

KSEB ENGINEERS' ASSOCIATION



IDUKKI POWERSCENE

AUGUST 2015

IDUKKI UNIT
idukkipowerscene@gmail.com

*Saluting before the memories of a great Indian Engineer
who envisioned a greater India*

Happy Engineers' Day

Sir. Mokshagundam Visvesvaraya

1860-1962

the first Engineer who awarded the
Bharat Ratna

" Remember, Your work may be
only to sweep a railway crossing,
But it is your duty to keep it
so clean that no other crossing
in the world is as clean as yours"



**Dedicated to
all Engineers and
Engineering Students
all over the Nation**



KSEB Engineers' Association, Idukki Unit,
Moolamattom - 685 589
Ph: 9744987420 E-mail: ksebeaidukki@gmail.com

Chairman	Noushad K. A. 9446008454 (CUG) 7736602437 (Personal)
Secretary	Rajasekhar Rao T. R. 9496009421 (CUG) 9744987420 (Personal)
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Powerscene Editor	Jomon Joseph 9496043173 (Personal)

PRESIDENTIAL ADDRESS

Dear Engineers,

This is an extra ordinary time to be an Engineer-Engineering and technology is continuously developing new ideas that will benefit society, Individuals, and world. Legendary engineers before us shown the great example and lead the way to ease the day to day life of our society. I am proud to extent the invitation of the engineers' day celebration on 15th September 2015 to commemorate the legendry engineer Bharat Rathna Sir. Mokshagundam Visvesvaraya(1860-1962). Engineering and technology may behind almost everything from our smart phone and the apps that can help us navigate at Sea, Track our health remotely control our homes as well as phone calls. There is something for everyone in engineering.

On this occasion of Engineers day Celebration we have a big job to do to increase public understanding of the important role engineering place in their daily lives and get more Young people excited about the possibilities of engineering carrier

Your's Faithfully,
sd/-
Chairman

Editorial Column

The Engineering fraternity across the country celebrates “Engineers' Day” on 15th September to commemorate the birthday of Sir Mokshagundam Visvesvaraya (1860-1962) the outstanding Engineer India had ever seen.

An Engineer par Excellence, he was the driving force behind the construction of many major dams and water supply schemes across the country. He was the Chief Architect behind the construction of the Krishna Raja Sagara Dam in Mysore which converted the patches of sterile land to fertile grounds for farming. The use of automatic sluice gates, an engineering innovation applied in many dams across the country was his idea. His contributions were not just in engineering infrastructure projects. He had been instrumental in setting up several industries & sectors including iron& steel, soaps, silk, sugar, banking & associates. He was called the precursor of economic planning in India. Due to his outstanding contribution to the society, Government of India conferred “Bharat Ratna” on this legendary in the year 1955.

In connection with the celebration of 48th Engineers' Day, the theme selected is “Engineering Challenges for Knowledge Era”.

The application of knowledge is considered as one of the key sources of growth in the global economy of a nation. Here we have a new terminology “knowledge currency”. Increased importance of knowledge provides great potential for the countries to strengthen their economic and social developments. Educated populations who can create share and use knowledge well be the basic pillars of knowledge currency.

As engineers we have a dominant role in the development of our Country by strengthening the knowledge currency. Novel ideas have to be developed, mastered and utilized in all engineering disciplines. Your place of work should be the factory of creativity where new products and processes are innovated which in turn forms the core of new knowledge. The life style of Sir Mokshagundam Visvesvaraya, the legendary Engineer can be the beacon for reason to gain knowledge and plunch into the depths of engineering challenges for knowledge.


Happy Engineers' Day Wishes to All


Secretary's Desk

Throughout human history, engineering has driven the advance of civilization. From the metallurgists who ended the Stone Age to the shipbuilders who united the world's peoples through travel and trade, the past witnessed many marvellous of engineering prowess. As civilization grew, it was nourished and enhanced with the help of increasingly sophisticated tools for agriculture, technologies for producing textiles, and inventions transforming human interaction and communication. Inventions such as the mechanical clock and the printing press irrevocably changed civilization. In the modern era, the Industrial Revolution brought engineering's influence to every niche of life, as machines supplemented and replaced human labor for countless tasks, improved systems for sanitation enhanced health, and the steam engine facilitated mining, powered trains and ships, and provided energy for factories.

