PANIMALAR ENGINEERING COLLEGE

(An Autonomous Institution, Affiliated to Anna University, Chennai)

JAISAKTHI EDUCATIONAL TRUST

BANGALORE TRUNK ROAD, VARADHARAJAPURAM,
POONAMALLEE, CHENNAI – 600 123

Department of Electrical and Electronics Engineering

IMPULSE (Technical magazine)

Academic Year 2022-2023

Col. Dr. Jeppiaar, M.A. B.L., Ph.D
Founder and Chairman

Message from secretary and correspondent

Engineers play the most vital and important role in nation building. They create new inventions using best engineered technologies to make human life more comfortable, secure and productive. In modern times, nations which have rich engineering and experienced management domains are flourishing economically and are providing better lives to their people We have excellent potential to grow in diversified areas and excel in Engineering and Management fields. We need enormous number of engineers and managers to write next story of success.

The essence of Engineering and Management education which has spread in India is a very positive sign not only to cater domestic needs but provide manpower to the entire world and become biggest technically trained community. JAISAKTHI EDUCATIONAL TRUST is a venture contributing to this Endeavour. We have started with full force to play a leading role in providing quality education and careers. We have identified the needs of modern engineering, technology and management education for modern age students, with a vision and mission accompanying transparency, accountability and accessibility which keeps us abreast and also ahead of our competitors.

At the outset I send my greetings to the Editorial Board of IMPULSE'22, for working on a Magazine best in all aspects. We want to provide a complete package of educational services to JET students. I believe this magazine will provide us the benchmark for continued improvement in overall development of the College. This magazine should be a good source of guidance for faculty and coming batches of students in choosing activities of their choice in their future for building their careers. I appreciate the efforts of the Editorial team who have done an excellent job in compiling JET activities over the year and disseminate them through this Magazine as well as on the JET website.

Dr. P. Chinnadurai, M.A., Ph.D

Secretary and Correspondent

Message from Director

"A DREAM COMES TRUE"

It is gratifying to be part of IMPULSE'22 and sketching this message for the consideration by the organizing and participating alumni of PEC as well as budding engineer entrepreneurs. I also thank the alumni for the space provided to express the views.

Alumni of every institution make major contribution to the institution more than any other constituent of the college / institution. They are the pillars for the decades / centuries of growth ahead in time. The complementary part is the assured personal growth to unsealed proportion as every alumnus is identified by the institution tag.

All self-financing Engineering colleges affiliated to various institutions are witnessing the era of three decades of EEE domination, which is presently tapering off. During this era the passed out students manning the needs of the EEE industry have contributed immensely to the "Shining India". These outstanding students migrated to this green pasture to pursue excellence leaving a side the core engineering area. Such a talent was not available to the societal turn around expected of Tamilnadu and India. The chronicle of academic excellence reveals missing pages of such graduates. As a result, the quality and standard of living in our villages have fallen behind the planned targets. The achievement was concentrated and centered on few cities only in which EEE companies are situated.

My view is that emphasis in placement and career choice should be highly inclusive and identify the components of academic excellence needed to do so. The well placed alumni of this institution should allocate time and money for this yeomen service. I sincerely believe that the forthcoming alumni meet will focus on many of the important issues like the present one.

I wish this meet all success.

Dr. C. Sakthi Kumar M.E., PhD.
Director

Message from HOD

Good things remain good only because they are always scarce. I am glad to pen for this wonderful magazine as an appreciation of the commendable efforts put forth by the team for its grand beginning. The efforts taken to bring about innovative content is appreciable. Content on the various opportunities available in the corporate world and alerts on various student level competitions shall be included hence forth.

EEE is the power Department of the Panimalar Engineering college With the growing demand of Electrical Engineers in the Government and private sectors, the Department is making best efforts to produce highly trained and capable engineers who can take up the challenges of the real world. The quality of academic instructions, conduct guidelines and college activities are designed to produce competent and successful engineers. In the Department, the focus is on preparing professional engineers.

It is my immense pleasure to send this message to the release of this Magazine of our Department. It is indeed a pleasure to see the progress of students at a time, when the country is moving ahead with development plans in Electrical Energy sector. I wish all the students who have involved in bringing out the magazine for their greater success and career ahead.

Dr.S. Selvi M.E., Ph.D
Professor and Head

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VISION OF THE DEPARTMENT

"To provide excellence in technical education of electrical and electronics engineering and produce globally competent engineers for the revolution of industry."

