job.

Chennai: A Biography V. Sriram Aleph Book Company Rs. 899

Ramya Kannan

"The human body has been designed to resist an infinite number of changes and attacks brought about by its environment. The secret of good health lies in successful adjustment to changing stresses on the body."

– HARRY J. JOHNSON

ENERGY – GLOBAL MISSION AND INITIATIVES INDIA'S COMMITMENTS AND STRATEGIES - 5

Sustainable Growth, Sustainable Energy, Emission reduction and Renewable Energy.

CoP 26 is considered an important step forward towards commitment to take steps to reduce carbon emission and ultimately **reach Net "0" Emission** so that the 'Global Surface temperature' is reduced to safe levels.

Carbon reduction or Net '0' cannot be imagined without addressing Coal and Petroleum and the submission is that Bio Energy can contribute to the cause in a big way.

We have been writing in these columns about the need for India to increase focus on Bio Energy with its huge potentials and the need for Technologies and Finances. India will need $12.4 trillion to meet long term net zero goals: Report of Energy World 6 4 22

The following are extracts from some of the recent press reports:

IPCC report highlights importance of bioenergy to fighting climate change

The three perspectives of energy security, energy independence, and climate change mitigation are the focus of bioenergy:

- We need to utilize the vast potential of energy production from sustainable biomass;
- We need a heat transition for climate-neutral energy security;
- We need to seize the opportunities of bioenergy to combine renewable energy production with CO_2 removal from the atmosphere.

Bioenergy is a widely used renewable energy in the world. It accounts for about ten percent of the global energy supply – for electricity, heating, cooling, and transport.

In Europe, bioenergy represents about 60 percent of renewable energy. There is room to expand the mobilization of biomass in a sustainable way and use it for modern and clean bioenergy applications.

Importantly, biomass can be stored, it is versatile and can deliver heat and power, supply fuels for transportation, or deliver renewable gas.

Bioenergy contributes substantially to climate change mitigation when it is produced from biomass that is grown sustainably or based on waste and residues; converted to energy products efficiently and used to replace fossil fuels.

Thus, bioenergy is an important and essential part of global energy security. It allows for more independence from fossil fuels.

Energy sector needs major revamp: IPCC

NEW DELHIAPRIL 04, 2022

UPDATED: APRIL 05, 2022 09:25 IST

Consortium of scientists says limiting global warming will require major transitions in the energy sector

Limiting global warming will require major transitions in the energy sector and this will mean drastically reducing fossil fuel use, widespread electrification, improved energy efficiency, and the use of alternative fuels, a consortium of scientists part of the Intergovernmental Panel on Climate Change (IPCC) said in a statement on Monday. These scientists were part of Working Group 3, or those with expertise to analyse how best the impact of greenhouse gas emissions could be mitigated.

An aspect of the report, of particular relevance to India, is that there is no place for new coal plants. The panel finds that all coal-fired power plants, without the technology to capture and store carbon (CCS), need to be shuttered by 2050 if the world aspired to limit global temperature rise to 1.5c.

According to the Central Electricity Authority, India has about 211 GW of operational coal-fired power plants — roughly 10% of global capacity. As per Global Energy Monitor data, another 31 GW was being constructed and about 24 GW in various pre-construction phases. None of the existing under construction coal-fired power plants in India have CCS facilities.

'Untapped potential'

"Having the right policies, infrastructure and technology in place to enable changes to our lifestyles and behaviour can result in a 70% reduction in greenhouse gas emissions by 2050. This offers significant untapped potential," IPCC Working Group III Co-Chair Priyadarshi Shukla said in a statement, "The evidence also shows that these lifestyle changes can improve our health and wellbeing."

The Summary for Policymakers of the IPCC Working Group III report, as the document is known, was approved by 195 member-governments of the IPCC, through a virtual approval session that started on March 21. It is the third instalment of the IPCC's Sixth Assessment Report (AR6), which will be completed this year.

Though the report was expected to be ready late last week, negotiations between scientists and governments over the report extended well into Sunday, as officials from major emerging economies insisted that the report acknowledge their developmental needs.

