VIBRANT tcet MECH ENGINEERS

THAKUR TRUSTS tcet THAKUR COLLEGE OF ENGINEERING & TECHNOLOGY

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MECHANICAL DEPARTMENT

Presents

MECHON

MECHNIEFFICIENT

RE-INNOVATING ENERGY EFFICIENCY

EDITION 5 | ISSUE 1

DEPARTMENT OF MECHANICAL ENGINEERING

"Education is the manifestation of the perfection already in man."
- Swami Vivekanand

VISION

"To become a department of eminence in the field of Mechanical Engineering"

MISSION

"To deliver an excellent undergraduate engineering program that prepares students for successful careers with social sensitivity, and also actively promotes the culture of research amongst students and faculty."

PROGRAM SPECIFIC OUTCOMES

PSO1: Identify Formulate and Analyze complex Engineering problems in Thermal Engineering, Design Engineering and Manufacturing Engineering domains.

PSO2: An ability to find out, articulate the local industrial problems and solve problems with the use of Mechanical Engineering tools for realistic outcomes.

PSO3: An ability of collaborative learning to find out cost-effective, optimal solutions for sustainable growth.

PROGRAM EDUCATIONAL OUTCOMES

PEO1: Prepare with a strong foundation in mathematical, scientific and engineering fundamentals that will enable them to have successful careers in Mechanical and Interdisciplinary Industries. (KNOWLEDGE)

PEO2: Strengthen their knowledge and skills through self-learning abilities throughout their professional career or during higher education. (SKILL & PROFESSIONALISM)

PEO3: Impart critical thinking skills and to develop innovative ideas for Research & Development (RESEARCH & INNOVATION)

MESSAGE BY MENTOR

DR. SANJAY KUMAR

I feel esteemed to be a part of the eighth issue of the e-magazine of the Mechanical Engineering Department. With a number of batches passed out, the Department has shown great potential. Our students have shown tremendous potential not only in academics but also in co-curricular activities and extracurricular activities. At the International conference, faculties and students have published technical papers in International journals. Some of the papers were also published in Tata McGraw Hill Publication.

For the overall personality development of students, apart from academics, participation in co-curricular and extra-curricular activities is the need of the hour. Students are encouraged to participate in National level competitions, and have won 1st prize at the hackathon. All these activities help in their holistic development, as a result of which they get admitted into reputed universities and get placed in prestigious companies. I commend all faculties, students, and staff members for their hard work in publishing the e-magazine, which represents the insights of the Mechanical Department. I wish them Best of Luck!

MESSAGE BY HEAD OF DEPARTMENT

DR. SIDDHESH SIDAPPA

I am delighted to know that our students have succeeded in publishing the eighth issue of mechon for the academic year 2021-2022. MECHON the departmental magazine has the prime objective of providing aspiring engineers a wide platform to showcase their technical knowledge and to pen down their illustrative and innovative ideas.

This magazine is intended to bring out the hidden literary talents in the students and teachers to inculcate strong technical skills among them. I congratulate and thank all the students and faculty co-ordinators who have made untiring efforts to bring out this magazine. I wish them all the best for releasing more such magazines in the future.

MESSAGE BY FACULTY INCHARGE

MR. PAWAN TIWARI

It gives me immense pleasure to present the eighth issue of 'MECHON' e-magazine of the Department of Mechanical Engineering. It is the talent and outlook of our students which is portrayed through this magazine. This is one of the best platforms for our students to present multifaceted personalities and innovative ideas. It also enables the students to be aware of their changing surroundings and to consistently learn about new technologies.

I take this opportunity to thank our respected Principal Dr. B. K. Mishra, Vice Principal Dr. Deven Shah, Mentor Dr. Sanjay Kumar, Head of Department Dr. Siddesh Siddapa, and all the faculty members for their perpetual inspiration and kind support. I believe that this edition will prove to be a success. I express my heartfelt gratitude to the editorial committee for their relentless efforts, the young writers for their valuable articles and all those who have been a part of 'MECHON'.

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RENEWABLE ENERGY
Where does India stand

RENEWABLE ENERGY - WHERE DOES INDIA STAND?

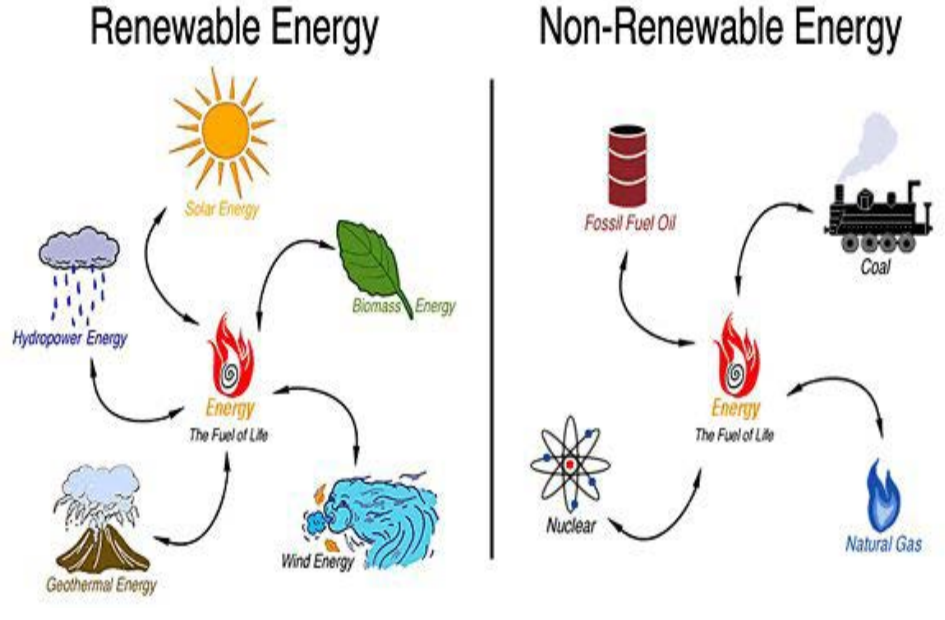
Renewable power is booming as innovation brings down cost and starts to deliver on the promise of a Clean Energy future. Hydropower is the largest renewable energy source for electricity in every country though Wind energy is soon expected to take over the lead like for example American solar and wind generation are breaking records and being integrated into the national electricity grid without compromising reliability. This means renewables are increasingly displacing dirty fossil fuels in the power sector offering the benefit of lower emissions of carbon and other types of pollution.

WHAT EXACTLY IS RENEWABLE AND NON RENEWABLE ENERGY?

A renewable energy source means energy that is sustainable, something that can't run out or is endless like the sun. When you hear alternative energy, it's usually referring to renewable energy sources too. It means sources of energy that are alternatives to the most commonly used non sustainable sources like coal.

Renewable energy often referred to as clean energy comes from natural sources or processes that are constantly replenished which include solar, hydro, wind energy, tidal energy, geothermal energy and biomass energy and non-renewable energy includes coal, gas and oil. Most cars and trains use non-renewable energy. They are made by burning fossil fuels to create energy. As the world shifts towards renewable power, India has also ramped up its renewable power generation capacity. The Indian government set a target of 450 Gigawatts of renewable energy capacity by 2030. For comparison the country's total energy generation capacity today is about 380 Gigawatts out of which 90 Gigawatts are renewable energy, not including large hydro power stations.

The Indian renewable energy Sector is the 4th most attractive renewable energy market in the world. India was ranked 5th in wind power, 5th in solar power and 4th in Renewable power installed capacity. Installed renewable power generation capacity has gained pace over past few years posting a compound annual growth rate of 17.33% between financial year 2016 to 2020 and with the increase in support of the Government and improved economics, the sector has become attractive from an investor perspective. As India looks to meet its energy demand on its own, this is expected to reach 15828 Terawatt hours by 2040. Renewable energy is set to play an important role. The government is aiming to achieve 227 Gigawatts of renewable energy capacity including 114 Gigawatts of solar capacity addition and 67 Gigawatts of wind power capacity by 2022 more than its 175 Gigawatts target as per the Paris agreement.



MARKET SIZE OF INDIA:

India is the third largest consumer of energy in the world after China and the United States. With a population of about 1.3 billion and high economic growth rate, India has huge demand for energy and is currently importing around 33% of its total energy needs. Covering this energy deficit - becoming an energy-independent nation and at the same time, not comprising the economic growth is a big challenge for India.

India's renewable energy sector is expected to attract investment of 80 billion United States dollars in the next 4 year, as of now the installed renewable energy capacity stood at 90.39 Gigawatts of which solar and wind comprised 36.91 Gigawatts and 38.43 Gigawatts respectively. Biomass and small hydropower constituted 10.14 Gigawatts and 4.74 Gigawatts respectively. By December 2019, 15100 MW of wind power projects where issued of which project of 12162 MW capacity has already been awarded. Power generation from renewable energy sources in India reached 127.01 billion units in financial year 2020 with the potential capacity of 363 Gigawatts and with policies focused on the renewable energy sector northern India is expected to become the hub for renewable energy in India. Some initiative government of India to boost India's renewable energy sector are as follows:

The government is committed to increased use of clean energy sources and is already undertaking various large scale sustainable power projects and promoting green energy heavily. In December 2020 SJVN Limited (Satluj Jal Vidyut Nigam Ltd) a public sector undertaking, under the Ministry of power entered into a memorandum of understanding with Indian renewable energy Development Agency Limited. A public sector undertaking under the Ministry of new and renewable energy to provide its services to SJVN for green energy projects. SJVN is developing a 100 MW Dholera solar power project and a 100 MW Raghanesda solar power project in Gujarat.

In November 2020 Ladakh got the largest solar power project set up under the central government make in India initiative at Leh Indian Air Force station with the capacity of 1.5 MW. The project, namely provision of a solar photovoltaic power plant, was completed within 12 months before the completion deadline of March 31st 2021.

CURRENT SCENARIO:

On November 17th Energy Efficiency Services Limited a joint venture of public sector undertakings under the ministry of power and Development Department of new and renewable energy signed a memorandum of understanding to discuss roll out of India first convergence project in the state of Goa. It is the country's first project to generate green energy from rural and Agriculture consumption in the state of Goa and is in line with international solar alliance a government of India initiative. In October 2020 the government announced a plant to set up an inter-ministerial committee under NITI Aayog to forefront research and study on energy modelling. This along with the steering committee will affect the India energy modelling forum which was jointly launched by NITI Aayog and United State agency for international development.

In August 2020 the government announced plans to offer land near its ports to companies for building solar equipment factories. India plans to add 30 Gigawatts of renewable energy capacity along a desert on its Western border such as Gujarat and Rajasthan. In November 2020 Sun source energy announced that it will develop a 4 MW grid-connected floating solar PV power project. Along with a 2 MW battery energy storage system in Andaman and Nicobar Island which was won in a tender bid with the Solar Energy Corporation of India. Once Commissioned it will be one of India's largest floating plus storage projects in Andaman which will in return reduce the existing reliance on diesel. The project will be situated at the reservoir of the kalpong river kalpong hydroelectric project dam in North Andaman.

In November 2020 the Airport Authority of India signed a memorandum of understanding with NTPC Vidyut Vyapar Nigam and NTPC subsidiary to promote use of electric vehicles and set up solar power plants at its airports. In October 2020 Patel Engineering announced that it has won an order of worth 211.15 million dollar to build 2000 MW subansiri lower hydroelectric project in Arunachal Pradesh. The Adani group aims to become the world's largest solar power company by 2025 and the biggest renewable energy firm by 2030. The assets of Adani group stands today at over 2.5 GW. This is expected to more than double growth touching 1W GB by 2025. The government of India has announced plans to execute a 238 million US dollar National Mission on advanced Ultra supercritical Technologies for cleaner coal utilization and setting up of two centers of excellence on clean coal Technology. In its quest for cleaner fuels the national Mission on CH_3-OH and dimethyl ether is being mounted. New center on solar photovoltaic thermal storage and solar fuels research has been approved. The government is committed to increase use of clean energy sources and is undertaking various projects and promoting green energy heavily.

In addition renewable energy has the potential to create many employment opportunities at all levels especially in rural areas.

FUTURE SCOPE:

India is aiming to attain 175 GW of renewable energy which would consist of 100 GW from solar energy, 10 GW from bio-power, 60 GW from wind power, and 5 GW from small hydropower plants by the year 2022. About 5000 compressed biogas plants will be set up across India by 2023. Biogas is a green energy source in the form of electricity and heat for the local grade. The waste can be converted into bio fertilizer and spread directly onto fields.

It has considerable environmental advantages, less emission of greenhouse gases like Methane, carbon dioxide and nitrous oxide. Biogas itself can be used interchangeably with natural gas as a fuel. Overall it is environment friendly, recirculates organic waste from industry and households and also reduces cost for Artificial fertilizers. It is expected that by 2040 around 49% of total electricity will be generated by renewable energy as more efficient batteries will be used to store electricity which will further cut the Solar Energy cost by 66% as compared to the current cost. Use of renewables in place of coal will save 54000 crore rupees that is 8.43 billion United States dollars annually. Renewable energy will account for 55% of total installed Power capacity by 2030. As per the central electricity authority estimate by 2029 to 2030 the share of energy generation would increase from 18% to 44% while thermal expect reduce from 78% to 52%

- Jitendra Chavan
Assistant Professor
Mechanical Department

SINGLE CYLINDER COMPRESSED AIR ENGINE

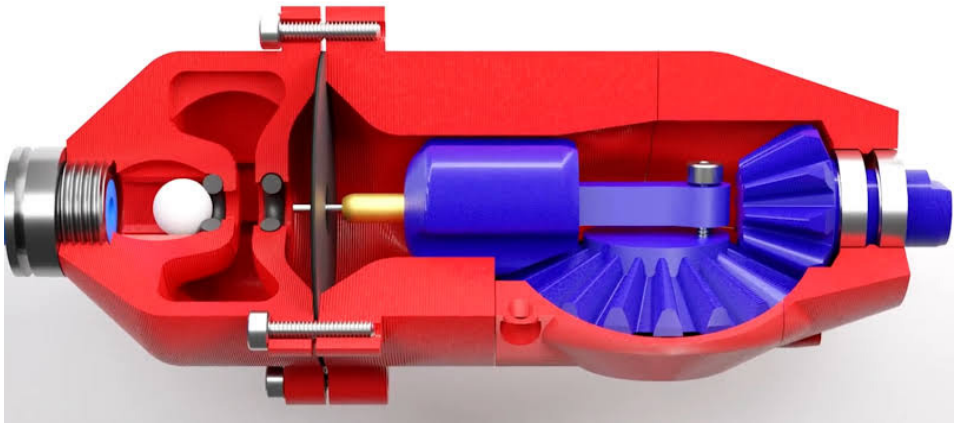
INTRODUCTION:

Emissions from the burning of fuels in vehicular transport are a major source of air pollution and are becoming a cause of concern in urban areas. Typical engines burn gasoline to move vehicles and release carbon dioxide, carbon monoxide and water vapor in the form of exhaust gases. These combustion products are causing global problems, such as the greenhouse effect, ozone layer depletion, acid rains and pollution which are posing great risk for the environment and eventually for the total life on the planet. But what if there were a way to run an engine with a source that is not only cleaner than hydrocarbon fuels but also more abundant? This can be done by a Compressed Air Engine (CAE).

Compressed air usage in the pneumatic application has been long proven. Air motors, atmospheric actuators and other various such pneumatic apparatus are in use. Compressed air was also used in some vehicles for uplifting the initial torque. Turbo charging has become one of the admired techniques to enhance power and improve the efficiency of the automotive engine that completely runs on compressed air. An Air Driven Engine makes use of Compressed Air Technology for its functioning. Compressed Air Technology is now extensively used preferred for research by different industries for growing different drives for different purposes. The Compressed Air Technology is quite straightforward. If we compress normal air into a cylinder the air would grasp some energy within it. This energy can be utilized for appropriate purposes. When this compressed air inflates, the energy is released to do work.

So this energy in compressed air can also be utilized to change the position of a piston. This is the fundamental working principle of the Air Driven Engine. It uses the extension of compressed air to drive the pistons of the engine. Therefore, an Air Driven Engine is basically a pneumatic actuator that creates useful work by expanding compressed air. This work provided by the air is utilized to give power to the crankshaft of the engine.

In the case of an Air Driven Engine, there is no combustion taking place within the engine. So it is non-polluting and less precarious. It requires lighter metal only since it does not have to withstand raised temperatures. As there is no combustion taking place, there is no requirement for mixing fuel and air. Here compressed air is the fuel and it is straight into the piston cylinder arrangement. It simply expands inside the cylinder and does applicable work on the piston. This work done on the piston provides adequate power to the crankshaft.



COMPRESSED AIR:

Compressed air is a combination of gases or a gas that has undergone greater pressure than the air in the general environment. Compressed air is regular air, the volume of which has been decreased with the help of a compressor. Compressed air, just like regular air, consists mostly of hydrogen, oxygen and water vapor. Heat is generated when the air is compressed, and the pressure of the air is increased. Current applications using compressed air are diverse, including jackhammers, tire pumps, air rifles, and aerosol cheese. Compressed air is clean, renewable and therefore a great competitor for today's conventional fuels. Its use is currently being analyzed as an alternative to Fossil fuels.

BEHAVIOUR OF COMPRESSED AIR:

When air at atmospheric pressure is mechanically compressed by a compressor, the transformation of air at 1 bar (atmospheric pressure) into air at higher pressure (up to 414 bar) is determined by the laws of thermodynamics. They state that an increase in pressure equals a rise in heat and compressing air creates a proportional increase in heat. Boyle's law explains that if a volume of a gas (air) halves during compression, then the pressure is doubled. Charles' law states that the volume of a gas changes in direct proportion to the temperature. These laws explain that pressure, volume and temperature are proportional; change one variable and one or two of the others will also change, according to this equation:

$(P1\ V1) / T1 = (P2\ V2)/T2$

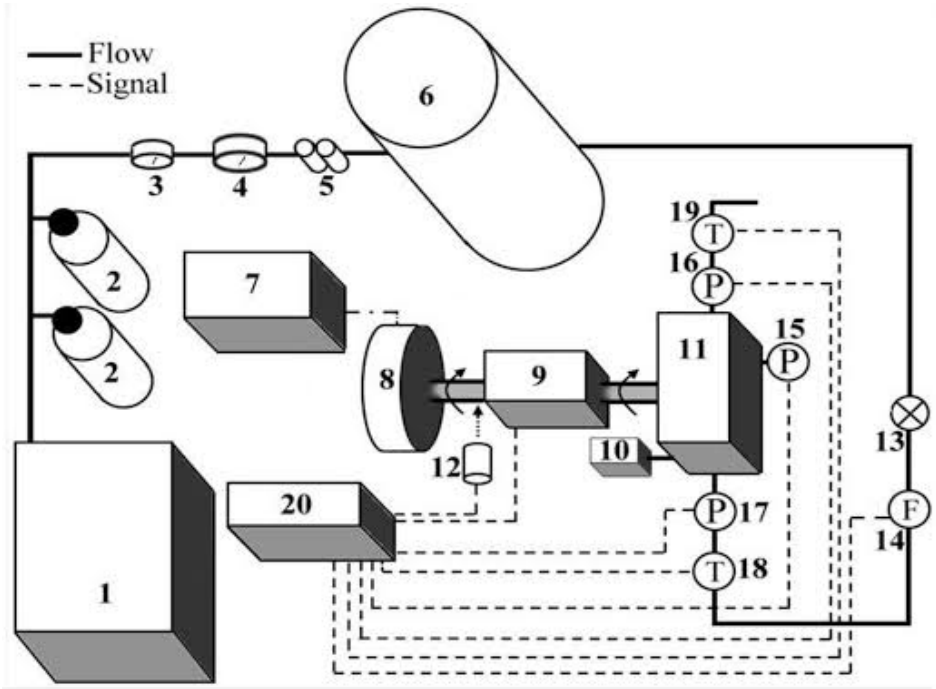
Compressed air is normally used in pressure ranges from 1 bar to 414 bar (14 to 6004 PSI) at various flow rates from as little as 0.1 m (3.5 CFM -cubic feet per minute) and up.

HOW COMPRESSED AIR FUELS A CAR:

According to the laws of physics any given space can be filled by the uncontained gases. This principle can be applied while inflating a balloon. Compressing a gas into a small space is a way to store energy. Later when the gas expands, that energy is released to do work. An air car performs in a similar manner. Compressed air cars need refilling. Popularization of this technology would result in an increase in the number of air refilling stations at convenient locations.

WORKING OF CAE:

Today, internal combustion engines in cars, trucks, motorcycles, aircraft, construction machinery and many others, most commonly use a four-stroke cycle. The four strokes refer to intake, compression, combustion (power), and exhaust strokes that occur during two crankshaft rotations per working cycle of the gasoline engine and diesel engine. The cycle begins at Top Dead Center (TDC), when the piston is farthest away from the axis of the crankshaft. A stroke refers to the full travel of the piston from Top Dead Center (TDC) to Bottom Dead Center (BDC).



1. Compressor
2. High pressure tank
3. High pressure regulator
4. Low pressure regulator
5. Water filter
6. Buffer tank
7. Power supply
8. Electromagnetic brake
9. Torque sensor
10. Starter
11. Engine
12. High pressure tank
13. Optical tachometer
14. Flow meter
15. Cylinder pressure sensor
16. Outlet pressure sensor
17. Inlet pressure sensor
18. Inlet thermocouple
19. Outlet thermocouple
20. DAQ

CONCLUSION:

This is a revolutionary engine design which is environment friendly, pollution free, but also very low cost. This rectifies both the problems of fuel crises and pollution. However immoderate research is needed to completely prove the technology for both its commercial and technical viability. Nowadays the continued need of energy is increasing, but primarily conventional sources of energy are restricted due to that rate on the price of petroleum also continues to be hiked. To please there need alternate fuel or energy is required. But while considering alternate fuel some of factors are to be considered like accessibility, economy, and environment friendly etc., based on that CAT (Compressed Air Technology) is best technology which tend engine to negligible pollutions. If further enhancement is carried out with stress analysis, thermodynamic analysis, decrease compressed energy loss and other losses then productivity of CAE may be further increases.

- Rupesh Deshbhratar
Assistant Professor
Mechanical Department

RENEWABLE ENERGY
An action pathway 2021

INTRODUCTION:

The renewable energy industry has seen impressive, global growth over the last decade and mechanical designs have played a key role in enabling the world's transition to clean energy and more sustainable practices. By improving the design of wind turbines, solar and geothermal power, as well as every stage of renewable energy development, we can improve reliability and reduce the cost as well.

Knowledge of thermodynamics, fluid mechanics, heat transfer, optimizing cooling systems, developing new energy storage technology such as thermochemical batteries and solar fuel for long duration energy storage, is essential for solving the renewable power challenges.Industrial systems as well as the materials that make up industrial equipment are essential proficiencies for a number of renewable energy systems.

KEY FACTORS:

• Improvements in technology that make it more efficient to procure, store and distribute renewable energy, less expensive to build renewable energy infrastructure.

• New multinational, national, regional legislation that mandates transitions to clean energy source. Ex: California passed a bill in 2018 mandating that utilities generate 50% of their electricity using clean energy by 2026 and 100% by 2045.

• A growing number of studies have published that supports economic benefits of renewable energy, which in turn help to support local policies, state policies and national policies that are friendly to renewable energy development.

