ELECTRICAL INSTALLATION ENGINEER

NEWS LETTER

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ELECTRICAL
INSTALLATION ENGINEER

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EDITORIAL

Dear Members, Fellow Professionals and Friends,

Seasons Greetings To All!

Prayers For 'Corona' Free Times Soon!

Greetings For A Happy Ayudha Pooja Day!

The month of October starts with our remembering and paying our respects to the Father of the Nation Mahathma Gandhi on his Jayanthi Day of October 2nd. It was Gandhi who could unite the minds of all people of India to successfully strengthen the fight for freedom, though there have been struggles for freedom in different parts at different times by different groups and leaderships. Immediately after Independence, it befell on Sardar Vallabhai Patel to physically unite the country to its present shape and dimensions, amalgamating hundreds of big and small kingdoms. The Wisdom of our great leaders could evolve one of the best constitutions and establish Democracy which is our pride for all times. Gandhi's role in the achievement of our freedom as well as development of a big band of quality leaders for the country can never be forgotten. Through his life and mission, Gandhiji could also be a lesson for everyone in the world at large which has made him a worldwide celebrity.

We celebrated Engineers Day in the month of September and this year during the World Engineers Day, UNESCO has put together a Document for "Engineering for a Healthy Planet" along with SDGs (Sustainable Development Goals), details of which are published elsewhere in this News Letter. The concern of the World for a safe planet and getting out of the dangers of 'Global Warming' has got quite focused in recent times with discussions and agreements to reduce carbon foot prints and work towards "Net '0' Emissions" by 2050 and so on, realizing that unless the world unites, the dangers of Global Warming can't be handled and mitigated. The plans and actions of our country, with focus on renewables and reduction and ultimate elimination fossils particularly in the energy and transportation sectors are all commendable.

We celebrate World Standards Day and World Habitat Day this month. IEC, ISO and ITU together celebrate World Standards Day, which is to celebrate the collaborative efforts of the thousands of experts worldwide that develop the voluntary technical agreements that are published as International Standards. We are all aware that Standards are the backbones of Safety and Reliability and they help ensure productivity. The economy improvements of Nations revolve around Productivity, Competitiveness, and the adherence to 'Standards' can help economy growth and can help the Urban Future and the Habitats too.

We have a culture of "Work is Worship" and we also have tradition to revere the equipments and tools that help us excel in our efforts on the "Ayudha Pooja Day" celebrated this month. It is indeed remarkable to witness the wide spread celebration on this day marked by devotion and gratitude. Ayudha Pooja comes at the end of "Navarathri" celebrations and it will be interesting to know that Navaratri, indeed, is worship of Goddesses of Knowledge and Skill, Business and Wealth and Power and Valor, representing all activities of the society and the country at large.

We thank all those members who have helped us by participating in the advertisement appearing for the issue June 2021 – E Focus Instruments India Pvt. Ltd., E Power Engineering, 3si Eco Power LLP, and Power Cable Corporation.

Editor

I don't think that India is much celebrated for its democracy. Democracy has been a very neglected commodity at home and abroad. – AMARTYA SEN

ENGINEER'S DAY 2021 - 'ENGINEERING FOR A HEALTHY PLANET - CELEBRATING THE UNESCO ENGINEERING REPORT'.

Engineering for Sustainable Development

EXECUTIVE SUMMARY - "Since wars begin in the minds of men and women it is in the minds of men and women that the defences of peace must be constructed."

The report highlights the crucial role of engineering in achieving each of the **17 SDGs**. It shows how equal opportunities for all are key to ensuring an inclusive and gender-balanced profession that can better respond to the shortage of engineers for implementing the SDGs. It provides a snapshot of the engineering innovations that are shaping our world, especially emerging technologies such as big data and AI, which are crucial for addressing the pressing challenges facing humankind and the planet. It analyses the transformation of engineering education and capacity-building at the dawn of the Fourth Industrial Revolution that will enable engineers to tackle the challenges ahead. It highlights the global effort needed to address the specific regional disparities, while summarizing the trends of engineering across the different regions of the world. By presenting case studies and approaches, as well as possible solutions, the report reveals why engineering is crucial for sustainable development and why the role of engineers is vital in addressing basic human needs such as alleviating poverty, supplying clean water and energy, responding to natural disasters, constructing resilient infrastructure and bridging the development divide, among many other actions, leaving no one behind. It is hoped that the report will serve as a reference for governments, engineering organizations, academia and educational institutions, and industry to forge global partnerships and catalyze collaboration in engineering so as to deliver on the SDGs.

Engineering the SDGs - It is essential that more young people, especially girls, consider engineering as a career

Engineering and the UN Sustainable Development Goals (SDGs)

SDG 1 - Engineering can address extreme urban poverty. How engineering can make it happen. Engineering drives economic growth and alleviates poverty through basic infrastructure such as roads, railways and telecommunications. However, much engineering work remains to be done to develop technologies that improve access to basic services such as clean water and sanitation, reliable energy and clean cooking fuels. Large populations in low-income countries are demanding access to the latest technologies for communication, education and health. Frugal innovation enables the development of affordable and reliable technologies that are accessible to all.

SDG 2 - Engineered mechanization of farming for food production in India - How engineering can make it happen. Agricultural, mechanical and chemical engineers have engineered mechanization for agriculture and food production, and increased productivity through the use of fertilizers and pesticides. Ongoing innovations by electronics and agricultural engineers include sensors for soil moisture and condition monitoring that optimize delivery of scarce water and fertilizers. Other innovations include robotics for the application of pesticides and fertilizers, weeding and planting, and communications technology for weather monitoring, forecasting and natural disaster warning, all of which are crucial to achieving global food security.

SDG 3 - Artificial Intelligence camera vision for COVID-19 fever detection in crowds. How engineering can make it happen. Engineering has been crucial during the COVID-19 pandemic with advanced technologies deployed, for example, in the search for a vaccine, through advanced manufacturing processes, logistics and transportation systems, and in 3D-printing for personal protective equipment. Engineering has eradicated diseases such as typhoid and cholera through clean water and sanitation. Biomedical engineering has developed medical devices for limbs, and improvements have been made in hearing, heart health and brain functioning. Robotics, computer vision and Artificial Intelligence (AI) are revolutionizing diagnosis, detection and surgical procedures, and improving accessibility for low-income countries.

SDG 4 - Young engineers learning about engineering and sustainable development. How engineering can make it happen. Engineers facilitate the delivery of education at primary, secondary and tertiary levels by employing new technologies, such as online learning tools and rapid communication systems. These

improve accessibility and reduce costs for students. Wi-Fi is implemented in more than 40 billion devices worldwide, underpinning advances in education and enabling other applications. Software and telecommunication engineers are fast expanding access to the internet through low-cost satellites and other aerial devices to deliver information and services to remote and low-income communities.

SDG 5 - Women engineers working on high voltage electrical systems. How engineering can make it happen. Ensuring women's access to technology and engineering will close many gender gaps, ensuring that women benefit from and participate in the technology revolution, which is critical to achieving the SDGs. Diversity of thought is vital for innovation and the development of solutions that reflect community standards, values and aspirations. New technologies developed by engineers are increasingly empowering female users in work and entrepreneurship, including mobile communications and the internet, which facilitate women's access to banking and financial and information services.

SDG 6 - Advanced engineering technologies using laser scanning for monitoring the dams in the world - How engineering can make it happen. Civil and environmental engineers have saved millions of lives through clean water and sewage treatment systems, eradicating waterborne diseases like cholera and typhoid. Every day, electrical and mechanical engineers ensure reliable system operations. Innovations in water treatment and recycling ensure clean water for all, even in arid zones. Despite these advances, more than 1 billion people still lack access to clean water and 2 billion have no access to basic sanitation. Urgent action, including by engineers, is required to address this challenge.

SDG 7 - Engineers are essential for designing, building and maintaining power infrastructure. How engineering can make it happen. Engineering has been essential for the generation and supply of electricity, which is vital for economic growth and better living standards. Yet nearly 1 billion people, predominantly in sub-Saharan Africa and South Asia, still lack access to a reliable source of electricity, the provision of which is a key task for engineers. Electrical, mechanical and environmental engineers have been central to the development of low-cost, zero carbon, renewable energy solutions, including wind, solar, wave and geothermal energy, making energy accessible in remote regions, while mitigating the impacts of climate change.

SDG 8 - Transport engineering is essential for economic growth and for sustainable cities. How engineering can make it happen. Engineering is now recognized as an essential enabler of economic growth, evidenced by the positive relationship between economic growth and the number of engineers in a country. Roads, railways, airports, telecommunications, and the supply of water and electricity are essential infrastructure underpinning all economies. This infrastructure is designed, developed and maintained by civil, mechanical, electrical and environmental engineers. Engineers are also responsible for such basic amenities as clean water, energy and housing, enabling citizens to maintain healthy and therefore productive lives, and to engage in decent work.

SDG 9 - Students developing innovations in chemical process engineering - How engineering can make it happen. A modern economy cannot exist without engineering. Engineers design, build and maintain infrastructure. Roads, ports, railways, communications, water supply and energy systems are the work of civil, mechanical and electrical engineers. Industry needs engineers in sectors such as mining, petroleum, chemicals and food processing, and all manufacturing is underpinned by mechanical, electrical, chemical and environmental engineers. Engineering innovations in AI, robotics, cloud computing and big data will drive future economic growth and employment.

SDG 10 - Engineering generates work and incomes. How engineering can make it happen. Through sustainable infrastructure and new technologies and innovations, engineers and engineering create jobs and opportunities, enabling access to housing, food, health and a decent living, all of which are crucial to reducing inequalities. Ensuring access to low-cost communications and mobile phones, information and education, medical diagnostics and treatment, especially in low-income countries, is also essential to addressing basic needs. Technologies that empower women to increase their participation in the workforce and that address chronic gender-based economic inequalities are being developed by engineers.

SDG 11 - Engineering infrastructure, such as the underground metro tunnel, is essential for sustainable development. How engineering can make it happen. Civil, structural, electrical, mechanical, environmental, software and telecommunications engineers are contributing to safe, inclusive and resilient cities, facilitating access to

affordable housing and public transport, clean air, water and energy, as well as the protection of natural and cultural heritage assets and greater resilience against natural disasters. Advanced engineering technologies are used in energy and resource efficient buildings, smart city lighting, efficient transportation systems, renewable energy sources, integrated water resource management, geospatial engineering, Building Information Modelling and data analytics, making cities more livable and sustainable.

SDG 12 - Biogas from treated sewage used to generate electricity at Wastewater Treatment Plants. How engineering can make it happen. Mining, civil, mechanical, electrical and environmental engineers play critical roles in managing the Earth's resources efficiently, through processing essential minerals, generating energy from renewable resources, using water resources sustainably, supporting agricultural production and managing biodiversity. Engineering innovations support resource management and responsible consumption through the 'circular economy' where outputs and products can become inputs into other processes and products. Innovations to recycle or reuse waste materials, including plastics, are being developed by materials and chemical engineers.

SDG 13 - The impacts of climate change, caused intense bush fires and smoke haze over Sydney, January 2020. How engineering can make it happen. Engineering enables climate change action. Engineered renewable energy sources with zero carbon emissions include hydroelectric, solar, wind and wave power, with green hydrogen facilitating energy storage at low cost. Resilient infrastructure addresses the escalating impacts of natural disasters including cyclones and floods. Greenhouse gas reductions through carbon capture, the transformation of waste bio-solids into energy, and timber building from rapid growth forests are other established actions. Other fast-evolving technologies to absorb carbon dioxide include the chemical processing of carbon from air to re-use as chemical feedstock and the use of low carbon building materials for housing.

SDG 14 - Engineering is needed to protect against rising sea levels and increasing beach erosion in coastal communities. How engineering can make it happen. Engineers have a vital role in preserving and protecting oceans and seas, and the life within them. Marine engineers are working with scientists and other engineering disciplines to address the degradation of fisheries, the pollution of oceans and the use of resources, including wave energy. Engineers are addressing solutions such as plastic pollution in oceans and managing ocean assets such as the Great Barrier Reef that are threatened by the impacts of climate change.

SDG 15 - Geo-engineering innovation is essential for discovering and protecting the Earth's resources. How engineering can make it happen. Environmental engineers are managing biodiversity through the responsible use of forestry resources and the preservation of habitats. Innovative technologies map the Earth's surface to provide geospatial information for agricultural monitoring and infrastructure design, and to predict natural disasters like earthquakes. These technologies are assisting Indigenous and disadvantaged groups to enhance their capacity to map, analyze and negotiate for sustainable development while protecting natural forests. Sensor and drone technologies can map forests and identify diminishing animal populations. DNA sequencing and microchips are used to track endangered species.

SDG 16 - Engineers from around the world discuss strong institutions for engineering education at the International Engineering Alliance Meeting, Hong Kong, June 2019. How engineering can make it happen. Engineering practice that is diverse and inclusive, sustainable and ethical is essential for advancing the SDGs. Engineers are partnering to develop strong institutions for engineering education, accreditation and regulation, which are essential for ensuring high standards of engineering education and the competency of engineers everywhere. The WFEO Model Code of Ethics for engineers is guiding other professional engineering institutions. Engineers are also improving standards to address corruption in engineering to maximize the benefit of infrastructure investments that support sustainable development for all.

SDG 17 - UNESCO Member States discuss the declaration of 4 March as World Engineering Day for Sustainable Development. How engineering can make it happen. Partnerships in engineering are essential to advance the goals of sustainable development, whether within engineering disciplines or across national and international engineering institutions, involving government, industry and universities. These partnerships are developing solutions and roadmaps to implement technologies, to build capacity and knowledge transfer mechanisms, and to establish inclusive approaches to sustainable development. World Engineering Day for

Sustainable Development, celebrated annually on 4 March, is a collaborative international effort to bring engineering and the community together to achieve these goals.