MISSION OF THE DEPARTMENT

- **To Provide good infrastructure and serene environment to our students and faculty members to meet the requirement of electrical and electronics engineering.**
- **To prepare the students through contextual technical education for their career enrichment.**
- **To impart knowledge on core engineering fields through projects, workshops and industry interaction.**
- **To prepare graduates with ethical, social and environmental awareness to demonstrate professionalism in multidisciplinary environment.**

Programme Educational Objectives (PEO)

PEO 1: To prepare students to analyze, design and implement basic electrical circuits and power systems using the knowledge of basic science and mathematics.

PEO 2: To train students with scientific and engineering knowledge so as to comprehend, analyze, design and create novel products and solutions for real time problems.

PEO 3: To prepare students with robust knowledge in core engineering for the betterment of placement, research and higher studies.

PEO 4: To inculcate graduates with communication skills, leadership qualities in their profession and adopt to current trends by engaging in lifelong learning.

PEO 5: To prepare graduates to demonstrate professionalism with social and ethical values.

PROGRAM OUTCOMES (POs)

PO 1: Engineering Knowledge : Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialisation to the solution of complex engineering problems.

PO 2: Problem analysis : Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO 3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO 4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO 5: Modern Tool Usage : Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PO 6: The Engineer and Society : Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO 7: Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of need for sustainable development.

PO 8: Ethics : Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9: Individual and Team Work : Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 10:Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large. Some of them are, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO 11: Project Management and Finance : Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO 12: Lifelong learning : Recognise the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES(PSOs)

PSO 1: Apply the basic knowledge of electrical and electronics engineering to analyze and solve the complex problems in Electrical Machines, Control Systems, Instrumentation, Power Systems and Power Electronic Systems.

PSO 2: Design and develop hardware and software requirements to meet the needs of Electric drives, Automation, Power Systems and Embedded systems based industries.

PSO3: To take up roles in a team, develop managerial skills, and contributes towards the electrical community globally

Recent Inventions In Electrical Engineering

High Efficiency Photovoltaic Cells

One of the enduring challenges of modern electrical engineering is to find an implementation of photovoltaic technology that is efficient, effective under varying operating conditions, and highly resistant to damage – while not being cost-prohibitive. Different engineering approaches have been used to raise collection and distribution efficiency, though perovskite-based cells have recently captured the most attention at major research facilities.

Green Energy Electrical Power Converter

Once you collect energy, converting it for use in the electrical system is an essential next step. A new power converter developed in the Department of Electrical Engineering at the University of Arkansas will now make it easier for users of renewable energy to shunt excess energy into the power grid. This has the potential to make rooftop solar initiatives much easier and to further incentivize homeowners to pursue energy efficient technology.

Smart Electrical Grids

As energy systems become more complex and energy sources become more diverse, smart grids are growing in importance worldwide. Smart grids integrate innovative electrical technology at multiple levels to improve flow control, detect malfunctions, and automate service delivery. With end-to-end communication between power plants, distribution sites, and the end user's electrical point-of-presence, it becomes possible to raise efficiency and reduce costs.

Personal Flying Cars

People – engineers and others – have been thinking about flying cars since The Jetsons. Now, a private U.S. firm called Terrafugia is tackling the engineering challenges necessary to deliver a personal flying craft that offers the control and safety required for regular civilian use. It calls its flagship product The Transition, which combines driving and flying in a single vehicle.

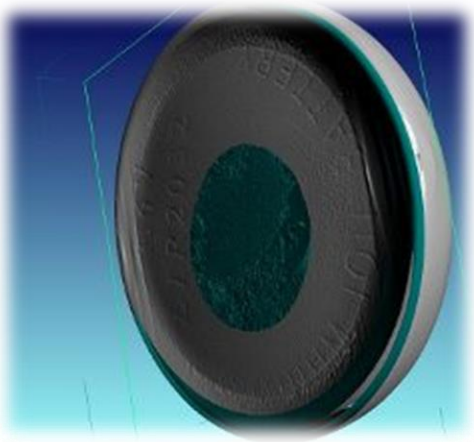
To create a commercially viable dual-use vehicle, Terrafugia has had to combine best practices in automotive technology and aeronautics. This includes a number of innovations of keen interest to electrical engineers, including an engine that successfully powers both the rear wheels and the propeller using unleaded gasoline. It also incorporates advanced carbon fiber construction.

Eye Tracking Technology

As many consumers develop an adversarial relationship to conventional digital advertising, eye tracking becomes essential – not only to deliver commercial messages, but to better understand what information is of greatest interest. As it has matured, eye tracking technology has grown into an important frontier in accessibility for the disabled, allowing technology access through eye movement. Sensitive electronic sensors are the basis of virtually all eye tracking. *-MADHAVA KANNAN. N III EEE*

Supercapacitors

Supercapacitors are an aptly named type of device that can store and deliver energy faster than conventional batteries. They are in high demand for applications including electric cars, wireless telecommunications and high-powered lasers.