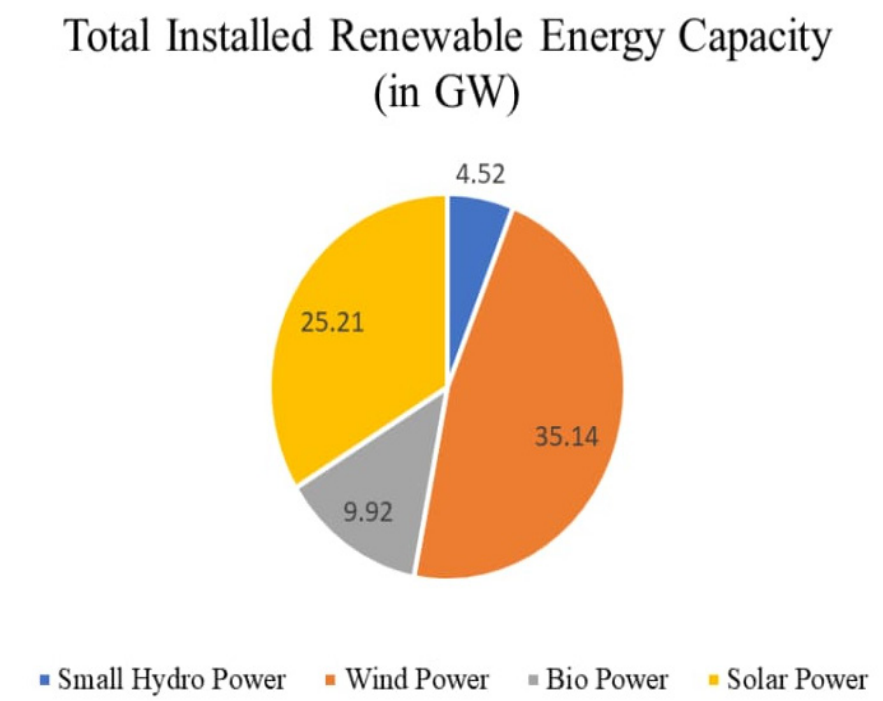
The energy sector is a highly multidisciplinary field, with contributions from mechanical, electrical, chemical and other types of engineering help to drive advances in renewable energy infrastructure. Mechanical engineering can work in every stage of renewable energy development as well as distribution to lower the cost of renewable energy infrastructure and make progress in efficiency and power generation.

ESSENTIAL DUTIES:

• Optimize existing renewable energy technology so that it becomes more cost efficient to develop related infrastructure.

• System integration of distinct renewable energy technologies.

• Research different material and study material interactions for use in renewable energy, has the potential to lead the development of new systems, technologies and infrastructure for generating and distributing power.



• Consult on renewable energy evolution projects to guide organizations regarding the best approach for reaching their sustainability goals, such as by identifying technology needs, costs and other aspects related to investing and building renewable energy infrastructure.
• Lead teams of engineers and researchers to design and optimize renewable energy infrastructure and system.

ADVANTAGES TO INDIA:

Robust demand: In June 2021, Prime Minister Mr. Narendra Modi stated that renewable energy capacity in India increased by 250% between 2014 and 2021 and the country ranks among the top five globally in terms of installed renewable energy capacity.

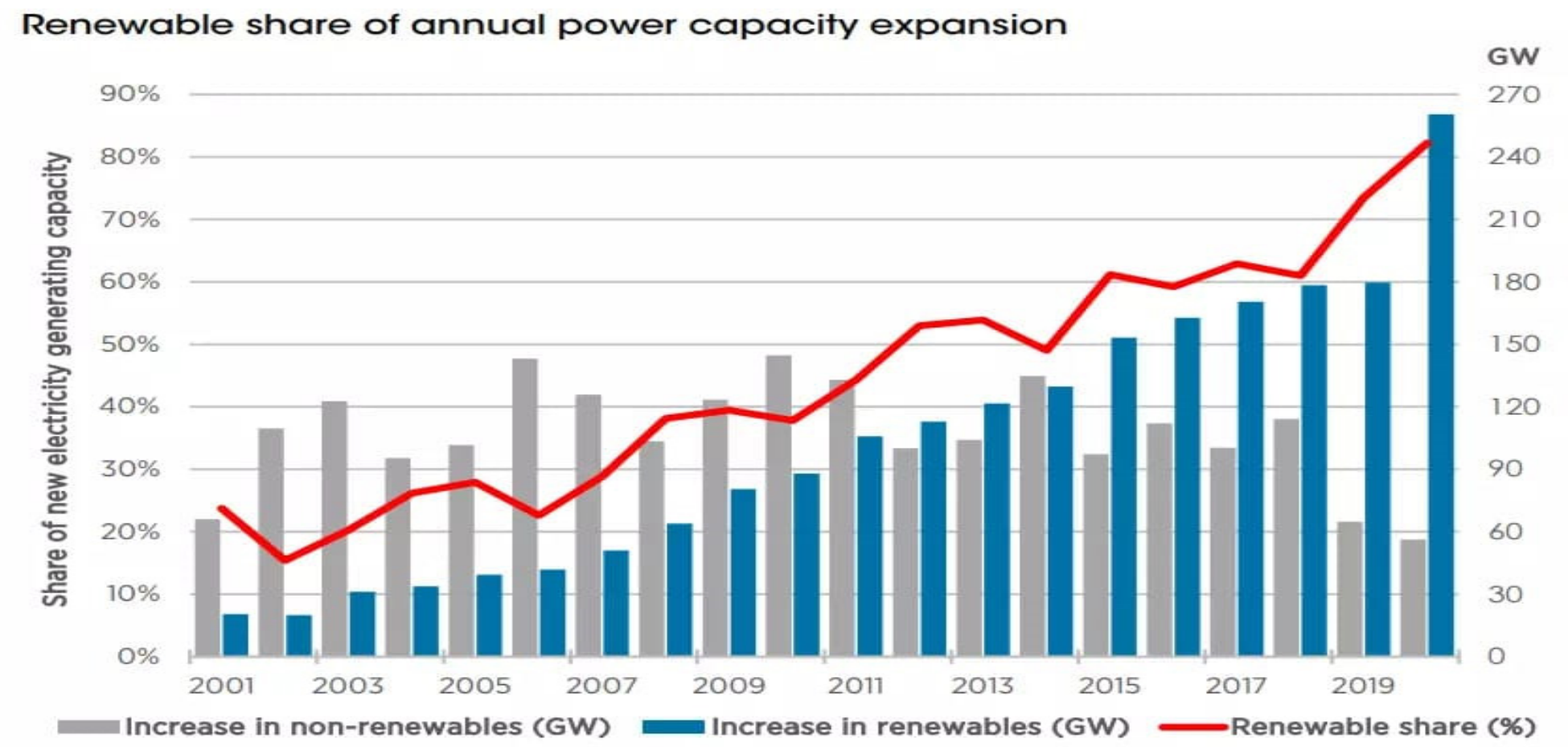
Competitive advantage: India ranked third on the EY Renewable Energy Country Attractive Index. As per the British Business Energy, India ranks third on renewable energy investments and plans. India was ranked fourth in wind power, fifth in solar power and fourth in renewable power installed capacity, as of 2020.

Policy support: In July 2021, to encourage rooftop solar (RTS) throughout the country, notably in rural regions, the Ministry of New and Renewable Energy plans to undertake Rooftop Solar Programme Phase II, which aims to install RTS capacity of 4,000 MW in the residential sector by 2022 with a provision of subsidy.

Increasing Investments: Non-conventional energy sector received FDI inflow of US $10.02 billion between April 2000 and March 2021

The Government is committed to increased use of clean energy sources and is already undertaking various large-scale sustainable power projects and promoting green energy heavily. In addition, renewable energy has the potential to create many employment opportunities at all levels, especially in rural areas.

- Karuna Nikum
ES&H Department



GREENTECH

REFRIGERATION SYSTEM

The energy and global warming crises have drawn renewed interests to thermally operated cooling systems from the air conditioning and process cooling fraternities.

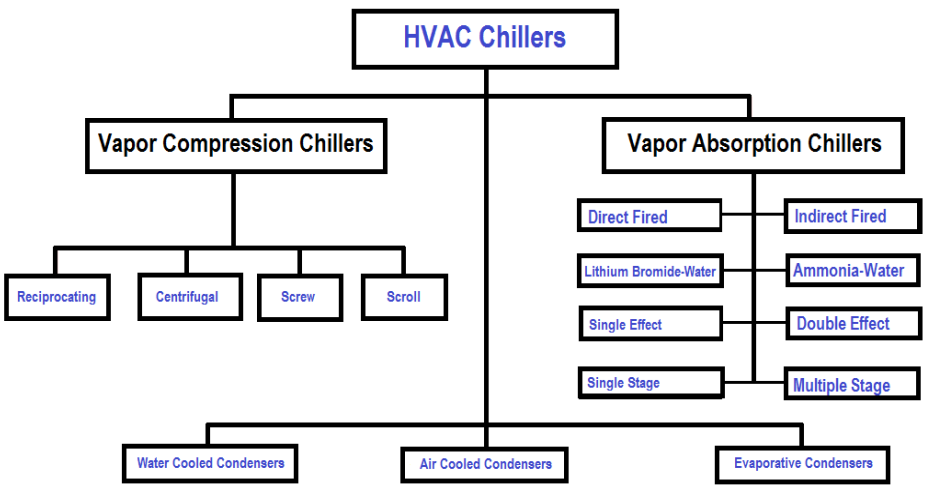
INTRODUCTION:

The absorption refrigerator utilises a chemical substance as the adsorbent which absorbs the refrigerant in the absorber and the waste heat is being used to recover the refrigerant free absorbent and enable it to be reused. (NH_3 + water) and (LiBr+ water) are the two commercially used working pairs for this kind of refrigerators.

These are two main categories of chillers:

1. Vapour Absorption
2. Vapour Compression

There are various types of Vapour Absorption and Compression chillers.



How does absorption chiller differ from other chillers?

The absorption chiller is different from other chillers as it doesn't have a compressor; instead, it uses heat to generate cooling. It does not use conventional refrigerants. It uses water as the refrigerant (no fluorocarbons). Absorption chillers can effectively utilize the waste heat from power generation which can be used for energy-efficient refrigeration.

The absorption chiller is one of the favorites due to the following specific reasons:

(1) It can be thermally driven by gas, solar and geothermal energy as well as waste heat, which help to reduce carbon dioxide emission to a great extent;

(2) It uses water as a refrigerant;

(3) It is quiet durable, contemptible to maintain, being nearly void of high speed moving parts;

(4) Its vacuumed operation renders it manageable to scale-up applications.

Lets see about Lithium Bromide and water pair which falls in type of Vapour absorption chillers:

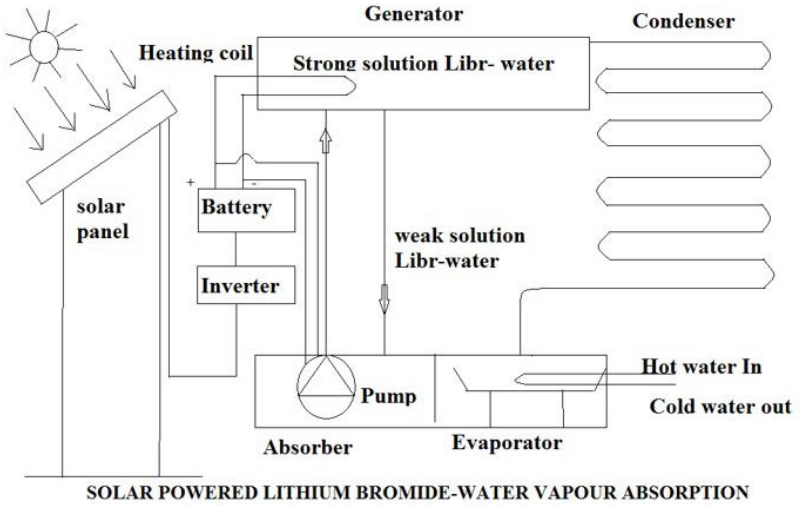
Li-Br AND WATER PAIR:

The process of absorption cooling is dependent on a thermochemical 'compressor'. Two fluids are used: a refrigerant and an absorbent. The fluids have a greater "affinity" for each other, which means one dissolves easily in the other.

In a water-lithium bromide vapor absorption refrigeration system, water is used as the refrigerant while lithium bromide (Li Br) is used as the absorbent. In the absorber, the lithium bromide absorbs the water refrigerant, creating a solution of water and lithium bromide.

The refrigerant usually water can change phase easily between liquid and vapor and circulates through the system.

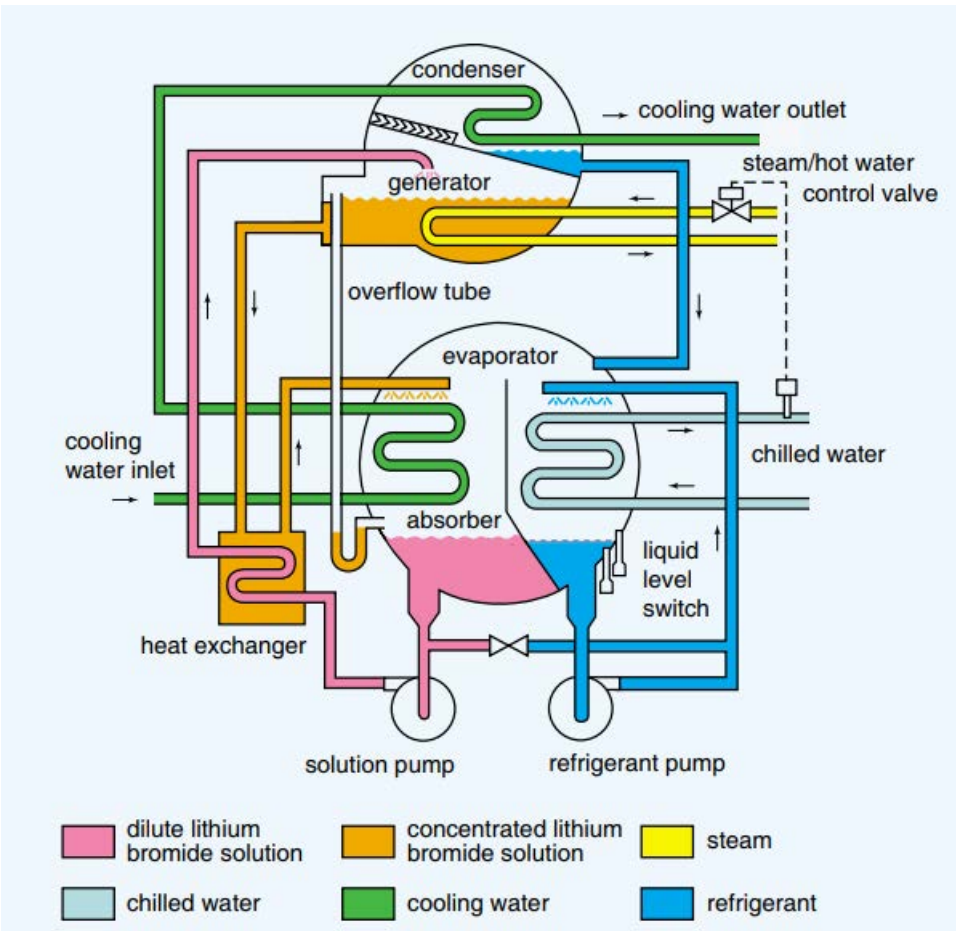
The heat from natural gas combustion or a waste-heat source drives the process. The high affinity of the refrigerant for the permeability (usually lithium bromide or ammonia) causes the refrigerant to boil at a lower temperature and pressure than it normally would and transfers heat from one place to another.



SOLAR POWERED LITHIUM BROMIDE-WATER VAPOUR ABSORPTION REFRIGERATION SYSTEM

PROCESS:

(1) Absorption systems use heat energy to produce the refrigerating effect. In these systems the refrigerant, i.e. water, soak up heat at a low temperature and low pressure during evaporation and releases heat at a high temperature and high pressure during Condensation.
(2) LiBr solution, which acts as the absorbent, is used to absorb the vaporized refrigerant. The evaporation of the refrigerant takes place at a low pressure.
(3) The dilute solution, which contains the soaked refrigerant vapour, is heated at a higher pressure.
(4) This leads to the vaporization of the refrigerant and thus the solution is reinstate to its original concentration. The cycle keeps replicate itself to give the desired chilling effect. In a double effect absorption chiller, the latent heat of condensation, contained in the vaporized refrigerant, is used in a second stage generator to enhance the efficiency of the cycle.
(5) The refrigerant goes through a series of processes to complete the refrigerating cycle. These are namely evaporation, absorption, pressurization, vaporization, condensation, throttling and expansion.
During this cycle, the refrigerant absorbs heat from a low temperature heat source and releases it to a high temperature sink.



Why should you consider the Li-Br and water pair over the generally used NH3 and water pair?

(1) Greater COP(coefficient of performance)value of refrigeration and air conditioning;
(2) It gives higher performance than the ammonia-water solution;
(3) Has no working fluid toxicity issues, unlike ammonia which is slightly toxic.

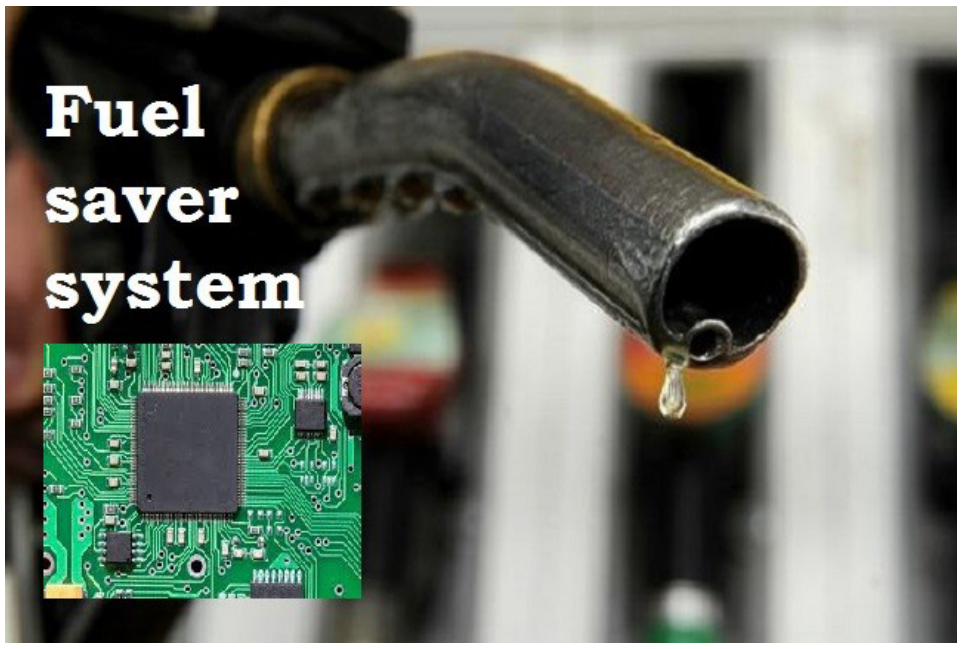
CONCLUSION:

The future for absorption chillers is bright. With power uses increasing electrical demand charges during peak hours as a strategy to delay building new power generating stations, absorption chillers can be the cornerstone for an electrical demand limit strategy.
With absorption chillers using “natural refrigerants,” they will become more attractive as more restrictions are placed on HCFC and other refrigerants. With the ameliorate lithium bromide solution concentration control, absorption chillers are more reliable.

- Vaishnavi Patil
S.E. MECH B

FUEL SAVER SYSTEM

The following design uses RF sender and Receiver technique to send signals which decide whether the engine of vehicle should be ON or OFF in traffic, thereby optimizing fuel consumption, preventing pollution (Air and Noise both) as well as road accidents and traffic violation.



INTRODUCTION:

The desire for energy has extremely increased after the industrial revolution when rapid growth of industrial townships took place. This exploration in the field of Innovation, inventions and machine design leads to the consumption of naturally occurring fuels such as coal or oil, that was formed millions of years ago from dead animals or plants. But disastrously, under the greed of this development, human beings didn't care about non-renewability of naturally occurring fuels i.e fossil fuels. By analyzing today's power greed, that day is not far away when nothing will be left to be utilized. Presently available fuel resources which are non-renewable can last only for about 50 years. Hence, serious thoughts need to be given for the conservation of these rapidly exhaustible energy resources. Now, due to an increase in population, the number of automobiles are also increasing, which leads to the consumption of fuel to a larger extent. Hence, there is an urgent need to conserve resources. Now, when we think wisely, a traffic halt is a place where the engine of a vehicle is switched ON unnecessarily. This problem can be solved by implementing the following idea in vehicles.

EXECUTION:

(1) It requires every vehicle to be equipped with the RF receiver and a microcontroller.
(2) Each lane leading to the traffic signal should have a pole with a microcontroller and a transmitter circuit, to transmit the lane id.
(3) Then lastly at each traffic signal, we again need a micro-controller and a transmitter circuit to send the lane IDs sequentially for 30 seconds each.

MECHANISM:

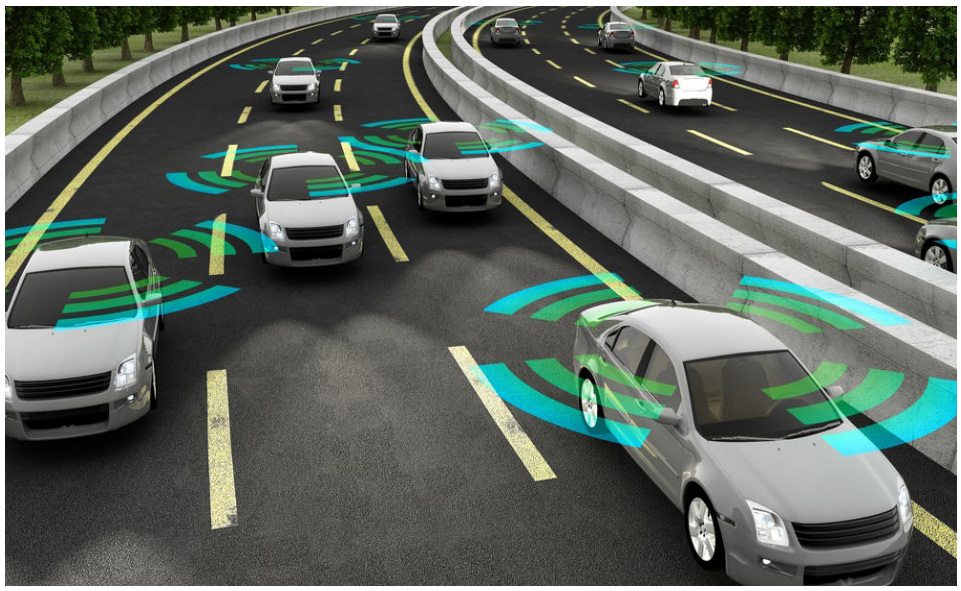
Step1- Vehicle will receive a lane ID when it enters the lane which leads to a traffic signal. That lane ID becomes the identity of all the vehicles belonging to that lane.
Step2- Micro controllers present in the vehicle will store the lane ID.
Step3- The receiver located in the vehicle will again receive the lane ID transmitted by the signal transmitter when the vehicle stops at a traffic signal.
Step4- The vehicle's microcontroller then matches this lane ID received, with the stored lane id which was stored when the vehicle entered the lane leading to the traffic signal.
Step5- If the lane IDs match, then the vehicle's micro controller sends a START engine command, which starts the engine in case it is in a stopped state. On the other hand, if the lane ids do not match then the vehicle microcontroller sends an OFF engine command, which will turn the vehicle engine OFF.

ADVANTAGE:

(1) Minimization of Air and Noise Pollution
(2) Optimization of Fossil fuel usage
(3) Better implementation of traffic rules
(4) System could be set up in any vehicle in any part of the globe.