Conclusion

As COVID-19 continues to spread across the world, the pandemic has revealed the multi-faceted contribution of engineering, and has brought to light the fault lines of inequalities around the world, chief among them the gaping and glaring scientific, engineering and digital divide between countries, which is particularly detrimental to youth. It is in this regard that this report can serve as a reference point for Member States. Through its international and intergovernmental scientific programs, networks of Centres and Chairs, its partnerships with various non-governmental organizations, multinational corporations and engineering educational institutions across the world in different disciplines, UNESCO fosters interdisciplinary and international partnerships in engineering, which is key to accelerating the delivery of the SDGs. No single discipline on its own can present a solution to achieving the SDGs because all the goals 'are integrated and indivisible and balance the three dimensions of sustainable development: the economic, social and environmental', as pointed out in the 2030 Agenda. A new paradigm for engineering is thus urgently needed; one that goes beyond the traditional division of disciplines and is inter and multidisciplinary in its approach, enabling engineering to address such highly complex issues as climate change. Furthermore, engineers need to understand and shoulder social responsibility by building a more sustainable, resilient and equitable world for all people, leaving no one behind. Engineers must think in a way that carefully considers social impacts, while being attentive to environmental impacts, so as to reboot the health of our shared nature and planet, and make engineering a true enabler, equalizer and accelerator to deliver on the SDGs.

Recommendations

Each chapter of the report concludes with a set of actionable recommendations that can be implemented by governments, educational institutions, engineering organizations, civil society or the private sector, with the up-to-date expertise of the engineering and scientific community. Some of the key recommendations are outlined below.Understanding the role of engineering and engineers in achieving the SDGs

1. Government, engineering educators, industry and professional engineering institutions need to promote greater understanding of the crucial role played by engineers and engineering in creating a more sustainable world. Equal opportunities and diversity

2. Governments and policy-makers should take urgent action to encourage more young people, especially girls, to consider engineering as a career in order to address the shortfall in the number of engineers, and to ensure the diversity of thought and inclusive participation necessary to achieving the SDGs.

3. The engineering sector as a whole should embrace the 'leave no one behind' ethos of the SDGs and ensure that technological solutions address current inequalities.Water as a global and strategic sustainability issue

4. Anticipated global water challenges related to the impacts of increasing water pollution and climate change need to be addressed, while benefiting from advances in science, technology and innovation in areas such as hydro-environmental models, decision support systems, microelectronics, nanotechnology, fine chemicals, biotechnology and information technology.

5. The social and environmental relevance of clean water and the holistic nature of the 2030 Agenda for Sustainable Development demand an integrated and systematic approach when dealing with the specificities of each of the 17 SDGs, all of which require intensive interdisciplinary analysis and multi-sectoral expertise for their implementation.

6. Engineered and nature-based infrastructure needs to be combined with water management approaches involving stakeholder engagement and bottom-up climate adaptation. Engineers need to be trained in recent advances in hydrology, intertwined with externalities such as technology and societal needs, in order to develop approaches for the implementation of SDGs and other water-related goals.Climate change awareness and resilience.

7. Countries can identify, understand and manage climate-change risks by prioritizing adaptation planning and actions, including implementing operational and maintenance procedures that extend the life of infrastructures that: i) are at critical risk of failure; ii) service a high level of demand; iii) are reaching the end of their life cycle; or iv) exceed the risk tolerance level and require significant investment to refurbish or replace.

8. Special attention should be given to developing vulnerable countries in building their capacities to deliver climate resilient infrastructures, by updating their national codes, standards and guidelines, and building capacity in their climate services, engineering and delivery capabilities. Public and private funding is needed for investment in engineering activities for disaster risk prevention and reduction, through structural and non-structural measures in order to foster resilience. Cooperation coupled with engineering research should be sought to identify and provide innovative solutions, including those that are nature based.Natural resources and sustainable energy.

9. In order to help achieve the SDGs, it is essential to develop sustainable and resilient energy systems. Policies and developments in this area must be based on rigorous facts and avoid preconceptions. To achieve these objectives, all energy options are open, depending on the national context. It is important to use simple and transparent economic criteria such as the cost per tonne of CO_2 avoided.

10. Suitable technologies to achieve sustainability in mining should be implemented and developed.

11. Governments and data owners need to make data findable, accessible, interoperable and reusable in an ethical way. Rules and standards need to be developed based on global consensus to enable efficient data sharing and data exchange.

12. Security and privacy of data have increased in relevance and must be part of the design process at all stages of the big data paradigm. International and interdisciplinary cooperation should be in place between academic institutions, universities and industry, as well as civil society, to advance AI innovation and applications for the implementation of the SDGs. Governments and civil society should promote international dialogue to reach global consensus on AI governance, and to adopt global principles, guidelines and standards for the responsible conduct of AI.

13. Smart engineering technologies and applications change the nature and economics of infrastructure. With the new generation of transport and healthcare facilities, disaster resilient infrastructure and low-carbon sources of energy, smart cities could be vehicles of purpose-driven innovation and test-beds for new applications and solutions. Engineering education and capacity-building for the SDGs

14. Government, engineering educators, industry and professional engineering institutions need to collaborate to fund and support strategies, in order to increase the number of engineers, to introduce an internationally harmonized approach for graduate attributes in engineering, and to promote ongoing professional competencies so as to ensure the high quality of engineers to achieve the SDGs. These benchmarks need to be recognized across the world and should form the basis of national engineering education systems to train engineers with the right skills.

15. Improving and strengthening STEM education in school is the foundation of higher engineering education and lifelong learning. Furthermore, the topic of ‘sustainability’ needs to be included in the curriculum for all education establishments, from schools and universities to engineering departments and professional training bodies.

16. Governments should increase their focus on interdisciplinary curricula, sustainable development and professional competencies, combining them with funding models that support these needs. National accreditation criteria should be formulated and accompanied by incentives and rewards for institutions meeting these requirements.

17. Studies should focus on interdisciplinary and complex problem-solving using student-centred, problem-based approaches and online learning.

18. Engineering institutions, industries and academia should cooperate to develop and implement an engineering professional certification system for the promotion of continuing professional development and the recognition of engineering qualifications and professional competences worldwide. Regional engineering cooperation.

19. There is a need to strengthen all types of interregional, regional and sub-regional cooperation for engineering capacity-building in alignment with sustainable development, including an emphasis on the engineering dimension across all SDGs, as well as inclusive standards, the mobility of engineers and the articulation of the engineering-education nexus to address imbalances in engineering capacity and economic development in the various regions of the world.

20. Engineering is a highly diversified sector in both educational and professional settings. A common approach is therefore needed to harmonize definitions and data recording, which should also reflect diversity trends in the engineering sector. Government institutions and engineering organizations should reinforce their cooperation to further harmonize the profession’s standards of data collection and study.

KNOW THY POWER NETWORK - 161

(Know thy Metal Oxide Surge Arrester (MOSA) – The security guard of power Station / Substation)

Now it is Olympics time – many games are going on at 32nd Olympics in Tokyo in Japan. Wrestling and running races are amongst them. The viewers' generally become tense while witnessing the wrestling matches and running races i.e. these matches ratcheting up their tensions and emotions. Similar heart stopper / nerve wrecking facing is experienced when we are able to witness the "bout between MOSA and intruding over voltage surges in a power network". In our local parlance, such fights are termed as "Mongoose – Snake" fight. This kind of MOSA's performance triggered a technical thought train in my mind and it is reflected as this "technical write up".

While bringing the significant features of the MOSA to the kind reference of readers, many questions are required to be answered. Amongst them significant are,

1. What is the over voltage spectrum that often threatens the lives of power system equipment?

Over voltage Spectrum

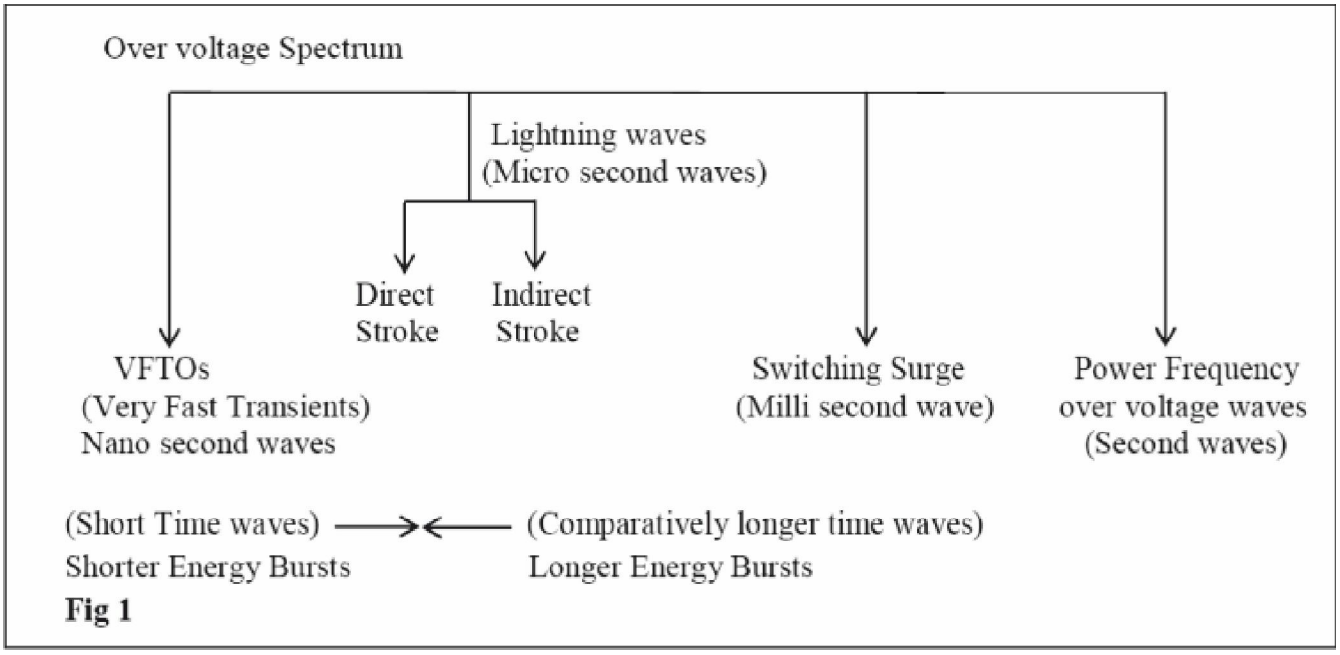

Fig 1

2. What are the intruding routes / paths of the over voltage waves that are outlined here?

- Overhead lines conductors
- Underground cables
- OH ground wires or line supports / towers
- All possible coupling paths in the station.

3. What are the possible measures to prevent the entry or moderation of these waves?

(We can call these measures as preventive gates that stop their flows) - (for reference see next page)

4. What is the significance of this write up on 'MOSA'?

Many readers may not have a clear view on the role of MOSA in the over voltage protection schemes. To throw light on this reality, this attempt has been made. MOSA forms the core of the over voltage protection chain and acts as the centre piece of the entire scheme. Its functioning under over voltage surges also present us an interesting phenomenon. On having a closer look at this standoff, the readers may have the feel of

witnessing a nail-biting wrestling match. Such experiences are common when the arrester encounters very fast transient waves, indirect lightning strokes and switching surges you may wonder to know that all these fights happen in the shortest possible time frame, (Nano (10^{-9}) and Micro (10^{-6}) seconds) which is beyond our comprehension.