Methane reduction

In the scenarios by the scientists, limiting warming to around 1.5°C requires global greenhouse gas emissions to peak before 2025 at the latest and be reduced by 43% by 2030; at the same time, methane would also need to be reduced by about a third. Even if this happened, it was almost inevitable that this ceiling would be temporarily breached but, with appropriate action, it could again dip down by the end of the century.

"It's now or never, if we want to limit global warming to 1.5°C," IPCC Working Group III Co-Chair Jim Skea, said in a statement, "Without immediate and deep emissions reductions across all sectors, it will be impossible."

The global temperature will stabilise when carbon dioxide emissions reach net zero. For 1.5°C, this meant achieving net zero carbon dioxide emissions globally in the early 2050s; for 2°C, it is in the early 2070s. Even limiting warming to around 2°C would still require global greenhouse gas emissions to peak before 2025 at the latest and be reduced by a quarter by 2030, their report emphasised.

"The latest IPCC report is a stark reminder to all developed countries to significantly bring forward their transition to a net-zero economy. This would leave additional carbon space for countries like India to meet their development priorities on the path to achieving their net-zero target. Further, to accelerate the low-carbon transition, developed countries should ensure higher flows of finance and technology transfer in critical areas such as renewables, electric vehicles, green hydrogen, and others. Failure to arrest the planet's warming to 1.5 degrees Celsius is likely to cause irretrievable damage to our ecosystems, which in turn could disproportionately devastate the economies and vulnerable communities in the Global South," said Arunabha Ghosh, CEO, Council on Energy, Environment and Water.

India has committed to net-zero year, or when it would cease to be a net carbon dioxide emitter, of 2070 and has defined a pathway to transition to renewable energy sources but also insisted on its right to coal use given its developmental needs as well underlining that the historical responsibility of climate change from fossil fuel rested with the developed countries, who needed to shoulder much of the mitigating burden.

Why India needs to count on sustainable bioenergy

India needs to look for ways out of its dependence on coal, oil, and especially gas, moving towards climate neutrality.

Energy savings and renewable energy are the key tools to achieve that.

Solar and wind energy are presently the focus of public attention when it comes to sustainable energy independence and energy security.

More attention needs to be paid to the global potential of bioenergy from sustainably sourced biomass - Because without bioenergy, the urgent step toward fossil-free greater energy security and climate neutrality will not succeed. It is the overlooked giant of the energy transition.

The report - Energy Sector needs major revamp – IPCC - is brief and has pinpointed the Power Generation sector using coal fired boilers. It talks about 211 GW of installed capacity and another 50 GW being in the process for capacity addition. The report has not looked at other critical areas like usage of Petroleum and CNG, which along with coal constitute the major 'Fossils'. A brief summary of urgent actions, developments and adoption of technologies, touching on some of the areas are given below, which can all be taken up for further deliberations with the participation of experts.

Glancing at usage of 'Primary Sources of Energy' in 2021, which is approximately put at 1000 MTOE, Coal is about 500 MTOE (about 1000 Million Tons of Coal) and Petroleum Crude about 200 MTOE (200 Million Tons of Crude Oil). For Net '0', coal and oil have to be addressed and solutions found to eliminate large portion of them if not the whole. Almost the whole of Coal is used for Power Generation and almost the whole of petroleum is used as Fuel for Automobiles. We all know that there are lots of efforts to address the Power Generation with Solar and Wind to a great extent, with the commencement of National Solar Mission in 2010. But the most important point to realize is that when it comes to availability of Electricity 24x7, storage etc become essential which makes it uneconomical. There are large plans to address the automobile fuel with EV and Hydrogen Power etc, which are also seeing progress.

The Report pinpoints about need for TECHNOLOGY and FINANCES for a country like India to proceed and contribute in a big way for Net'0' by 2050 (or 2070). This is very important and the list of solutions which are detailed below will illustrate the point.