In the last century ended, engineering recorded its grandest accomplishments. The widespread development and distribution of electricity and clean water, automobiles and airplanes, radio and television, spacecraft and lasers, antibiotics and medical imaging, and computers and the Internet are just some of the highlights from a century in which engineering revolutionized and improved virtually every aspect of human life.

Engineers must join with scientists, educators, and others to encourage and promote improved science, technology, engineering, and math (STEM) education in the schools and enhanced flow of technical information to the public at large- conveying not just the facts of science and engineering, but also an appreciation of the ways that scientists and engineers acquire the knowledge and tools required to meet society's needs.

In sum, governmental and institutional, political and economic, and personal and social barriers will repeatedly arise to impede the pursuit of solutions to problems. As they have throughout history, engineers will have to integrate their methods and solutions with the goals and desires of all society's members. So in pursuing the century's great challenges, engineers must frame their work with the ultimate goal of universal accessibility in mind.

Your's Faithfully,

sd/-

Rajasekhara Rao T.R.

KSEB AT A GLANCE

Er. Naveen T R

This August is enriched with the joy of our festival Onam. The harvesting festival showers its happiness, wealth and prosperity to KSEBL also. In addition to the DA increase, bonus and festival allowance, some important decisions were come from the central government and KSEBL that we can look forward to survive from this severe power shortage. The most important one is the environmental clearance for our Athirappally project. Proposed project includes a dam of 23 metres (75 ft) height and 311 metres (1,020 ft) width on the Chalakudy River in the Vazhachal Forest Division about 5 kilometres upstream of Athirappilly Falls and 400 metres upstream of Vazhachal Rapids (Vazhachal Falls). The proposed project is for 163MW and with minimum environmental impact. KSEBL is expecting production of the electricity in the range of 98 and 604 million units (MU) annually from this project. In addition to the 1 MW solar plant at Kanjikkode, it is also decided to install 200MW solar panel at Kasargode by Renewable Energy Corporation of Kerala, a joint venture of KSEBL and Solar Energy Corporation of India. Out of this 200MW, 100MW project will be through Central Ministry of Renewable Energy approved viability gap funding project. The other 100 MW equally by Indian Renewable Energy Development Agency and Tehri Hydro Development Corporation. Full board meeting of Directors also decided to install 3MW solar panel above the canal of Barapol SHEP. We started Onam celebration with charity activities as earlier. KSEBL given 4.15 Lakh to cancer patients in RCC in association with the blood donation camp held at Thiruvananthapuram. In the meeting, an organ donation willingness certificate signed by about 200 employees was given to Medical College superintendent.

Sri. N. S. Pillai IA &AS took charge of KSEBL Director (Finance) on 13-08-2015. He has been working as Accountant General in Chattisgarh state. This 1995 batch IA&AS officer is a native of Kollam. He had been also working as accounts member and performance audit officer in Kerala.

In this month board also decided to lay optical fibre cable to connect different substations so as to enhance communication facility. Recovery of CESS on the cost of building and other construction work was another important decision taken by KSEBL as per the direction in CAG audit report. The CESS rate is one percent of the total cost incurred by the employer. This amount will be credited in a special welfare fund of building and construction workers.

Board also decided to dispose the e-waste in various offices and premises of KSEBL. The convenor of waste disposal committee is authorised to dispose the wastes by the limited quotations from three predefined firms and to accept the highest offer. It is also decided to promote hydel tourism in Mattupetti as well as in Aanayirankal dam. Mattupetti tourism project is known as Sun Moon Valley as we can see sun and moon simultaneously on the horizon in certain days. Aanayirankal tourism project is known as Elephant Abode as its one of the favourite place for elephants. KSEBL is expecting the sightseeing and boating in these centres will attract more and more people to this venture.