But to realize these applications, supercapacitors need better electrodes, which connect the supercapacitor to the devices that depend on their energy. These electrodes need to be both quicker and cheaper to make on a large scale and also able to charge and discharge their electrical load faster. Their novel method starts with carbon-rich materials that have been dried into a low-density matrix called an aerogel. This aerogel on its own can act as a crude electrode, but Pauzauskie's team more than doubled its capacitance, which is its ability to store electric charge.

Effective supercapacitor electrodes are synthesized from carbon-rich materials that also have a high surface area. The latter requirement is critical because of the unique way supercapacitors store electric charge. While a conventional battery stores electric charges via the chemical reactions occurring within it, a supercapacitor instead stores and separates positive and negative charges directly on its surface.

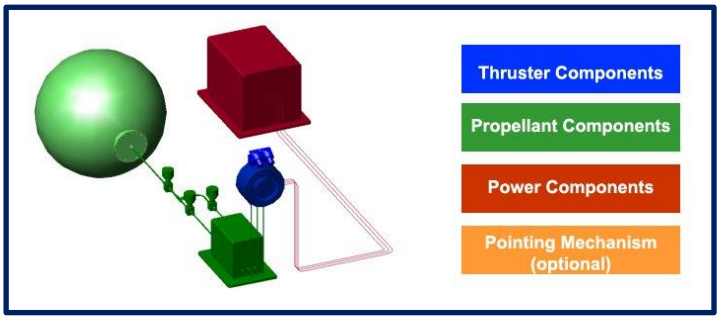
To get the high surface area for an efficient electrode, the team used aerogels. These are wet, gel-like substances that have gone through a special treatment of drying and heating to replace their liquid components with air or another gas. These methods preserve the gel's 3-D structure, giving it a high surface area and extremely low density. It's like removing all the water out of Jell-O with no shrinking.

After obtaining the dried, low-density aerogel, they combined it with adhesives and another carbon-rich material to create an industrial "dough," which Lim could simply roll out to sheets just a few thousandths of an inch thick. They cut half-inch discs from the dough and assembled them into simple coin cell battery casings to test the material's effectiveness as a supercapacitor electrode

-JEEVITHA R, III EEE

All-Electric Propulsion Satellite

Electric Propulsion (EP) is a class of space propulsion which makes use of electrical power to accelerate a propellant by different possible electrical and/or magnetic means. The use of electrical power enhances the propulsive performances of the EP thrusters compared with conventional chemical thrusters. Unlike chemical systems, electric propulsion requires very little mass to accelerate a spacecraft. The propellant is ejected up to twenty times faster than from a classical chemical thruster and therefore the overall system is many times more mass efficient.



Electric Propulsion, when compared with chemical propulsion, is not limited in energy, but is only limited by the available electrical power on-board the spacecraft. Therefore EP is suitable for low-thrust (micro and milli-newton levels) long-duration applications on board spacecrafts. The propellant used in EP systems varies with the type of thruster and can be a rare gas (i.e. xenon or argon), a liquid metal or, in some cases, a conventional propellant.

The communications satellite is being operated by ABS, a Bermuda-based satellite network that provides TV, Internet, and cellular services across the world. Unlike conventional satellites, which have mostly used propellant systems that burn chemicals of

one kind or another to get about the place, the ABS–3A makes use of a xenon-ion propulsion system to achieve thrust.

Specifically, the all-electric propulsion system uses electron bombardment to create xenon ions, which are then expelled by the spacecraft, producing thrust in the opposite direction.

While electric propulsion isn't as powerful as chemical propellants when it comes to producing raw thrust, it can be up to 1,000 times more efficient than chemical propellant, which is why it's suitable for long-range or long-duration space missions. Due to its high efficiency, with enough time, a constant emission of ions will also enable spacecraft to reach higher speeds than a chemical propellant.

As a largely stationary satellite, the ABS–3A won't need to be heading anywhere in a particular hurry, although its use of the propulsion system will enable it to adjust its altitude and position in orbit.

Boeing says the satellite contains a sufficient quantity of the inert, non-hazardous element xenon to power the craft's propulsion needs for its operational lifetime. The ABS–3A has an expected lifespan of 15 years, after which time it presumably becomes space junk, floating around in orbit and causing general mayhem.

While the ABS–3A is the world's first satellite to make use of a fully electric propulsion system, it's certainly not the first spacecraft to incorporate electric propulsion. Vessels using different kinds of electric propulsion have been in existence since the 1960s.