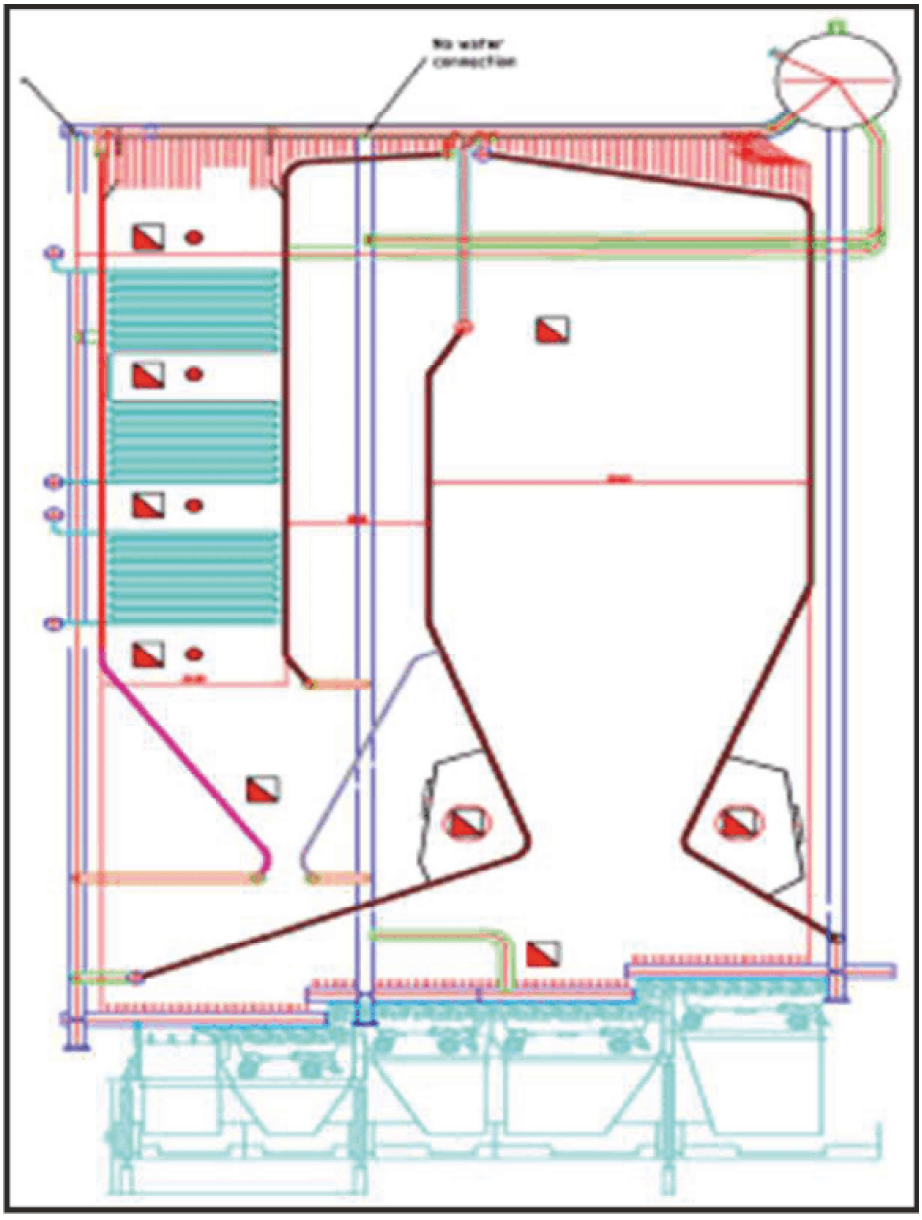
Having been involved in some field studies with an MNC Company some years back, the author has a clear perception that India has a huge untapped potential in the area of "BIO ENERGY" and has been presenting

details which have been presented in these columns based on the studies and discussions. With the support of Technology and Finances, it could really be easy for India to make a huge progress towards Net'0', with year on year progress. All Bio Energy solutions are "Firm" and can facilitate availability 24x7.

In the brief below, what is listed first are some of the large Programmes (including Bio Energy) initiated by Government of India, which all need to be accelerated, followed by Programmes that can be commenced with the identification of sources and transfer of Technologies that are already developed in countries like Europe, US and others.