Earlier column of at a glance started with the discussion of anomaly transfer orders. In this month also, there is not much change in the case of anomaly orders. Several transfer orders of AE and AEEs came in this month also, raising a question in my mind how long the discussion of anomaly orders will pursue in this column. It's time for us to think about whether this is fair on the part of an organisation like KSEBL. The significance of Engineers' Association is very high in this context as we are the only association who can demand strongly for the implementation of online transfer system.

The water storage in hydroelectric projects is not hopeful. The dip in the expected monsoon adversely affects the storage. The intermittent weak rain keeps the storage in Idukki dam in and around 55%. The Maximum Consumption and Maximum Demand in this month was 65.47MU (on 25-08-2015) and 3492 MW (on 31-08-2015) respectively.

*We welcome your valuable articles to
idukkipowerscene@gmail.com*

INTEGRATION vs DISINTEGRATION

Er. Jayeshlal S.R.

31st December 2013 was a memorable day for the Indian Power Sector. The then existing NEW grid was synchronised on this day with the S grid forming a strong National Grid which was then fondly called as ONE Grid. The much highlighted slogan was One Nation – One grid – One Frequency.

Formation of State Electricity Boards was the first major development in power sector in Independent India by transforming the various Electricity Departments and corporations into State Electricity Boards. The reorganised State Boundaries still remained boundaries for the network too. In 1964, five regional Electricity grids were formed by the Central government with the concurrence of the states with a view to strengthen the network and to ensure regional cooperation in Power Sector. For decades, the Electricity system in India remained as five regional grids. The merger of various regions to form stronger and stable network has begun in October 1991 with the merger of North-East and Northern grids. The synchronisation went on to West in March 2003, North in August 2006 and finally the Southern grid to complete the transformation in 2013. Even though Direct Current linkage between various regions existed previously, the system eluded the nature of a common grid due to existence of different frequencies.

Now that the Nation has a single largest electricity network with a common frequency assumes significance when the electricity sector itself has passed through major structural changes across the country. Post enactment of Electricity Act 2003, the State Electricity Boards were chopped into many pieces that were suited to the needs of certain corners, neither in public interest nor in National interest. The spurt of various 'Gencos', 'Transcos' and 'Discoms' really did not serve any additional purpose than destroying the common privileges previously enjoyed by the public. While private participation in Power Sector is mooted as the best means for creating a competitive atmosphere in the field, it is important that improvement of quality of power and services can certainly be achieved without private players.

One may curiously look at the striking indifference in the developments. When the network grows stronger and boasts of a national pride, the constituents go solo disintegrating the national perspective. The Electricity sector as of now cannot boast of a centralised organisation despite having common laws governing them. Need of the hour is the vertical integration of the Power Sector to stand tall against the Indian Railways, Indian Customs Department, Income tax Department etc. The former State Electricity Boards can become new Electricity zones, still accommodating the regional imbalances. The organisation will then become the single largest in the country in terms of employee strength and service rendered.

Hope the next transformation in Power Sector
will achieve this goal.

Synchrophasor Technology –Devices (PMUs) and Applications

Er. Pradeep S.V.

Part I

Introduction

A phasor measurement unit (PMU) or synchrophasor is a device which measures the electrical waves on an electricity grid, using a common time source for synchronization. Time synchronization allows synchronized real-time measurements of multiple remote measurement points on the grid. In power engineering, these are also commonly referred to as synchrophasors and are considered one of the most important measuring devices in the future of power systems. A PMU can be a dedicated device, or the PMU function can be incorporated into a protective relay or other device. Dr. Arun G. Phadke and Dr. James S. Thorp invented the PMU in 1988. Early prototypes of the PMU were built at Virginia Tech. Macrodyne built the first PMU (model 1690) in 1992.

Motivation for Synchrophasor technology

Before we go through the technology let's know why we need synchrophasor technology. What special thing it can provide than the previous technology not providing.