Preventive Gates - *(Continuation matter for the 3rd point)*

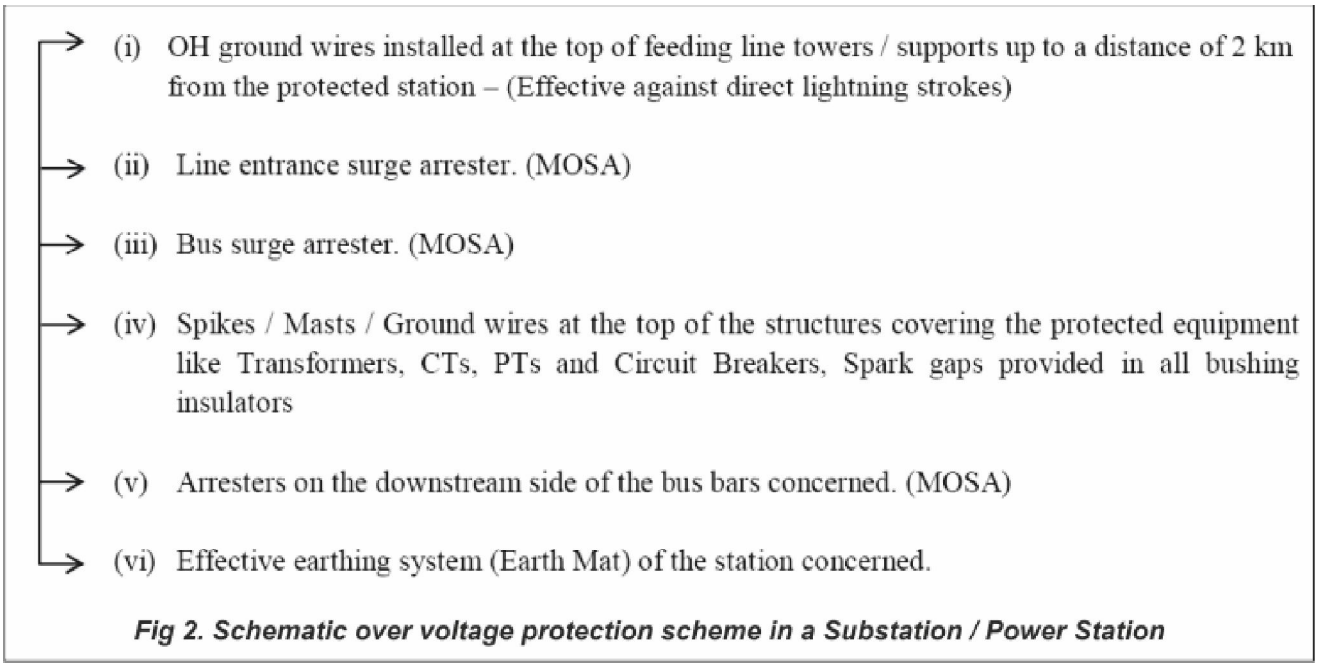

Fig 2. Schematic over voltage protection scheme in a Substation / Power Station

5. What are the characteristic features of surge arresters in general and MOSAs (Gapless Arresters in particular?

(a) Surge Arrester in General

- Basically made up of Non-linear Resistors
- Its role in a Power System is akin to that of a "Safety Valve" in a boiler i.e when the power system is choked with very high voltage stresses, it simply comes to its rescue and released its voltage pressure by diverting / providing necessary paths for the forces that bring such high voltage stresses in it. In other words it is the main protective device for the power system equipment against the over voltage surges like VFTOS, Indirect Lightning Strokes and Switching Surges.
- Its main function: (i) To create / provide the conducting path for the invading surge, connects it to the ground very quickly and (ii) To clamp the voltage across the arrester terminals to a safer level (arrester protective level)
- Generally treated as an "Automatic Voltage Limiting Device" or "Automatic Earthing Device"
- Their main duty is to intervene and discharge the energy carried by the dangerous surges and then return back to their original insulating status and get ready or back on track for the next operation.
- Their presence is a must for all power stations and substations because they provide a protective umbrella over all the protected equipment.
- When the over voltage surges enter the station, in no time, the arrester builds up its defense mechanism, shows its reaction and stops the intending electrical waves.

(b) Classification of Surge Arresters

(i) Gapless Arrester –MOSA – Metal oxide Arrester or ZnO Arrester

- These are currently in wide application
- ZnO (Metal oxide) discs are stacked and housed in a hermetically sealed hollow porcelain / composite dielectric insulator.
- The number and the size of discs employed depend upon the requirements like system voltage and energy dissipation needs.
- As no protective gaps are employed these are called as Gapless Arresters
- Depending up on the energy dissipation needs, these are further classified as station and distribution class arresters.

(ii) Gapped Arrester – Silicon Carbide Arresters

- The discs are made up of silicon carbide; as these discs lack higher energy dissipation capacities to protect themselves from normal service frequency voltage, series protective spark gaps are provided. Owing to this, these arresters are called as "Valve Type Arresters" or "Gapped Arresters".
- Now these arresters are not in wide use (these become obsolete)

Many factors are required to be addressed in a overvoltage voltage protection scheme associated with a substation / power station. In the present context, as we are dealing with the general features of MOSA and its protective function, these factors are not brought into our discussion / focus.

As we know the MOSA has no protective gap, the ZnO discs, by virtue of their high non-linear characteristics, are able to withstand the power frequency voltages during its normal system operation. The metal oxide arrester blocks are designed in such a way that they are able to trigger and enter into conduction mode sharply at preset voltage during the presence of over voltage surges like VFTOs, Indirect Lighting Strokes and Switching Surges and cease to conduct precisely at the exit of the intruding voltage waves (i.e when the impressed voltage falls below the preset voltage). Its operation at voltages above its conduction level is dependent on several factors that include

- The energy level and duration of the invading voltage waves
- The energy dissipation capacity of the ZnO discs
- The temperature levels of Metal oxide elements

(c) MOSA how it works?

It is well known that the basic operation of the arrester is to limit the intruding surge to the protective levels of the arrester (designed discharge voltage) and thereby ensure the safe operation of the power system and its connected equipment. The arrester operation can be compared to an "Oscillating Pendulum" which moves from non-operating zone (capacitive mode) to an operating zone, (resistive zone) and then returns back to its original (normal) insulation conditions. i.e. it gets back on track and get ready for next game. To put it in simple terms, it can be stated that when encountering an over voltage surge, it immediately starts moving from its insulating position, (capacitive mode) and reaches the other end Viz. conducting, resistor position and quenches the challenging over voltage waves and then return backs to its original insulation position. All these phases occur in nano / micro seconds.

Under normal operating conditions as out lined above, the arrester behaves mostly like a capacitor with a high resistance in series. This causes the flow of very small leakage current (in the order of a few micro amps) through it. Upon the impingement or impression of high frequency over voltage surges. Over voltage surges, it

suddenly changes its status with the consequential flow of very high current through it to the ground. Upon the decay of this invading current surge, it automatically regains its original status (Capacitive Mode), reveals itself and clamps the voltage across it.

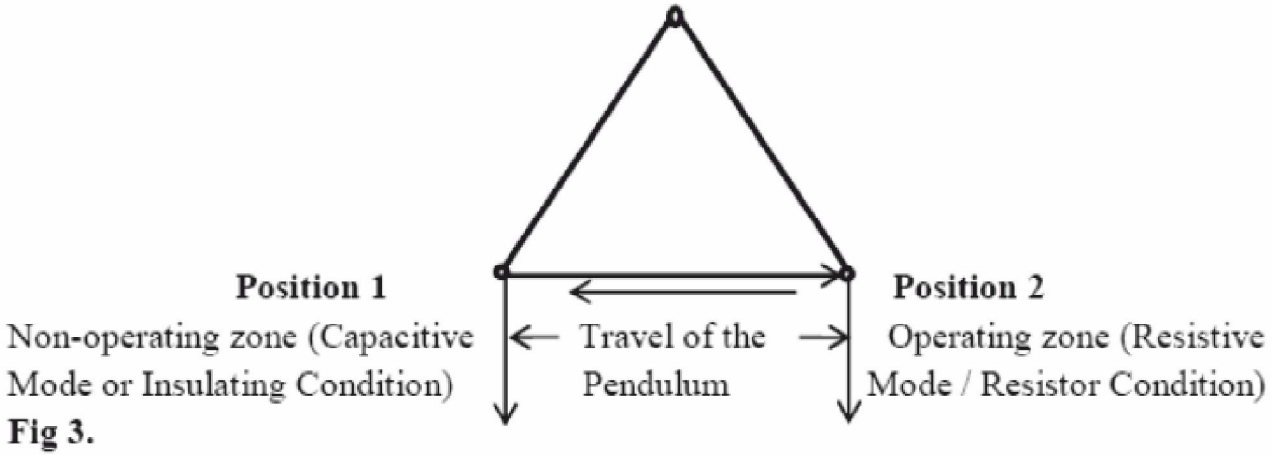

Fig 3.

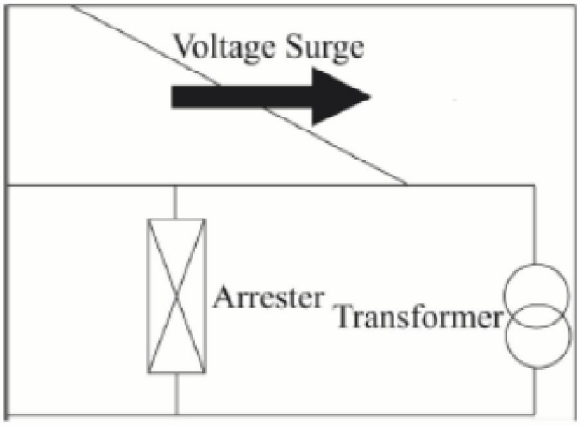

Fig 4.

Fig 3 & 4 depict the arresters functions schematically

MOSA, while facing indirect lightning waves and switching surges finds no difficulty in encountering them and "Turns On" effortlessly i.e. it is firmly well in control of all these situations. But it has its own Achille's heel. Owing to this, it finds its going against steep fronted VFTOs is tough or difficult; so during the incidence of VFTOs most of the times, it is on its back foot and fails to turn on or operate in time. i.e. it trails behind the VFTOs which are generated during the operation of Gas Insulated Substation (GIS) and mostly over shadows the operation of MOSA. The variations in the operation of MOSAs against VFTOs are mainly brought by stray and block capacitance present in the substation.

(To be continued)

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EFFICIENCIES OF ORGANIC SOLAR CELLS

Researchers have identified a key mechanism responsible for the lower efficiencies of organic solar cells and shown a way that this hurdle might be overcome.

The international group of researchers, led by the University of Cambridge, identified a loss pathway in organic solar cells which makes them less efficient than silicon-based cells at converting sunlight into electricity. In addition, they identified a way to supress this pathway by manipulating molecules inside the solar cell to prevent the loss of electrical current through an undesirable state, known as a triplet exciton.

Their results, reported in the journal Nature, suggest that it could be possible for organic solar cells to compete more closely with silicon-based cells for efficiency.

Organic solar cells, which are flexible, semi-transparent, and cheap, can greatly expand the range of applications for solar technology. They could be wrapped around the exteriors of buildings and can be used for the efficient recycling of the energy used for indoor lighting, neither of which are possible with conventional silicon panels. They are also far more environmentally friendly to produce.

“Organic solar cells can do lots of things that inorganic solar cells can’t, but their commercial development has plateaued in recent years, in part due to their inferior efficiency,” said Dr Alexander Gillett from Cambridge’s Cavendish Laboratory, the paper’s first author. “A typical silicon-based solar cell can reach efficiencies as high as 20 to 25%, while organic solar cells can reach efficiencies of around 19% under laboratory conditions, and real-world efficiencies of about 10 to 12%.”

Organic solar cells generate electricity by loosely mimicking the natural process of photosynthesis in plants, except they ultimately use the energy of the sun to create electricity rather than convert carbon dioxide and water into glucose. When a light particle, or photon, hits a solar cell, an electron is excited by the light and leaves behind a ‘hole’ in the material’s electronic structure. The combination of this excited electron and hole is known as an exciton. If the mutual attraction between the negatively charged electron and the positively charged hole in the exciton, akin to the attraction between the positive and negative poles of a magnet, can be overcome, it is possible to harvest these electrons and holes as an electrical current.

However, electrons in solar cells can be lost through a process called recombination, where electrons lose their energy — or excitation state — and fall back into the empty ‘hole’ state. As there is a stronger attraction between the electron and hole in carbon-based materials than in silicon, organic solar cells are more prone to recombination, which in turn affects their efficiency. This necessitates the use of two components to stop the electron and hole from recombining rapidly: an electron ‘donor’ material and an electron ‘acceptor’ material.

Using a combination of spectroscopy and computer modelling, the researchers were able to track the mechanisms at work in organic solar cells, from the absorption of photons to recombination. They found that a key loss mechanism in organic solar cells is caused by recombination to a particular type of exciton, known as a triplet exciton.

In organic solar cells, triplet excitons present a difficult problem to overcome, as it is energetically favourable for them to form from the electrons and holes. The researchers found that by engineering strong molecular interactions between the electron donor and electron acceptor materials, it is possible to keep the electron and hole further apart, preventing recombination into triplet excitons from occurring.

Computational modelling suggests that by tuning the components of the organic solar cells in this way, the timescales of recombination to these triplet exciton states could be reduced by an order of magnitude, allowing for more efficient solar cell operation.

“The fact that we can use the interactions between components in a solar cell to turn off the triplet exciton loss pathway was really surprising,” said Gillett. “Our method shows how you can manipulate molecules to stop recombination from happening.”

"Now, synthetic chemists can design the next generation of donor and acceptor materials with strong molecular interactions to suppress this loss pathway," said co-author Dr Thuc-Quyen Nguyen from the University of California, Santa Barbara. "The work shows the path forward to achieve higher device efficiency."

The researchers say their method provides a clear strategy to achieve organic solar cells with efficiencies of 20% or more by stopping recombination into triplet exciton states. As part of their study, the authors were also able to provide design rules for the electron donor and electron acceptor materials to achieve this aim. They believe that these guidelines will allow chemistry groups to design new materials which block recombination into triplet excitons, enabling organic solar cells with efficiencies closer to silicon to be realised.

NANO CHINESE EV

Electric vehicles are slowly gaining ground in major car markets around the world and compact electric cars have got special attention from buyers as they are comparatively cheap and easy to maintain.

Chinese carmaker Wuling HongGuang has been in news quite a lot lately for its compact offering Mini EV and now the company is making it to the headline again, thanks to its new electric car called Nano. Indians associate that name with Tata Motors' smallest production car.

Wuling Nano is reportedly the world's smallest electric car

Wuling Nano is reportedly the world's smallest electric car. Introduced at the 2021 Tianjin International Auto Show, the car looks similar to the Baojun E200, made by the same company.

Designed to be used in a city, the car has a turning radius of less than four meters and can only seat two people. The car is 1,526mm wide, 1,616mm tall and 2,497mm in long, which makes it smaller than the Tata Nano.

The EV gets a 33PS electric motor that can generate a maximum torque of 85 Nm, enabling a top speed of 100 km/h. The motor draws its power from an IP67 lithium-ion battery with a 28 kWh capacity.

The battery is placed under the seats. According to the company, the battery can be charged in 13.5 hours using a regular 220-volt domestic socket and with a 6.6 kW AC adapter, it can be charged in just 4.5 hours. The company also claims that the car can travel up to 305km on a single charge.