PRESENT SCOPE:

(1) The Project has a broad spectrum scope, it can be used in almost all places where there is a traffic signal.
(2) It can perform in the places where the temperature ranges between -55°C to 125°C.
(3) It is a fully computerized and automated system (no user interfaces) hence anybody who owns a vehicle can use it without the requirement of any expertise about it



FUTURE SCOPE:

Self-regulating Drive system: A drive system that would automatically take care of few Specifications of the vehicle (Speed limit, No honking zones, no parking zones etc) and reduce the number of criteria for the driver to contemplate . Thus, allowing him/her to focus more on the road and less on other things.
To synchronize fuel usage in all kinds of engines: This system could be fit into a vehicle running on unconventional fuels (hydrogen fuel, solar powered, Bio fuels etc) to regulate the fuel usage to increase its efficiency.
Modulate vehicles to run at optimum speed: The system would assist the driver to drive at an optimum speed (the speed at which the output power of the vehicle is high considering low excretion by the vehicle), keeping road conditions and vehicle model in contemplation etc.
Driving assistance in hilly sections: Due to slim roads, only one vehicle would be capable of parlaying a turn at once. When two vehicles approach from both sides, a signaling point could be set up at the turn and the vehicles could communicate with each other through the signal. Thereby assisting each other to safely work out the turn.
Intelligent Braking System: If a vehicle moving ahead applies brakes instantaneously, the driver of the vehicle behind will have very less time to react to it. To cut back on these effects, signals can be sent to the vehicles behind and they would get some time to think and take necessary actions.

CONCLUSION:

Though the initial one-time setup charges do apply, the long term benefits are very high. A complete module is simply in budget. The system is highly safe, secure, dependable and does not need any Importunity. It acts as an automatic traffic control system which in turn prevents road accidents and helps to regulate traffic rules in a better way. Hence, once the system is installed, it can be used to save a large amount of fuel, which not only diminishes fuel consumption but also abate the air pollution which in turn reduces global warming, and the chain goes on.

Hardware interfaces: 89s5x trainer kit
Software interfaces: Kiel tool & SPG burner

-Abhishek Tiwari
S.E. MECH B

BIOMIMICRY

INTRODUCTION:

Industrialization led to the Age of Innovation where new technologies were created and consumed. We started using fossil fuels and other non-renewable energy resources for our daily needs. These increasing energy requirements have led to a depletion of non-renewable sources of energy. Hence for a sustainable future, we need smart energy-efficient solutions. To protect the environment, we need to learn from the environment. Biomimicry is the process of drawing inspiration from nature, to solve human challenges. It is not just about copying or mimicking nature, but using what natural evolution has learned over the course of billions of years to inspire solutions.

The term 'Biomimicry' was coined by biologist and author Janine Benyus in her book Biomimicry: Innovation Inspired by nature. She defines biomimicry as "the study of nature's models and methods and then imitating or emulating these designs and processes in the development of technologies.

Biomimicry is being used to reduce the energy consumption of a product and increase its efficiency. Projects based on Biomimicry can create new ways for humans to live sustainably without degrading the planet's natural beauty and resources. Biomimicry uses ecological standards to judge the human innovations and it's long term effect. This new trend in product designing also helps man to understand the importance of the environment These are intelligent designs that can effectively help to solve the current energy crisis.

Energy-efficient designs based on Biomimicry include:

(1) PowerCone

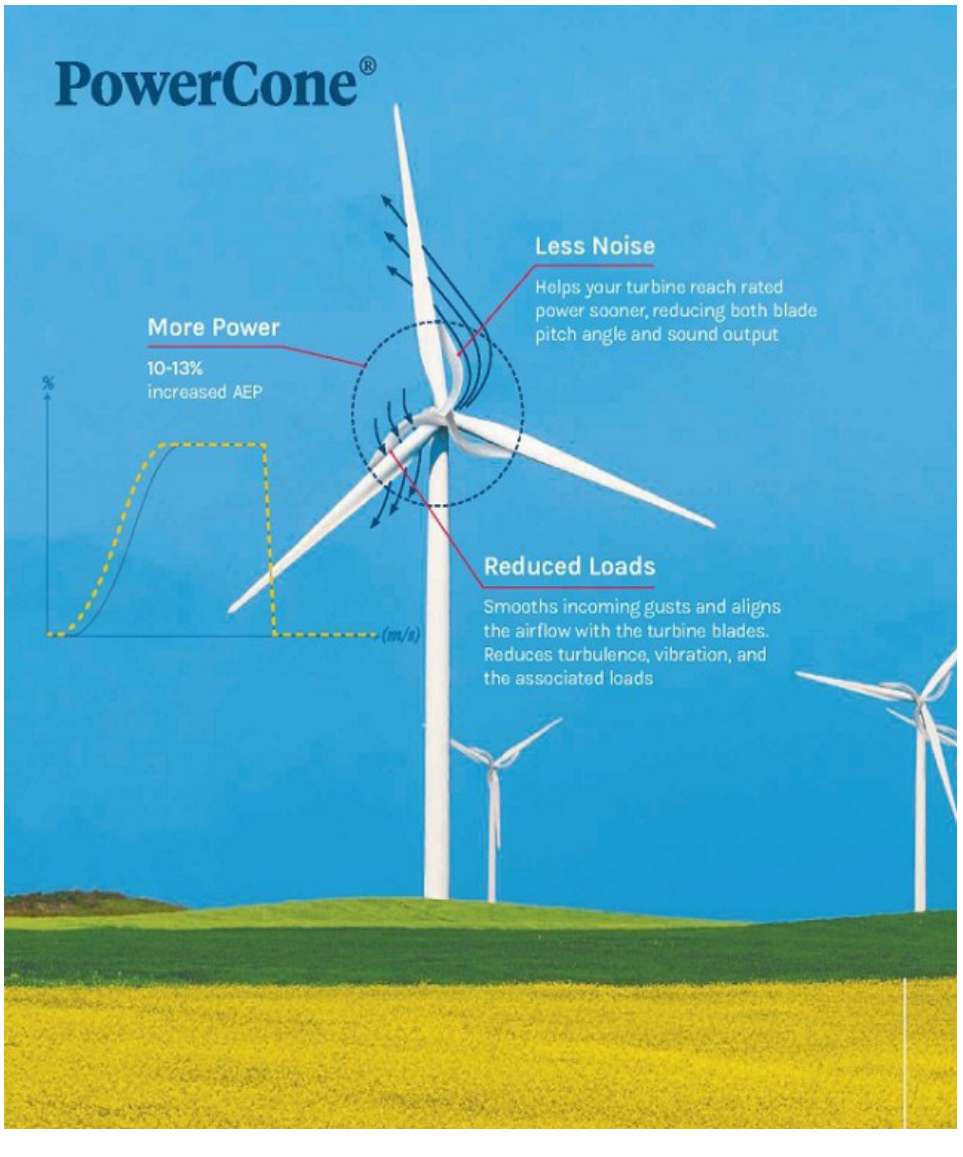
(2) BioWave Tidal Energy

(3) Tubercule Wind Turbine

POWERCONE:

PowerCone is a device designed by Biome Renewables. This device takes inspiration from the species of kingfishers diving to catch a small fish. When a kingfisher enters the water, it creates no disturbance to the surface.

The naturally piercing shape of its beak has inspired various designs. The device fits on the center of the turbine and its spiral shape redistributes more air toward the turbine blades. This makes the turbine more aerodynamic, and more efficient. This design decreases the noise and power consumption of a turbine and can be used for bringing a turbine to its minimum load. The traditional turbine system have root lekeage that decreased their power output.Powercome design also helps to reduce the root lekeage that causes turbulence. Biome Renewable promises a 13% increase in power generation through this biomimicry design.



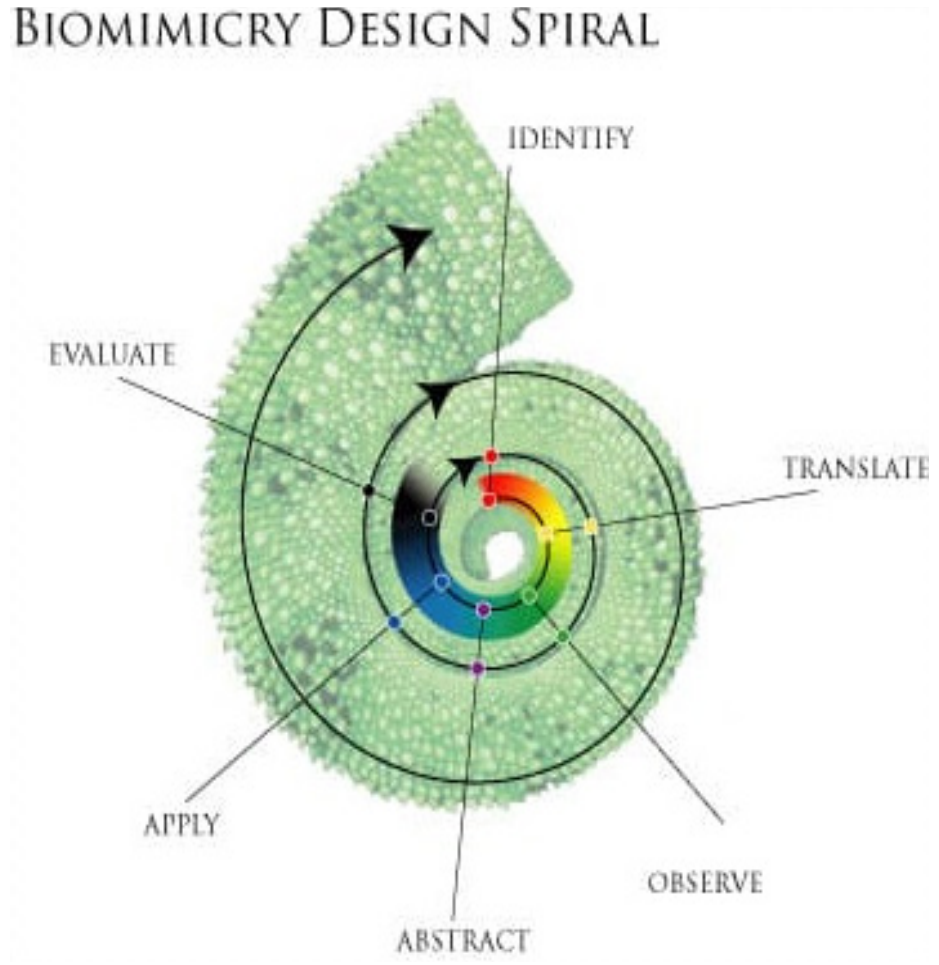
BIOWAVE TIDAL ENERGY:

It is a tidal power technology designed by an Australia-based company BPS. The device is based on aquatic flora and fauna for better hydrodynamics. It mimics the movements of underwater plants during wave currents to generate power. The new design generates a greater, more consistent power supply than a common tidal energy system.

TUBERCULE WIND TURBINE:

This turbine innovation is inspired by the pectoral fins of humpback whales. The shape of their front flippers has small bumps on the edge known as tubercules. The tubercules pushes the water current into a compressed, faster flowing stream between the bumps. This reduces the drag on the fins and increases the speed.

Based on this, the tubercules can be used in turbine design to make it turn faster with less drag, generating more energy. This biomimicry design is tested by a company Whalepower that generates power from 10mph winds that usually require 17mph wind speed.



CONCLUSION:

Biomimicry designs are highly beneficial to the environment as well as the industry. It increases efficiency by decreasing the energy requirements and generates great results. It is being effectively used in manufacturing, design, and other industries to generate miracles like tubercule turbines and self-healing materials. It can serve as a smarter alternative to conventional energy generation and genrate sustainable energy.

Biomimicry can also be defined as a collaboration between man and environment. It broadens the perspective towards smart innovations and broadens the design space.

The motivation to go green has become every company's social responsibility to maintain the environment and stay relevant. Companies like McDonald, Honda, have also started switching to greener transportation systems.

Hence we all need to work together for a sustainable future.

- Anjali Pathak
S.E. MECH B

SMARTFLOWER

INTRODUCTION:

Solar energy has been a part of our green energy management system for a long ever since the innovation of solar cells. We also quickly adapted to the new change in the way we draw energy for our requirements. But there is always a scope for improvement in everything. This improvement is often inspired by mother nature in form of various living organisms.

One such inspiration and reimagination of design is the Smartflower. This solar panel system is ground-mounted with the sun tracking feature enabled contributing to its smartness. It comes with many other smart applications that stand up to its claim of being smart.

WHAT IS SMARTFLOWER?

It is a self-sustaining, all-in-one solar solution whose aesthetic design and functions greatly differ from the conventional rooftop panel system. Since it is ground-mounted it eradicates many limitations of installation and potential risks while operating and maintaining it. The smart flower includes a dual-axis tracker that tracks the sun's movement and thus maintains a 90-degree angle with the rays which therefore maximizes the Solar power production.

The dual axis switches the panel in various directions so that the panel rotates in all directions. This tracking system is powered by Arduino consists of servo motors, stepper motors, raindrop sensors, temperature and humidity sensors, and LCD. This accounts for the 40% increase in power production as compared to a similar-sized average panel system. Till now it may seem the same as a non-roof-based system, but now we enter the innovative part of this system.

A SmartFlower is a design based on biomimicry of the petals of a Sunflower.

DESIGN:

Smart is a catchy word but here it's well deserved by the way the Smartflower is designed. The cost to install a Smartflower ranges from $25,000 to $30,00.Pricing for the Smartflower and the Smartflower with integrated car charging is not yet available Its distinct design directly influences the way it performs. It has 12 petals. In the morning when the sun rises the petals automatically opens up circularly and resemble a sunflower. Also, during the day, it tracks the sun exhibiting an intelligent behavior like a natural quality of plants that is heliotropism.

After the sun sets the petals automatically close by themselves and while closing, they clean themselves. Wondering how? The answer to this is the use of simple brushes attached to each petal which when moves clean the lower petal. This cleaning also contributes to good absorption of light in another round.

Another feature it shows is it's self-contained ability. All the hardware and other components are contained within the same body making it easy for installation as well as disassembly. Smart cooling the system includes rear ventilation to keep it up to 18 degrees Fahrenheit (-7.7 degree Celsius) cooler than it would otherwise be, improving the thermal life of the cells and thus increasing the output 5-10% than average. Smart protection- this panel system monitors the weather conditions and considers the information to decide whether to stay / open or fold up together for protection.

Smart system – like many other internet-connected devices, the Smartflower gives the user the option to access the information about the system and control it accordingly. The Smartflower has an annual output of 3800-6200 kWh, depending on the location for sunlight, so it can provide up to half of the household needs. It captures 40% more energy than the traditional system.

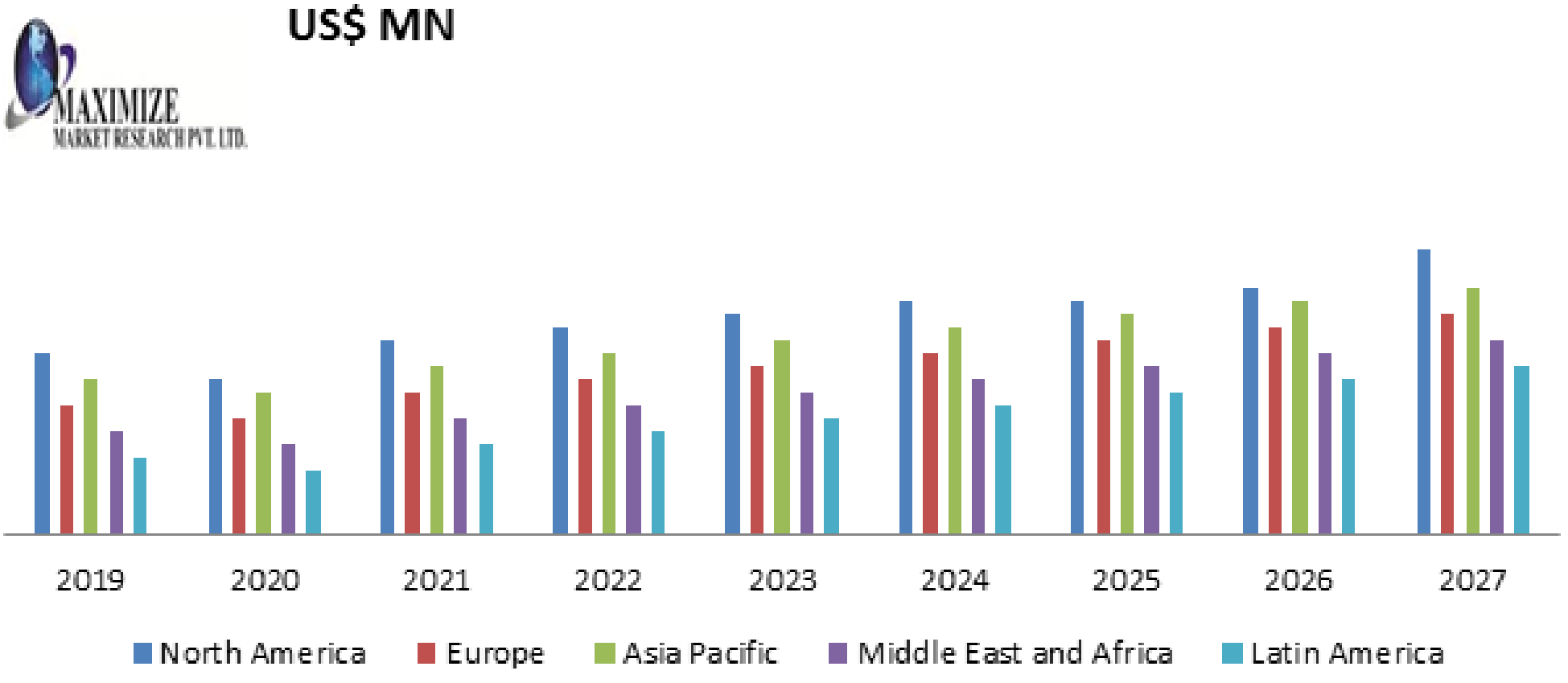
FUTURE SCOPE:

Since renewal energy and sustainable development has gained deserved attention and importance with the growing awareness its evident from the past few years that people have not been reluctant in switching to solar power, realizing the potential benefits, and thus this trend will continue to grow bigger with the word of mouth and necessity of use. This product in mass production has the potential to become the most cost-effective technology and serve for a better future.

CONCLUSION:

The SmartFlower is an innovative design to create a sustainable future.It mimics nature to understand the challenges and is a better alternative to PV systems. It also has great sculptural design and artistic value Smartflower simplifies the solar experience and includes smart safety and tracking features.

- Sahil Shinde
S.E. MECH B



FLOATING SOLAR FARM

INTRODUCTION:

Floating solar farm is an area or a location where solar panels are placed in water or a place where the panels may float. Nowadays solar farms are very important and crucial since everyone in the world or you can say most of them in the world are using the non renewable energy resources. So we all should head towards the renewable energy resources which are solar energy, wind energy, biomass, geothermal energy, tidal energy etc. because the non-renewable energy may end at some extent and indeed the day is not so far so to avoid or you can say to make the delay of this end we need to switch to the renewable energy resources as well so we are heading towards this floating solar farm.

FLOATING SOLAR FARM IN BRIEF:

Come on let's know more about floating solar farm, solar power is now the cheapest source of electricity and nowadays electricity is important or mandatory in fact I would like to say that without electricity there would be a blockage or a stop or a break to your life.

Now the question is what is floating solar farm? So floating solar farm, also known As FLOATOVOLTAICS which is a connection of electricity through solar farm and it is floating on water so basically solar power production installed or mounted on a structure that floats on a water body or a lake or a small part of sea is know as floating solar farm.

Accordingly, floating solar farm is a farm which does not occupy land. So there would not be an interruption or any issues of land.

HISTORY OF FSF:

American Danish, French, Italian and Japanese were the first countries to start registering the patterns of floating solar panels, back in February 2008 the Italians were the first registered patent regarding PV models on water. So now the question is what is a PV module? PV modules are nothing but is solar panel or solar cell, photo voltage cell or a group of voltage cells mounted together in a framework for installation. These frameworks basically use sun as the source of energy and converts the heat energy to electrical energy, Solar PV module are used for boosting the power output of PV cells by connecting them.

Once a group quoted several solutions that were put forward in the years 2008 to 2011 and 2012 to 2014 was the group of the MIRARCO (Mining Innovation Rehabilitation and Applied Research Corporation Ontario, CANADA). Further without being exhausted the installations can be distinguished between three sections:

(1) PV modules mounted on rafts built in plastic and galvanized steel

(2) PV modules are organised by mounting it on rafts, fully in plastic.

(3) PV plants constituted by modules mounted on pontoons

It is not so easy to give the detailed analysis of the many small PV floating plants built in the first 10 years but still the plot here below is based on the data given from the web for FPV with more than 500 KW of power, the given below graph diagram is for the PV floating in MWp installed in past 10 years from 2010 to 2019. Solar power is the world's cheapest source of electricity, according to a 2020 IEA report.

WORKING:

Now let's know more about how does a solar farm work and is it profitable so the solar farm works as in the structure is like the solar panels face the sun and gives shade or you can say covers the whole water body so the evaporation does not takes place so to avoid evaporation and to increase water harvesting. Solar panels or floating solar farm may give a big role for the places which lack with water. The floating solar panel works in as the solar panels for the group of voltage cells in a framework is connected with a group or a very big wire and the heat energy is converted into electrical energy through the media which is solar panel when the sun rises or the heat provided by the sun falls on solar panel show the the heat energy is converted to electrical energy and that electrical energy is provided to us through the connection of wires or a big wire and then there is distribution of the electricity.

IS IT PROFITABLE!?

Yes indeed it is profitable for each and everyone of us because the floating solar farm is a framework in which the heat energy is converted into electrical energy and it is a renewable resource energy and also if it ok in figures that and the landowner who lease the land out for a solar farm can earn between $250 to $3000 per acre per year.
According to the research it is found that the rental income for solar farms are increasing rapidly given that current subsidy free solar rents are £500 to £650 per acre per annum in UK.

WORLD'S LARGEST FSF:

On the Islands of BATAM, the world's largest floating solar farm is being built in Indonesia on an area of 1,600 hectares with an expected output of 2.2 GW. It will also have the largest ESS with storage capacity of over 4000 MW construction will start in 2022 and will be completed in 2024.

Indonesia:
Sunseap Group's floating solar farm will be located on the Duriangkang Reservoir in BATAM Island, Indonesia spanning around 1,600 hectares. It will be the largest floating solar farm in the world.

Singapore:
A shortage of land has limited Singapore's adoption of solar power but now they may have found a solution in floatovoltaics floating solar panels that can lie in reservoirs or other water bodies, running up to 10% more efficiently than those on land. The one hectare test bed now running in Singapore includes ABB solar inverter technology and can supply energy for up to 250 households.
Let's be more specific. Where is India's largest floating solar plant ?

NTPC Simhadri:

Located at NTPC Simhadri in Andhra Pradesh, the 25 MW floating SPV project covers an area of hundred acres Bharat Heavy Electricals Limited (BHEL) said without disclosing the project cost. "BHEL" has successfully commissioned India's largest Floating Solar PV plant.

ADVANTAGES:

(1) The retaining walls protect solar panels installed on the ground by reducing erosion frequently is can wash away the dirt and sand keeping the foundation of solar panels but the floating solar panels may help in not even getting in touch of Dirt.

(2) Floating solar on water has better efficiency because they benefit from additional diffuse radiation from surface reflections.

(3) Floating solar panels on water perform better because of the cooling effect of water in the surroundings.

(4) The main advantage of floating solar farm is that there is no requirement of any land.

(5) Floating solar panels are very useful because they are the renewable sources of energy.