1. India has large dependence on Lift Irrigation for its agriculture and as on date there are more than 20 Million Electrical Pumping sets in use all over the country. It is very fitting that all these Electrical Sets are converted to use Solar Energy, and in case the entire lift irrigation is shifted to Solar, it can relieve energy consumption by over 50 GW from the Grid. Government of India has already announced a scheme for about 1.2 Million Pumping Sets with a Subsidy of 70%, loan of 20% and 10% to be met by farmers. Some states like Haryana has made some progress and this needs to be accelerated. The point is that if the farmers go with 'Grid Connected' Solar installations, they could probably show some earnings too, as they will not need to use pumping sets round the year and on all days.

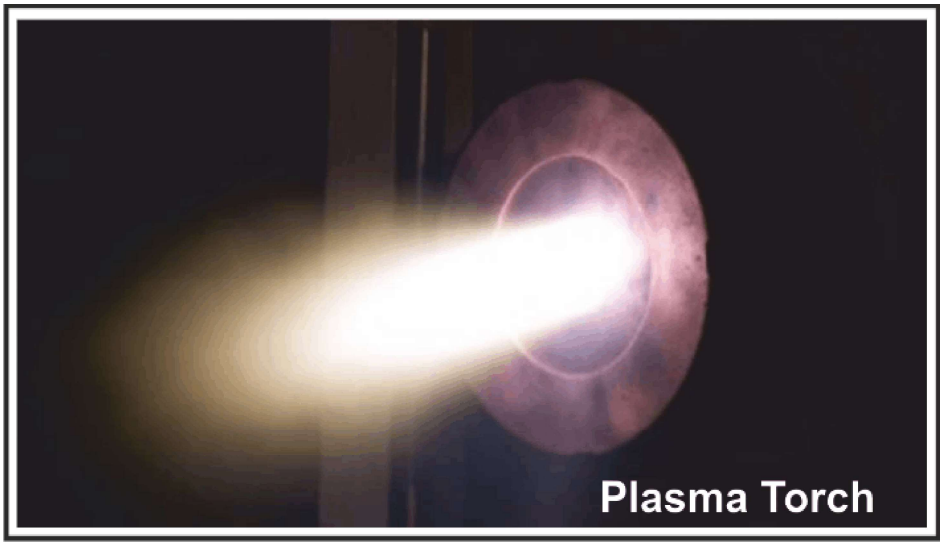
2. Government of India has already launched an initial scheme for producing 15 MTOE (15 Million Tons of Petrol, Diesel and CNG equivalent) of Bio CNG or CBG with potential of over 63 MTOE. This CBG can be used as Auto Fuel or Cooking Gas or as Fuel for Power Generation through Gas Turbines or "Bloom Energy" Plants. There is progress (PM Inaugurated a CBG Plant at Indore recently) but it needs to gallop.