When it comes to safety, Wuling says the car gets an insulation fault alarm and short circuit protection for the battery. The EV also gets electronic stability control, electronic brake-force distribution, tyre pressure monitoring system, and reversing radar. In terms of features, it gets a keyless entry system and a 7-inch display.

IMPLEMENTING ADVANCE WIND ENERGY SCENARIOS

Implementing advance wind energy scenarios could achieve a reduction in global warming atmospheric average temperatures of 0.3 to 0.8 degrees Celsius by the end of the century, according to new research from Cornell University.

"Early action will reap dividends," said Rebecca Barthelmie, professor in the Sibley School of Mechanical and Aerospace Engineering. "In terms of averting the worst of climate change, our work confirms that accelerating wind-energy technology deployment is a logical and a cost-effective part of the required strategy. Waiting longer will mean more drastic action will be needed."

Barthelmie and Sara C. Pryor, professor in the Department of Earth and Atmospheric Sciences, authored the research. It published in the journal Climate.

To avert environmental disaster, other greenhouse gas reduction strategies will also need to be implemented, they said.

In early August, the Intergovernmental Panel on Climate Change (IPCC) Working Group I Sixth Assessment Report said that climate change is rapid and intensifying, and that Earth's atmosphere could add 1.5 degrees C of average warming by 2040. To avoid further warming, the IPCC report said there must be transformational change.

"Our work shows that it is feasible for the United States to accelerate its deployment of wind energy," Barthelmie said, "to substantially reduce carbon dioxide emissions and that will make a real difference to the kind of warming that the world endures."

Global wind resources exceed current electricity demand, Pryor said, and the cost of energy from wind turbines has declined sharply. "It makes perfect sense to rapidly deploy wind energy as a key part of decarbonizing the electricity supply," she said.

The global wind energy industry has been growing. Since 2005, the total installed capacity of global wind energy shows a 14% annualized growth rate for Asia, Europe and North America. Global wind energy electricity production expanded from 104 terawatt-hours (one trillion watts for one hour) in 2005 to 1,273 terawatt-hours in 2018, the paper said.

In 2019, wind energy generated approximately 6.5% of 26,600 terawatt-hours of global electricity demand. Six countries are generating more than 20% of their demand, while the United Kingdom, Germany and Spain are close to achieving 20% of electricity demand with wind energy. China has reported about 5% of its electricity supply from wind energy.

The United States generates 8.4% of its electricity from wind, as of 2020, with six states (Texas, Iowa, Oklahoma, California, Kansas and Illinois) containing more than half of wind energy capacity, according to the U.S. Energy Information Administration.

Wind turbines are now deployed in 90 countries, Barthelmie said, generating about 7% of global electricity, and the expansion of installed capacity of wind energy continues.

Sectors like solar and wind have become less expensive than fossil fuels. "So there really aren't any arguments anymore for not making this kind of change," Barthelmie said. "Both technically and economically, advanced deployment scenarios are feasible. It needs more political will."

The research was funded by the U.S. Department of Energy

"A good scientist is a person with original ideas. A good engineer is a person who makes a design that works with as few original ideas as possible. There are no prima donnas in engineering." – FREEMAN DYSON

MAERSK SECURES GREEN METHANOL TO POWER WORLD'S 1st CARBON-NEUTRAL VESSEL

A.P. Moller-Maersk, a shipping giant based in Denmark, has identified its partners to produce green fuel for its first vessel to operate on carbon neutral methanol: REintegrate, a subsidiary of the Danish renewable energy company European Energy.

REintegrate and European Energy will establish a new Danish facility to produce the approx. 10.000 tonnes of carbon neutral e-methanol that Maersk's first vessel with the ability to operate on green e-methanol will consume annually. Maersk will work closely with REintegrate and European Energy on the development of the facility.

"This type of partnership could become a blueprint for how to scale green fuel production through collaboration with partners across the industry ecosystem, and it will provide us with valuable experiences as we are progressing on our journey to decarbonise our customers' supply chains," says Henriette Hallberg Thygesen, CEO of Fleet & Strategic Brands, A.P. Moller – Maersk.

"Sourcing the fuels of the future is a significant challenge, and we need to be able to scale production in time. This agreement with European Energy/REintegrate brings us on track to deliver on our ambition to have the world's first container vessel operated on carbon neutral methanol on the water by 2023," she adds.

The methanol facility will use renewable energy and biogenic CO2 to produce the e-methanol. The fuel production is expected to start in 2023. The energy needed for the power-to-methanol production will be provided by a solar farm in Kassш, Southern Denmark.

REintegrate has a proven track record for producing green e-methanol with a test laboratory in Aalborg, says Maersk. The new facility will be its third e-methanol facility, as they are also constructing an e-methanol facility in Skive with startup 2022.

While the renewable energy will be produced in Southern Jutland, it is yet to be decided where in Denmark the power-to-methanol facility will be located.

Maersk announced the dual fuel vessel, an industry first, in February 2021. In June, Maersk announced that Hyundai Mipo Dockyards will be building the 2100 TEU (Twenty Foot Equivalent) feeder.

"The world's first methanol feeder" will be 172 metres long, and it is expected to join the Maersk fleet in mid-2023. It will sail in the network of Sealand Europe, a Maersk subsidiary, on the Baltic shipping route between Northern Europe and the Bay of Bothnia. It will fly the Danish flag.

"This job is a great scientific adventure. But it's also a great human adventure". – FABIOLA GIANOTTI, Higgs Boson physics

PLASTIC UPCYCLING

Researchers have developed a clean and cost-effective way to upcycle used plastic, transforming it into valuable nanomaterials and high-quality fuel.

Key points

- New tech produces carbon nanotubes and clean liquid fuel from used plastic
- Smart solution for upcycling plastic and agricultural waste simultaneously
- Circular economy approach to help turn two massive waste streams into genuine revenue

Globally only about 20% of waste plastics are recycled. Boosting that figure remains a challenge as recycling plastic cleanly can be expensive and usually produces lower-value products, often making it financially unviable.

The new method from researchers at RMIT University in Melbourne, Australia, can produce high-value products from plastic — carbon nanotubes and clean liquid fuel — while simultaneously upcycling agricultural and organic waste.

The team's two-step process, revealed in the Journal of Environmental Management, converts organic waste into a carbon-rich and high-value form of charcoal, then uses this as a catalyst to upcycle the plastic.

Lead researcher Associate Professor Kalpit Shah said upcycling two massive waste streams through one circular economy approach could deliver significant financial and environmental benefits.

"Our method is clean, cost-effective and readily scaleable," Shah said.

"It's a smart solution for transforming both used plastic and organic waste — whether tonnes of biomass from a farm or food waste and garden clippings from household green bins.

"We hope this technology could be used in future by local councils and municipal governments to help turn this waste into genuine revenue streams."

High-value nanomaterials

The new plastic upcycling approach offers a sustainable alternative for the production of carbon nanotubes (CNTs).

These hollow, cylindrical structures have exceptional electronic and mechanical properties, with applications across a broad range of sectors including hydrogen storage, composite materials, electronics, fuel cells and biomedical technologies.

Carbon nanotubes are in growing demand, particularly in aerospace and defence, where they can facilitate the design of lightweight parts. The global market for CNTs has been projected to reach $5.8 billion by 2027.

Turning old into new

The new method starts with converting agricultural or organic waste to biochar — a carbon-rich form of charcoal often used for improving soil health.

The biochar is used to eliminate toxic contaminants — such as Poly-cyclic Aromatic Hydrocarbons, known as PAHs — as the waste plastic is broken down into its components of gas and oil.

The process eliminates those contaminants and convert plastics into high-quality liquid fuel.

At the same time, the carbon in the plastic is converted into carbon nanotubes, which coat the biochar.

These nanotubes can be exfoliated for use by various industries or the nano-enhanced biochar can be used directly for environmental remediation and boosting agricultural soils.

The study is the first to use low-cost and widely available biochar as a catalyst for making contaminant-free fuel and carbon nanomaterials from plastic.

Shah, the Deputy Director (Academic) of the ARC Training Centre for Transformation of Australia's Biosolids Resource at RMIT, said while the study only investigated one type of plastic the approach would be applicable to a range of plastic types.

"We focused on polypropylene as this is widely used in the packaging industry," he said.

"While we need to do further research to test different plastics, as the quality of the fuel produced will vary, the method we've developed is generally suitable for upcycling any polymers — the base ingredients for all plastic."

Hyper-efficient reactor

The experimental study conducted at lab scale can also be replicated in a new type of hyper-efficient reactor that has been developed and patented by RMIT.

The reactor is based on fluidised bed technology and offers significant improvement in heat and mass transfer, to reduce overall capital and operating costs.

The next steps for the upcycling research will involve detailed computer modelling to optimise the methodology, followed by pilot trials in the reactor.

The team from RMIT's School of Engineering is keen to collaborate with plastic and waste industries to further the research and investigate other potential applications of the upcycling method.

The research was supported through an Australian Research Council DECRA Fellowship.

SHAPOORJI PALLONJI GROUP COMPANY

Shapoorji Pallonji group company, Sterling and Wilson Solar Ltd has secured its first order worth about Rs 1,500 crore for its waste-to-energy business from an undisclosed leading developer of energy assets in the UK and Europe.

The move is in line with the company's last month announcement for the expansion of its renewable energy offerings to include hybrid energy, energy storage and waste-to-energy solutions.

Further, the facility will process 23.2 tonnes of non-recyclable solid municipal waste per hour, diverting over 185,600 tonnes of waste each year.

Also, it would generate around 19.6 MW of energy, enough to power over 30,000 homes, and would also provide heat that can be used by nearby businesses, the company, which is one of the world's leading solar EPC and O&M solutions providers, said in a statement.

Commenting on winning the order, Amit Jain, Global CEO of Sterling and Wilson Solar Group, said, "we are delighted to have bagged our first order in the waste-to-energy segment, which we recently forayed into. This is a double delight since it is also our first order in the European market, further cementing our position as the most trusted partner in the EPC segment. Since waste-to-energy projects have a larger execution period, through such orders, the company will be able to manage a consistent revenue stream year-on-year."

"This is an important project for the region, in terms of sustainability and renewable power generation. With over two billion tonnes of municipal waste produced globally each year, the treatment of non-recyclable trash that otherwise emits methane from landfills will help reduce greenhouse gases in the atmosphere," he added.

The company's scope of work for this project includes design, engineering, procurement, construction, commissioning and testing of the facility, Boiler (fuel - Refused Derived Fuel), 19 MWe steam turbine generator and condensor, pollution control equipment, water treatment plant, associated balance of plant and subsequent O&M.

Meanwhile, the construction of the plant is expected to begin in Q3 FY22 and will likely be commissioned in three years.

SENVION INDIA SECURES 591 MW WIND TURBINES CONTRACT FROM JSW ENERGY

Alfanar Group's wind turbines manufacturer Senvion India has bagged a 591 MW order from JSW Energy, an arm of USD 13 billion JSW Group, for the latter's ongoing pipeline of ~ 2.5 GW of renewable energy projects.

Alfanar Group's wind turbines manufacturer Senvion India has bagged a 591 MW order from JSW Energy, an arm of USD 13 billion JSW Group, for the latter's ongoing pipeline of ~ 2.5 GW of renewable energy projects.

As per the contract, Senvion will supply its 2.7 MW turbines for the project.

Once fully operational, these wind turbines will produce enough clean electricity to power more than 4,50,000 Indian homes.

Commenting on winning the order, Jamal Wadi, Chairman of Senvion India / President & CEO of Alfanar's construction and renewable business globally, said, "the trust that JSW Energy has placed in Senvion India with the order is a testimony to the superior technology and performance of Senvion India's wind turbines. Alfanar is committed to strengthen Senvion India to deliver its projects on time with high-quality standards and continuously evolve as the top technology OEM of wind technology."

The company said that the key factors which enable it to win the contract include a competitive product due to a high level of indigenization, technical strength, and quality.

However, the delivery of the turbines will start from the first half of 2022.

On the partnership with Senvion, Prashant Jain, MD & CEO of JSW Energy, said "we are happy to work with Senvion in our flagship wind projects. Senvion presented a high-quality proposal backed by quality turbines, strong engineering capability and an attitude to jointly work towards solutions for the successful execution of the project. We look forward to on-time completion of the under-construction wind projects."

"It is a very satisfying win with JSW and Senvion is very thankful for the trust JSW management has put in Senvion solutions and team. The success of such a project depends on pre-engineering and optimization which helps not only in winning but in execution later. The two teams are now working relentlessly to meet the commissioning timelines and to build a world-class project. Senvion is fully committed to deliver world-class technology and significantly contribute towards the vision of the Indian Government to achieve 450GW of installed renewable power in the country by 2030," said Amit Kansal, MD & CEO of Senvion India.

Meanwhile, the project also comes with a 10-year Fleet-ProTM O&M contract, under Senvion comprehensive maintenance program for its installed turbines. Fleet-Pro delivers a high-quality digital interface with turbines, on-line prognosis and diagnosis and prompt service to realize the full potential of the wind farms.

TDS LITHIUM BATTERY

TDSG is the India's first Lithium-ion Battery manufacturing plant in Gujarat which is being set up jointly between TOSHIBA Corporation, DENSO Corporation and Suzuki Motor Corporation to manufacture and supply Lithium-ion battery to Maruti Suzuki and Suzuki Motor Gujarat. The manufacturing operation will be derived by Suzuki's expertize with contribution of TOSHIBA's cell technology and DENSO's module technology.