(6) Floating solar farm is very useful cause while any sort of water may not harm the solar panels in fact they may clear the dirt and debris that accumulates on the panels over time.

DISADVANTAGES:

(1) The PV modules which are mounted very close to water can harm the aquatic life.

(2) The PV module reduces air circulation and cooling effect from evaporation.

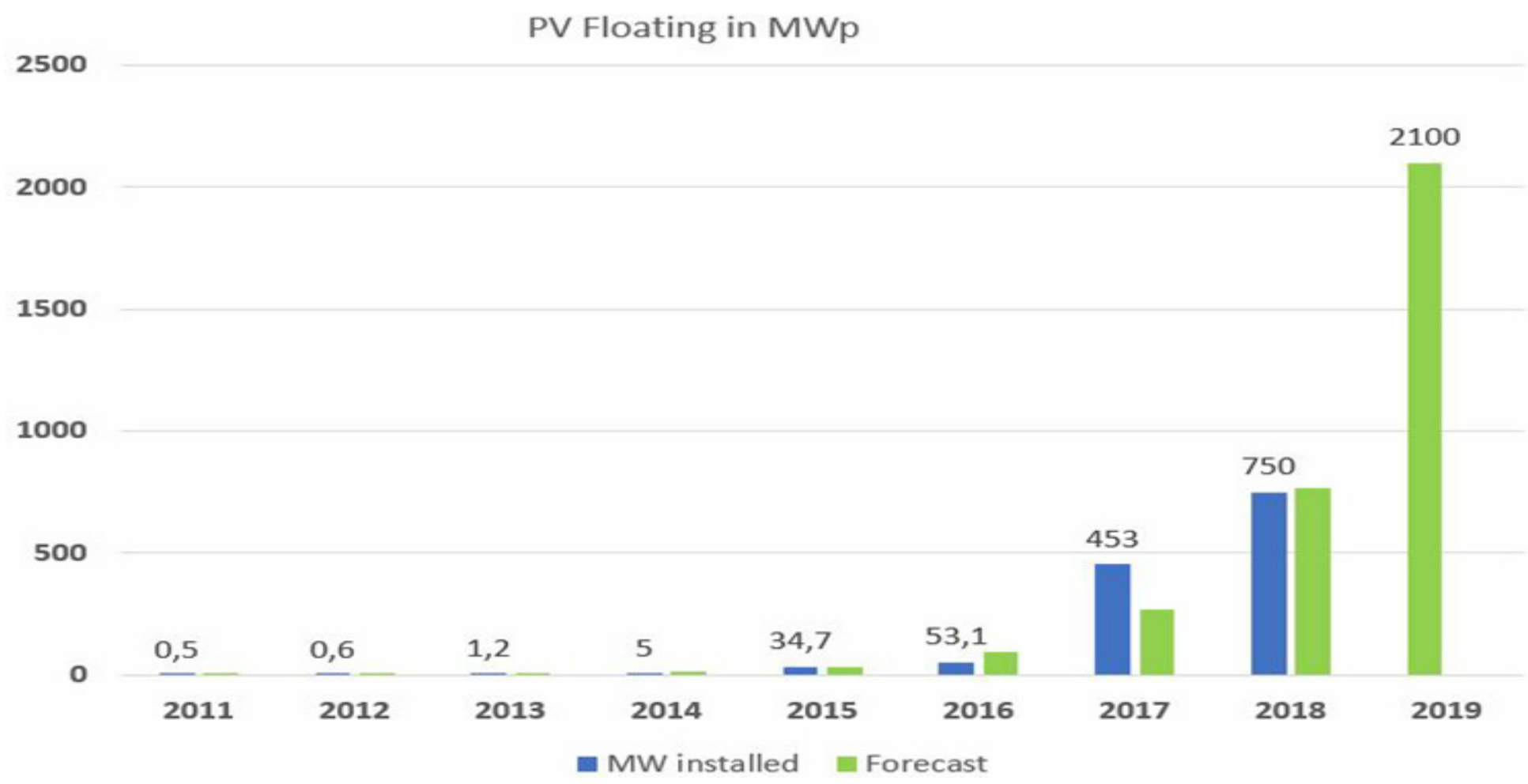
(3) It also generates a high humidity environment for both PV module and cables.

(4) The size of system is dependent on your available space.

(5) Requires sunny weather to work its best and cannot be used at night.

(6) Cost. the initial cost of purchasing a solar system is fairly high.

- Deepak Gupta
S.E. MECH A



LOWDUST CONSTRUCTION TECHNOLOGIES

INTRODUCTION:

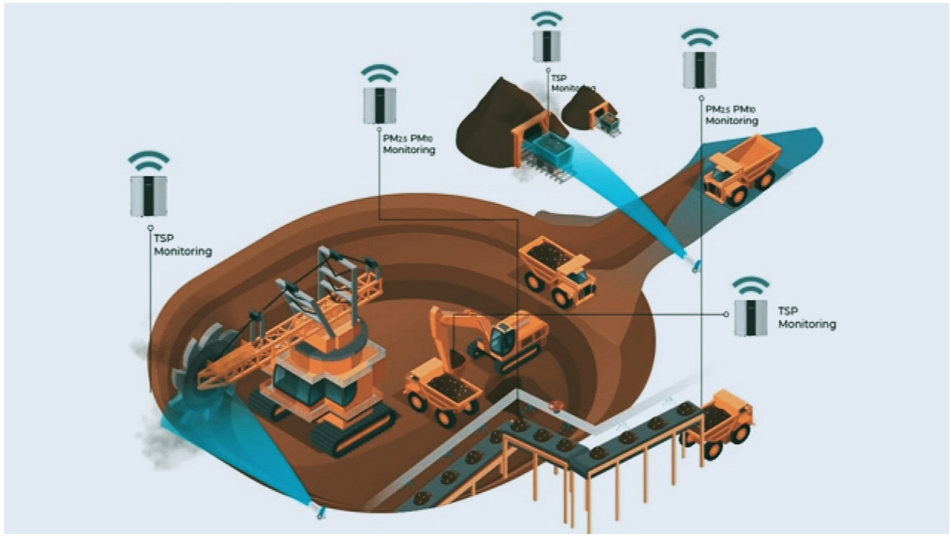
We are in an era where pollution is on a continuing rise and it's about time to accelerate to fight against it but the question arises 'Do we know enough about pollution to prevent it?' Yes, we know about water, air and sound pollution but what about dust. Yes!, dust.

In an ever growing nation of India where infrastructure keeps on expanding, the quantity of dust pollution created is massive. A truck fills up with sand and heads towards the development site as a road of India it has its perks of ups and downs, lefts and rights the dust spills and floats through the air and inhaled by the people around, Even the cars that follow kicks those dust causing respiratory issues and reduces the civility and When the truck eventually reaches the positioning, the sand is kept next to the road, right outside the location and therefore the traffic passing by again launches the particles causing havoc. The road around the site also gets damaged during picking of the sand by Pickaxe Construction activities that produce particles like metallic, gravel and concrete dust causing plenty of damage and dust spill around the area. Industries like cement manufacturing and thermal power-plants contribute to heavy dust pollution, these results in the adverse effects on the health of the workers and residents living within the proximity causing cancer, lung scarring and fibrosis and even some environmental conditions like notorious haze pollution which has been experienced in some Chinese cities. It became a necessity to develop low dust construction technologies and expand its use.

To mitigate the dust pollution by construction, some of the useful technologies and methods are Dry Construction Technique, Behavioral Control, Artificial Intelligence Regulated Construction System and 3D printing construction.

DRY CONSTRUCTION TECHNOLOGY:

Dry Construction Technique focuses on lightweight interior construction. If we blow over definition, it's the employment of innovation to cut back the employment of water, spread of dust and therefore the impact of construction on the environment. This method emanated from a necessity to scale back the mass without compromising on the structural strength. It's widely used now, mostly all the real estate projects now are built using this method because it aids good economics, better building mechanics, premium sound insulation, fire protection, ease of repair, renovation and maintenance and also shortens the development time (up to 70%). As it is a lightweight method, it's 8-10 times lighter than the concrete and traditional bricks. Discrepant from the normal method, it generates minimum construction waste and thereby reduces dust pollution.



BEHAVIORAL CONTROL:

Much research and studies on waste and health management in constructions has concluded that behavioral control techniques would be much beneficial if taken care of and lots of research is yet to be done on that.

This technique majorly segregates the work and puts it under three criteria:

- Reduction of dust generation

Changes in working methods is the main step here, we use ready mixed concrete rather than site mixed, prefabricated materials and materials with modular construction. Ground surfaces are hardened vegetation or greening is finished to scale back dust, dump trucks are covered while transporting excavated materials. Everything is very controlled including the speed, the loading and reloading operations of sand, roads and seated within construction sites with appropriate height.

- Administrative Control

Technologies like dust monitors, dust catchers and dirt auditors, etc are accustomed to maintaining the air quality and for reducing dust pollution .Workers are regulated to use proper personal protective gears. To scale back the indoor works are done during dust breaks or windy air, gusts and outdoor activities are suspended.

- Engineering Control

The area must be covered with dust proof cover, net, etc and systems like dust collectors, wet dust suppressors, vehicle wheel washing, fresh air supply to dilute the dust content and chemical agents to settle the dust down are the most important processes dole out within the technique.

AI REGULATED CONSTRUCTION:

Cement Manufacturing industries, thermal power plants, mines and constructions constitute heavy dust pollution. This threatens the health and welfare of the workers and the residents nearby. By monitoring material concentration around such dust-prone locations data-driven actions will be taken to suppress dust levels. Here comes the utilization of artificial intelligence controlled systems. A sensible real-time suspended particle monitor is employed to observe the material of 1μ to 100μ in size and by profiling the particulate by its size within the given criteria like PM2.5, PM10, PM100 detailed dust analysis is made possible. The information is then accustomed to give commands to dust collectors, mist cannons and sprinkles to get activated if there's increase in the dust above the set index and also an alert is additionally sent to the administrator about the activities. Around and in earth works, civil work, mining quarries it's really essential to make sure the activities don't seem to be violating the air quality regulations. It's a brand new technology and extremely few industries use it. Many companies do research and innovative machines on basis of that for e.g. Ozium company have innovated a monitor to detect the dust quantity and to give commands to the dust reducers and it's called 'Ozium Dustroid' .

3D PRINTING:

The idea of 3D printing a wall was first resonated in 2004 by Proff. Behrokh Khoshnevis, University of South Carolina. Since then, the innovation gained momentum and it's now even possible to create a house in only 20 hours.The professor made an FDM 3D printer that had been mounted on a robotic arm that extruded concrete layers rather than plastic to form a 3D model. The Contour Crafting technology already reflects all the qualities which are supplied with it like reduction in cost and waste (dust, gravel, etc), faster developing speed, less accidents and more. It was a brilliant discovery which marked the employment of 3d printing but it remains much less-used than other sectors. This construction technology fabricates buildings and construction components

using 3D printing as a core technology. There are many alternatives as subgroups like large scale additive manufacturing (LSAM), Autonomous Robotic Construction System (ARCS) and also Freedom Construction(FC). There could also be a range of 3D printing techniques but for construction scale mainly extrusion of concrete method is employed, during this extrusion process, concrete, cement, wax, foam or polymers are excluded in layers to make walls and other structures. Powder bonding and additive welding are the additives used together with it. 3D printing at construction level features a wide application across private, public, commercial and industrial sectors. As a technology which uses the cement/concrete which are the most dust causing agents in wet form and in highly controlled manner, it reduces the dust and other wastes produced from the development. It takes almost half of the time taken in normal construction methods. Today, it's under practice and few new houses, settlements and bridges are being constructed using this technology. This technology includes a brilliant future scope, it may have been less used technology in construction scale but many construction firms are realizing this innovative techniques importance and are making improvements in it. World's first 3D printed house was built in Europe and was totally approved by the government, COBOD Internationals and other main authorities. India's first 3D constructed liable house was integrated into a shelter at IIT Madras in 5 day.

CONCLUSION:

Considering the reduction in construction time, health and welfare of the laborers, techniques like Dry Construction Technology, Behavioral control, AI Regulated Construction System and 3D printing construction technology should be highly helpful. Dry construction technology forms about 80% of the work. Energy and water efficiency besides other environment-friendly practices have been adopted to make the buildings green. It can reduce the dust pollutants and other waste to an over sized scale. Even more fascinating, 3D printing is now being used to complete full-scale projects as well. Beyond modeling applications, builders can 3D print parts and components to be used in the actual construction of projects!
Especially AI Regulated Construction System and 3D printing construction technology must have more importance and far more research, studies and enhancements should be made in these technologies, to side construction towards greener and dust free. AI Regulated Construction System and 3D printing construction technology, these both technologies should be used combined for mitigating the construction pollution and innovating the development structure.

- Yuvraj Nishad
S.E. MECH A

GREENWAY OF AEROSPACE

INTRODUCTION:

Green Aviation (Green way of Aerospace and Aviation) involves programs to improve aircraft fuel efficiency, developing the next generation of well organized air traffic control, and develop new technologies and systems engineering processes to reach the future of carbon-neutral air transportation across the globe which will lead to the least amount of carbon emissions to the environment.

AVIATION:

Looking into aviation methods developed through many years, still no fully sustainable methods had been reached. The World requires sustainable energy in almost every possible way in upcoming technologies, ideas, or innovation. And aviation and aerospace both play an important role in this. The aviation industry will be responsible for at least nearly 25% of the carbon emissions in the atmosphere by 2045 according to the analysis being made, which is not a good sign for our mother earth and its population. Increasing growth in the aviation sector in past decades resulted in damaging the atmosphere. Daily thousands of planes get operated continuously for many years though it is required. The specific impacts created by a growing Aviation sector require a general admiration of the science of climate change and the global greenhouse gas management challenge. Rapidly growing problems of GreenHouse affecting the atmosphere. The total carbon dioxide component has risen from approx. 280 ppm to 390 ppm in 2011 which is worse.

AEROSPACE:

Now, considering Aerospace; there has been tremendous growth in spacecraft technologies since the 1970s. Since then every year many countries have been operating space agencies and experimenting with spacecraft or rockets to send them into space. For many years there was at least 1 person in the ISS (International Space Station) till now. Supplies are getting sent to them in a specific period to keep them working. For that, every time a new rocket and supply capsule is also used. Then those rockets with boosters and other parts become debris and that all keeps orbiting the earth and getting burnt while trying to re-enter the earth. As well as greenhouse gases, rocket engines release chlorine and particles of soot and aluminum oxide that destroy ozone. These issues are growing more pressing with the arrival of commercial spaceflight. There were 114 spaces set in motion in 2020, but there may be up to 1,000 per year in future.

Two main giants in the aerospace field NASA (National Aeronautics and Space Administration) and ES (European Space Agency) are currently running on these techniques. Then SpaceX introduced their new idea of using the rockets or spacecraft again. SpaceX accomplished the first vertical soft landing of a reusable orbital rocket stage on December 21, 2015, after delivering 11 Orbcomm OG-2 commercial satellites into low Earth orbit. The first reuse of a Falcon 9 first stage took place on 30 March 2017. In 2017, when SpaceX made history re-using a rocket booster and for the first time in space travel, the expensive piece of metal i.e the boosters of the rocket was not left to rust after one use. The company claimed that they significantly reduced waste and the cost of space travel. However, the materials used on the rockets are astonishingly overpriced and difficult to recycle when they are no longer functional. The Falcon 9 rocket of SpaceX depends on kerosene and oxygen and every time on every launch, the carbon emissions are not nearly as big as older missions. If the frequency of space flight hits twice a month as put forward by SpaceX, overall carbon emissions from these flights from SpaceX alone could reach over 4000 tons.

According to the reports Elon Musk said that his space company SpaceX generally places sustainability and sustainable energy at the forefront of the company. The company was to push forward towards sustainable energy instead of energy that creates carbon emissions that destroy the planet.
The main challenge which will come to the forefront is the cost of the development in the industry. If somehow the entire aviation industry and their operations go in a green way (use of sustainability) in future the cost will rise extremely and not everyone can afford it. Sustainable fuels are the top most priority to engage more and more possibilities of greener space travel. Currently almost all spacecraft use many varieties of fuels; more are based upon fossil fuels. We all know that fossil fuels will not last forever in the future. The private spaceflight company Blue Origin owned by Jeff Bezos used a potentially greener option liquid hydrogen and oxygen by the New Shepherd Propulsion Module .

CONCLUSION:

Reusable rocket systems can knock down some of the waste generated or associated with spaceflights. Normally rocket boosters, fuel tanks and the other parts or components are getting wasted after single use. But guiding them to get back to earth in a controlled manner can give rise to new possibilities in the future. Like Falcon 9 rockets can be used more than 100 times.Honestly environment friendly space travel is way far from today's time. But many government and private organizations are constantly working to get the proper ideas on these innovations to convert them into reality. To stop the damaging impact on our planet.

The major question is,"Will it be ever completely possible?"

- Anand Gupta
S.E. MECH A

UNDERWATER WINDMILL

What is an underwater windmill?
"It's like putting a windmill in water" - Bjorn Bekken
Or it resembles a windmill that is placed under the water, like large river beds and ocean floors.

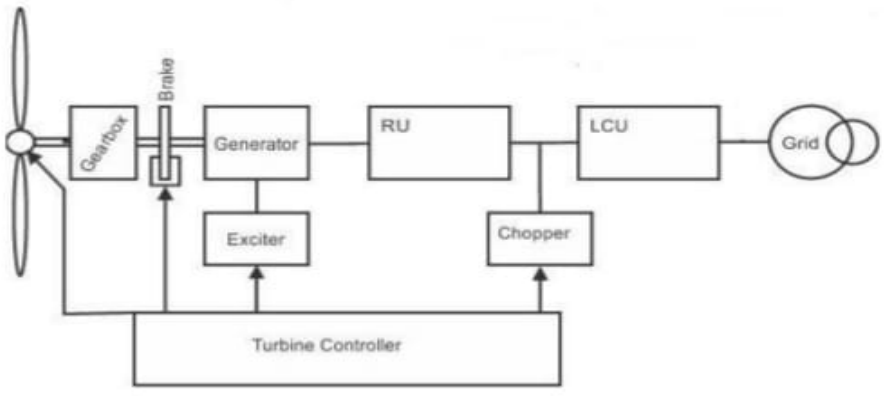
INTRODUCTION:

Nowadays, Renewable energy generation is growing rapidly due to the issues of increasing global warming and the national requirement of electricity supply. A largely unused potential to supply 170 TW of electricity annually is ocean energy. Tidal stream turbines are underwater windmills. They are driven by the kinetic energy of the moving water, the same as the way that wind turbines rotate by the flow of air. The generator is placed in a marine current that is generated when water is moved by tidal forces. Tidal stream turbines can majorly help in energy production. An Underwater windmill extracts power from the tides. Technologies based on renewable energy are becoming an increasingly favorable alternative to the conventional usage of fossil fuel since it is not sustainable. Tidal energy is renewable and reliant. It is like wind energy technology, where blades rotate due to the wind. In an underwater windmill, rotor blades are driven by tidal waves or currents.

BLOCK DIAGRAM:

Power generation / Working of the underwater windmill-
The gravitational pull of the moon produces a tidal current that spins the long blades of the turbine. It generates electricity via the different parts of an underwater windmill. Underwater Windwill uses an Tidal Stream Generator which works on kinetic enery of water currents. It is the first technology in the world that feeds electricity directly from a tidal current into a power grid. The gravitational pull from the moon produces a tidal current that causes the channel at about 8 feet (2.5 meters) - (10 meters) long blades to spin. The blades rotate at a speed of seven revolutions per minute. It sufficiently produces 700,000 kilowatt-hours of non-polluting energy per year. The first windmill created to produce electricity was utilized in 1888 by Charles F Brush. The underwater turbines that are attached to the windmill are fairly straightforward, they are windmills attached to the ocean or river bed, that are moved by the tidal currents which in turn spins the blades like an airplane propeller, the hydrodynamic effect of flowing water pass the blade rotates the blades thus turning on the generator which is connected to the rotor via a gearbox. The produced electricity is then carried to the shore using cables.

Block Diagram



MAINTENANCE:

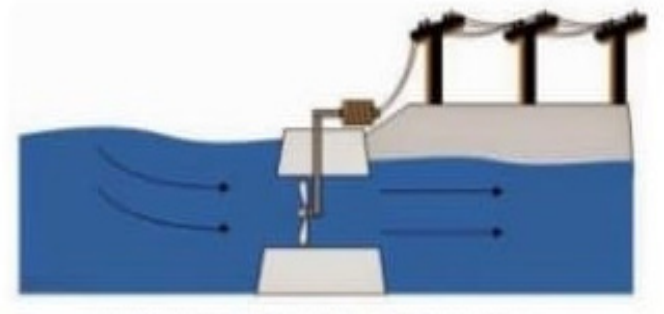
Maintain of an Underwater Turbine can be risky due to the aquatic environment.When the device is submerged in a fast current, maintenance will be challenging and expensive. So, the gearbox and generator have to be lifted above the surface. Once raised, any maintenance or repairs can be carried by attending the structure from a surface vessel.

ADVANTAGES:

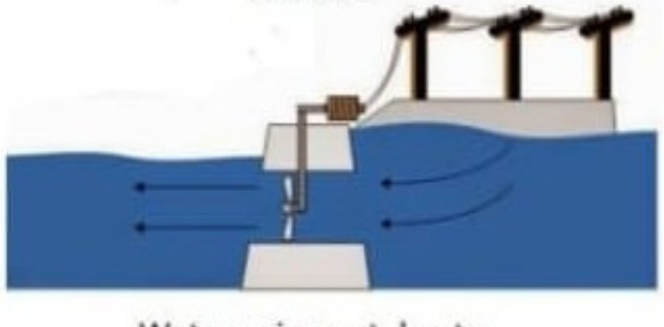
- The initial construction costs are high, but the overall maintenance is affordable.
- Tidal and ocean currents are renewable and produce no emission.
- Our dependence on fossil fuel will decrease
- Has less impact on the environment.
- Energy output is 100 % authentic, as tides are as sure as the moon.
- It is hidden directly underneath the water.