-NITHYA SRI S ,II EEE A

Novel Technique for Selective Harmonic Elimination in Multilevel Inverters

THE developments of FACTS devices , medium voltage drives , and various types of renewable energy resources have given great opportunities for the implementation of medium- and high-power inverters. The main problem with these applications is the frequency constraint of the pulse width modulation (PWM) which are limited by switching losses and electromagnetic interferences which is the results of high. Thus, to overcome the mentioned problems, selective-harmonic-elimination- (SHE-) based optimal pulse width modulation (OPWM) are proposed which are able to reduce the switching frequency and the total harmonic distortion of output voltage . A typical multilevel inverter utilizes several DC voltage sources to provide a stepwise waveform in output voltage which makes a great development on output voltage THD while the output waveform approaches nearly sinusoidal waveform. Related to the inverter circuit topologies the dc sources can be interconnected or isolated. Because of the intricacy of the problem, in most studies on the

SHE methods for multilevel inverters, it is assumed that only one switching angle per each voltage level is defined and the dc voltage sources are balanced (equal to each other). But in practical applications, depending on the output waveform and operation scheme of the inverter, the dc sources could be unbalanced or several switching's per each level are involved.

SHE method is a modulation strategy whose goal is to determine the proper switching angles to eliminate the number of low-order harmonics which cause to minimize the output waveform THD. The SHE method requires low switching frequency and stepwise waveform of output voltages to be applied. The main goal in SHE method is to determine the switching angles in which with the obtained switching angles the fundamental component reaches to the desired value and the undesired harmonics; basically low-order harmonics are eliminated. The defined objective function for SHE problem includes a set of nonlinear transcendental equations which may involve several local optima. Solving the SHE problem is available with the help of several procedures. Resultant theory is a novel which is based on methodical calculations. In resultant theory method the provided equations which are defined for SHE are converted into an equivalent set of polynomial equations, and then resultant theory is applied to the obtained equivalent equations which are naturally high-order polynomials. The main problem with this method is the complexity of calculation. The complexity increases when the number of switching angles is increased and so makes the equivalent equation harder to be solved or even not to be solved. Another approach for solving is the Newton-Raphson method, and it is a Numerical iterative technique.

However, the great difficulty of these techniques is the proper initial guess requirement that should be near to the exact solution. It is evident that giving a proper guess is very difficult in most cases but if a proper initial guess is available, Newton-Raphson method works properly. This difficulty is the result of the SHE problems search space which is unknown for anybody, and no one knows whether a solution exists or not, and if exists, what is the proper initial guess? A recently developed novel method to deal with the SHE problem is based on evolutionary algorithms such as Bee algorithm . However the search spaces intricacy would increase vividly if the number of switching angles increases and both methods fall into the trap of local optimum points of search space. Surely, the precise limitation for the number of switching angles cannot be determined in evolutionary algorithms. So, increasing the number of switching angles reduces the probability of finding the optimum switching angles, unfortunately. The SHE-PWM is a novel method that provides more number of the degrees of freedom (DOFs) and makes available to eliminate more harmonic components with no need to change the perceivable hardware of the inverter.

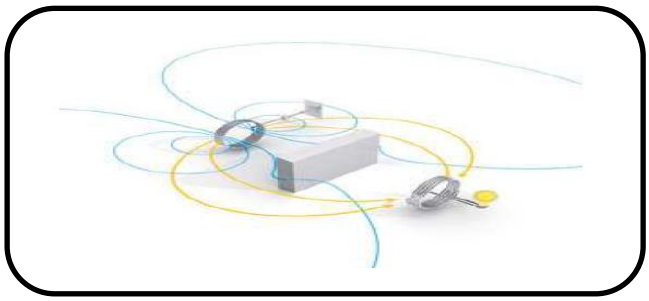
In SHE-PWM, each active device can be switched at least twice per cycle, and larger number of harmonic components than in the case of fundamental frequency switching scheme can be eliminated. The major problem related to the SHE-PWM method is that as

the number of switching angles is increased; none of aforementioned methods can be applied to determine the switching angles.