The Lithium-ion battery joint venture sees the equity stake split between Suzuki (50 percent), TOSHIBA (40 percent) and DENSO (10 percent). 180 MILLION USD (Investment amount) has been invested between all three Japanese ventures for the lithium-ion battery manufacturing plant slated to be ready by 2020.

Given the focused by The Government of India to achieve **30% electric vehicle sales by 2030** which ultimate aims to reduce of carbon emission into climate and helps to enhance the economic and social life of People. TDSG wants to contribute to the society through its technology and advance quality of **Lithium-ion Battery** under the roof of Make-in-India strategy which will help to the increase the standard of social life, creation of Job and boost to the Indian economy.

Having past **working experience in Japan almost 5 years** all three Japanese organization is delivering high quality products to the society. Durability and constant technology enhancement is in DNA of all 3 JV.

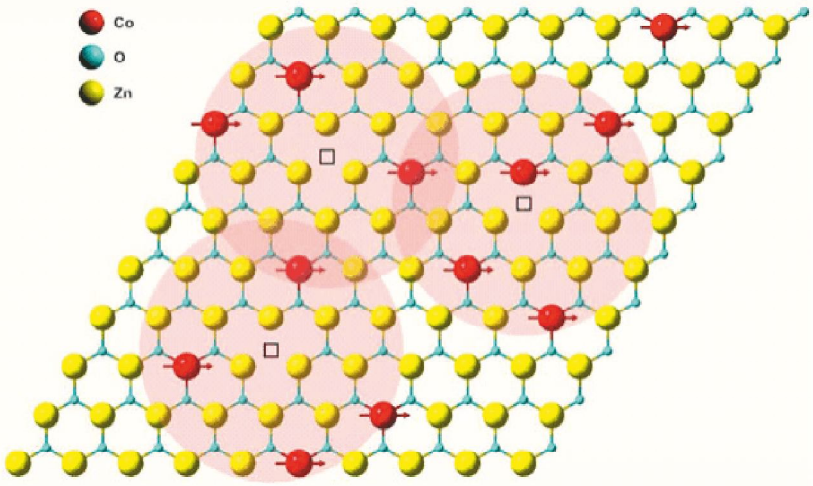
Prime objective for company is to meet the requirement of new generation life which is growing with fast pace and requiring the instant solution. Our Lithium-ion battery will promise for rapid charge and long life with high standard of safety.

With the continuous progress and efforts, company has aim to become the **No.1 Lithium-ion battery company of India.**

TDS Lithium-Ion Battery Gujarat Private Limited (TDSG)

WORLD'S THINNEST MAGNET CREATED

The one-atom thin 2D magnet, created by Dr. Jie Yao from the University of California, Berkeley, and the Lawrence Berkeley National Laboratory, and his colleagues, could make big advances in next-generation memories, computing, spintronics, and quantum physics.



Chen et al. report the observation of room-temperature ferromagnetism in 2D graphitic Zn1-xCoxO (gZCO) monolayer with strong environmental stability; red, blue, and yellow spheres represent cobalt, oxygen, and zinc atoms. respectively. Image credit: Lawrence Berkeley National Laboratory.

"We're the first to make a room-temperature 2D magnet that is chemically stable under ambient conditions," Dr. Yao said.

"This discovery is exciting because it not only makes 2D magnetism possible at room temperature, but it also uncovers a new mechanism to realize 2D magnetic materials," added Rui Chen, a graduate student at the University of California, Berkeley, and the Lawrence Berkeley National Laboratory.

Dr. Yao, Chen and their co-authors synthesized the cobalt-doped van der Waals zinc-oxide magnet from a solution of graphene oxide, zinc, and cobalt.

Just a few hours of baking in a lab oven transformed the mixture into a single atomic layer of zinc-oxide with a smattering of cobalt atoms sandwiched between layers of graphene.

In a final step, graphene is burned away, leaving behind just a single atomic layer of cobalt-doped zinc-oxide.

"With our material, there are no major obstacles for industry to adopt our solution-based method. It's potentially scalable for mass production at lower costs," Dr. Yao said.

To confirm that the resulting 2D film is just one atom thick, the researchers conducted scanning electron microscopy experiments to identify the material's morphology, and transmission electron microscopy imaging to probe the material atom by atom.

With proof in hand that their 2D material really is just an atom thick, they demonstrated that the magnet successfully operates at room temperature.

As a whole, the experiments showed that the graphene-zinc-oxide system becomes weakly magnetic with a 5-6% concentration of cobalt atoms.

Increasing the concentration of cobalt atoms to about 12% results in a very strong magnet.

To the team's surprise, a concentration of cobalt atoms exceeding 15% shifts the 2D magnet into an exotic quantum state of 'frustration,' whereby different magnetic states within the 2D system are in competition with each other.

And unlike previous 2D magnets, which lose their magnetism at room temperature or above, the scientists found that the new magnet not only works at room temperature but also at 100 degrees Celsius (212 degrees Fahrenheit).

"Our 2D magnetic system shows a distinct mechanism compared to previous 2D magnets. And we think this unique mechanism is due to the free electrons in zinc oxide," Chen said.

The team's *work* was published in the journal *Nature Communications*.

ELECTRICAL MAINTENANCE UNIT
(QUESTION & ANSWERS) - 10

176. What is the use of conservator in the transformer?

It is a drum type cylinder mounted on the top of the transformer through a small pipe. … of the conservator is kept empty. To indicate the level of oil in the transformer an indicator is fixed. Conservator will help the oil inside the tank by providing sufficient space to expand and to contract as its temperature varies without exposing much surface area. That is it limits the air with oil due to its less surface area.

177. What is the use of breather in the transformer?

Breather is a bottle shaped steel tube, which is attached to one side of conservator to allow the air to pass in and out of the tank or conservator through the calcium chloride and silica gel, which is filled in it to absorb the moisture contained in the air. When the silica gel absorb the moisture its colour changes from blue to pink.

178. What is the use of buchholz relay in the transformer?

It's a protection relay used in oil immersed transformer to protect the transformer from insulation failure, core heating or any other type of internal faults, which may cause the heating of winding beyond the specified temperature. This relay is placed in between the pipe connecting the conservator and the tank. Generally used in power transformer of above 500 kVA.

It consists of two operating floats and is operated by two mercury switches separately provided for the alarm and trip. Due to internal fault (collection of gases) or leakage of oil if the oil level comes down the alarm relay first operates and then the trip relay operates to isolate the transformer from the circuit.

179. What is the use of explosion vent in the transformer?

It is also a safety device of a transformer, which protects the transformer tank from the high consequences of the high-pressure gases induced or developed by any type of short circuit in the transformer by allowing the gas to escape by puncturing the diaphragm.

180. What is the emf equation for transformer?

Always maximum flux reaches from zero to maximum in one quarter of the cycle.

That is in … of second. That is equal to 1/200 second.

Average rate of change of flux = Q_m / … f. = Q_m * 4 * f.

= 4 f Q_m Weber / second.

As the coil has N turns the average emf induced in the coil = 4 f Q_m N volts.

But the rms. Value = average value * form factor.

I rms. Value of emf = 1.11 * 4 f Q_m N volts.

= **4.44 f Q_m N volts**.

181. What are the losses in transformer?

In transformer there are losses due to,

1. Resistance of the winding (copper losses)
2. Eddy current and Hysterisis in the iron parts and core (core and iron losses)
3. Losses due to leakage reactance (leakage flux)

At No load the copper losses and leakage flux losses are negligible due to the very less primary current.

At loaded condition copper losses and leakage flux losses will exist in considerable manner. Copper losses are variable and can be calculated by $I_p^2 * r_p$ and $I_s^2 * r_s$.

182. What are the types of cooling in transformer?

1. Natural cooling.
   a. Air natural cooling (Dry type).
   b. Oil immersed natural cooling.
   c. Oil immersed, forced oil circulation with natural cooling.
2. Artificial cooling.
   a. Oil immersed forced air circulation with air blast cooling.
   b. Oil immersed blast cooling.
   c. Air blast cooling.
3. Artificial cooling (water).
   a. Oil immersed water cooling.
   b. Oil immersed forced oil circulation with water cooling.
4. Mixed cooling (water).

   This is the method of cooling combining oil natural, water, air natural, air blast and forced oil.

183. State the type transformers?

Transformers can be classified into different groups and types based on the following factors.

1. Type of core.
   a. Core type transformer core.
   b. Shell type transformer core.
   c. Berry type transformer core.
   d. Spiral type transformer core.
2. Method of cooling.
   a. Natural cooling transformer.
   b. Artificial cooling transformer.
   c. Artificial cooling (water) transformer.
   d. Mixed cooling transformer.
3. As per transformer ratio.
   a. One to one transformer.
   b. Step down transformer.
   c. Step up transformer.
4. Based on number of phases.
   a. Single-phase transformer.
   b. Two-phase transformer.
   c. Three phase transformer.
5. As per winding connection.
   a. Star-star connected.

b. Star-delta connected.
c. Delta-delta connected.
d. Delta-star connected.
e. Open delta connected.
f. Scott connected.

6. As per the size of the transformer.
   a. Distribution transformer (upto 500 kVA).
   b. Power transformer (above 500 kVA).
7. Based on function and utilization.
   a. Auto transformer.
   b. Potential transformer (instrument transformer).
   c. Current transformer (instrument transformer).

184. What is the humming of transformer?

Humming is a sound, which is produced due to the vibration of the cores in the transformer. The vibrations are produced due to the change in polarity of an alternating current or voltage and by the loose of lamination of the core. Both can be minimised by tightening the core of the transformer.

185. What are the types of AC three phase motors?

Mainly there are two types.

1. Synchronous motors.

a. Plain synchronous motors.
b. Auto synchronous motors.

2. A-synchronous motors.

a. ***Induction motors***.

1. Single phase motors
   - Shaded pole motor.
   - Capacitor start capacitors run motor.
   - Capacitor start induction's run motor.
   - Split face motor.
2. Three phase motors.
   - 3ϕ single squirrel cage motor.
   - 3ϕ double squirrel cage motor.
   - Squirrel deep bar induction motor.
   - Slipring induction motor.

b. Commutator motors.

1. Single phase commutator motors.
   - Plain repulsion motor.
   - Repulsion start induction's run motor.
   - Repulsion induction motor.
   - *Series motor or universal motor.*

2. 3ϕ commutator motors.
   - 3ϕ series motor
   - Charge motor.
   - Compensated motor.

186. What is the working principle of 3ϕ induction motor?

When 3ϕ supply is given to stator, a rotating magnetic field of constant magnitude is produced. This rotating magnetic field produces induced emf in the rotor winding as per faraday's laws and this induced emf causes to circulate a heavy induced current in the rotor winding due to very small resistance of rotor. At the initial moment the frequency of induced emf is equal to the frequency of the stator supply voltage, when the rotor is stationary as in the case of secondary of a transformer. The rotor induced current according to lenz's law flows in such a direction that it opposes the cause, which is inducing it. In this case the cause producing the rotor current is the relative speed between the rotating magnetic field if stator and the rotor and is maximum when the rotor is stationary. Hence to reduce this relative speed rotor conductor (rotor) starts to rotate in the same direction in which the stator field is rotating and tries to catch it up. The rotation of this rotor is developed due tog the torque developed in the rotor by interaction between the rotating magnetic field of stator and the field produced by the rotor current.

187. What is torque?

As said above torque is a turning or twisting moment of a force about an axis and it is measured by the product of force * radius at which the force acts.

There are two types of torques.

a. Starting torque: This is the torque, which is required to start the motor at load or no-load.
b. Running torque: This is the torque, which is required to run the motor at normal speed and at normal load.

The letter 'T' denotes torque in induction motor and torque is proportional to $I_r \phi \cos \varphi_r$.

That is $T \propto Ir \phi \cos \varphi_r$. Where I_r = rotor current.

ϕ = Flux = stator flux per pole in Weber.

$\cos \varphi_r$ = rotor power factor.

188. What is slip?

The difference in speed of stator magnetic speed 'Ns' (synchronous speed) and rotor speed 'Nr' is called slip or absolute slip and it is denoted by the letter 'S'.

$S = Ns - Nr / Ns$.

Slip has no unit. Percentage of slip of induction motor varies from 4 to 5% in small motors and 1.5 to 2.5% in big motors.

In other words slip 'S' = f_r / f. Where f_r is rotor frequency and f is stator frequency.

189. What is the working principle of double squirrel cage induction motor?

In double squirrel cage motor outer cage rotor winding is of high resistance and low reactance. Inner cage winding is of high reactance and low resistance.

At the time of starting rotor frequency is equal to the stator frequency and there by the reactance of the inner cage winding is comparatively high ($X_L = 2\pi fL$) because it is linking more inner winding than the outer winding. So the impedance of inner cage winding is very high. Hence the current flow through inner cage winding is very less comparing to the outer cage winding. That is a very high ratio of current is passing through the outer cage winding at the time of starting and there by produces very high starting torque.

When the rotor starts running the speed of the motor can be increased and the slip will be decreased and there by the rotor frequency ('S' = f_r / f). So that in the running condition the reactance of the inner cage decreases to the lowest value and hence the Impedance ($X_L = 2\pi fL$). So the current in inner cage winding will be comparatively more than the outer cage winding at the time of running. So now inner cage winding produces more torque than outer cage at the time of running and the motor running torque is good enough.

190. Why starter is necessary to start the AC motor?

a. At the time of starting motor starting current is high (4 to 5 times). Therefore if motor is directly started the supply voltage may be disturb.

b. By the help of starters starting and stopping of motors can be made easily as we required. Because starters provides overload tripping difficulties.

c. The help of starters can protect motor against the single phasing by the action of overload arrangements.

d. Protect the motor from no-voltage and its difficulties.

e. Permits automatic control when required.