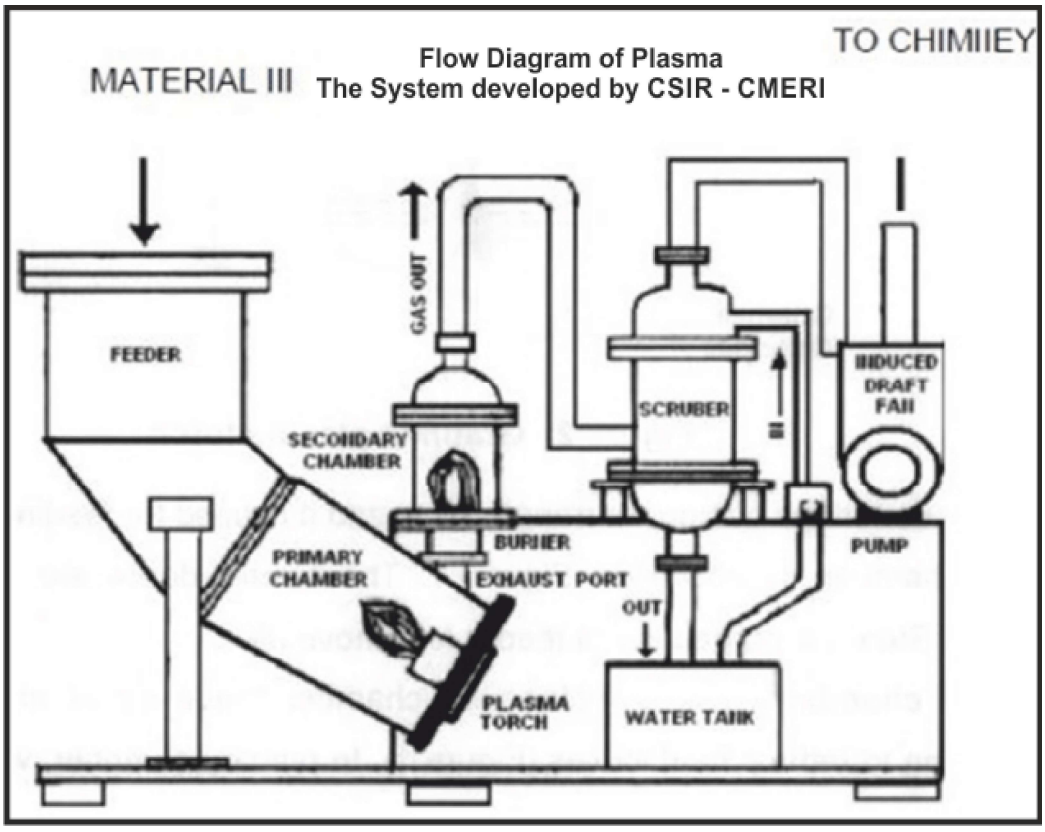


3. Power Generation utilizing Biomass has not progressed substantially in India because, the technologies of combustion and gasification employed require use of dry woody biomass or easily combustible materials. As the costs of these materials have escalated and the availability limited, viability have become a problem. What is needed is a combustion technology that can handle any biomass

including difficult to burn types like poultry litter, straw and many more, even with moisture content of say 30 to 40%, which are available in plenty in many clusters and all over the places. Biomass power plants with boilers utilizing the technology of special grates and water walls are developed and are in use in many parts of Europe. We should get this technology and can probably standardize on a capacity of say, 7.5 MW capacity to restrict the biomass transportation needs. The author's study included some Poultry, Coconut and Arecanut clusters and a Taluq level study of availability of various kinds of Biomass. It was seen that the clusters can take a number of 7.5 MW Plants and each Taluq (India has a total of about 5200 Taluqs) can easily take one 7.5MW Plant or more. Given below is Illustration of a special grate water wall boiler.

4. Wastes and Biomass to Power through PLASMA Gasification 1





"Plasma Gasification" is a proven technology for gasification of any kind of biomass for heat or power generation. The initial costs could be high, but the technology is found effective even for MSW. Central Mechanical Engineering Research Institute, under CSIR developed a Plasma Gasification System specially to address plastic wastes to produce electricity. They are designed to handle even smaller quantities like 1 Ton per Day (TPD) to 500 TPD. Globally, Westinghouse has patented Plasma Torches which are highly Energy Efficient.

5. Biomass to Bio Oil or Bio Crude production utilizing 'Pyrolysis' technology seems to be a high potential area for India. The author's study was around the sugarcane cultivation area feeding to a sugar factory and the biomass focus was the trashes and tops which are abandoned in the fields and are later burnt. A Mobile Pyrolysis Plant with capacities to handle about 10 Tons per day could be a good solution as the transportation of biomass can be avoided, taking the mobile plant right to the fields. India, the second largest producer of sugarcane, has an annual production of 380 Million Tons of sugarcane, generating about 60 Million Tons of trashes and tops, which can help produce about 30 million tons of Bio Oil. This technology can be used for other kinds of biomass too. Technologies are developed and in use in Europe and Canada. The Picture below is of a 10 Tons per day, Mobile Plant put together in a University Industry collaboration Project in Canada.

There are quite a few more Bio Energy Technologies like TORRIFACTION, HYDRO THERMAL CARBONIZATION and so on which have all been developed in many countries and India has potential to apply all of them. The initial costs could be addressed with Technology Transfer and Local Manufacture and so on.