-PAVITHRAN V , II EEE B

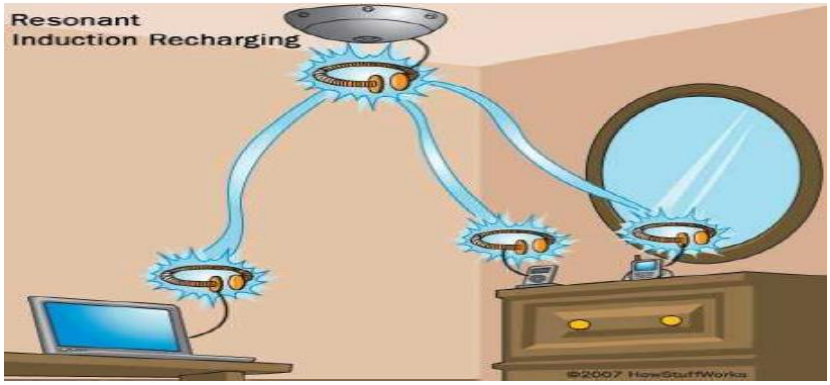
WITRICITY

WiTricity is nowadays the latest and the most trending technology when we consider wireless power transmission. The based fundamental used in this technology is the magnetic resonant coupling. This is because two resonant objects of the same resonant frequency tend to exchange energy more efficiently to a considerable amount of distance.



WiTricity illustration WiTricity power sources are actually devices that are specially designed magnetic resonators. These magnetic resonators can be used for efficiently transferring power over distances via the magnetic near-field. In the above figure of WiTricity power source, the left side is connected to AC power or we can call it the primary side. The blue lines represent the magnetic near field induced by the power source because of the primary connection. The yellow lines represent the flow of energy from the source to the WiTricity capture coil or the secondary coil. We can see that the bulb glows as the current is induced in the secondary coil which is the result of magnetic resonant induction coupling.

Magnetic Resonant Induction Coupling used in WiTricity Magnetic Resonant Induction Coupling forms the basis of WiTricity. This basically involves two bodies which exchange energy by magnetic oscillations which is much more efficient than wired exchange. Inductive coupling is when two conductors are magnetically coupled. In this current through one wire induces voltage in the other wire. This is caused due to electromagnetic induction. When the two conductors or coils are adjusted so that they resonate at the same frequency the phenomena is called Resonant Induction Coupling. Due to the resonance a strong interaction is set up between the sending unit and the receiving unit. As per the work of MIT scientists, when a pair of electromagnetic resonators is coupled using magnetic field a strong connection is a observed. Using this phenomena power transfer from one resonator to other is possible.



The distance between the pair of resonators being much larger than the resonator itself. The coil connected to a power source acts as the sending unit. The function of this coil is to emit non radiative magnetic field. The magnetic field is in the range of mega hertz. The receiving coil resonates with this magnetic field and a connection is established between sending and receiving coils. The magnetic field establishes a strong interaction between the resonators. The interactions with the surrounding environment are weak and hence magnetic coupling proves to be efficient for WiTricity. Thus power can be transferred over long distances without being affected by external environment. It can also be possible to have a single sending unit and multiple receiving units. These can be located at remote places and connected to a single central sending unit.

-SANJAI R , II EEE C

10 Fun facts about engineering and technology

1. The word engineer comes from a Latin word meaning ‘cleverness’.

2. The fastest passenger train in the world is the Shanghai Maglev with a maximum operational speed of 267 mph.

3. The largest wind turbine in the world is in Denmark. It is 720 feet tall, has 260-foot blades, and can generate 8 megawatts of power (enough to supply electricity for 3,000 American homes).

4. The snowboard was invented by an engineer. Serman Poppen invented a toy for his daughter by tying two skiis together and attaching a rope to one end. This invention called the “snurfer” eventually evolved into the snowboard. With some engineering twists and turns along the way, the snowboard has become a marvel of geometry, chemistry, and biomechanics.

5. According to Moore's Law, microchips double in power every 18 to 24 months. Gordon E. Moore, a founder of Intel, proposed the concept in 1965.

6. Big Brutus is the second largest electric shovel in the world. The electric shovel constructed in 1963 took more than 150 railroad cars and over a year to build. It is 160 feet tall and operates at 15,000 horsepower. The shovel had to be shut down in 1974 because the cost of operation was twice that of the value of coal it recovered.

7. Although there is much debate about this fact, the first video game, called “Tennis for Two” was introduced in 1958 and created by William Higinbotham.

8. The first computer program was predicted by Ada Lovelace in a paper she published in 1843. Ada suggested that plan for calculating Bernoulli numbers with a new calculating engine called the “Analytical Engine”.

9. The Atari Portfolio was released in 1989 and was the world’s first palmtop computer. Two years later it appeared in the film Terminator 2, where it was used by John Connor to hack an ATM and retrieve the key to the vault in the Cyberdyne lab.

10. One Google search produces about 0.2 g of CO2. But since you hardly get an answer from one search, a typical search session produces about the same amount of CO2 as does boiling a tea kettle. Google handles about 1 billion search queries per day, releasing some 200 tons of CO2 per day.