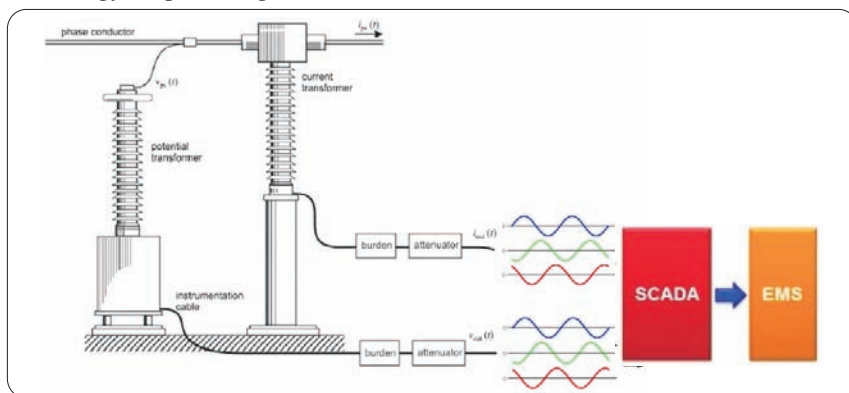
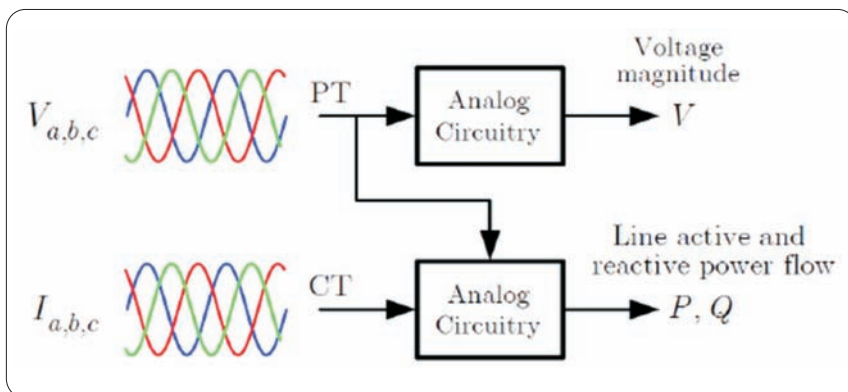


Fig.1 Present system of measuring data using SCADA Technology

Measured values sampled generally every 4-6 seconds are displayed on the Energy Management System (EMS) screens.



Bottle necks

System monitoring is more critical during disturbance and transients
 Faster synchronized data is needed to capture the dynamics
 Fast real time control is possible only with real time situational awareness
 Time synchronized wide area measurements are not available from SCADA.
 Angle Measurements are not available from SCADA

Synchrophasor Technology nothing but going from
*'still photography of sections of the power system
 with limited time synchronization'* to *'video photography of the entire
 power system in a time synchronized manner'*.

(To be Contd.....)

POWER SYSTEM PROTECTION

Er. L. Manoj Gopal

Why the CT secondary should not be kept open?

We know that for a transformer the primary current depends on the current in the secondary. But in a Current Transformer the primary current is the line current itself and is independent of the CT secondary current. The CT is normally operated with its secondary in almost short circuited condition. The secondary mmf will oppose the primary mmf and so the flux in the core will be just sufficient for normal working and it will not be overheated. If the secondary is somehow opened while the primary is taking current, there will not be any secondary mmf to oppose the primary mmf. The unopposed primary mmf will set up high flux in the core (may saturate the core) and it will produce excessive core loss which will eventually damage the core due to overheating. Also when the secondary is open, dangerously high voltage can develop across the CT secondary which can cause failure of insulation of that winding, terminals etc., and can cause shocking hazard to personnel working in the C&R panels. This will result in the failure of the CT. Don't be under the impression that the CT will flash immediately when the secondary is open. There were cases of CT remaining healthy for one or two days even after secondary opening in my experience (Remember those CTs were of low ratio and installed in lightly loaded feeders!). But please don't belittle CT opening because the CT damage can happen quickly also and it depends on many factors like amount of continuous load current (primary current), CT Ratio, occurrence of a fault when the secondary is in open condition, voltage level etc. So never leave the secondary of a CT open!