DISADVANTAGES:

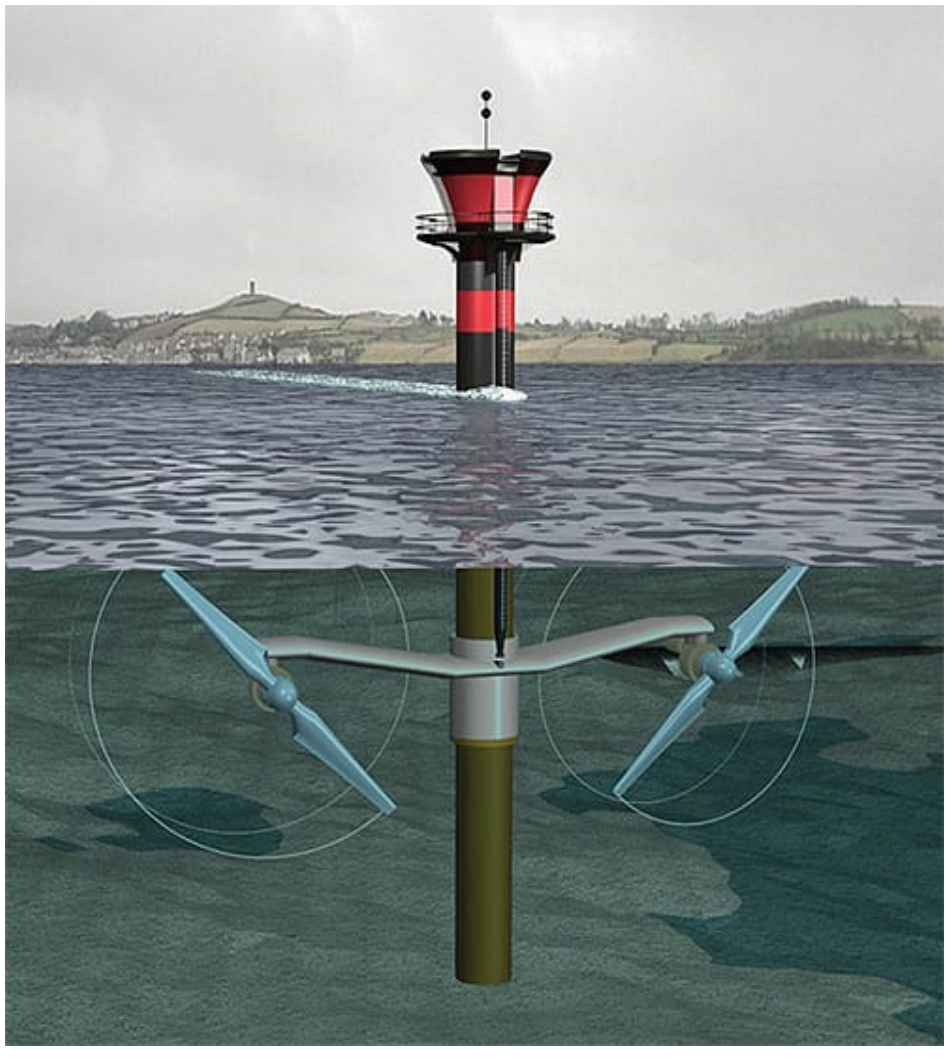
- Offshore turbines cost more than wind turbines.
- The salt content in ocean water causes corrosion of steel.
- Fishing activities are restricted in the areas of the powerplant.
- It damages the surrounding habitat up to 500 km away.
- Construction underwater is difficult. Noise abatement.



Water going in due to ocean currents



Water going out due to ocean currents



CONCLUSION:

Tides play a very important role in the global climate and the ecosystem for the Ocean Habitats. Tides have great potential as a renewable energy source. Depleting oil reserves, the emission of greenhouse gases by burning Coal, Oil, and other fossil fuels, is forcing people to replace traditional energy sources with renewable energy. Tidal energy can be the future for the revolutionary development of new efficient, low-cost, and environmentally friendly energy. Hydraulic energy can be used for multi- Megawatt Tidal power farms and Power stations with turbines generating a few Kilowatts of energy. Such power stations can be used to provide clean energy to small communities or even individual households located near continental shorelines, straights, or on remote islands with strong tidal currents.

- Advait Angawalkar
S.E. MECH A

SOLAR POWERED CAR

INTRODUCTION:

The Automobile Industry works on two quotes "The best or nothing at all" and "The only real mistake is the one from which we learn nothing". It is an industry that keeps on changing rapidly, that's why is its also called a 'Changing Industry'. The Automobile Industry has changed from diesel/ petrol cars, and now the electric car is changing into solar-powered cars.

On August 31, 1955, at the General Motors Powerama Auto Show in Chicago, a small vehicle 32 cm long became a major attraction. It wasn't a toy; it was the first-ever car in history to run on solar power, a miniature that wanted to lay the foundation for a future in which vehicles would be powered by a clean and inexhaustible source of energy: The Sun. The idea of cars running on solar power caused quite a stir, specifically at a time when the fight against the climate crisis was high on the agenda of major international organizations.

Aside from the racing world, photovoltaic cell technology is currently not widely used in the automotive market. The main obstacles are the prohibitive cost associated with using the technology, space constraints that limit the number of panels that can be attached to the car, the range of the car, and the speed it can attain.

A solar panel enables photon or light particle's electron to excite and generate a flow of electricity. Solar panels are made up of many smaller units called photovoltaic cells that are linked together. Each photovoltaic cell is essentially a sandwich of two slices of semiconductor material,e.g., silicon. Silicon mixes with other materials, usually phosphorous and boron, to give each "disk" a positive or negative electrical charge.

When a photon in sunlight releases an electron, the electric field pushes the electron out of the silicon junction. The electrons transfer them to the wires.

ADVANTAGES:

- Saves money on fuel.
- It is sustainable and environment friendly.
- No additional costs except battery replacement.
- Does not cause noise pollution or air pollution.

Some solar-powered automobiles have attempted to open the doors to the customer. One of the designs mentioned is Lightyear One with a distance potential of 435 miles(seven hundred kilometers), it makes use of photovoltaic cells that shop 20% greater electricity than conventional ones, and they perform independently. One of the biggest problems with today's all-electric vehicles is their range, you can't go more than a few hundred miles without needing a charge. The panels of Lightyear One themselves, given the right condition, can generate enough power to travel more than 20,000 miles a year, which adds up to three hundred and sixty-five days in the desert and yes, it can also be charged through traditional charging stations. The first source is the sun and the second is the ordinary outlet. The company says that you can now expect to charge it overnight with a range of two hundred and fifty miles, especially given the price.

The car will be super light thanks, to the solar cells that are quite light and small on the battery, which means that compared to a heavier one, you get more range for the same.

By following the laws of physics, Lightyear One gets the most out of every ray of sunlight. Its energy use of only 83 Wh per kilometer on the WLTP cycle enables it to reach a range of 725 kilometers. Compassing solar cells encased in safety glass, the study solar roof, and hood live up to rigorous auto industry regulation for grid charging. The patented double-curved solar array achieves 215 WP/ M^2. It is fully automotive compliant.

There are several reasons why even the most advanced automakers have not been able to create a fully solar-powered car. The first and foremost reason is the solar panels itself. The commercially operated solar modules we currently use have a defect between 20° and 35°.To supply a solar car with electricity, we would therefore need a lot of additional space for solar cells. However, this poses two other problems: weight and cost. Solar panels are neighter cheap nor weightkess. Packing the car body with solar panels means you add a lot of weight and cost to the car. Solar foils have been developed that are much lighter than the panels but at the same time, less efficient.

And when you factor in the weight of the battery, a solar-powered car seems less and less feasible in the real world. On a clear day, the earth's surface receives around 1kW of solar energy per square meter, since highly efficient 4-square meter photovoltaic modules can generate around 8kWh of electricity per day; it only achieves a range of around 40 km with normal panels. Bad weather, driving conditions, improper disk placement, and debris will most likely make it difficult for the solar car to match this value. Also, solar-powered cars are not 100% green. If you look at how batteries and solar cells are manufactured, especially how the minerals used are extracted, it becomes clear that every vehicle has its share of the CO_2 footprint.

CONCLUSION:

Current research on lightweight batteries and highly efficient photovoltaic cells make solar-powered cars fit for the future. There is also the option of placing solar panels on the roofs of electric or hybrid cars as a supplementary energy source that is not intended to move the car but can provide the necessary energy. Currently, the use of photovoltaic panels for driving has not been proven to be an efficient solution to the fossil fuel substation issue. But it can serve to complement the other systems. We must take advantage of such clean technology.

- Shamsheer Atwal
S.E. MECH A

HYBRID ENERGY SYSTEM

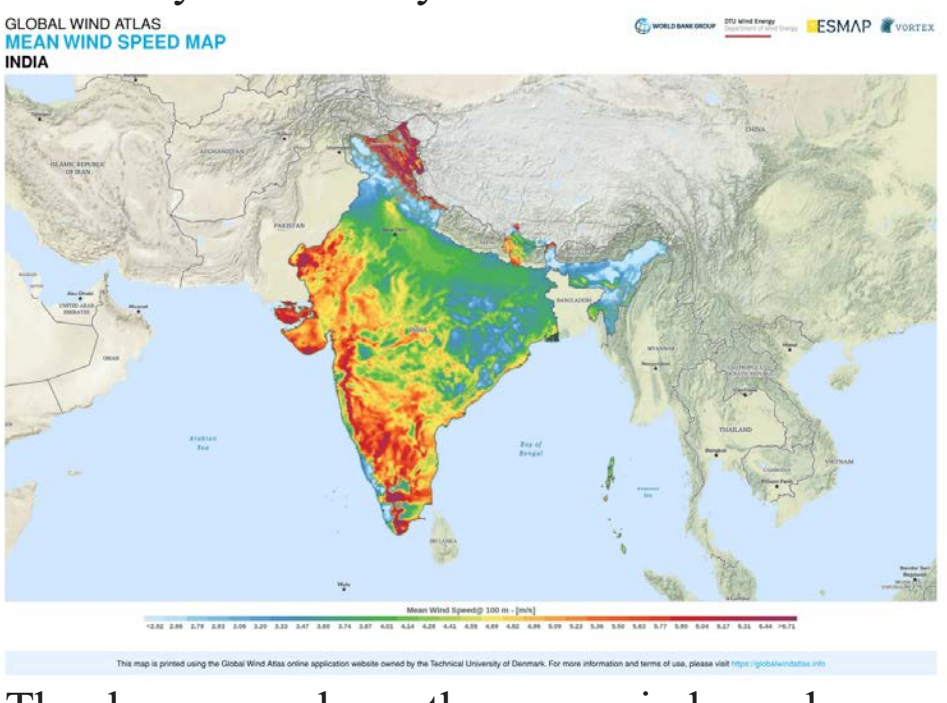
INTRODUCTION:

For many decades we have been using coal, natural gas, and nuclear as forms of energy, but they generated byproducts that harm our environment. Non-Renewable energy is also limited in supply. As a result, the demand for renewable energy increased, and we turned towards wind, hydro, and solar energy to generate electricity. To increase the electricity production, we can combine two or more energy sources.

The Hybrid-electric system combines wind energy and solar electric technologies to increase the energy efficiency. It offers several advantages over either system individually. Wind speeds are low in the summer. The winds are strong in the winter when less sunlight is available. Because the peak operating times for wind and solar systems occur at different times of the day and year, hybrid systems are more suitable. Hybrid energy systems are still an emerging technology.

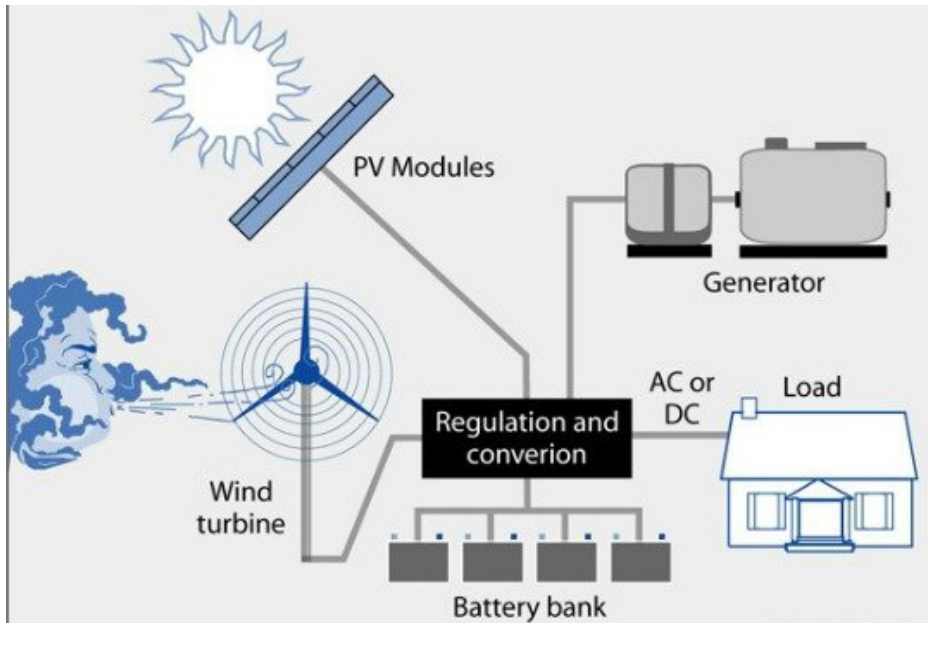
CONCEPT:

A solar-wind hybrid power system uses solar insolation and wind energy to produce electricity. As both solar radiation and wind speed vary throughout the year, neither can provide reliable electricity individually.



The above map shows the mean wind speed across India. As you can see, the western region of India has maximum wind speed. Therefore, there are already 14 wind farms present in the western region.

Now we will discuss solar energy in India. According to the geographic condition, we get enough sunlight to produce a good amount of electricity from it. The combination of both wind and solar can give a reliable source of electricity in India.



COMPONENTS OF THE SYSTEM:

Windmill and Solar Panels:

A windmill is a structure that converts wind power into rotational energy through sails or blades, but the term can also be extended to windpumps and wind turbines.

These are different types of wind turbines. The first type is a land turbine and the second one is for ships. These turbines can be used in both a decentralized and a grid-tied power system.

Solar energy, radiated from the Sun is capable of producing heat, causing chemical reactions, and generating electricity. The total amount of solar energy incident on Earth is more than the world's current energy requirement. If harnessed correctly, this source has the potential to satisfy all future energy requirements.

Solar cells hybrid made from metal halide perovskite solar cells (PSCs) has garnered a great amount of attention due to their low price, design, low-temperature processing, and light absorption properties.

They are flexible, semitransparent and lightweight. Perovskite thin films can also be printed, leading to scalability and high manufacturing rates. A recently printed PSC has reached 12.2% efficiency, the highest among printed PSCs.

Notably, combined perovskite and Si-PV materials have shown a record efficiency of 28% under laboratory conditions, as demonstrated by Oxford PV. While stability and durability have remained a major concern, a recent low-cost polymer-glass encapsulation system has enabled PSCs to withstand standard operating conditions.

A combination of solar panels with the windmill will look like this:

The energy generation will vary in India as we observe that solar output is maximum between 11 am and 3 pm, while the wind speed is highest in the late evening and mornings. Peak power demand is during evening hours 6-9 pm, which cannot be catered by either wind or solar. If we can store some energy during high generation hours and release it into the grid during demand hours, the combined "Hybrid" system can produce clean energy. The storage systems can be batteries or pumped hydro and mechanical storage flywheels. The intermittency of wind and solar can also be balanced by adding a rampant source of energy. The overall output of the hybrid system can be matched against a required load. It provides both baseload and flexible power.

Hybrid systems are becoming increasingly cost-competitive, driven by the cost reductions in battery storage. An optimal combination of solar, wind, and storage systems can deliver stable round-the-clock power at a cost of around 6-7 Indian Rupees per kilowatt-hour (kWh). Similarly, Levelized costs of solar energy have plummeted from 4.63 Indian Rupees per kWh in 2016 to 2.50 Indian Rupees per kWh and may fall as low as 2 Rupees per kWh in the next three to five years. If the above levels are reached, analysts predict that a Hybrid energy system can potentially compete with 30-40 percent of existing coal-fired stations in India. Several leading Indian corporates have also shown interest in increasing the use of clean power.

CONCLUSION:

An off-grid system will be more suitable for Indian villages as the houses have enough space to install the hybrid energy system. It can serve as an energy source that will benefit the villagers and the environment.

- Suraj Mahato
S.E. MECH A

GREEN PUBLIC TRANSPORTATION SYSTEM

INTRODUCTION:

Green public transportation is a transportation system that does not affect the environment negatively. The field of green public transportation has expanded a lot in the past few years, owing to the rising petrol and gas prices across the world. Green public transportation is essential for the current time and an energy-efficient future. Some examples of green public transportation are sharing electric bikes, electric buses, metros, and subways. Green vehicles run on wind, hydrogen, or solar energy.

IMPORTANCE:

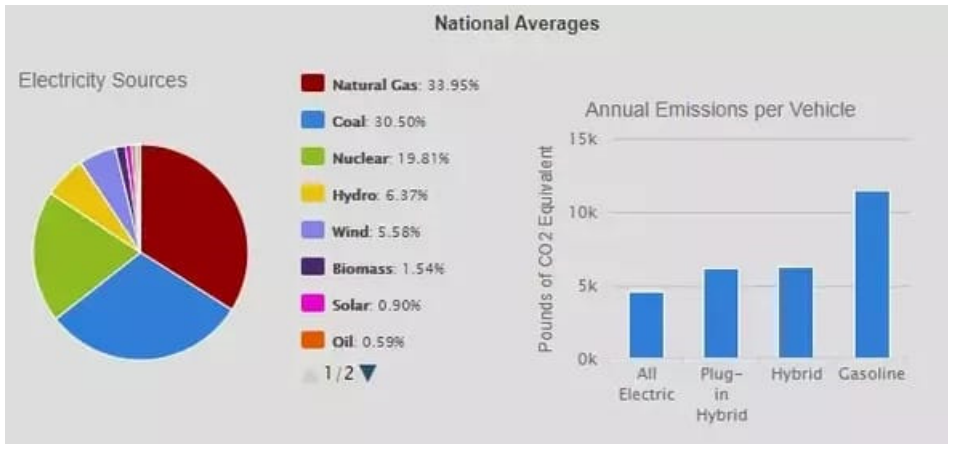
Green public transportation is very important in today's scenario where the environment is depleting everyday and dependence on non-renewable energy is increasing, thus posing a threat to the environment.

Green public transportation is important as it reduces the burden on the earth's natural resources of fossil fuels such as oil and natural gas. These fuels take millions of years to replenish.

Another reason is that using fossil fuels poses a great threat. The fumes generated from running vehicles are harmful to the ecosystem and increases pollution levels. When humans inhale the polluted air or drink contaminated water, they are at risk of diseases like asthma. Thus we all need to switch to green transportation.

Green public transportation like metro, electric vehicles and using public transport is not only good for the environment but also helps to save a lot of money spend on petrol or gas. This slowly helps us to save money and thus, adds to our bank balance.

Electric Vehicle VS Normal Vehicle:



REDUCING POLLUTION:

General and public represent 27% of Europe's total greenhouse emissions. Switching to electric public transport results in a reduction in nitrogen oxide, carbon dioxide, and sulfur dioxide emissions. This is particularly important given that the WHO estimates that air pollution causes 1 in every 9 deaths worldwide.

ECONOMIC MOBILITY:

Efficient and affordable public transport enables economic advancement in cities and facilitates access to markets and resources. Electric transport requires less maintenance and is less likely to break down. As a result, investment in electric transport infrastructure delivers better performance and better support.

REDUCES COSTS:

Whilst a higher upfront cost to electric public transport may be required, many studies have shown that electric vehicles are substantially cheaper to operate. This means it can be more affordable and more accessible for those it is designed to serve.

BETTER PERFORMANCE:

Since electric vehicles have extremely high torque power, their pickup is very quick and smooth, leaving gas-powered vehicles. Most people are quite surprised at how much more comfortable the ride is too, and some say that it makes gas-powered seem clunky and clumsy.

REDUCES RANGE ANXIETY:

The performance of an electric vehicle extends beyond great torque. Recent electric cars have better range performance. This is possible because of advancements in battery technology and electric regenerative systems in vehicle braking.

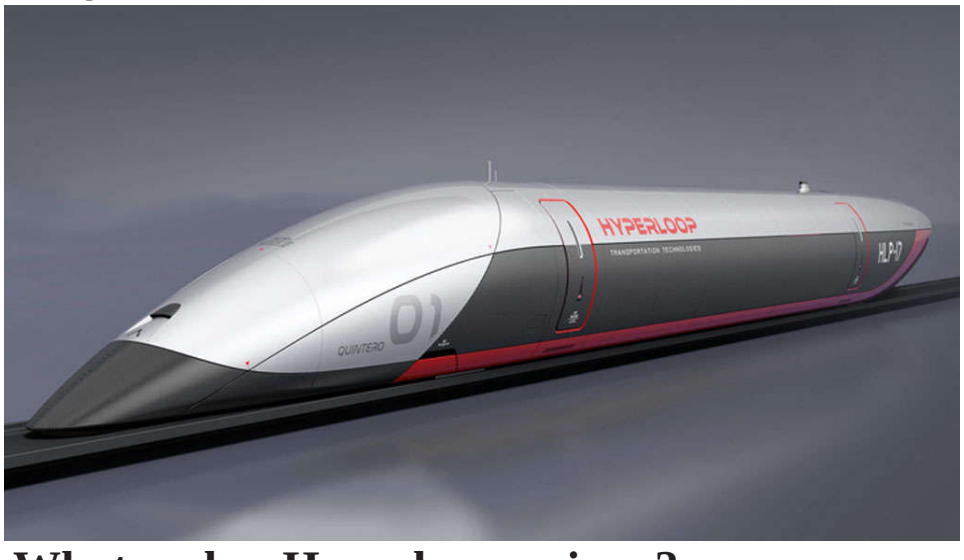
Current Electric Public Transport:

(1) Bus
(2) Metro
(3) Subway
(4) Electric Car
(5) Electric Scooter
(6) Trains

Future of Electric Public Transport:

HYPERLOOP TRAINS:

Hyperloop is a new form of ground transport currently in development by several companies. It could see passengers traveling at over 800 miles an hour in a floating pod that races along inside giant low-pressure tubes, either above or below the ground.



What makes Hyperloop unique?

There are two major differences between Hyperloop and traditional rail. Firstly, the pods carrying passengers travel through tubes or tunnels, from which most of the air has been removed to reduce friction. This allows the pods to travel at 750 miles per hour.

Secondly, rather than using wheels like a train or car, the pods are designed to float on air skis, using the same basic idea used in air hockey tables, or using magnetic levitation to reduce friction.

Benefits of Hyperloop:

Hyperloop could be cheaper and faster than train or car travel, and it can also be cheaper and less polluting than air travel. It is also quicker to build than traditional high-speed rail.

Hyperloop could therefore be used to take the pressure off gridlocked roads, making travel between cities easier. It can potentially unlock major economic benefits.

When will the first Hyperloop transportation be available?

Several companies are working to turn this idea into a functioning commercial system.

Elon Musk's vision is to bring Hyperloop technology by the early 2030 and the company has raised $400 from private investors for the technology.

Hyperloop technology is still developing. At the moment, the earliest Hyperloop is likely to be up and running in 2023, but services are expected to be later, as trials are still in their early stages.

Hence, Green Transportation technologies can help solve the global energy crisis.

- Aditya Yadav
S.E. MECH B

CURRENT TRENDS IN GREEN ROBOTS

INTRODUCTION:

The trend toward green manufacturing is emerging so fast that green robots become a wonderful tool for manufacturing. Using robots as a part of the assembly process, even within the early stages of development or refinement, helps to cut back the time and human efforts to plug in green products. Not only these robots are also helping to fight global climate change, improve recycling and make manufacturing more sustainable. We don't usually consider robots as being eco-friendly. But, the utilization of robots for sustainability can soon become a reality, all due to green robots. Climate changes must be checked more urgently than ever before, and we have already started using technologies like AI, blockchain, and IoT to fight climate changes. Green robots, too, can help us to fight against global climate change. Different forms of robots are already being developed that may help preserve the environment in various ways, from fighting wildfires, helping manage our waste and to cleaning our water bodies. Below are a few examples of green robots which are helping with environmental sustainability.

ROCYCLE ROBOT:

Currently many of the recycling plants and industries use magnets to sort metals and air cleaners to retrieve paper and plastic, most of the segregation of waste is done manually. The solution for this can be an innovative robotic arm which might be able to identify, grip and move waste materials intended for recycling in respective can. This robotic arms will perform their function beside the conveyor belts that carry thousands of waste materials a day. Their soft grippers and sensors can delineate paper, metal and plastic waste. Their high deformation capacitive strain and pressure sensors can then allow them to grab boxes, papers and cans. It may even distinguish waste that might go unrecognized by a human operator.