(To be continued)

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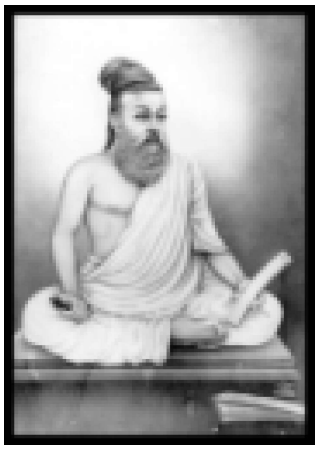
TIRUKKURAL ON CITIZENS



We are all proud that we are a great, large and sustaining democracy of the world, with diversities to the maximum. Let us remember with pride that we are the oldest civilization of the world too and there are lot of evidences to show that even when the kings were ruling, the system prevailed that they were ruling on behalf of the people. This is how, then or now, the quality of people or citizens of the country decide the quality of the democracy and the rule. Though there are lots of areas in our country's democracy, where corrections and improvements are urgently needed, we can certainly hope for betterments, addressing both the leaderships and the quality of citizens. The Kurals chosen will bring out some of the important qualities of honorable citizens.

Vazhanguva Thuulveezhnthak Kannum Pazhangudi Panbil Thalaippiridhal Indru Kural 955

வழங்குவ துள்வீழ்ந்தக் கண்ணும் பழங்குடி
பண்பில் தலைப்பிரிதல் இன்று. *குறள் 955*

"Behold the men who come of ancient and noble families, they give not up their liberality, even when their means of munificence are diminished."

Nalamvendin Naanudaimai Vendum; Kulamvendin Venduga Yaarkkum Panivu Kural 960

நலம்வேண்டின் நாணுடைமை வேண்டும்
குலம்வேண்டின்
வேண்டுக யார்க்கும் பணிவு. *குறள் 960*

"If thou desire virtue, thou must cultivate the sense of shame; and if thou want to honour your family (and the community and society at large) thou must be respectful unto all."

FOR LOVERS OF ENGLISH LANGUAGE

I met a surgeon who named his son Naïf (pronounced Knife).

I said what an apt name!

Then I came to know the following:

1. Lawyer's daughter Sue.
2. Radiologist's son Ray.
3. Ophthalmologist's daughter Iris.
4. Florist's daughter Rose.
5. Mechanic's son Jack.
6. Archaeologist's son Doug.
7. Thief's son Rob.
8. Gymnast's son Jim.
9. Jeweler's twin daughters Ruby and Pearl.
10. Ornithologist's son Robin.
11. Orthopedician's son Boney.
12. Barber's son Harry.
13. Solicitor's son Will.
14. Accountant's son Bill.
15. Horticulturist's daughter Ivy.
16. Gardener's son Pete.
17. Monarch's son Prince.
18. Dramatist's daughter Oprah.
19. Sanitation engineer's son John.
20. Highway engineer's son Miles.
21. Dietician's daughter Olive.
22. Actor's son Oscar.
23. Photographer's son: Click.
24. Gastro-physician's daughter: Enema
25. Homeopath's daughter: Arnica.
26. Teacher's son - Mark

"To keep the body in good health is a duty...otherwise we shall not be able to keep the mind strong and clear." – BUDDHA

HOME FESTIVALS - 6

ஆனி - Aani (June/July)

This is the one month of the year when there are no home festivals — coinciding not uncoincidentally with an intense month of agricultural effort. However, during Aani, major temple festivals are held for Lord Siva as Nataraja, King of Dance (left), and for Siva and Parvati.

HOME FESTIVALS - 7

ஆடி - Aadi (July/August)

There are two major home festivals this month. The first is **Adi-Perukku**, in honour of the Kaveri River. Women and girls go to the nearest river where they place offerings on a bamboo tray (upper left) into the water, then have a feast upon the riverbank. **Varalakshmi Vratam** ("Vow to bring Lakshmi") is also a ladies' festival, in which paintings of the Goddess of Wealth are made upon the walls (upper right), kumbha pots intended for worship are decorated with Her image. Beside the pot are placed various cosmetics, comb, beads, etc and worship is done. Then the ladies sing songs inviting the Goddess to their home. Kozhukkatai, rice and jaggery cakes are a favourite of the day. In the evening, friends are invited to the home and given clothing, coconuts and sweets.

(To be continued)

"It is health that is the real wealth, and not pieces of gold and silver."

– MAHATMA GANDHI

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