In many cases the ammeter selector switch becomes the cause for CT opening. When we rotate the switch to read the current in each phase there will be chance of CT opening due to selector switch damage/loose contact and we cannot notice that also. So I strongly recommend to go for 3 ammeters, one in each phase and avoid the selector switch while placing the order for new control and relay (C&R) panels. If the CT opening is on the protection core, it can be detected by the operation of some protective functions like Earth Fault, Negative sequence, Broken Conductor etc. But if the opening is on the metering core no relay is there to detect it and so I suggested the use of three ammeters by avoiding the selector switch, so that the operator on duty can notice the same.

PRE COMMISSIONING TESTING OF CURRENT TRANSFORMERS

The following tests are generally carried out before the commissioning of a CT,

1) Ratio Test

After shorting the CT secondary cores (S1,S2) , inject a current in the primary winding (P1,P2) using the test kit. A current of 10A or 20A will be sufficient to check the ratio. Higher value of the current can be injected if the test kit has the capacity. After injecting measure the current in the secondary using a very accurate clamp meter which has accuracy of the order of milliampere. Kyoritsu make digital clamp meter Model No 2010 is commonly used by the relay wing.

2) Polarity Test

The Polarity of the CT is important for properly connecting to the relay. We check the instantaneous polarity ie the moment when P1 is positive S1 should be positive. To check this we connect a galvanometer or a center zero dc ammeter having micro/milli ampere range to the CT secondary winding with S1 to positive terminal of the meter and S2 to the negative. Connect P2 of CT to the negative of a torch battery say 1.5 V or 3V. . Just touch the positive of the battery to P1. You will see a positive kick in the meter if the polarity is correct. Otherwise the kick is in the negative direction.

3) Magnetising Characteristics or OCC

♦ Open Circuit Characteristic test or OCC is done on each secondary core. This test is to identify the protection core and metering core, check the knee-point voltage V_k and the magnetizing current I_e at V_k or $V_k/2$ etc. After disconnecting the external circuit if any, apply an ac voltage to the secondary terminals using an autotransformer. Connect a voltmeter across the circuit and an accurate ammeter in series or use a clamp meter . Slowly increase the voltage in steps and note the magnetizing current using the clamp meter connected. Tabulate the result till the core is saturated or up to the knee-point. When the core is saturated we can see a shoot up in the magnetizing current with voltage. The knee point is the point on the excitation curve where there is more than a 50% increase of magnetizing current for a 10% increase in voltage. Verify the V_k and I_e obtained with the name plate of the CT.

4) Lead Injection Test

This test is done to ensure the continuity of the CT secondary circuit and to check the actual burden of each core. We will do this test only after finishing all the external wiring from the CT secondary to relays, meters etc. After finishing this test do not do any modification in the CT secondary circuit or else we have to do the test again. Connect the current injection kit to the CT secondary terminal and inject the rated secondary current (1A or 5A if the I_n is 1A or 5A respaly). Connect a voltmeter across it to check the voltage at the time of injection. Multiply the voltage measured by the applied current and that will be the burden or VA of that core. Compare it with the rated burden. Don't do the lead injection from the

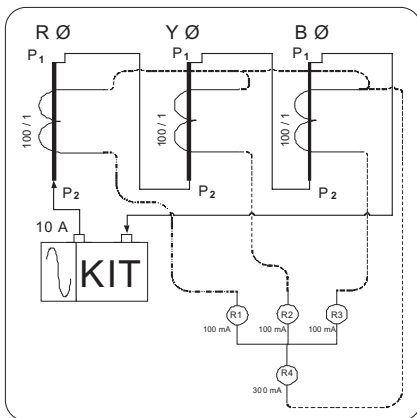
CT marshalling box, but do it from the secondary terminals of the CT itself for ensuring the continuity 100 %.

At the time of current injection from each core check the current at the final point in the control panel. If there is any loose contact or open circuit we can find out the same while testing. If the circuit is open we cannot inject the current from the kit and if there is loose the burden will be very high. To find the correct spot of loose contact or open , inject part by part; that is after shorting at the CT marshalling box (MB) inject from CT secondary to MB, from MB to C & R panel etc.