(To be continued)

Courtesy: https://www.scribd.com/document/244623258/Question-and-Answers-Electrical-Maintenance-Unit

3-PHASE DISTRIBUTION TRANSFORMERS 11 OR 433 KV/415-240V (OUTDOOR TYPE) - 8

42 DEVIATIONS:

42.1 The bidder shall fill in the following schedule which will be part of the offer. If the schedule are not submitted duly filled in with the offer, the offer shall be liable for rejection.

Schedule-A: Guaranteed Technical Particulars

Schedule-B: Schedule of Deviations

43.1 The bidders are not allowed to deviate from the principal requirements of the Specifications. However, the bidder is required to submit with his bid in the relevant schedule a detailed list of all deviations without any ambiguity. In the absence of a deviation list in the deviation schedules, it is understood that such bid conforms to the bid specifications and no post-bid negotiations shall take place in this regard.

43.2 The discrepancies, if any, between the specification and the catalogues and / or literatures submitted as part of the offer by the bidders, shall not be considered and representations in this regard shall not be entertained.

43.3 If it is observed that there are deviations in the offer in guaranteed technical particulars other than those specified in the deviation schedules then such deviations shall be treated as deviations.

43.4 All the schedules shall be prepared by vendor and are to be enclosed with the bid.

Annex-I

METHODOLOGY FOR COMPUTING TOTAL OWNING COST

TOC = IC + (A x **Wi) + (B** x **Wc) ; Losses in KW**

Where,

TOC = Total Owning cost

IC	=	Initial cost including taxes of transformer as quoted by the manufacturer
A factor	**=**	**Cost of no load losses in Rs/KW (A = 288239)**
B factor	**=**	**Cost of load losses in Rs/KW (B = 93678)**
Wi	=	No load losses quoted by the manufacturer in KW
Wc	=	Load losses quoted by the manufacturer in KW

Annexure – A

Check-list for Inspection of Prime quality CRGO for Transformers

During inspection of PRIME CRGO, the following points needs to be checked by the transformer manufacturer. Utilitity's inspector shall verify all these points during inspection:-

A) In case PRIME CRGO cutting is at works of Transformer Manufacturer:

1. Review of documents:
   - Purchase Order (unpriced) to PRIME CRGO supplier/Authorised Agency
   - Manufacturer's test certificate
   - Invoice of the Supplier
   - Packing List
   - Bill of Lading
   - Bill of Entry Certificate by Customs Deptt.
   - Reconciliation Statement as per format below
   - Certificate of Origin
   - BIS Certification

Format for Reconciliation/Traceability records

Packing List No./date /Quantity of PRIME CRGO received

Name of Manufacturer

Manufacturer test certificate No./date

Serial No.	Details of package / job	Drawing Reference	Quantity involved	Cumulative Quantity Consumed	Balance in Stock

2.1 Inspection of PRIME CRGO Coils:

a. PRIME CRGO-Manufacturer's Identification Slip on PRIME CRGO Coils

b. **Visual Inspection of PRIME CRGO Coils offered as per packing list (for verification of coil details as per Test certificate & healthiness of packaging).**

c. **Unique numbering inside of each sample of PRIME CRGO coil and verification of records to be maintained in the register for consumption of CRGO coil.**

d. **ISI logo sticker on packed mother coil and ISI logo in Material TC.**

2.2 During inspection of PRIME CRGO, surveillance testing of sample shall be carried out for Stacking Factor, Permeability, Specific watt loss at 1.5 Tesla and/or 1.7 Tesla, thickness depending on the grade of PRIME CRGO and aging test etc. applicable as per relevant IS/ IEC standard, Tech. Spec., MQP and Transformer manufacturer plant standard.

Inspection Clearance Report would be issued after this inspection

3. **Inspection of PRIME CRGO laminations:**

Transformer manufacturer representative will inspect laminations and issue their internal Inspection Clearance Report. Inspection will comprise of review of traceability to prime CRGO coils, visual Inspection of PRIME CRGO laminations and record of burr/bow. After clearance given by transformer manufacturer, Utility will issue an Inspection Clearance Report after record review. If so desired by Utility, their representative may also join transformer manufacturer representative during this inspection.

Inspection Clearance Report would be issued after this inspection

4. Inspection at the time of core building:

Visual Inspection of PRIME CRGO laminations. In case of suspected mix-up/rusting/decoloration, samples may be taken for testing on surveillance basis for tests mentioned in B.2.2.

Inspection Clearance Report would be issued after this inspection

NOTE :-

a) Transformer Manufacturer to ensure that PRIME CRGO is procured from POWERGRID approved vendors and CRGO manufacturer should have valid BIS Certificate for respective offered Grade.

b) Transformer Manufacturer should also involve themselves for ensuring the quality of CRGO laminations at their Core Cutter's works. They should visit the works of their Core cutter and carry out necessary checks.

c) **General -** If a surveillance sample is drawn and sent to TPL (if testing facility not available with the manufacturer), the Transformer manufacturer can continue manufacturing at their own risk and cost pending TPL test report on PRIME CRGO sample drawn. Decision for acceptance of PRIME CRGO shall be based upon report of the sample drawn.

These checks shall be read in-conjunction with approved Quality Plan, specification as a whole and conditions of contract.

Sampling Plan (PRIME CRGO)

33 / 11 kV	-	1st transformer and subsequently at random 10% of Transformers (min. 1) offered for inspection.
DTs and other ratings	-	1st transformer and subsequently at random 2% of Transformers (min. 1) offered for inspection.

NOTE: One sample for each lot of CRGO shall be drawn on surveillance basis.

CRGO has to be procured only from POWERGRID approved vendors. List of such vendors is available at the following website. Since the list is dynamic in nature, the site may be checked from time to time to see the list of approved vendors.

http://apps.powergridindia.com/ims/ComponentList/Power-former%20upto%20420%20kV-CM%20List.pdf

Courtesy: www.mstcecommerce.com>RenderFileViewVideo

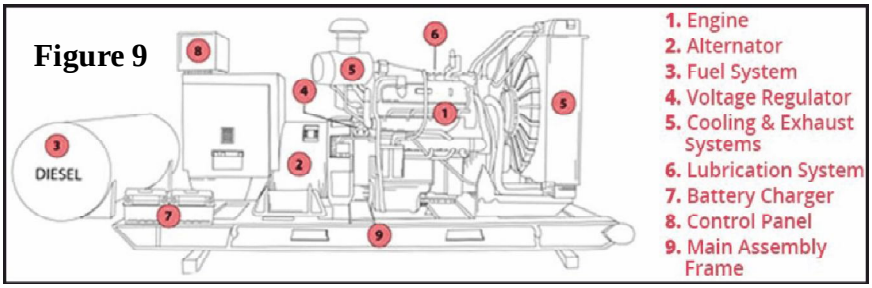
HOW GENERATORS WORK - 4

The Main Parts of a Diesel Generator

Every *diesel generator* is made up of at least nine different - but equally important - parts. These are the:

- Diesel Engine
- Alternator
- Fuel System
- Voltage Regulator
- Cooling System & Exhaust System
- Lubrication System
- Battery Charger
- Control Panel
- Main Assembly Frame or Skid

Figure 9



To better understand how a power generator works to convert mechanical energy into electrical energy, we will look at the roles of all these components, starting with the diesel engine.

Diesel Engine

This is simply a basic diesel engine, it's no different to the ones found in cars, vans, lorries or other large vehicles. This is the source of the mechanical energy, and the size of the engine matters. If you want a larger generator output, then you need a bigger engine. The larger the engine, the more electrical output you are able to produce.

Alternator

This is essentially the component that's responsible for generating power output. Here, we see the concept of electromagnetic induction come into play.

An alternator is made up of many complex components, but one of the most crucial aspects is the rotor. This is a shaft that rotates - driven by the mechanical energy supplied by the engine - with multiple permanent magnets fixed around it. In doing so, this creates a magnetic field.

This magnetic field created continuously rotates around another critical part of the alternator: the stator. Simply put, this is a variation of different electrical conductors that are tightly wound over an iron core. This is where things start to become slightly more scientific. According to the principle of electromagnetic induction, if an electrical conductor remains stationary and a magnetic field moves around it, then an electrical current is induced.

In summary, the alternator takes mechanical energy created by the diesel engine, which drives the rotor to create a magnetic field that moves around the stator, which in turn generates an alternating current.

Fuel System

The fuel system mainly consists of a fuel tank with a pipe that connects it to the engine. Here, diesel can be supplied directly to the engine, which will then kick start the whole process explained above. The size of the fuel tank ultimately dictates how long a generator can remain active for.

Our range of *silent canopied generators* usually come with fuel tanks included at the base of the electric generator as standard. If a larger capacity of fuel is required, we can design and manufacture a *bespoke extended base fuel tank*, or the unit can be attached to an *additional free-standing bulk fuel tank*.

For larger power generator projects that require the genset to be installed into an *acoustic enclosure*, separate fuel systems are usually installed or located either inside the enclosure, underneath the enclosure or sometimes even both.

Voltage Regulator

Here, we have the most complex part of an electric generator. The voltage regulator serves one rather self-explanatory purpose: to regulate the voltage output. There is too much that happens here to explain in this article alone, we'd probably need an entirely separate piece to describe the whole voltage regulation process.

In simple terms, it ensures that the generator produces electricity at a nice steady voltage. Without it, you would see massive fluctuations dependent on how fast the engine is working. Needless to say, all the electrical equipment we use will not be able to handle such an unsteady power supply. So, this part works its magic to keep everything smooth and steady.

Cooling System & Exhaust System

These two components both play very crucial roles, and the good news is that they're easy to understand! A cooling system works to help prevent your generator from overheating. There is coolant released in the generator which counters all the additional heat energy produced by the engine and alternator. The coolant then takes all this heat through a heat exchanger and gets rid of it outside of the generator.

The exhaust system works in the same way as your car exhaust. It takes any gases produced by the diesel engine, brings them through a piping system, and exhausts them away from the genset.

Lubrication System

This component attaches to the engine and pumps oil through it to ensure all the parts work smoothly and don't grind against one another. Without it, the engine will break down.

Battery Charger

All diesel engines need a tiny little electrical motor to help kick it into action. This small motor requires a battery, which needs to be charged. The battery charger keeps it nice and full of charge, either by an external source of the generator itself.

Control Panel

This is simply where the generator is controlled and operated. On an electric start (or auto start) generator you will find a whole host of controls here that allow you to do different things or check certain figures. This could include anything from the start button and a frequency switch, to an engine fuel indicator, coolant temperature indicator and much more.

Main Assembly Frame

Every generator needs to be contained somehow, and this is what the main assembly frame is. It houses the generator and is where all the different parts are built onto. It keeps everything together, and it can be an open design - or closed (canopied) for added protection and sound attenuation. Outdoor generators are typically housed in a protective frame that's weatherproof to prevent damages.

So, there you have it, that's how an electric generator works. The diesel engine supplies the alternator with mechanical energy, which is then converted into an electrical current thanks to the magnetic field producing an electromagnetic induction. But, now you know exactly how that happens, along with all the different parts inside a power generator as well.

Courtesy: Critical Power Products & Services

OFFSHORE WIND ENERGY IN INDIA - AN INSIGHT

Introduction

India is blessed with a coastline of about 7600 km surrounded by water on three sides and has good prospects of harnessing offshore wind energy. Considering this, the Government had notified the “Nationaloffshore wind energy policy”as per the Gazette Notification dated 6th October 2015. As per the policy, Ministry of New and Renewable Energy will act as the nodal Ministry for development of Offshore Wind Energy in India and work in close coordination with other government entities for Development and Use of Maritime Space within the Exclusive Economic Zone (EEZ) of the country and shall be responsible for overall monitoring of offshore wind energy development in the country. National Institute of Wind Energy (NIWE), Chennai will be the nodal agency to carryout resource assessment, surveys and studies in EEZ, demarcate blocks and facilitate developers for setting up offshore wind energy farms. Ministry set a targetof 5.0 GW of offshore wind installations by 2022 and 30 GW by 2030 which has been issued to give confidence to the project developers in India market.