LATRO SPIDER ROBOT:

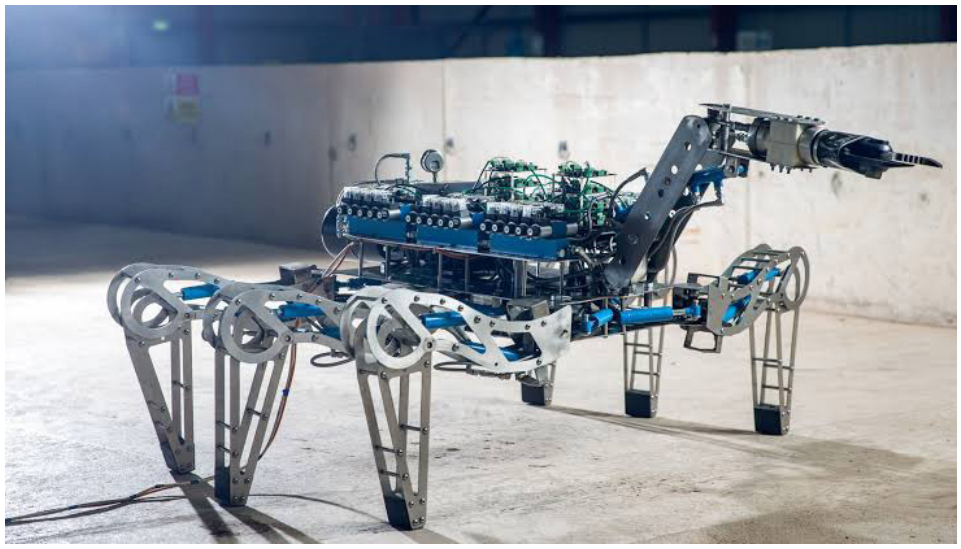
Humans who help pack up waste at decommissioned or damaged nuclear facilities must take extreme precautions to limit their exposure to radiation like dressing in special suits and carrying sensitive radiation monitors. Even then, they have to carefully limit what proportion of time they spend within the hot zone.

But Latro, a proof-of-concept robot, has no such limitations. About the dimensions of a board, the spider-like robot has six legs that enable it to climb over obstacles and collect stuff and a computer brain that lets it make some decisions while being remotely operated by a person. It's developed for a particular application which needs a robust robot and versatile control. The bot could soon be helping shut down other nuclear hotspots or working to examine oil tanks.

It is used for monitoring and decommissioning of both dry and wet nuclear storage facilities. It works in contaminated radioactive environments that are too hazardous or difficult for humans to figure in. The robot is meant to chop, sort and retrieve material from storage facilities. Latro has six long legs for motion and two arms for carrying large grippers and cutters.

Some of its advantages are: It can save money and time for the manufacturing companies.It can

reduce the prices of equiptment. It never gets tired and slows down. Once Latro is out of battery, it quickly charges then gets straight back to figure.



THERMITE ROBOT:

Thermite RS3 is nearly as hefty as a wise car and may withstand exposure to extreme elements. It features a cannon which will blast water or foam at 2,500 gallons per minute and align itself vertically to figure as a sprinkler. It's operated via device with high-definition video feedback. It can run twenty hours non-stop before being eager to refuel. Using mounted cameras, it can travel into extremely hazardous situations, like wildfires, while being controlled from up to 1/4 mile away. With some firefighting modifications, it may be used as a fireplace neutralizer. Onboard is an innovative cooling system that has consistency by using a number of the water pumped as a coolant throughout its body. Although it pumps a 3rd less water than a fire engine (1,500 gallons per minute) it also costs considerably less. Let alone its ability to enter hazardous areas without putting people in harm, it might be seen putting out wildfires in the future.

MAX AI:

Max-AI robotic sorters use AI, computer and robotics to sort waste so humans don't need to. Through deep learning technology, Max employs both multi-layered neural networks and a vision system to determine and identify objects similarly to the way someone does. From robotic sorting to real-time material identification, this technology is powering real solutions and reducing any health risks that come together with human labor. Especially with COVID19 of high importance, removing gloves and masks from the waste stream.

The robotic sorter uses its vision system to work out the fabric, its computer science to think and identify each item, and a robot to choose targeted items. This technique is in a position to create multiple sorting decisions autonomously. All of this can be done at rates exceeding human capabilities.

- Aakash Yadav
S.E. MECH B

ALGAE ENERGY

A POSSIBLE "GREEN" GOLD:

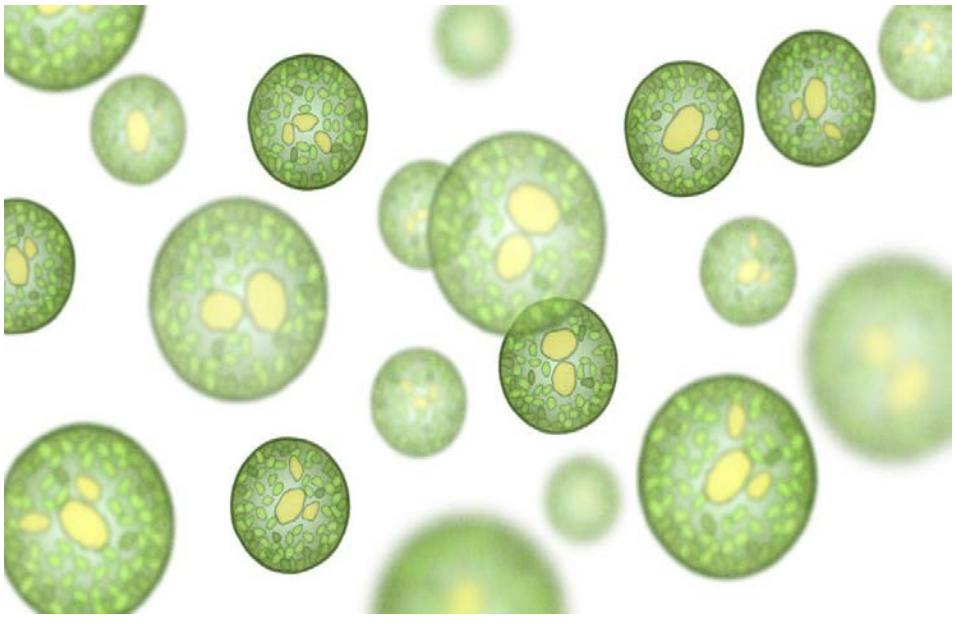
It's difficult to think of a humbler organism than algae, or a less-likely prospect to become the savior of our energy future. How can these minuscule and arguably, not so pleasant looking scum in places ranging from fish tanks at home to large ponds, can be of any help for energy production? That's what researchers and scientists were of the opinion before the early 20th century. In 1942, European scientists Richard Harder and Hans Von Witsch were the first to propose that micro algae could be a source of lipids for food or fuel. Extensive Research began in the US, Germany, Japan, England, and Israel on culturing techniques and engineering systems for growing microalgae on larger scales, particularly species in the genus Chlorella. But why algae? "No human endeavor can be more exciting than one that concurrently addresses the three major crises humankind is currently facing: food security, energy efficiency and environmental sustainability.", quotes Augusto Rodríguez-Villa, in his note as the CEO of Alga Energy. Algae grows 10 times more rapidly than terrestrial plants, and less than a tenth of the land is needed to produce an equivalent amount of biomass for fuel creation. It grows on abortive and non-arable land, so it doesn't compete with other crops for land. Because it doesn't require natural water, it can be fertilized more efficiently than land crops, and we can avoid the intensive water usage, wasteful fertilizer runoff, and downstream eutrophication associated with modern agriculture.

APPLICATION OF ALGAE:

Algae has come out as a popular element in industries like cosmetics, pharmaceuticals, food and beverage, bio fuels, and more. Most recently, the benefits of algae have been making waves in sustainable energy and environmental technology. Algae has many benefits that make it an ideal choice for creating a variety of interesting products.

HIGHLY ABLE TO CREATE BIOFUEL:

The word biofuel refers to any type of solid, liquid, or gaseous fuels which can be derived from renewable raw materials. Agricultural crops are allocated as first-generation biofuels due to their use for food or feed. Biofuel derived from algae is dubbed as the 'third-generation biofuel' and it holds several key edges over earlier feed stocks based on plant crops such as grain and Saccharum. Microalgae grow quickly and contain high oil content compared with plant crops, which take a season to grow and only contain a maximum of about 5 percent parched weight of lubricant. During the peak growth phase, some microalgae can double every 3½ hours. Studies have shown that oil content of microalgae usually ranges between 20 percent and 50 percent, while some strains can even reach as high as 80 percent!



Biodiesel:

Algal biomass holds three main components: carbohydrates, proteins, and lipids/natural oils. Because the bulk of the natural oil made by microalgae is in the form of triacylglycerol, which is the right kind of oil for producing biodiesel, microalgae are the absolute focus in the algae-to-biodiesel arena.In recent years study of biodiesel has been widely acknowledged and it is mostly produced from oil seed crops like soybean oil, palm oil and rapeseed oil. The production cost of biodiesel is mainly determined by the type of raw material used, as it is a critical factor reckoning for 50-85% of total fuel price.

Chlorella vulgaris and Chlorella protothecoides are two main species, containing high oil content that has been studied for production of biodiesel. The algal biomass extracted from wastewater contains a mixture of various algae and hence different fatty acid profiles can be obtained. Using a mixture of different systems, biodiesel has been produced from algae Chlorella sp, Euglena sp, Spirogyra sp, Scenedesmus sp, Desmodesmussp, Pseudokirchneriellasp, Phormidium Sp.

Biomethane Production:

For biomethane production, an anaerobic digester containing synergistic microbial populations, converts algal lipid, protein and carbohydrate to methane and carbon dioxide. Methane is extensively used both as a fuel and chemical feedstock. Carbon dioxide is diverted back into the culture system.

Bioethanol:

Ethanol has a lower energy density than that of gasoline, meaning more ethanol - in terms of volume and mass - needs to be blazed to produce the same amount of energy. Algae are the optimal source for production of bioethanol due to the large number of carbohydrates/polysaccharides and thin cellulose walls two general processes are used for production of bioethanol from algae, Fermentation and gasification. In various countries, commercial ethanol is produced from sugary and starchy crops on a large scale by fermentation.The starch of microalgae is emancipated from the cells with the aid of enzyme, acid, alkali and yeast, Saccharomyces cerevisiae is added to initiate fermentation and sugar is converted to ethanol. The finished product from fermentation i.e. ethanol is then drained and pumped into a holding tank attached to a distillation unit.

AS AN ALTERNATIVE ENERGY SOURCE:

Microalgae can also be used to produce energy in several other ways. Some algal species can generate hydrogen gas under specialized growth conditions. The biomass from algae can also be burned alike to wood or anaerobically digested to produce methane biogas to generate heat and electricity.

AID IN CARBON SEQUESTRATION:

Carbon segregation is a natural or artificial process by which carbon dioxide is removed from the atmosphere and held in solid or liquid form. As every autotroph, Algae is able to absorb CO_2, carbon dioxide, because it needs CO_2 for food production, i.e. photosynthesis. As algae grows, it will absorb CO_2 at high rates while liberating O_2, or oxygen, which can help clean discharge from nuclear power plants and other energy sources releasing carbon dioxide.

This is one of the advantages of aquatic carbon capture and biomass production systems that it has the ability to capture CO_2 in ponds in a nongaseous form as bicarbonate. At average pHs (≥ pH 7) and temperatures (below 30 degrees Celsius), the preside form of CO_2 in water is bicarbonate. The bicarbonate is subsequently dehydrated and the resulting CO_2 is captured ultimately in the form of algal biomass. Between 1.6 and 2 grams of CO_2 is detected for every gram of algal biomass produced.

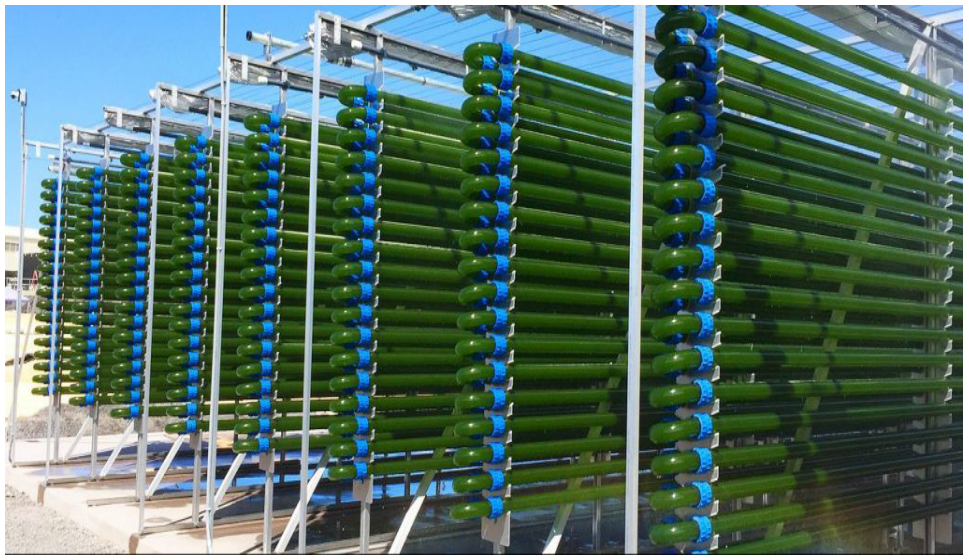
ALGAE OIL EXTRACTION:

Step1- Algae are typically found growing in ponds, waterways, or other wetlands which receive sunlight and CO_2. They are either harvested in Open pond systems which are simple expanses of water sunken into the ground with paddle wheels to mix or closed photobioreactor systems that are bounded and which allows more precise control over growth conditions and resource management.

Step2- Once green, muddy biofilm is formed by algae, it can be harvested easily using operations like filtering, scraping, size reduction, and drying.

Step3- Energy in the form of photons is absorbed by the algae cells, which convert the inorganic compounds of CO_2 and water into sugars and oxygen. The sugars are finally converted into complex carbohydrates, starches, proteins, and lipids within the algae cells.

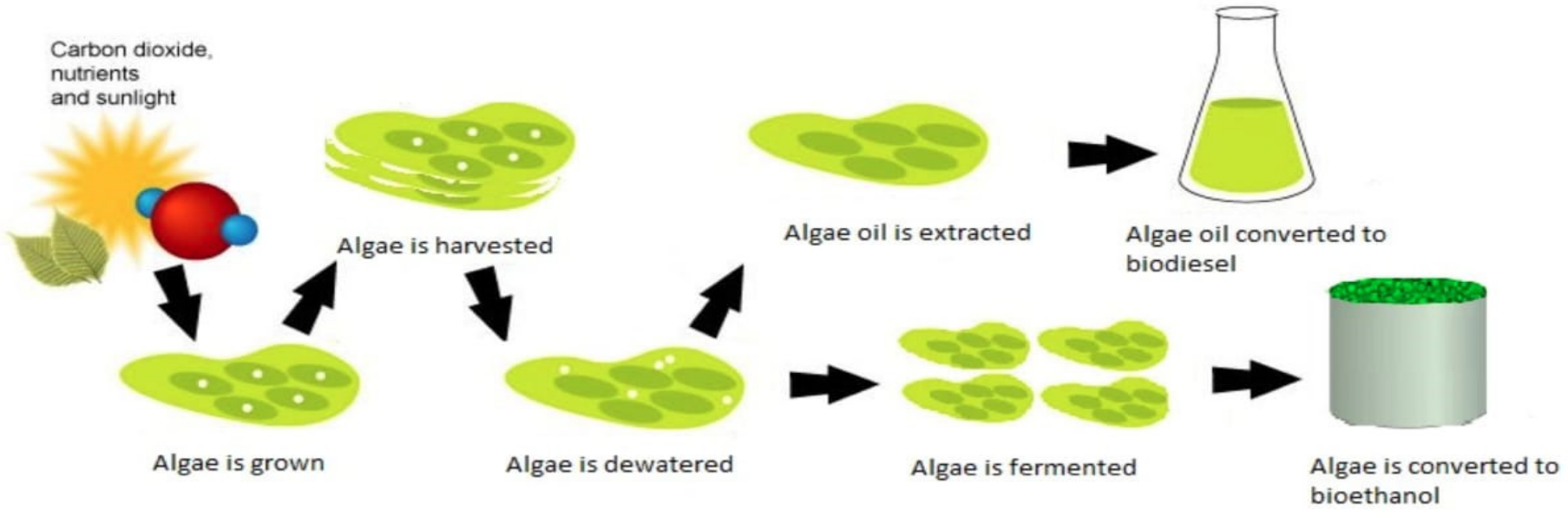
Step4- In order to extract the valuable lipids, the traditional process begins by differentiating the algae biomass from the water broth in the dewatering stage using centrifuges, filtration, or flocculation techniques. Once the oil is removed from the cells, it is processed into biodiesel, jet fuel, ethanol, synthetic fuels, or other chemicals.



CONCLUSION:

Algae is highly beneficial in terms of its general usage as well as environmental applications. Currently, algal energy production is still too expensive to be commercialized. Due to the static costs associated with oil extraction and biodiesel processing and the variability of algal biomass production, cost-saving attempts for algal oil production should focus on the production method of the oil-rich algae itself. This needs to be approached through increasing both algal biology (in terms of biomass yield and oil content) and culture-system engineering. The days are not far away when we will live in buildings that will be beautifully enclosed in photosynthetic membranes and vertical gardens, harvesting solar energy, producing bioproducts and food for city dwellers.

- Shreyas Vispute
S.E. MECH B

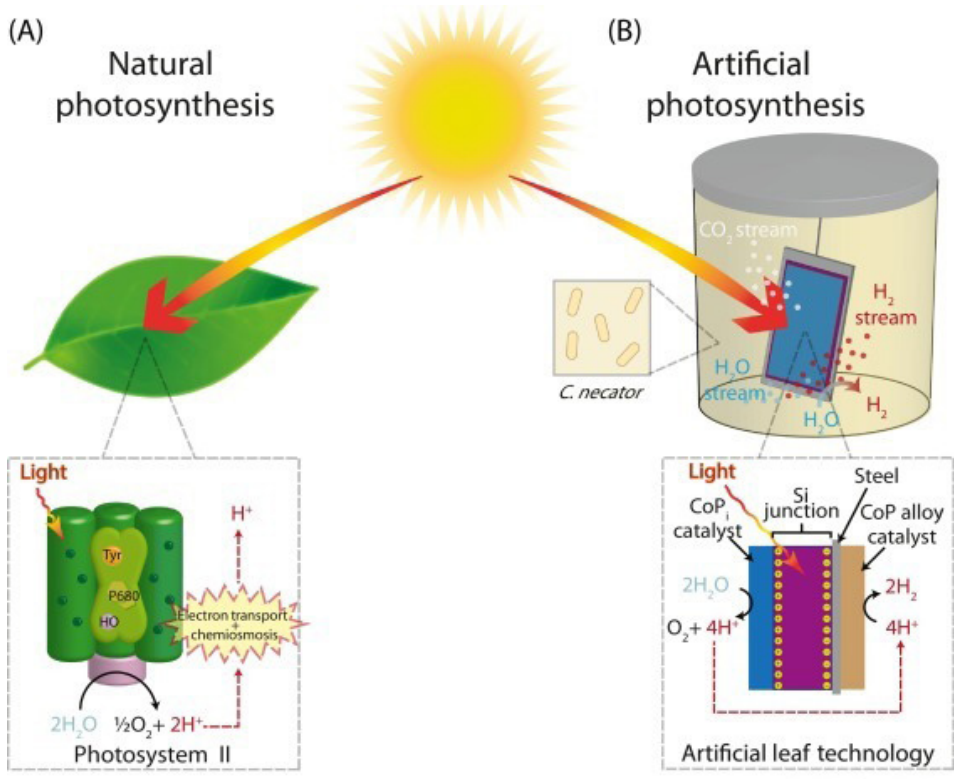


ARTIFICIAL PHOTOSYNTHESIS

INTRODUCTION:

Artificial photosynthesis (AP) is an umbrella term, accepting totally novel approaches to research into and evolution of technologies for nonpolluting electricity generation, fuel production and carbon sequestration using solar energy. As the name indicates, the inspiration is drawn from natural photosynthetic systems, which developed in organisms that were among the primitive known to exist on earth. The natural systems are thus the product of an extremely long (> 2.5 billion years) process of developmental refinement. The "grand vision" of artificial photosynthesis is to technologically reproduce the components of natural photosynthesis on a large scale for efficient solar energy transformation. The program offers the prospect of economical photovoltaic electricity production and food generation requiring minor water usage compared to conventional agriculture. In addition, totally renewable hydrogen generation from suitable water sources, such as seawater, becomes feasible. Bockris, in a seminal analysis of future energy options, concluded that fabrication of hydrogen fuel from electrolysis of water would become a practical approach if a "super catalyst" for the anodic, water-oxidizing reaction could be established. It has now appeared that nature has solved this problem, within oxygenic photosynthesis, almost to the absolute limit of thermodynamic efficiency.

The overall procedure of photosynthesis consists of two main phases, the so-called "light" and "dark" reactions. In the first, light energy is preoccupied by "antenna" chlorophyll molecules in unique cell membranes (thylakoids) and shifted to "reaction center" chlorophylls. Here electrochemical reactions commence that generate two vital "energy-rich" biological compounds; adenosine triphosphate (ATP) and reduced pyridine nucleotide. Oxygen is produced as a byproduct in this process and is released to the atmosphere. The premature steps in this chain are actually nature's own photovoltaic energy conversion systems (photosystems), in which the trapped light energy is first converted into electrically stored energy in cell membranes. The light phase requires the collaboration of two different such membrane-bound photochemical assemblies (called photosystems I and II). Each photosystem functions in series, to photochemically "charge" the membrane.



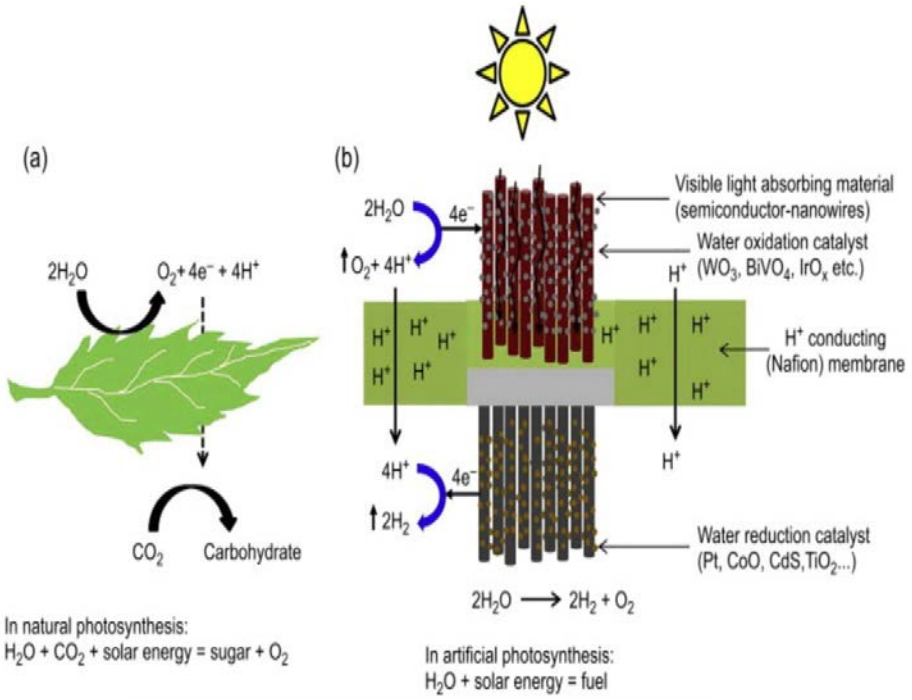
INTEGRATED STRATEGY:

There is an emerging identification that power generation must ultimately come from renewable, non-polluting sources. It is also apparent that decent water, in many parts of the world, will become a progressively limited resource and thus agriculture must change to drastically reduce water usage. Therefore, technological strategies are required that recognize these goals and that identify possible ways through intermediate and precursor technologies that will achieve the goal. Here we propose a strategy of artificial photosynthesis as a means of attaining these aims of clean power generation and dry food production. Key steps in the natural photosynthesis processes of plants and bacteria gives the models and inspiration for

a completely biomimetic, industrial-scale technological approach to achieving the following specific goals:

• Photovoltaic electricity generation using novel, low-cost, artificial systems with the inherently high photon-capturing and charge-separation efficiency of natural cell biology. These power stations will directly provide the national grid.