When we inject current from the CT secondary it will pass only through the external circuit not to the CT secondary because of its high impedance. Or in other words if we inject 1A from the CT terminal, we get 1A itself in the ammeter or relay in the control and relay panel. In my experience there were two cases of not getting the applied current at the receiving point. In one case it was leakage due to the low meggar value of CT secondary and in othercase some current was flowing in the CT secondary itself may be because of its saturation or failure.

5) Cross Connection Test

This is the test which check both the polarity and ratio. Here the CT primary is connected as shown in the figure below.



To understand the beauty of the cross connection test consider this example. You inject a current of 10 A from the kit as shown in the figure. Since all the phase CTs are of the ratio 100/1, a current of 100mA each will get in relay R1, R2 and R3. If the polarities are correct then the current in R4 will be 300mA because the current in R4 is the arithmetic addition of the currents in R1, R2 and R3. Suppose there is a mistake in the polarity of one phase in either the

primary winding or in the secondary winding, then also the currents in R1, R2 and R3 will be 100 mA each but the current in R4 will be also 100mA. This is because the secondary currents in two phases will cancel each other. If we donot check this mistake by this test and correct the polarity, it will result in the unwanted operation of relay R4 during normal working condition. (The relay R4 is an earth fault relay and will be discussed in coming volumes)

(To be Contd.....)

Service Matters

Er. Radhakrishnan C.G.

Temporary Appointments:-

Rule 9 (KS & SSR)

- (a) (i) Where it is necessary in the public interest, owing to an emergency which has arisen to fill immediately a vacancy in a post borne on the cadre of a service, class or category and there would be undue delay in making such appointment in accordance with these rules and the Special Rules, the appointing authority may appoint a person, otherwise than in accordance with the special rules, temporarily:

Provided that before a person is appointed under this clause, persons who are admittedly senior to him shall also be appointed even if they are absent from duty whether on leave (other than LWA or taking up other employment) or on foreign service or on deputation or for any other valid reason, (except due to suspension) and allowed to continue as such subject to the condition that persons so appointed shall not be eligible for the higher time scale of pay by virtue of such appointments unless otherwise specifically ordered by the Government.

- (iii) A person appointed under clause (i) shall be replaced as soon as possible by a member of the service or an approved candidate qualified to hold the post under the said rules.

(Provided that persons appointed under clause (i) shall be replaced in the order of seniority based on length of temporary service in the unit.

- (v) There shall be paid to a person appointed under clause (i) or clause (ii) the minimum pay in the time scale of pay applicable to such service, class or category:

Provided that, if the person appointed is a member of another service, he shall be paid the pay admissible to him in the higher time scale based on the pay in the lower time scale applicable to him under the rules regulating the fixation of

pay, if such pay is higher. He shall be paid increments in the time scale at the intervals, as fixed by the Government from time to time.

Provided further that persons appointed temporarily through employment exchanges shall not be eligible for increment in the time scale even if they complete the prescribed period of service fixed for sanctioning such increment.

Probably this would be the most controversial rule that KSEB LTD has ever used. Even I am a victim of the misinterpretation of this rule. I had to work as Assistant Engineer for 5 years without increment. Clause (v) clearly states that if the person appointed is a member of another service, he shall be paid increments in the time scale. But in the appointment order it was deliberately written that “he shall be paid increments in the substantive lower post only.” By virtue of this temporary appointment a group of young engineers were harassed terribly. The board even invented a new designation Assistant Engineer (Temp.) merely for harassing a group of young engineers.

(to be continued..)

Er. Asha Sunil

Do you have Charisma?

Start captivating your audience with star quality!

Amazing new research shows that people as diverse as the freedom campaigner Martin Luther King, South Africa's first black president Nelson Mandela, former US President John F. Kennedy, the actress Marilyn Monroe, Argentina's first lady Eva Peron and Britain's Princess Diana all had something in common. They had the ability to induce their own emotions in others.

If you study these people's voices and facial expressions in detail, you'll find that they communicate a considerable number of emotions. In this way they form a vibrant, attractive image of themselves. Charisma, the magical x-factor, is defined in the Oxford English Dictionary as "the capacity to inspire devotion or enthusiasm." A study of charismatic communication skills by American scientist Annette Towler proved these skills are superior to other presentation techniques. These methods can be learned and we can all use them in our presentations. Fifty percent of charisma is innate and 50 percent is trained, says British researcher Richard Wiseman of the University of Hertfordshire.