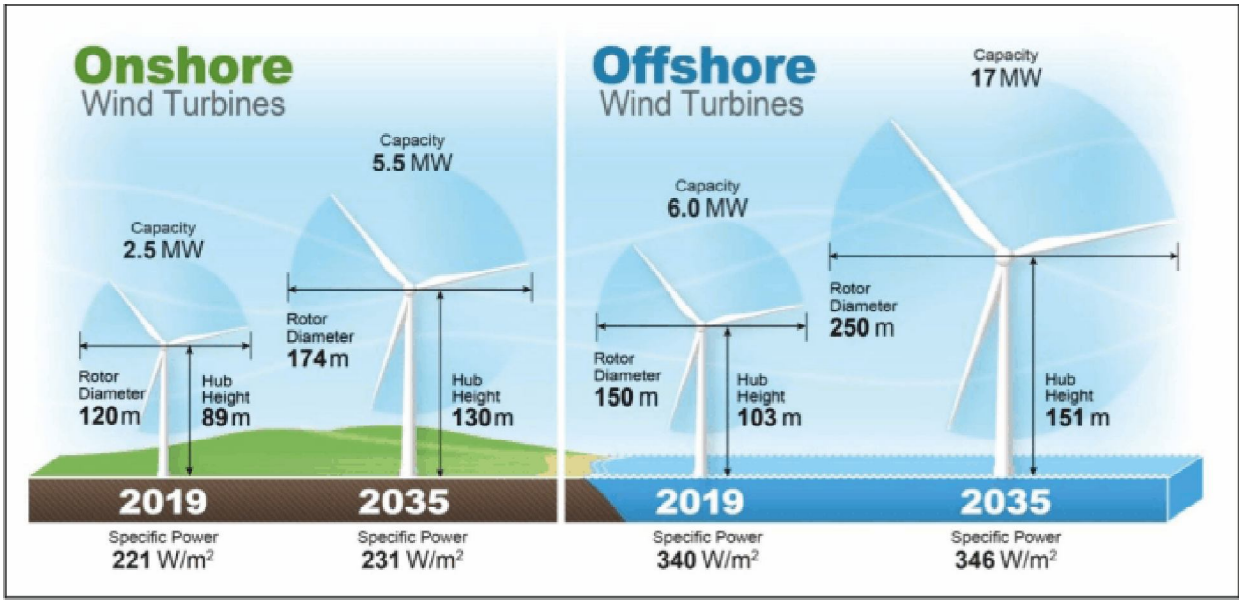
The wind resources assessment carried out by the National Institute of Wind Energy (NIWE) gives total wind energy potential at 302 GW at 100 meter and 695.50 GW at 120 meter hub height. Out of the total estimated potential more than 95% of commercially exploitable wind resources are concentrated in seven states (Andhra Pradesh, Gujarat, Karnataka, Madhya Pradesh, Maharashtra, Rajasthan and Tamil Nadu). The precious land resources required for onshore wind projects are gradually becoming a major constraint. With exhaustion of best windy sites, we expect upward movements of market determined tariffs for onshore wind energy in future.

Offshore wind power offers a plausible alternative in such a scenario. Absence of any obstruction in the sea offers much better quality of wind and its conversion to electrical energy. Offshore wind turbines are much larger in size (in range of 5 to 10 MW per turbine) as against 2-3 MW of an onshore wind turbine. While, the cost per MW for offshore turbines are higher because of stronger structures and foundations needed in marine environment, the desirable tariffs can be achieved on account of higher efficiencies of these turbines after development of the eco system.

Global Scenario

Globally offshore wind is about two decades old history with the first offshore wind turbine in Denmark in 1991 which has been decommissioned in 2017. As of now the total installation is about 35.3 GW in 18 different

countries of which important ones are- UK (10428 MW), China (9996 MW), Germany (7689 MW), Denmark (1701 MW), The Netherlands (2611 MW), Belgium (2261 MW), Sweden (192 MW). Capacity additions in last four years stands at 57% of the total capacity out of which 6358 MW commissioned in 2020, 4679 MW in 2019, 4792 MW in 2018 and 4495 MW in 2017.



Facilitating Offshore Wind Energy in India (FOWIND)

Is a project implemented from December 2013 to March 2018 by a consortium led by Global Wind Energy Council (GWEC) and supported by European Union (EU) to assist India on its offshore wind power development and in turn contribute to India's transition towards use of clean technologies in the power sector. The project focused on the States of Gujarat and Tamil Nadu for identification of potential zones for development through techno-commercial analysis and preliminary resource assessment. The outcomes of the FOWIND are summarized in the following reports.

1. Inception Report
2. GlobalOffshore Wind Policy Assessment Outlook.
3. Pre-FeasibilityReport For Offshore Wind Power Development In Gujarat.
4. Pre-Feasibility Report For Offshore Wind Power DevelopmentIn Tamil Nadu.
5. Report On Supply Chain, Ports And Logistics.
6. Grid Integration Study For Offshore Wind Firm DevelopmentIn Gujarat And Tamil Nadu.
7. Feasibility Report For Offshore Wind Power Development In Gujarat.
8. Feasibility Report For Offshore Wind Power Development In Tamil Nadu.
9. India's Offshore Outlook From 0 GW To 5 GW.

First Offshore Wind Power project in India (FOWPI)

Is another project getting implemented from December, 2015 by a consortium led by COWI and supported by European Union with an objective to provide assistance up to the stage of Pre-Financial-Investment-Decision

(Pre-FiT) and provide general assistance for capacity building of Indian stakeholders within offshore wind sector. The following reports are already published under FOWPI project.

1. Metocean Study.
2. Metocean Weather Windows for installation.
3. Metocean Data Requirements.
4. Procedures for Offshore Wind.
5. FOWPI Wind Turbine Layout and AEP.
6. Advisory Electrical Concept Design.

Identified Offshore Wind Zones for Initial Project Development

Based on the preliminary assessment from satellite data and data available from other sources eight zones each in Gujarat and Tamil Nadu have been identified as potential offshore zones for exploitation of offshore wind energy. Initial assessment by NIWE within the identified zones suggests 36 GW of offshore wind energy potential exists off the coast of Gujarat only. Further, nearly 35 GW of offshore wind energy potential exists off the Tamil Nadu coast.

Offshore Wind Resource Assessment through LiDAR

The offshore wind energy potential estimation carried out through satellite data needs to be validated through actual ground measurements in order to make the data bankable. Ministry has decided to launch a measurement campaign deploying Light Detection and Ranging (LiDARs) at the identified zones off the coast of Gujarat and Tamil Nadu. One LiDAR was commissioned in November 2017 for Offshore Wind Resource assessment in identified zone-B off the coast of Gujarat nearly 25 km away from the port of Pipavav. Two years data collected from the deployed LiDAR has been analyzed and the report is published at NIWE's website.The raw data can be accessed from NIWE website (https://niwe.res.in/department_wsom_lidar_raw_data.php). As per the report, the annual average wind speed at the locations is observed to be 7.52 m/s at 100m hub height.

Oceanographic, Geophysical and Geotechnical studies

In addition to the wind data, the viability of offshore wind projects also largely depends on the condition of site in terms of oceanographic data, geophysical and geotechnical data. Ministry has planned to carry out the required study in this regard through NIWE and provide the basic data to the stakeholders before commencement of the bidding so as to mitigate the risks. Geo-physical Survey for 365 Sq. km (Gujarat) for 1.0 GW project capacity in Gujrat has been completed. One rapid EIA has also been carried out for this site.

The first 1.0 GW offshore Wind Energy Project

The first offshore wind energy project of 1.0 GW capacity was planned in the identified zone-B off the coast of Gujarat in order to bring the economy of scale and localization of necessary ecosystem for offshore wind energy sector. In principle (stage-I) clearance as per the National offshore wind energy policy from relevant Ministries/Departments for a 1.0 GW offshore wind energy project in Zone –B off Gujarat coast has already been obtained. Expression of Interest (EoI) for the first offshore wind project of 1.0 GW capacity off Gujarat coast has been floated on 10.04.18 by NIWE. Thirty five International/Multinational and Indian Developers/ OEMs have participated in the EoI and subsequent consultation process who provided their inputs for bidding process. Ministry has constituted a committee to finalize a roadmap for development of offshore wind energy in the country along with the upcoming projects.

ENERGY – GLOBAL MISSION AND INITIATIVES INDIA'S COMMITMENTS AND STRATEGIES -1

Sustainable Growth, Sustainable Energy and Renewable Energy

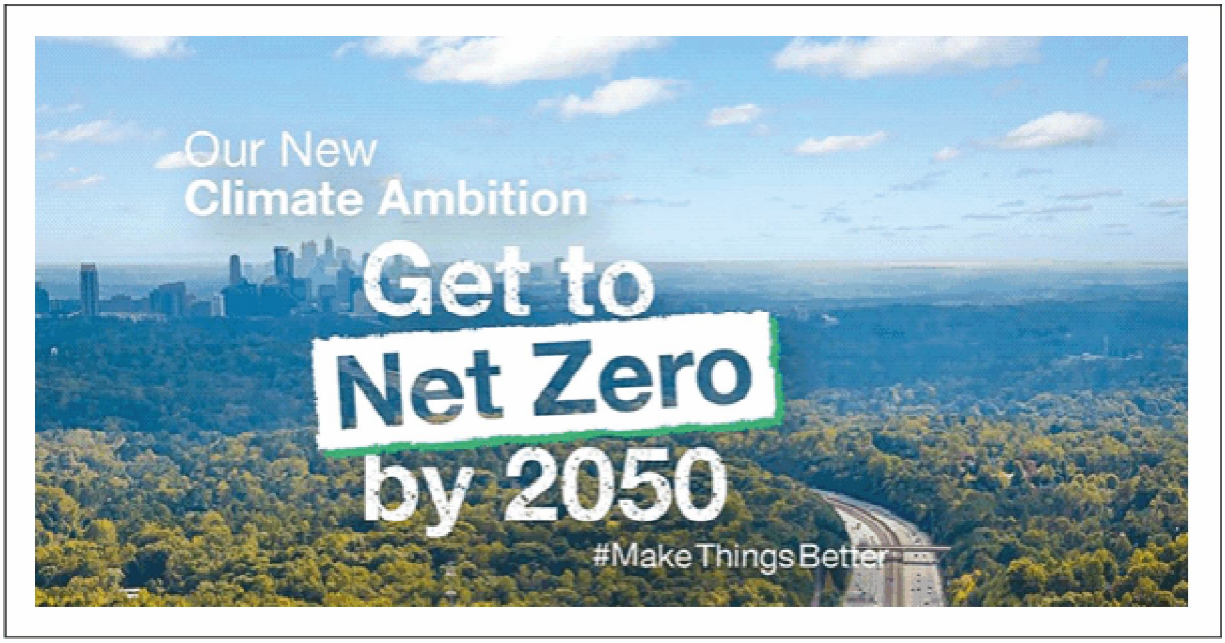
Wind and Solar Initiatives have been in the forefront ever since with lot of investments, visibility and progress in India and across the World.

Bioenergy which is a 'Firm Energy' (24x365) as against Wind and Solar which are 'Infirm Energy' (Seasonal and part of the day only), require investments in Innovation and Technology as India has a huge potential Global activities,

Ambitious Road Map of the World for Net Zero Emission by 2050

Safety of the Planet and the People are the key considerations by the World and near consensus is being achieved by most of the countries with regard to the dangers and the Road Map to be agreed and executed by all the countries of the World. India is one of the large countries of the World with large responsibility and we have been participating ij all deliberations and have also been demonstrating our commitments and progress. In this part, the outlines of Global plans and Road Map is presented with materials collected from various International sources. It includes Clear details about understanding Carbon Emission terminologies for uniformity.

International Energy Agency Unveils Ambitious Roadmap to Net Zero Emissions By 2050



In a new report, the International Energy Agency (IEA) says that to achieve net-zero emissions, all new investments in fossil fuel projects such as pipelines must be ended, and it calls for the rapid adoption of renewable energy such as solar and wind energy, and a large-scale research and development programme to develop future technologies, including producing energy from hydrogen and removing carbon dioxide from the atmosphere.

What is Happening?

- The IEA report, entitled "Net Zero by 2050: A Roadmap for the Global Energy Sector," says that with current climate pledges, the world will "fall well short" of reaching net-zero emissions by 2050 and keeping global temperature rise to 1.5 degrees Celsius.
- The IEA says that the world must embrace "an unprecedented transformation of how energy is produced, transported and used globally."

- The report lays out 400 milestones on the road to net zero emissions by 2050, including a halt in investment on coal-fired power plants, no new sales of internal combustion passenger cars by 2035 and the decarbonisation of the global electricity sector by 2040.
- The IEA also calls for the quadrupling of solar and wind power capacity in this decade and a global push to adopt energy efficiency improvements of 4% a year by 2030.
- Rapidly transitioning away from fossil fuels must happen because the IEA says that weaning the economy off fossil fuels will add USD$5 trillion in energy investments by 2030, create millions of jobs and lead to a global GDP in 2030 4% higher than a business-as-usual approach.
- With 90% of electricity coming from renewable sources, solar making up the single-largest source of global energy and fossil fuels mainly used in the manufacture of plastics and other products and in producing electricity with carbon capture-and-storage, the "world looks completely different," according to the IEA.

Faith Birol, IEA executive director, says, "The scale and speed of the efforts demanded by this critical and formidable goal … make this perhaps the greatest challenge human kind has ever faced."

Understanding Carbon Neutral, Carbon Negative, Net Zero, Climate Positive – What is the difference?

When we all know what terms to use, we all can compare the efforts of nations, organizations and individuals. If we all come up with our own definitions and terms, none of us will be able to know what others are doing.

Carbon neutral, negative, net zero, zero emissions, low carbon, climate positive… As more and more nations, organizations and individuals take bold climate action, more and more terms describing that action are flying around. But what do these terms mean? How do they differ? What are good terms to use and what's just plain marketing mumble?

Let's dive in.

Carbon neutral

You're carbon neutral if the amount of CO_2 emissions you put into the atmosphere is the same as the amount of CO_2, emissions you remove from the atmosphere. Your impact is neutral, zero. Putting it bluntly, you're maybe not making it actively worse, but you're not making it better either.

Carbon negative

Carbon negative takes that idea a step further. You're carbon negative if the amount of CO_2 emissions you remove from the atmosphere is bigger than the amount of CO_2 emissions you put into the atmosphere. Your impact is positive, meaning you're actively doing something to better the climate.

At Compensate, we believe carbon negativity is the only way forward. The "safe levels" of CO_2 (350 ppm) were surpassed back in 1987, so we have both the historical responsibility and it is critically urgent to actively clean up the atmosphere.

Net zero, net zero emissions

Net zero is broadly the same as carbon neutral: Emissions are still being generated, but they're offset by the same amount elsewhere. The "net total" of your emissions is then zero.