- *BALAMURUGAN M, IV EEE*

Improvement of Power Quality by using PWM Converter Technique

Power quality is one of major concerns in the present era. It has become important, extremely, with the introduction of sophisticated devices, whose performance is very thoughtful to the quality of power supply. Power quality problem is occurs manifested as a non-standard voltage and current or frequency the results are failure with the end use equipment. One of the wide problems dealt here is the voltage sag. Power quality issues and resulting problems are consequences of the highly use of solid state Switching devices, non-linear and power electronically switched loads, electronic type loads .The Advent and wide spread of high power semiconductor switches at utilization, distribution and Transmission lines have non sinusoidal currents . The electronic type load causes voltage Distortions, harmonics and distortion. Power quality problems can cause system equipment mal Function, computer data loss and memory mal Function of the sensitive equipment such as computer, programmable logic devices [PLC] controls, and protection and relaying equipment . Voltage sag and swell are most wide spread power quality issue affecting distribution systems, especially industries, where involved losses can reach very high values. Short and shallow voltage sag can produce dropout of a whole industry. In common, it is possible to consider voltage sag and swell as the origin of 10 to 90% power quality problems . The main causes of voltage sag are faults and short circuit, lightning strokes, inrush currents and swell can occur due to a single line-to ground fault on the system, which can also result in a temporary voltage rise on the unfaulted phases

Because of advances in solid state power devices and Microprocessors, switching power converters are used in more and more modern motor drives to convert and deliver the required energy to the motor. The energy that a switching power converter delivers to a motor is controlled by Pulse Width Modulated (PWM) signals applied to the gates of the power transistors . PWM signals are pulse trains with fixed frequency and magnitude and variable pulse width. There is one pulse of fixed magnitude in every PWM period. However, the width of the pulses changes from pulse to pulse according to a modulating signal. When a PWM signal is applied to the gate of a power transistor, it causes the turn on and turn off intervals of the transistor to change from one PWM period to another PWM period according to the same modulating signal. The frequency of a PWM signal must be much higher than that of the modulating signal, the fundamental frequency, such that the energy delivered to the motor and its load depends mostly on the modulating signal.

This type of analysis will be more useful as the end result motivates the improvement of the power quality in that particular area. Some problems can also be improved, solved and mitigated by using some useful software tools.

- *AYAPPAN J, III EEE*

Economics of Power Generation and Production Of Electricity.

The world energy economy has the largest influence on the decisions that people and governments make. Current global consumption rates are depleting the planets ability to sustain our way of life. Increased demand means increased prices in every sector of the world economy. The selection of electricity production modes and their economic viability varies in accordance with demand and region. Hydroelectric plants, nuclear power plants, thermal power plants and renewable sources have their own pros and cons, and selection is based upon the local power requirement and the fluctuations in demand. Nuclear, coal, oil and gas plants can supply base load, with the lowcarbon option being nuclear. Thermal energy is economical in areas of high industrial density, as the high demand cannot be met by renewable sources. Nuclear power plants can produce a huge amount of power from a single unit. However, recent disasters in Japan have raised concerns over the safety of nuclear power, and the capital cost of nuclear plants is very high. Hydroelectric power plants are located in areas where the potential energy from flowing water can be harnessed for moving turbines and the generation of power.

It is not an economically viable source of production where the load varies too much during the annual production cycle and the ability to stop the flow of water is limited. Renewable sources other than hydroelectricity (solar power, wind energy, tidal power, etc.) due to advancements in technology, and with mass production, their cost of production has come down and the energy is now in many cases cost-comparative with fossil fuels. There are some very important example and point to study for producing the cheap and high torque bearable electricity for industrial and general consumption in a country. The cost, quality and capacity of electricity depend upon the country and its nature resource along with economy. The power generation methods should be adopted and selected on the base of free nature fuel, 365 days per year's available, quality and quantity of requirement, characteristics, country economy, Environmental impact, reliability, capital and operational cost etc.

THIRISHA R , II EEE A

Ten interesting things about India power

1. India has an installed capacity of more than 170,000 megawatts, up from a mere 1,362 megawatts at the time of Independence in 1947
2. The majority (around 60%) is generated from coal and lignite, while just under a quarter (about 22%) is hydro-electric