Here are some ways to train yourself in the fine art of charisma:

- 1) ***Harness the Power of Technique:*** The first way of gaining more personal appeal is to express feelings through your face and the tone of your voice. Vocal passion and silent body language work for any who employ them.
- 2) ***Master the Details:*** In sports, a few hundredths of a second can make a big difference and the same holds true for body language. Your audience will read far more than you're aware of in your body language, both consciously and unconsciously. How you walk, talk, move and act – your tone of voice together with the words you choose – all convey messages. Taken together, they create personal magnetism. A detail such as the position of your eyebrows can affect how others regard you. "A smile is the shortest distance between two people" said entertainer Viktor Borge. A smile goes beyond any intercultural communication difficulties. But it has to come from the heart. When you speak, use the full potential of your voice. A person with strong convictions and powerful feelings often appears attractive and charismatic. Use those feelings in your speech.

3) ***Be Poetic***: Speaking in pictures is another way of increasing your charisma. Why are metaphors, similes and anecdotes so effective? They go directly to our subconscious and, therefore, aim straight for the goal. So, build bridges by using imagery and reach the listener so that he or she more can easily remember what you say. Each individual can interpret your images in his or her own way. Poetic wording also forms alluring sound bites.

4) ***Share your Vision*** : Visions attract! Do you know how to express your dreams meaningfully? Start by cultivating your own passions. If you can imbue others with hope, energy and enthusiasm – making them believe your ideas are possible – you will certainly gain their interest.

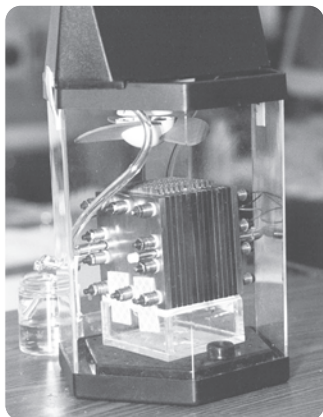
With Courtesy to : TM Amardeep Shinde, Excel Oman Toastmasters

Fuel cell -An Introduction

Er. Naveen T.R.

Power demand is increasing in a steep manner. In order to cop up with the rise in consumption, we have to increase generation. Now the world is searching for effective alternative power sources for the sake of sustainability of power sector. Here my humble attempt is to give an introduction about fuel cells. Even though now its application is limited (distributed generation, supply for remote or locomotive etc.), the advancement in technologies will help to produce electricity in bulk amount with a reasonable cost.

A fuel cell is a device that converts the chemical energy from a fuel into electricity through a chemical reaction with oxygen or another oxidizing agent. Welsh Physicist William Grove developed the first crude fuel cells in 1839. The first commercial use of fuel cells was in NASA space programs to generate power for probes, satellites and space capsules. Since then, fuel cells have been used in many other applications. Fuel cells are used for primary and backup power for commercial, industrial and residential buildings and in remote or inaccessible areas. They are used to power fuel cell vehicles, including automobiles, buses, forklifts, airplanes, boats, motorcycles and submarines. Commercial type fuel cell is shown in figure



In many cases it is not feasible or possible to protect against all hazards with a single relay. So a combination of different types of relays are used which individually protect against different risks. Each individual protection arrangement is known as a protection system (protection function in numerical relays) while the integration of all is called a protection scheme. Protection for generators at Moolamattom or Lower Periyar is an example of such an integrated scheme. But with the advent of numerical type of Generator Management and Transformer Management relays, a number of protection functions can be incorporated in a single relay. The Generator Management relay at

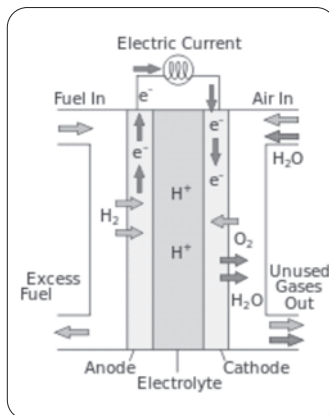
Moozhayar Pallivasal, Neriamangalam, Sengulam, Panniyar etc are examples.