• "Dry agriculture," engaging enzyme bed reactor systems to fix carbon dioxide from the air or other suitable sources, powered by hydrogen and bioelectric transducers drawing power from the national grid. These will make carbohydrates (food), liquid fuels, chemical feedstocks, and polymers for fiber production. Water usage will be at or near the total chemical least and thousands of times lower than in conventional agricentre.



TECHNOLOGICAL APPROACH:

This is composed of four programs, whose components are joined through energy transfer systems. These are electricity (the national grid) and majority hydrogen. The energy and mass flows then need not be stoichiometric ally integrated. It is expected that the 'dry agriculture' carbon fixation process in programs 3 and 4 would use only a fraction of the outputs from programs 1 and 2, which produce electricity and hydrogen respectively.

Natural photosynthesis carries out the following complete reaction in the carbon fixation process:

$CO_2 + H_2O$ + [light energy] O_2 + carbohydrate

However, in nature the complex series of reactions summarized above is characterized by three fundamental, limiting factors:

• The "bioelectron flow" produced by the primary photochemical processes must be fully utilized locally within the organism, principally through carbohydrate production in plant cells.

• The CO_2 extracted from the environment is at low (0.03% in air) concentration, which inevitably requires that vast water loss, through transpiration, go along with the CO_2 uptake process. This is the main reason plants need water.

• All of the biochemical-biophysical reactions must occur in the existence of oxygen, essentially at atmospheric concentrations. Natural systems disburse a major metabolic effort in dealing with the toxic effects of this reactive species. In H_2 generating organisms the H_2 production occurs only in subcellular regions from which background O_2 has been actively expelled.

Industrial-scale artificial photosynthesis offers the prospect to circumvent these restrictions. This is because the light and dark reactions may be completely "uncoupled" in a biomimetic system, both in terms of the actual energy-material flow balance and even the condition to be physically co-located in space. The interconnection then becomes the existing electricity grid and transport of excessive energy fuel intermediates (hydrogen). This modular organization permits most system components to operate totally anaerobically, which will be crucial to the practical viability of the total approach.

ENGINEERING APPROACH:

As observed in plants, the basic photosynthesis reaction is

$CO_2 + H_2O$ + Sunlight + Nutrients

Carbohydrates + O_2

Artificial Photosynthesis System (APS) refers to any man-made arrangement that carries out this basic reaction in a manner or setting that is different from that of nature. An engineering or industrial realization of APS implies intensification and widespread use (and/or large-scale application) of Reaction , so that potentially thousands of tons of CO_2 per year could be converted into useful products.

ECONOMIC VALUE:

The viability of an APS will largely be determined by the economic and environmental benefit it could create for society and by the safety, health, and environmental acceptability of the system. It is evident that:

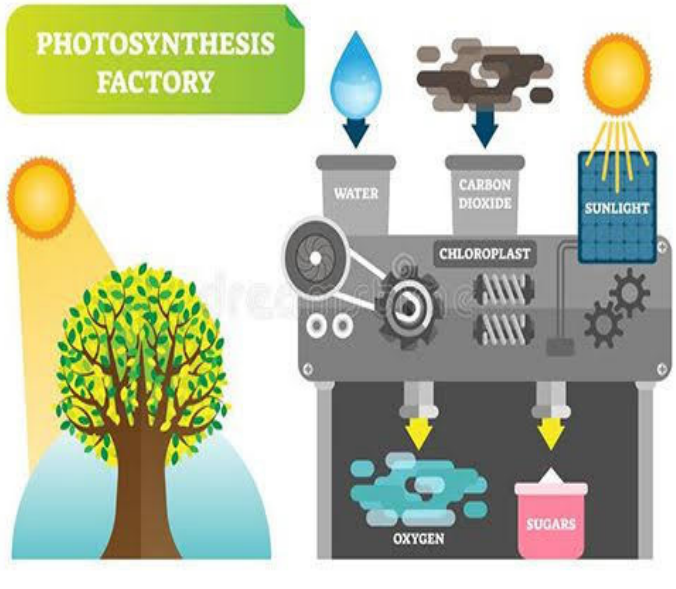
(1) The value of the APS system will necessarily be generated by its potential impact on the issues of greenhouse gas buildup, energy production, defendable food production and water use faced by the world;

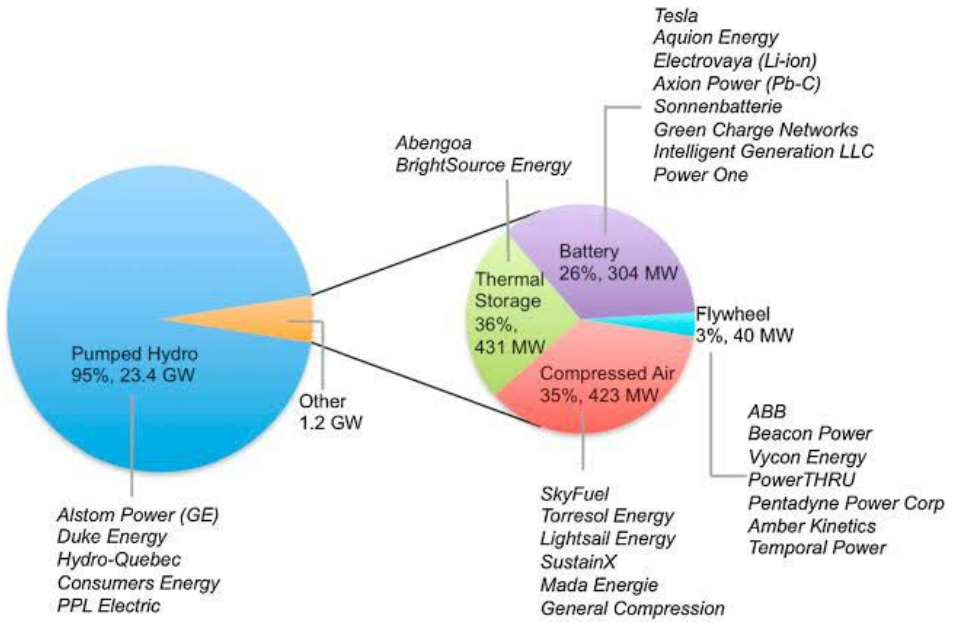
(2) Energy and food needs are currently met by fossil fuels, forests, and farms; and

(3) APS require to overcome the inherent limitations of natural photosynthesis systems to improve upon the photosynthesis of farms and forests.

ADVANTAGES:

Fossil fuels are in short supply, and they're funding pollution and global warming. Artificial photosynthesis could offer a new, possibly ideal approach out of our energy predicament. It has benefits over photovoltaic cells, found in today's solar panels. The direct conversion of sunlight to electricity in photovoltaic cells styles solar power a weather and time dependent energy, which decreases its function and increases its price. Artificial photosynthesis, on the other hand, could produce a storable fuel. Unlike most methods of generating alternative energy, Artificial photosynthesis has the ability to generate more than one type of fuel. Artificial Photosynthesis produces a clean fuel without generating any toxic by-products, like greenhouse gasses and makes it an ideal energy source for the environment.





CONCLUSION:

As humans, we have really fight back to replicate nature's photosynthetic process, where a plant transfers simple molecules into others with richer energy content, which is probably the most effective way to storing solar energy.

Solar cells and photoelectrochemical cells for artificial photosynthesis are definite solutions to current and future global energy demands and an alternative to the scarcity and environmental impact problems associated with fossil fuels. However, synchronized efforts among different segments of society the scientific community, industry, and government are still necessary to implement scientific discoveries and technological progress for the service of the population.

- Shyam Shah
S.E. MECH B

SUPERCONDUCTOR AND NANOTECHNOLOGY

INTRODUCTION:

It is found that for some materials resistivity suddenly drops to zero when cooled below a certain temperature**,** this zero-resistive property is termed "superconductivity" and that material is known as "superconductor". It was first discovered in 1911 by the Dutch physicist, Heike Kamerlingh Ones. Superconductors are used for efficient transportation. Ex: For material like mercury, the resistivity suddenly drops to zero at a very low temperature, typically near the boiling point of liquid helium.

TERMINOLOGIES:

There are some terminologies to understand the superconductor's concept. These are as follows:

Critical Temperature: A temperature at which the material from normal conducting state changes into a superconducting state Below the transition temperature, the resistivity of the material is exactly zero.

Critical Magnetic Field: Superconductivity can be destroyed by a strong magnetic field. The minimum value of the applied magnetic field even though that material is kept below critical temperature is called "critical field (Hc)".

Critical Current (IC): The maximum current that a superconductor can carry without reverting to its normal state is known as Critical current.

Persistent currents: When a superconducting ring is placed in a magnetic field & the field is switched off, a current is induced in the ring. Such steady current flowing in a superconductor is known as "persistent current".

TYPES OF SUPERCONDUCTORS:

According to their response to an external magnetic field, superconductors are classified into two types:

Type-I superconductors

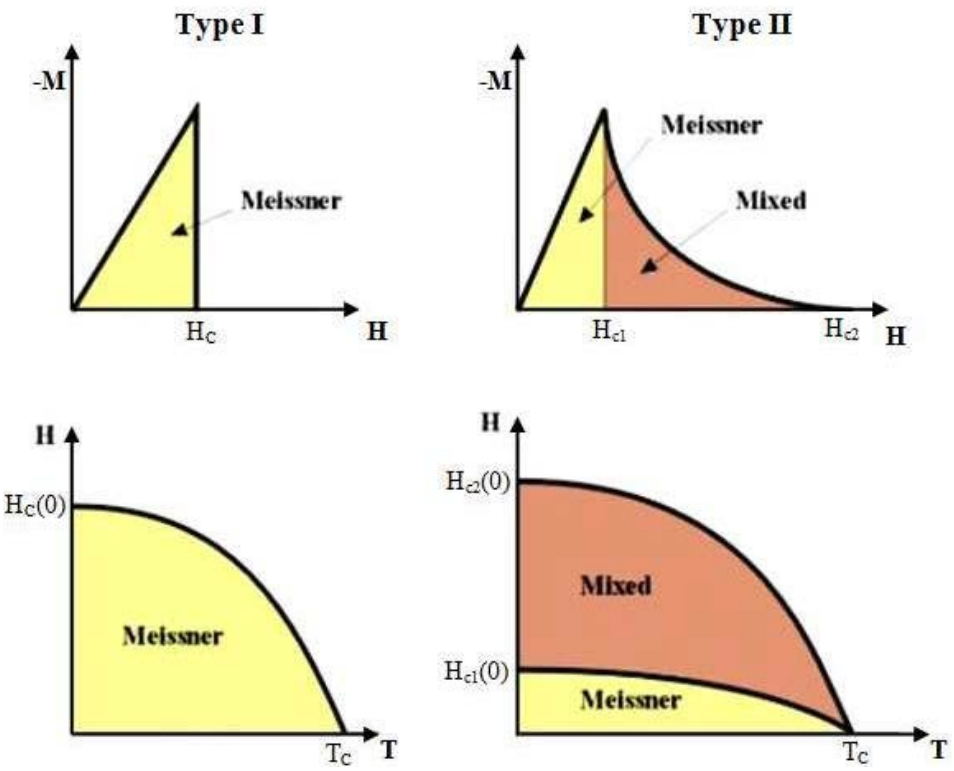
Type-II superconductors

TYPE-I SUPERCONDUCTORS:

The materials in which the magnetization grows linearly with the external field up to H=Hc and then drops to zero are called Type-I Superconductors. These types of materials are perfect diamagnetic, which expels the magnetic flux completely from their body. These are poor carriers of electrical current. It is also known as Soft Superconductors. Ex: lead, tin, mercury, indium, etc.

TYPE-II SUPERCONDUCTORS:

In some materials, the magnetic flux penetrates from the lower critical magnetic field Hc1 and continues till the upper critical magnetic field Hc2. These are Type-II Superconductors. It is also known as Hard Superconductors. Ex: alloys of niobium, Aluminum, silicon, and vanadium, etc.



APPLICATIONS:

Superconducting magnets:

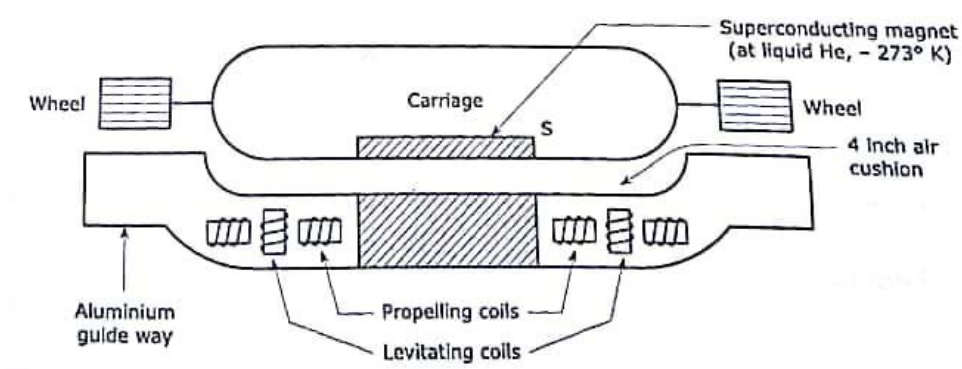
Solenoids made of superconducting wires can generate strong magnetic fields without consuming a large amount of power. As superconductors can carry many larger currents densities without energy loss, and the superconducting magnets will be lightweight & compact.

Superconductioning Transmission Cables:
Power transmission through large distances can become very economical using superconducting cables due to transmission loss. Also, the power can be transmitted at low voltage levels.

Magnetically Levitating Trains (MAGLEV):
MAGLEV is an acronym for magnetic levitation. It has a superconducting magnet built into the base of the carriages. The coaches of the train float above the track due to the Meissonier effect of superconductors.

CONSTRUCTION:

An aluminum guideway is laid on the ground and carries an electric current. The wall of the guideway has a series of a horizontal and vertical magnetic fields. The current flowing through horizontal coils produces a vertical magnetic field. And it levitates the train keeping it afloat. Horizontal coils are known as "Levitation coils".
And the current passing through the vertical coil produces a horizontal field that pushes the train in the forward direction, this vertical coil is known as "Propelling coils".
When we need to stop the train, the current through the levitating and propelling coils is switched off. The biggest advantage of it is that there will be no friction, no energy loss, and no fuel requirement.

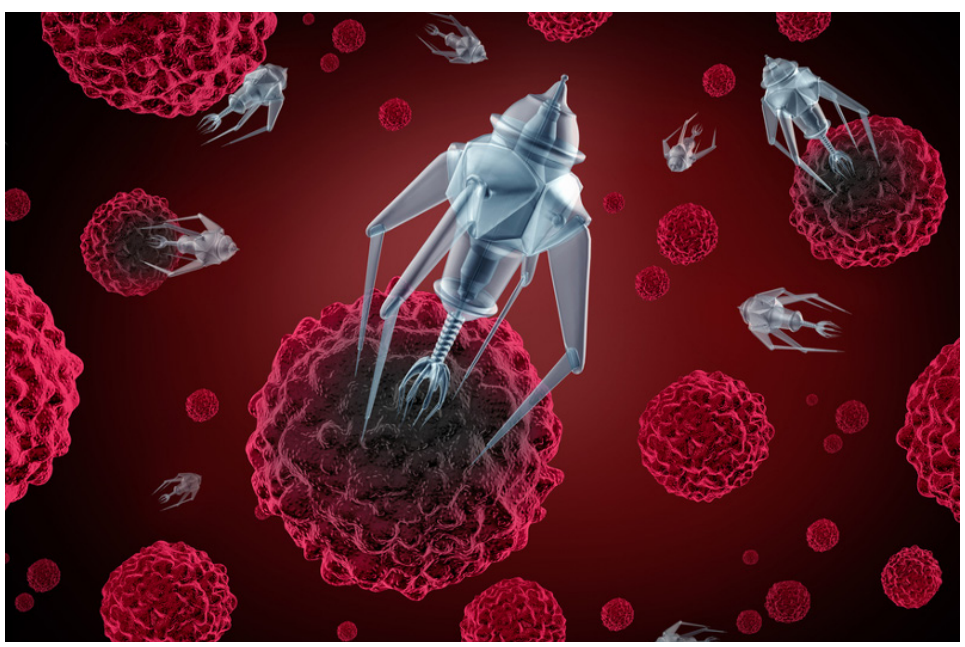


NANOTECHNOLOGY INTRODUCTION:

Nano is a word that comes from a Greek word, meaning "dwarf". The term "Nanotechnology" was first used by Richard Feynman in 1959 in his article "There is plenty of room left at the bottom". It is a technology or applied science that deals with particles smaller than 100 nanometers. Nano Science is a field of science that is concerned with the study of atoms, molecules, and objects whose size is on a nanometer-scale (1Nm=10^-9 m).
Materials behave differently on a nanoscale. It is due to the change in the fundamental property of matter due to the increased ratio of surface area to volume.
Nanotechnology is helping mankind to revolutionize many technologies and sectors including medical, transportation, energy, food safety and environment.
Gold at the macro scale is chemically inert but at the nanoscale, it behaves as a catalyst.
Application of nanotechnology include:
(1) Nanoparticles
(2) Nanomedicine
(3) Nano pharmacology
(4) Nanorobots
(5) Military applications
(6) Nano – Solar panels

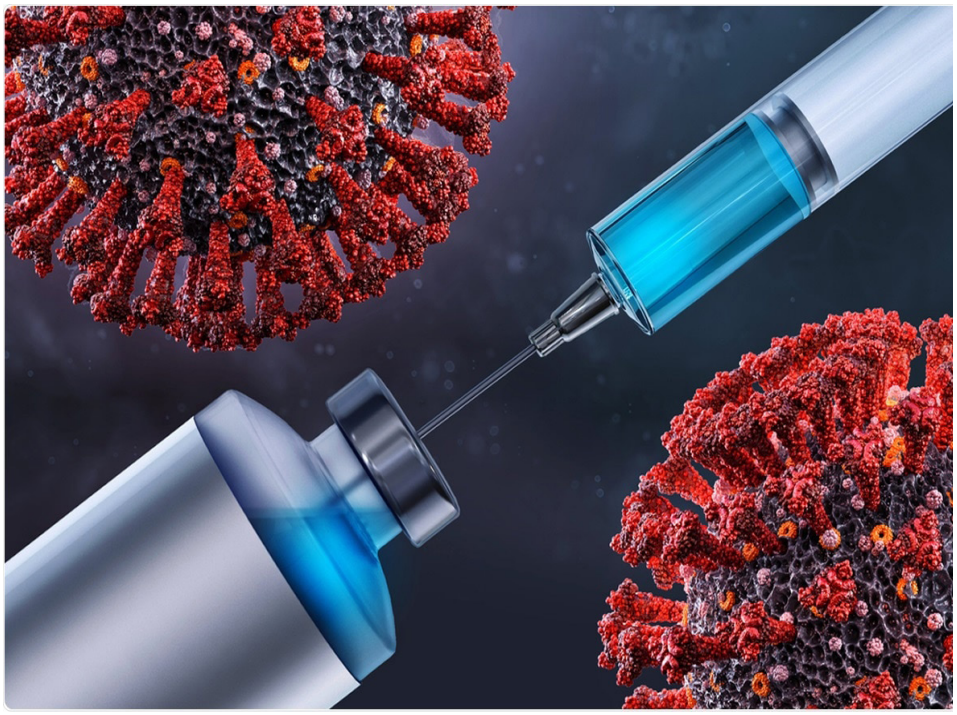
NANOPARTICLES:

These are tiny particles that have special properties that are used in areas of great significance. Ex: nanoparticles of Titanium dioxide are used in the field of cosmetics. They are transparent on the skin and can absorb and reflect UV rays.



NANOMEDICINES:

The size of nanomaterials is very similar to that of biological molecules and structures therefore, these nanomaterials find extensive use in in-vivo and in-vitro biomedical applications. It is a field of nanotechnology where Nanomaterials and devices are designed for the medical purpose of diagnosis. Nanomedicine is the application of nanotechnology to achieve innovation in healthcare. It uses the properties developed by a material at its nanometric scale 10-9 m which often differ in terms of physics, chemistry or biology from the same material at a bigger scale. It contains the detection and controlled manipulation of human biological system at the molecular level via engineering nano devices and nono structures.

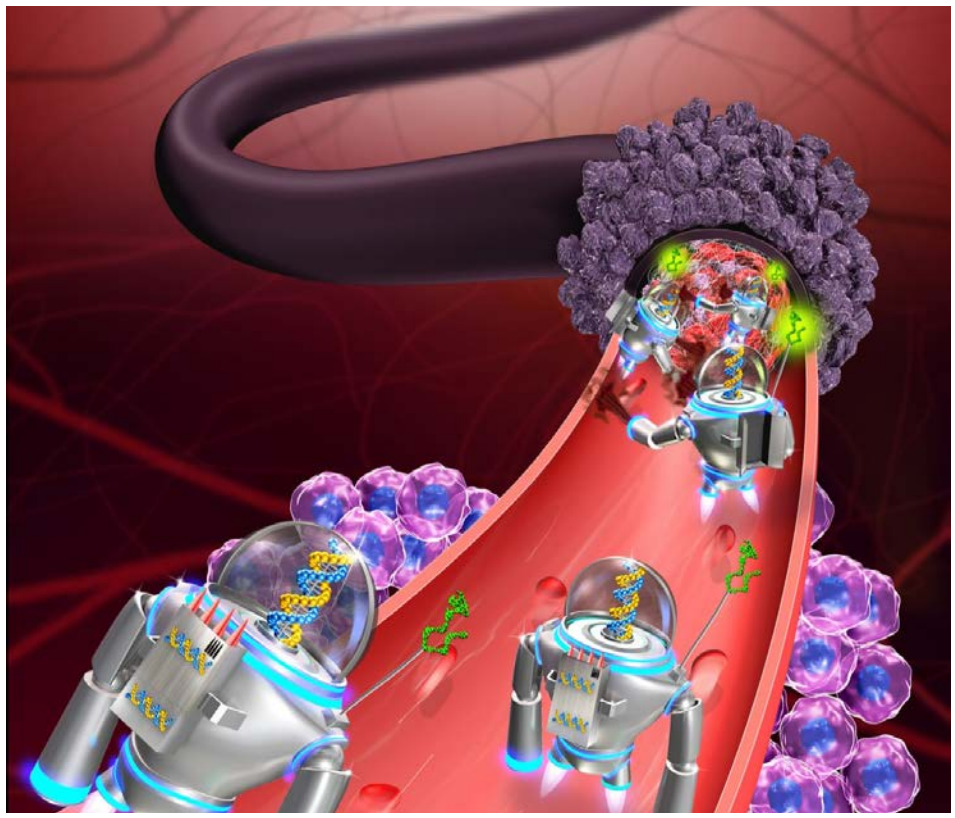


NANO PHARMACOLOGY:

Pharmology is concerned with the uses, effects, and modes of action of drugs. It involves the linking of fabricated nonmaterials to biologically active compounds or molecules that are used as probes and drugs to identify and target abnormal cells. The idea of using nanoparticles to enhance the efficacy of diagnostic and therapeutic drugs is based on the fact that nanoscale substances have properties distinct from those of substances in the macro dispersed form. In particular, due to the high specific surface area of nanomaterials, surface phenomena (adsorption, desorption and adhesion) become predominant in their interaction with macromolecules or biological objects.