3. Despite its soaring energy needs, India has one of the lowest per capita rates of consumption of power in the world - 734 units as compared to a world average of 2,429 units. This is nothing compared with say, Canada, (18,347 units) and the US (13,647 units). China's per capita consumption (2,456 units) is more than three times that of India.
4. The low per capita consumption is despite the fact that the power sector has been growing at more than 7% every year.
5. Homes and farms are consuming more power today than industries and businesses. Industrial consumption has actually dropped from 61.6% in 1970-71 to 38% in 2008-2009.
6. India has suffered consistent power shortages since Independence in 1947. Peak demand shortage is more than 10%, whereas the overall energy shortage is more than 7%.
7. Sixty-five years after Independence, only nine states - Andhra Pradesh, Gujarat, Karnataka, Goa, Delhi, Haryana, Kerala, Punjab and Tamil Nadu - of 28 have been officially declared totally electrified.
8. India remains perennially energy starved despite 15% or more of federal funds being allocated to the power sector. Bankrupt state-run electricity boards, an acute shortage of coal, skewed subsidises which end up benefiting rich farmers, power theft, and under-performing private distribution agencies are to blame, say experts. There is no shortage of money, and the problem, as the Planning Commission admits, is more "in the delivery process [than] in the system".
9. Transmission and distribution losses have leapt from 22% in 1995-96 to about 25.6% in 2009-2010. The states with the worst losses are Indian-administered Kashmir, Bihar, Chhattisgarh, Jharkhand and Madhya Pradesh. The best performers: Punjab, Himachal Pradesh, Andhra Pradesh and Tamil Nadu.
10. India's first power generation company was the private Calcutta Electric Supply Corporation (CESC) started in 1899. The first diesel power plant was set up in Delhi in 1905. The first hydro-electric power station was set up in Mysore in 1902. At the time of Independence, about 60% of India's power sector was privately owned. Today, about 80% of the installed capacity is in the hands of the government. Private companies own 12% of the capacity.

-MOHAN RAJ K , II EEE B

A Pound of Butter (Honesty)

There was a farmer who sold a pound of butter to a baker. One day the baker decided to weigh the butter to see if he was getting the right amount, which he wasn't. Angry about this, he took the farmer to court.

The judge asked the farmer if he was using any measure to weight the butter. The farmer replied, "Honor, I am primitive. I don't have a proper measure, but I do have a scale." The judge asked, "Then how do you weigh the butter?"

The farmer replied;

"YOUR HONOR, LONG BEFORE THE BAKER STARTED BUYING BUTTER FROM ME, I HAVE BEEN BUYING A POUND LOAF OF BREAD FROM HIM. EVERY DAY WHEN THE BAKER BRINGS THE BREAD, I PUT IT ON THE SCALE AND GIVE HIM THE SAME WEIGHT IN BUTTER. IF ANYONE IS TO BE BLAMED, IT IS THE BAKER."

Moral of the story: In life, you get what you give. Don't try and cheat others.

-NANDHAGOPAL R ,II EEE B

The Obstacle In Our Path (Opportunity)

In ancient times, a King had a boulder placed on a roadway. He then hid himself and watched to see if anyone would move the boulder out of the way. Some of the king's wealthiest merchants and courtiers came by and simply walked around it.

Many people loudly blamed the King for not keeping the roads clear, but none of them did anything about getting the stone out of the way.

A peasant then came along carrying a load of vegetables. Upon approaching the boulder, the peasant laid down his burden and tried to push the stone out of the road. After much pushing and straining, he finally succeeded.

After the peasant went back to pick up his vegetables, he noticed a purse lying in the road where the boulder had been. The purse contained many gold coins and a note from the King explaining that the gold was for the person who removed the boulder from the roadway.

Moral of the story: Every obstacle we come across in life gives us an opportunity to improve our circumstances, and whilst the lazy complain, the others are creating opportunities through their kind hearts, generosity and willingness to get things done.

- *ADITHYA G, IV EEE*

For A Friend Who Helped Me

A person who will listen and not condemn
Someone on whom you can depend
They will not flee when bad times are here
Instead they will be there to lend an ear
They will think of ways to make you smile
So you can be happy for a while
When times are good and happy there after
They will be there to share the laughter
Do not forget your friends at all
For they pick you up when you fall
Do not expect to just take and hold
Give friendship back, it is pure gold.

- *HEMALATHA U, EEE III*

Inspirational Lessons From the Failures of 4 Great Leaders

Failure is a necessary experience if you want to eventually be successful. That may seem like an illogical statement, since failure and success are generally considered complete opposites. However, the experience of failure is both enlightening and motivating as long as you view it with the right perspective; learning from your mistakes and working harder to achieve your goals are both important ingredients in finding success.

In the moment, failure can range from disheartening to devastating, depending on the severity of the experience. As a young professional, or an entrepreneur, or anybody trying to achieve something significant, failure has the potential to hold you back indefinitely--but only if you let it. Take inspiration from the hundreds of radically successful individuals who reached their peak only after multiple rounds of significant failure. Here are some of their stories.