There are many types of fuel cells, but they all consist of an anode (negative side), a cathode (positive side) and an electrolyte that allows charges to move between the two sides of the fuel cell. Electrons are drawn from the anode to

the cathode through an external circuit, producing direct current electricity. Hydrogen is the most common fuel, but hydrocarbons such as natural gas and alcohols like methanol are sometimes used. Working of the fuel cell is similar to that of battery. At the anode a catalyst oxidizes the fuel, usually hydrogen, turning the fuel into a positively charged ion and a negatively charged electron. The electrolyte is a substance specifically designed so ions can pass through it, but the electrons cannot. The freed electrons travel through a wire creating the electric current. The ions travel through the electrolyte to the cathode. Once reaching the cathode, the ions are reunited with the electrons and the two react with a third chemical, usually oxygen, to create water or carbon dioxide.

As the main difference among fuel cell types is the electrolyte, fuel cells are classified by the type of electrolyte they use. Fuel cells are different from batteries in that they require a constant source of fuel and oxygen to run, but they can produce electricity continually for as long as these inputs are supplied. Fuel cells come in a variety of sizes. Individual fuel cells produce very small amounts of electricity, about 0.7 volts, so cells are "stacked", or placed in series or parallel circuits, to increase the voltage and current output to meet an application's power generation requirements. A single unit of fuel cell is shown in figure.

In addition to electricity, fuel cells produce water, heat and, depending on the fuel source, very small amounts of nitrogen dioxide and other emissions. The energy efficiency of a fuel cell is generally between 40-60%, or up to 85% efficient if waste heat is captured for use. The fuel cell market is growing, and Pike Research has estimated that the stationary fuel cell market will reach 50 GW by 2020.



Salaam –e- Apps

Er.Amalchith V.A.



MalayalaSangeetham.Info:Malayalam songs database

Platform: Android

Category: Music & Audio

Developers: MSI

MalayalaSangeetham.Info, popularly known as MSI, lets you to search for your Malayalam songs from the most comprehensive database comprising of about 40,000 songs. It enables sharing details of the songs with your friends.

Songs can be searched by various options like song title, movie name, music director, lyricist, raaga, etc. Lyrics of each song along with its complete details is made available. Option of customized search allows you to search for songs with complex queries.



TrackID™:Music Recognition

Platform: Android Category: Music & Audio

Developers: Sony Mobile Communications

The TrackID™ music recognition app is the finest method to identify the music around you. Just tap the TrackID™ button and within seconds the application recognises the song you are listening to.

Now offline mode was introduced for those with limited internet connectivity. It allows you to capture the song when you are listening and will identify it later when your internet connection is restored.

KSEB ENGINEERS' ASSOCIATION



Cordially invite you to Commemorate

Engineers' Day Celebration 2015



Bharat Rathna
Sir. Mokshagundam Visvesvaraya
1860-1962

Tuesday, September 15th 2015, Time: 6:00 pm

Venue: Circuit House KSEB Ltd., Generation Circle, Moolamattom 685 589

Welcome Speech : **Er. Shaji K. Mathews**

Vice Chairman, KSEBEA Idukki Unit

Presided by : **Er. Noushad K.A.**

Chairman, KSEBEA Idukki Unit

Inauguration : **Er. Brijlal V.**

Chief Engineer (Generation)

Key-note Address : **Engineering Challenges in Knowledge Era**

Prof. Dr. M. Jayaraju

Principal, MES College of Engineering, Chathanoor, Kollam
(Former Director ANERT)

Felicitations

Vote of Thanks : **Er. Rajasekhar Rao T.R.**

Secretary KSEBEA Idukki Unit

Followed by Dinner

All Engineers are Invited



(for circulation among members only)

KSEB Engineers' Association, Idukki Unit,
Moolamattom - 685 589

Ph: 9744987420 E-mail: ksebeaidukki@gmail.com