The confusion here is that sometimes net zero is used to talk about *all* greenhouse gases and sometimes it's used to talk only about CO_2. Technologies play a big part in "net zero" as well: If a process generates CO_2, but also captures and stores it, it can be net zero. An example of this would be a coal-fired power plant that's fitted with carbon capture and carbon storage tech. A plant like this could possibly qualify as net zero.

Most national and international climate goals are aiming for *net zero* by either 2030 or 2050. To reach it, emissions must be reduced, but offsetting and sequestering emissions are also absolutely necessary to reach the goals.

Zero emissions

This one should be easy, but it's actually not. You're creating zero emissions when there's no CO_2 released at all. In our current system, however, no technology is truly zero emissions. Even the greenest of tech has so called embedded emissions. These are emissions that are created in the manufacturing of technology. So there might be zero *ongoing* emissions from use.

Low emissions, low carbon

9 times out of 10 this term tells us that we've wandered into marketing territory. You're "low emissions" when you create less CO_2 than would be considered business as usual. But how much less? What's business as usual? What are you comparing your numbers to? It's a confusing term, and therefore best avoided, our sustainability experts say.

Carbon positive, climate positive

Marketing term alert here as well. Some companies have used these terms to describe their efforts to reduce emissions. Both slightly confusing terms are used to talk about what scientists would just call carbon negative.

What does it matter? Why are the terms so important anyway?

Confusing terms are usually the product of marketing. When we all know what terms to use, we all can compare the efforts of nations, organizations and individuals. If we all come up with our own definitions and terms, none of us will be able to know what others are doing.

Honest sustainability communications will always be clear about what's actually being done: what is included in the emission calculations, how the emissions are compensated, and how compensation fits into emission reduction efforts.

If you haven't taken into account the full scope of your carbon footprint, it can be dangerous to make the claim for carbon neutrality.

If you are aiming to be carbon negative, you need to be sure your footprint calculations, and the compensation methods, are rock-solid.

If you're only counting CO_2, but claim to be climate neutral, you might simply be wrong. It's good to remember that CO_2 is not the only greenhouse gas that exacerbates climate change.

Bottom line? Using the correct terminology can make the difference between actual climate action and greenwashing.

In this report

The number of countries announcing pledges to achieve net-zero emissions over the coming decades continues to grow. But the pledges by governments to date – even if fully achieved – fall well short of what is required to bring global energy-related carbon dioxide emissions to net zero by 2050 and give the world an even chance of limiting the global temperature rise to 1.5 °C.

This special report is the world's first comprehensive study of how to transition to a net zero energy system by 2050 while ensuring stable and affordable energy supplies, providing universal energy access, and enabling robust economic growth. It sets out a cost-effective and economically productive pathway, resulting in a clean, dynamic and resilient energy economy dominated by renewables like solar and wind instead of fossil fuels. The report also examines key uncertainties, such as the roles of bioenergy, carbon capture and behavioural changes in reaching net zero.

(To be continued)

S. Mahadevan, *B.E., F.I.E., M.B.A.,*
Consultant, Energy and Energy Efficiency,
Mobile: 98401 55209

YOUR WATER CONSERVATION CAN START FROM THE KITCHEN, THANKS TO THIS NOZZLE FROM WATERSCIENCE

The AERA WSN-721 water saving nozzle & faucet for kitchen taps claims to save upto 85% water from the usual nozzles. How does it do this? And more importantly, why is this important today?

It is no secret today that water, that most basis necessity and resource, is demanding ever higher effort and attention to ensure everyone gets their fair share of access. The government of India has seen it fit to start a national mission, the Jal Jeevan Mission, which aims to deliver potable piped water to every household in the country by 2024.

Tiny But Effective

Such a massive effort has put the spotlight squarely on the India's larger cities and towns, which had the 'privilege' of this luxury till now. Part of the focus has involved studies on use of water in existing households, and the results have been shocking. Wide variances have been discovered, with wasteful usage among the biggest causes for the disparities. Anything between 30 to 50% of water delivered through the pipeline network is being wasted today. That puts the onus on the end users like us to do what we can to reduce wastage with the rest, without compromising on lifestyle requirements.

This is where Bengaluru-based Waterscience, a company focused on putting cutting edge science, technology and research to work to ensure you get the best quality water possible has another offering now. The offerings from firms like Waterscience matter, because while many innovators have built products, few products actually scale up to reach market, and are as easily available as the Waterscience portfolio, which is being sold on ecommerce sites and its own website today.

The new product from Waterscience is a water saving nozzle. Typically, a water saving nozzle acts like a filter which splits a single, bulbous flow of water into many tiny streams which in turn directs air into the water flow. Due to the introduction of air, water has less space for it to flow so the water effusion is reduced, resulting in water savings.

True to this description, when we tested the AERA WSN-721 water saving nozzle from Waterscience for a month, the results have been good. While the regular nozzle would allow a litre to flow out in about 20 seconds, the Waterscience nozzle was comfortably more efficient as promised, taking twice as much time without compromising on flow quality.

With two flow modes, its high flow mode took almost twice as long to full up a litre, offering close to 50% savings in water use for everyday tasks. The mist-mode, which is the second mode is really useful when you are washing dishes for instance, saving upto 12X on your normal water usage. Changing between modes requires a simple downward tug, when you want to get water at higher volume for instance.

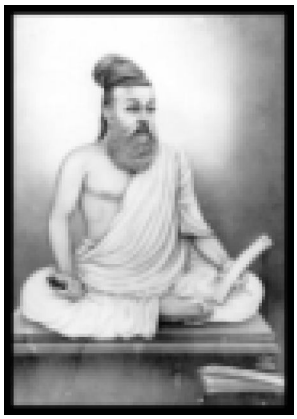
The feedback we have from our user is that at no stage did she feel any issues from the lower flow rate, and the mist mode really saved a lot of water on the earlier single flow nozzle when cleaning dishes.

The nozzle seems versatile enough to work with most taps available in the market in standard 24mm size, though we would advise you to check once. A three year product warranty is long enough to guaranty some

sort of ROI too possibly, besides the satisfaction of knowing you have done what you could do to prevent water wastage.

While this is hardly the product that will be sold on an ROI pitch, the truth is that the AERA WSN-721 delivers some real savings that matter way beyond your monthly water bills. Products like these adopted at scale will add up to making a huge difference, and enabling not just existing infrastructure to last longer, but also help high usage households to control usage better.

TENETS FROM TIRUKKURAL FOR GOOD GOVERNANCE AND GOOD LEADER



Both in governance of the Corporation or the State, intelligence is an inseparable part to know what is happening around, visibly and otherwise. In running of Business it can be understood as Market or Environment intelligence and in case of running states, gathering of intelligence all the time could become very complex depending on emergencies and challenges. In Business as markets are opened up across countries both opportunities and challenges have increased with sharp needs of intelligence. When we look at our own country and challenges with regard to security, we have substantial challenges, both within the country due to communal mindsets and outside due to Geo Political developments. The needs for very sophisticated intelligence and spying has increased substantially as we are a large, diversified and Democratic country.

Tiruvalluvar deals with State and spies and sharp intelligence gathering and necessities and the characteristics of them in Tirukkural and some of them are dealt below:

Ellarkkum Ellam Nigazhbavai Engnandrum
Val Arithal Vendhan Thozhil ***Kural 582***

vyyhufFk vyyhk e|fogit vQQhdWk
tyyw|jy Ntejd njho|y. ***Fws| 582***

"It is the duty of the Prince (head of organization or state) to learn all the time everything that befalleth everyman everyday"

Kadaa Vuruvodu Kannanjathu Yaandum
Ugaaamai Vallathe Otru ***Kural 585***

flhm cUnthL fz zQrhJ ahzLk
cfhmik tyyNj xwW. ***Fws| 585***

"Behold the man who can wear an unsuspicious appearance, who will not know confusion before any man and who can guard his secrets from ever leaking out; he is the proper man for the work of intelligence"

WHY CHENNAI IS CALLED SUPERKING

Chennai is the 2nd city in the world to become a municipal corporation next to London, in the year 1688.

Chennai is the only city in India which will have 2 international ports, Chennai port, Ennore port,

Chennai has the longest beach in india, 12kms urban beach, 2nd longest in the world.

Chennai is the only city which houses a national park within city limits. The Guindy national park.

Chennai is the only city which has three rivers flowing through it, Adyar, Covum river, kosasthalai river.

Chennai's Old Mahabalipuram Road is the single largest IT corridor in india.

Chennai is the single largest automobile manufacturer in Asia. Fondly called the Detroit of Asia.

Chennai houses the largest bus terminus in Asia at koyambedu.

Chennai is the birth place of 'Chicken 65' @ Hotel Buhari.

Chennai has the largest library in Asia, Arignar Anna centenary library.

Chennai's vandalur zoo is the largest zoo in India.

Chennai's Guindy engineering college the oldest in india, 1794.

Two of the top ten engineering colleges in India located in a single road, IIT Madras, CEG(college of engineering — Guindy/Guindy engineering college), at Sardar Patel road, Chennai.

Chennai houses the oldest shopping mall in India, Spencer plaza, 1863

The Madras High court is the world's second largest court complex.

Chennai is the only Indian city attacked during world war.

Chennai, city of flyovers, largest number of flyovers in india.

Kathipara flyover, is the largest clover leaf flyover in Asia.

Chennai is the Indian city with most number of foreign visitors annually.

Chennai is the health capital of India, with most number of foreign and domestic foot falls.

Royapuram railway station, is the oldest functioning railway station in india.

Integral Coach Factory(ICF), Chennai is the world's largest rail coach manufacturer.

Madras Medical college, the oldest medical college and oldest hospital in india, 1664.

The first ever flight in Asia flew in and around Chennai, 1910.

Oragadam is the largest automobile hub in South Asia, with 22 Fortune 500 companies.

Chennai has the highest number of cinema theatres in India. Quite obvious, Tamil film industry has given 4 Chief ministers to the state.

Chennai has the oldest race tracks in india, both horse race, motor race.

Madras school of art is the oldest fine arts institute in india(1850).

Higginbothams, Mount road, chennai is the oldest book store in India(1844).

EID parry, chennai is the oldest company in India (1780).

MRF, chennai is the largest tyre manufacturer in india.

Madras regiment is the oldest infantry regiment of Indian army(1750).

AVM studio is the oldest surviving film production house in India.

St. George's Anglo Indian higher secondary school is the oldest school in India(1715).

Chennai is also the only city in the world where all forms of surface transport are manufactured... From bicycles, 2 wheelers, cars, trucks, armored personal carriers, locomotives, railway coaches, main battle tanks... the entire range of surface transport. Not even Detroit can boast of this wide range of surface transport.

தமிழ்நாடு அரசு

மக்கள் நல்வாழ்வு மற்றும் குடும்பநலத்துறை

இந்திய மருத்துவம் மற்றும் ஹோமியோபதி ஆணையரகம்

நிலவேம்பு குடிநீர்

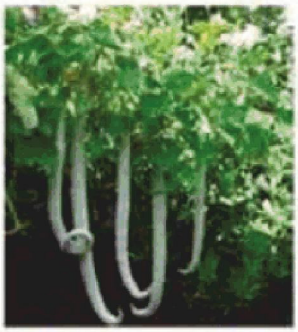
இவற்றில் சேரும் மருந்துகள்

நிலவேம்பு

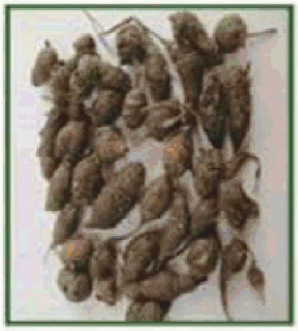
வெட்டிவேர்

விலாமிச்சம்வேர்

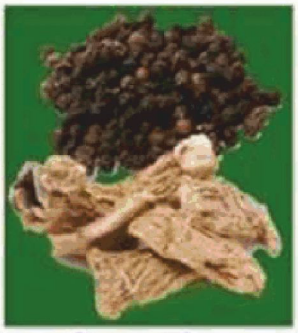
சந்தனம்



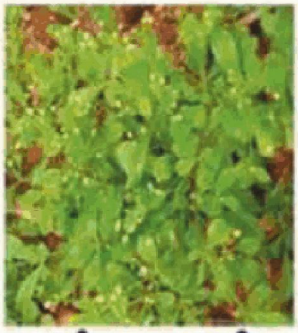
பேய்ப்புடல்



கோரைக்கிழங்கு



சுக்கு,மிளகு



பற்பாடகம்

குடிநீர் அளவு

5 வயது முதல் 12 வயது வரை உள்ள குழந்தைகளுக்கு 10 மி.லி. தினமும் 2 வேளை அருந்தவும்.

பெரியவர்களுக்கு 50மி.லி. தினமும் 2 வேளை அருந்தவும்.

எல்லா வகை காய்ச்சலும் குணமாகும்

HOME FESTIVALS - 10

Aippasi (October/November)

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

(To be continued)

HOME FESTIVALS - 11

Karttikai (November/December)

Krittika Dipa (right) is a joyous festival held on the Kritttika nakshatra (when the moon is in Pleiades constellation). Also called Sivalaya Dipa, it is celebrated most famously at Tiruvannamalai (upper left in the painting), on top of Arunachala Hill, home of saint Ramana Maharishi. A bonfire is lit on top that can be seen for miles around. Karthigai Purnima, the full- moon day, honours Lord Murugan. In one traditional story, six sparks from Siva's third eye became six babies (lower left), later gathered into one six-headed Arumugam (centre) by Parvati. Celebrations include lighting hundreds of oil lamps especially the standing lamp (right) of the home. On this day in Orissa, devotees make banana leaf boats and float them in the river with oil lamps, especially the standing lamp (right) of the home.

(To be continued)

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