Bill Gates

Bill Gates is one of the most recognizable figures in the tech industry, responsible for creating Microsoft and currently standing as one of the wealthiest people on the planet. Many people attribute his success to a kind of luck or sudden twist of fortune; he had a great idea at just the right time during the technology boom, and got rich developing it to perfection. But the reality is, Bill Gates experienced a crushing failure before he had anything to do with Microsoft. Originally, Gates created a product called Traf-O-Data, which analyzed data from traffic tapes. The product didn't work properly, and the company never took off, so Gates decided to try something else.

The Lesson:

Traf-O-Data never had any hope of being successful, but that was no reflection on Gates's potential. if your idea, even though it seems great, doesn't pan out the way you thought it would, remember that you still have plenty of ideas and opportunities ahead of you.

Stephen King

One of the most recognizable novelists of the modern era, Stephen King is widely regarded as a master of horror writing. Despite now having dozens of financially, critically, and popularly successful titles in circulation, King's first novel, Carrie, was almost a failure. The novel was rejected 30 times before it was finally accepted and published, leading to King's breakout career. King considered quitting, and many people would have quit, but his perseverance led to greatness.

The Lesson:

Simple adjustments can turn a failure into a success. Revising your idea, targeting a different audience, or redefining your brand identity could all easily take a failed concept and turn it into something more successful.

Steve Jobs

A mastermind of technological innovation and corporate vision, Steve Jobs is responsible for making Apple the company it is today. However, his past is littered with failures, setbacks, and crushing defeats. Jobs started Apple in 1976 and the company began to take off, but after an unsuccessful product launch in 1985, Jobs was kicked out of his own company. Most ordinary people would have given up at that point, but instead, Jobs founded a new company called NeXT. NeXT was considered unsuccessful as well, at least for a time, until it caught the eye of a struggling Apple in 1997. Apple purchased the company and brought Jobs back into a leadership position, which he used to develop and launch Apple's breakthrough products, including the iPod, iPhone, and iPad.

The Lesson:

Perseverance is everything. Because he committed himself to doing great things, Jobs was able to work past his personal and professional failures, and eventually leave behind a monumental and unprecedented legacy.

Walt Disney

Today, Disney is an entertainment giant of nearly unfathomable scale. It holds hundreds of properties, including Marvel Studios and the Star Wars franchise, and continues producing record-setting films and operating theme parks around the globe. Behind the initial company was the innovative, imaginative genius of Walt Disney himself. While many people recognize his earliest successful films, few know the difficulties he faced prior to making them. Disney's first animation studio was dissolved, and Disney could not afford to pay his rent. Even after the successful premiere of Snow White, many of Disney's early movies--classics like Pinocchio and Fantasia--were financial failures.

The Lesson:

The strength of an idea cannot be objectively measured by its relative success or failure. Most of Disney's earliest films are considered masterpieces, even though commercially, they were objective failures. Even Disney's first studio, which went under, likely produced some amazingly high-quality work.

The next time you experience failure, on a small or large scale, remind yourself that you're in good company. In your own life, ask anyone you feel has been successful in achieving their goals or living their dream if they've ever experienced failure. The answer is, invariably, yes. Failure is never the end of the road--it is only a small step in the greater journey. Pick yourself up, learn what you can from the experience, and force yourself to move on.

-YASHINI S ,II EEE A

Dr. A.P.J Abdul Kalam – the great man

When his team worker could not take his kids to an exhibition because of hectic work, he did!

During a hectic project, one of the 70 scientists working on it asked Dr Kalam if he could leave at 5.30 pm that evening as he had promised to take his kids to an exhibition. Dr. Kalam gave him permission. However, the scientist got busy with work only to realise that it was 8.30 pm. When he looked for his boss, he wasn't there. Guilty for having disappointed his kids, he went back home only to find that his kids

weren't there. When he asked his wife where they were, she replied, "You don't know? Your manager came here at 5.15 pm and took the children to the exhibition."

When Dr. Kalam noticed him working hard at 5pm, he thought to himself that this person would not leave work, but if he had promised his children, they should definitely enjoy the exhibition. So he, the boss, took the lead and took them there!

-PRASAD N , II EEE B

Hardwork

By the sweat of your brow you eat
You toil night and day
With your hands and feet
You put your mind to everything
You work on it with all your might
To satisfy the thing called *need*
We all *need* something
We all *want* something
Sometimes our *want* becomes our *need*
We all have something we want to achieve
We work hard
Even under the hottest day
We seek that shining star
Though lost in a vast sea wave
Hardwork begins with a stumble
Greatness begins by being humble

-FEVIN CLINTEN R , II EEE C