NANOROBOTS:

Nanorobots combines the AI system with the efficiency of nanotechnology. Medical and nanorobots would circulate freely throughout the body when injected into the bloodstream. These would carry drugs that will be selectively released on coming with the abnormal cell.



NANO-SOLAR PANELS:

Nanotechnology can be incorporated into solar panels to convert sunlight to electricity more efficiently for a promising and inexpensive future of energy. Nanostructure solar cells could be cheaper to manufacture and easier to install since they can be made in flexible rolls rather than discrete panels. Since nanostructures typically are only a few hundred nanometers in size, they create an interface between the air and the nanostructure, particularly those composed of silicon, which become graded rather than planar. This change in the solar cells' design allows for light to be precisely guided and absorbed into the cell, rather than reflected away.

- Simpi Yadav
S.E. MECH B

BIOFUELS

INTRODUCTION:

Today, we are working to upgrade the next generation of energy solutions, which includes advanced biofuels, carbon capture technologies, natural gas, and new energy-efficient processes to minimize the damage to the environment. In addition to the in-house capabilities, association with leading research and technology companies, national labs, and universities are necessary to solve the energy crisis.

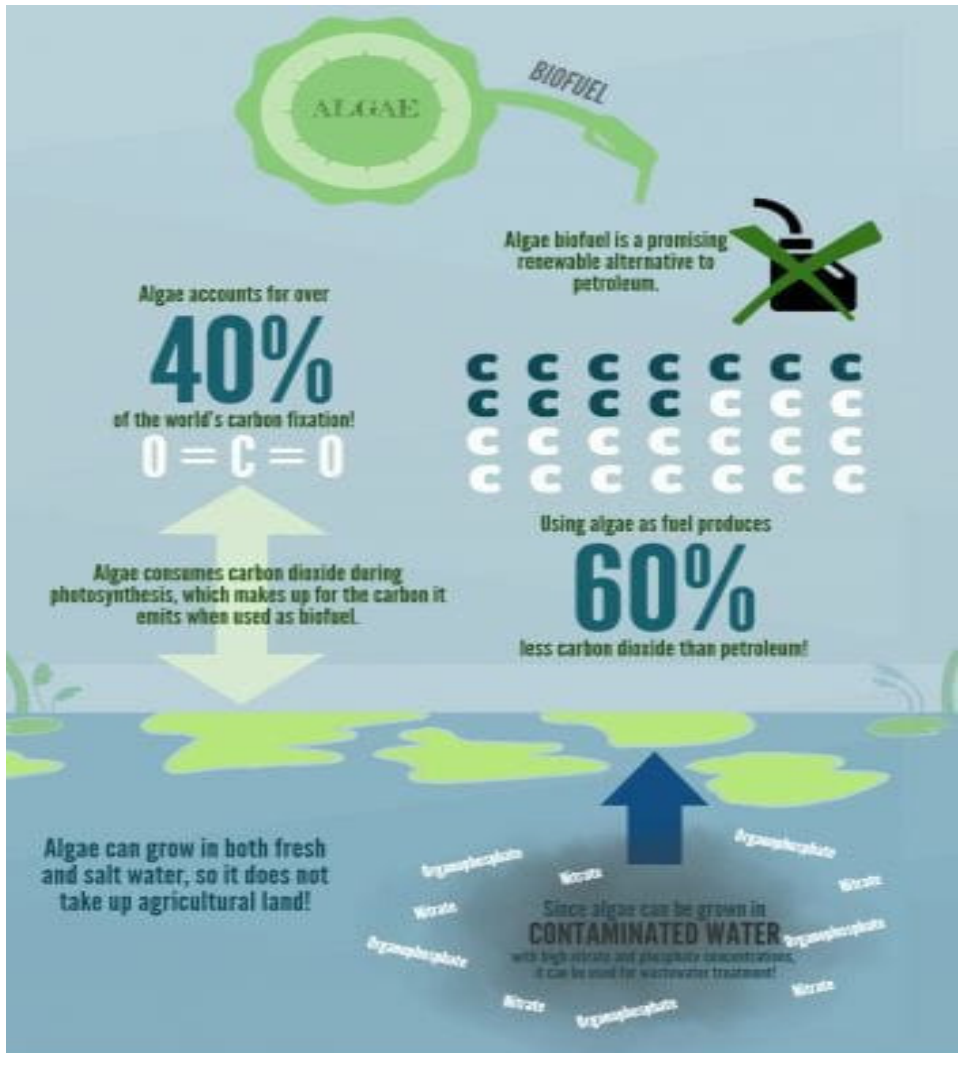
While all forms of energy are necessary, including natural gas and renewable energy such as solar and wind, new technologies are needed to reduce the emissions on a global scale.

These advanced biofuels propose the desired greenhouse gas reductions collated with today's transportation fuels. There are 3 generations of biofuels: First-generation biofuels seed from food, so they also have to emulate the population's definite food supply. The next generation of biofuels comes from non-food biomass, but it is more intricate and demands more energy and materials. Third-generation biofuels are an inexpensive, high-energy, and renewable source of energy. They could also lessen the impacts on land, water, and food supplies in comparison with traditional biofuels like sugar cane. Algae naturally create oils that can be converted into renewable, lower-emission fuel. Biofuels used today are largely extracted from crops.

Corn and sugarcane are used to make ethanol, while biodiesel is made from vegetable oils. Biofuels created from algae and cellulosic biomass, give a renewable fuel source that does not compete with supplies of food or fresh water. These advanced biofuels can be produced on a large scale and are created from sources that consume carbon dioxide. The liquid is important in the purification of biofuels. Liquid segregation can be done by two different methods:

(1) Combining of the phases in either purpose built equipment, mechanical mixers or static mixers where pressure is applied to intensify the surface free energy of the fluids to generate droplets, or in the thin flow of the fluid mixture in pipes.

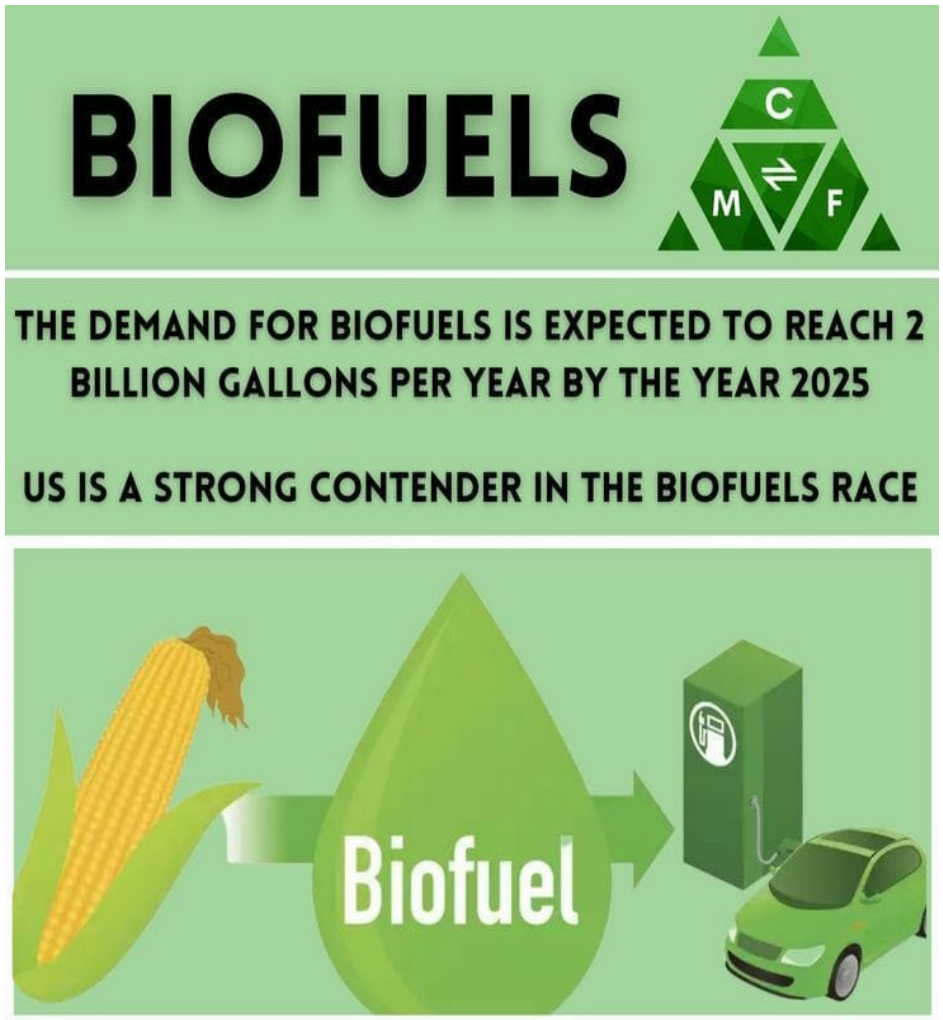
(2) Cooling the saturated liquid below the solution point so that the solute phase condenses out of the solution resulting in the production of a second liquid phase.



BIOFUEL FACTS:

(1) Biofuel have drastically reduced costs per gallon from $400,000 to $6. That digit is expected to drop soon, making them rival today's fossil fuels. This will lead to cars, trucks, and planes running on gasoline and diesel again.

(2) You might be able to ride an algae surfboard soon. While biofuels are focused on fuel for transportation, many products today, such as plastic and paint, are produced from petroleum. Biofuels could make these products obsolete.



Different types of Biofuels include:

BIODIESEL:

A diesel engine invented by Rudolf Diesel in the 1890s could run on various fuels, including vegetable oil. A new diesel engine for the Paris Exhibition premiered in 1900 which ran on peanut oil, but it wasn't preferred due to the availability and cheaper prices of petroleum at that time. Interest in biodiesel grew as individuals became more concerned about sustainability and renewable energy sources. It is estimated that there are 125 biodiesel plants in the United States alone, which can produce three billion gallons of fuel annually. Biodiesel can be produced from several sources, including vegetable fats and animal fats. Besides being readily available and having several environmental advantages, biodiesel has several other benefits as well. Instead of producing greenhouse gases, it utilizes less energy, it's also cheaper to produce. It doesn't require extractions like fossil fuels or needs fracking. It also helps to reduce smog and improves air quality.

ETHANOL:

Alcohol biofuel Ethanol is the same as alcoholic beverages, which are made with ethyl alcohol. A biofuel made from corn sugar, wheat sugar, barley sugar, and hemp sugar is called ethanol. The common agricultural produce used is sugarcane. It has been mandatory in Brazil since 1976 for ethanol to be blended with gasoline. In the U.S., most cars can run on a blend of 10% ethanol, which is produced from corn.

HYDROCARBON:

Hydrocarbon biofuels are made up of biomass sources, created with different chemicals, biological and thermal processes. The hydrocarbons used to make jet fuel and petroleum gasoline share an amazingly similar chemical composition as these fossil fuels. Hydrocarbons are compatible with today's engines without the requirements of any conversions. Currently, propane and natural gas are distributed via pipelines and systems that use hydrocarbons.

HEMP BIOFUEL:

Biodiesel produced from hemp is a viable alternative to conventional biodiesel. Unlike other biomass plants, hemp can be easily cultivated. The process is known as phytoremediation which also cleans the polluted soils. Hemp plants have been used to remove radioactive materials from the Chernobyl nuclear disaster site, as they can remove toxins and hazardous materials from the soil. Another advantage of Hemp biofuel is that it doesn't need to be cultivated on primary cropland that can be used for growing food. Generally, edible plants such as corn, wheat, and peanuts are preferred for preparing biofuel but using hemp reduces the amount of food produced used for energy generation which can be used to meet the food requirements of the increasing population.
Hence, Biofuel is a great energy alternative for a greener future.

- Lavanya Bhat
S.E. AI&DS

AMELIORATION

TEAM MAVERICKS RACING

Formula Student is the world's biggest competition for engineers. Every year, competitions are held all across the globe. Founded by the 'Society of Automotive Engineers' in 1981, the first competition in Europe took place in 1998. At present, there are more than 600 teams from universities all over the world competing with their self-constructed race cars.

MISSION:

The goal is to develop and provide a platform for student engineers to build and learn. It offers a unique way to test students' theoretical knowledge in a practical context. Students gain and develop skills such as engineering, project management, and teamwork.The winner is not necessarily the team with the fastest car, but the one with the best package regarding construction, performance, financial planning, and sales argument.

Team Mavericks Racing was born in 2016 as a brainchild of engineering students of TCET (Thakur College of Engineering and Technology), we as a team of dedicated students taking care of project planning, management, and execution involving car designing, fabrication, and testing. Team Mavericks Racing, the official Student Formula Team of TCET, Mumbai designs and manufactures Student Formula Style Vehicle and represents TCET, Mumbai in Formula Imperial Event which is organized by ISIE India. The team is participating for the 3rd time in Formula Imperial 2021 with improved design to enhance performance.

AIM:

The main aim is to design and fabricate a more efficient and economical student formula vehicle that also runs on New/Renewable Energy. We are aiming to participate in Formula Bharat in 2023 with our new team being recruited, the research and work for the same are in progress.

The main innovation that the team will be incorporating this year will be the autonomous feature, being one of the very few formula student teams working on an autonomous feature in India, the experience and guidance are also very minimum. The goal is to build a formula student vehicle from scratch capable of autonomous driving on a track made up of orange and blue cones. The entire process of building such a vehicle, starting from the car model and the embedded hardware platform to the end-to-end machine learning pipeline necessary for automated data acquisition, labeling, and model training. The end-to-end machine learning pipeline allows a deep learning model to take input from the hardware platform and control the movement and behavior of the vehicle. The entirety of the implementation of the project is written using the Python scripting language and a number of its libraries and application programming interfaces (APIs). For the mathematical parts programmed in Python, the project uses the NumPy library, a mathematical library for scientific computing in Python. The machine learning model is made on darknet architecture.

COMPETITIONS:

Formula Imperial 2020

- AIR Position 2nd
- 2nd in Innovation Round
- 3rd in Design Round
- 4th in Cost Round
- 5th in Business Round

TEAM MAVERICKS OVER THE YEARS:

Being a Formula Student Electric Team, Team Mavericks Racing provides a platform to engineering students to showcase their skills and apply their knowledge on a working model i.e. Formula Student Vehicle. Formula Student is not only a racing event but most importantly a project management opportunity where the students can learn a lot, from technical concepts behind an automobile to non-technical life skills like approaching for sponsorship, managing your team, and finance.

FUTURE PLANNING:

Started in 2016 Team Mavericks Racing now has an experience of more than 4 years, can confidently participate in National Level Formula Student Competitions.

Team Mavericks aim to participate in Formula Bharat 2023 the premium Formula Student Competition of India. After gaining enough experience and achieving the set goals and targets, the team will also try to participate in International Formula Student Competitions and represent India in the FS Community.

Alok Yadav - Team Captain

Advait Batwalkar - Vice-Captain

Saurabh Gupta - Design Head

Sneh Bheda - Sponsorship & Marketing Head

Rohit Yadav - Finance & Inventory Head

Prof. Mahendra Shelar - Team Mentor

TEAM ECLIPSE RACING

VISION:

Team Eclipse is a group of young automotive enthusiasts who have a common goal of designing and developing an ergonomically refined single-seater Formula Race Car and compete in various Formula Student competitions around the globe. Formula Student is an International Student Competition in which students have the challenge to design and build a single-seater Formula Race Car and compete against other teams from all over the world at one of the Formula Students Competition. The competition is not won solely by the team with the fastest car, but rather by the team with the best overall package of design, performance, finances, and sales planning.

MISSION:

This year, we are committed to designing and building our own Formula Student Race Car by favoring good engineering practices. We are a group of people who believe in extensive hard work and teamwork, Here at Eclipse Racing, we strive to learn and test our theoretical knowledge in a practical context. Experience, build, learn and grow is and always will be the primary goal of Team Eclipse Racing

COMPETITIONS:

This year our team is participating in Formula Bharat 2022 from 20th to 25th January 2022 at Coimbatore. Formula Bharat is a national-level event and is a part of the global student Formula series hosted in around 11 countries per year, where engineering students build and design their Formula Style Race Car to compete against 50+ teams from all over India.

Having participated in SUPRA SAE-INDIA 2019, we gained insight into the areas we need to improve upon. Despite being a small team of 13 Automotive Enthusiasts without any prior experience designing and manufacturing Race Cars, we managed to secure the 97th rank amongst 130+ Teams from across the country. We were placed 19th amongst 130+ teams for our Business Plan in SUPRA SAE-INDIA 2019.

Shrawan Thakre - Team Captain

Prof. Sachin Oak - Team Mentor

TEAM TECHNOCRATS

VISION:

We aspire to set a benchmark in the National and International Student-Vehicle Competitions specialising in All Terrain Vehicles.
We seek to become the paradigm of a student team through our permanent commitment and our teamwork to build a superior vehicle every year.
To participate and excel in various design, static and dynamic events around the globe.

MISSION:

The aim of Team Technocrats is to design and engineer an All-Terrain Vehicle with structural superiority, dynamic stability and manoeuvrability through rough terrains:
To showcase our skills at a national level.
To build a bridge between imagination and real engineering through designing & manufacturing.
To gain practical and hands-on experience in the design of an automobile.
To develop leadership, teamwork, problem-solving and critical thinking skills.

FUTURE PLANNING:

Team Technocrats plans to participate in FMAE QBDC 2022. which is expected to be held in February 2022 and also other Quad Bike challenges like Quad Torc Concept.

1. Designing the vehicle:
All domains work with one prime goal – to design a reliable and robust high-speed ATV. The work is initiated with hundreds of iterations for suspension and steering mechanism to choose the best design and reliability for our vehicle. The parts designed by various domains namely chassis, suspension, steering, brakes and powertrain will be simulated under various testing aspects to analyse their performance.

2. Deciding the material and budget:
The most significant and challenging part as a team is to build a vehicle with high quality components and also to maintain the budget. The ultimate objective is to design the elements which are capable to bear all loads in static and dynamic conditions. Mechanical properties of diverse materials suitable for fabricating a component will

be studied, followed by their testing and the one which meet the criteria will be selected.

3. Manufacturing:

The manufacturing process will start with making a prototype of the chassis. Vendors and dealers will be contacted to find the best possible market price for the raw materials required. It is estimated that the fabrication process will take approximately 3 months.

PROGRESS:

Team Technocrats was founded in 2017 by a college team of ATV enthusiasts in Thakur College of Engineering. We have successfully Designed and Fabricated 3 Quad Bikes till now and have also participated in QUAD-TORC thrice. Our team has now decided to Design and Manufacture the Fourth version of our Quad Bike and participate in FMAE QBDC'21.

ISNEE QUAD - TORC

2017

- AIR-16 in QUAD-Torc'17
- 2nd in Business Plan
- 6th in Endurance Race

2018

- AIR-18 in QUAD-Torc'18
- 2nd in Business Plan
- 15th in Endurance Race 2018

2019

- AIR-6 in QUAD-Torc'19
- 1st in Cost Plan
- 1st in DisAsm event
- Judge's Choice Award
- 2nd in Business Plan
- 3rd in Traction
- 3rd in Fuel Economy
- 6th in Endurance Race 2017 2019

ISNEE QUAD - TORC CONCEPT 2020

TEAM TECHNOCRATS

- AIR 1 – Overall Champion
- Best Design
- Best Business Plan
- Judgers choice Award (Best tech savvy: Mr. Balaji Murthy)

TEAM KRATOS

- AIR 3
- Judgers choice Award (Best female participant: Ms. Anushka Moharir)

Mr. Nitesh Gohil - Team Captain

Mr. Raj Bhosale - Team Manager

Ms. Shravani Dighole - Design Head

Mr. Shubham Gawade - Technical Head

Mr. Jignesh Chavda - Marketing Head

Prof. Sachin Oak - Team Mentor

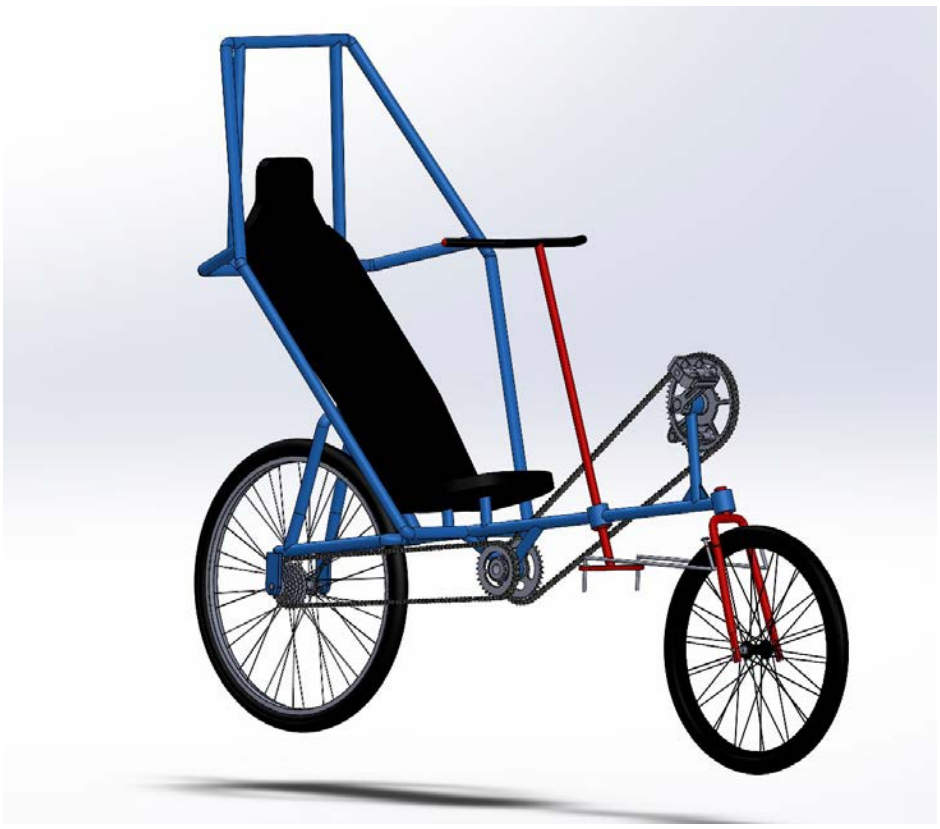
TEAM PHOTON

EXPERIENCE:

The HPVC 2021 was held online globally amid the Covid-19 pandemic. The significant phase of manufacturing had to be skipped. Knowing this fact, Team Photon devoted its time to research on HPVs and their subsystems. Since the competition was online, the ideas were boundless and conceptual designing played a major role. For the same, team members had to learn CAD and simulation software such as SolidWorks, Fusion 360, and ANSYS.

After getting a generalized idea of HPV by the design reports and other research documents/papers, the team finalized to go with a Semi-recumbent bike. The team further researched by dividing individual domains. Features of the vehicle and subsystems were concluded by brainstorming sessions and debates on a virtual platform.

The team came up with several iterations to design one of the challenging HPV Enhancements and optimizations were done and finally "ZARF" was designed, implying the barriers and difficulties the world overcame and its interminable spirit. It signifies the global response to our fight against the coronavirus pandemic.



COMPETITION:

Since the competition in 2021 was at a global level, the bars were set high. The team took several mock presentations and feedbacks from mentors of the team.

We had an opportunity to present our "ZARF" on 28th Feb 2021 in CDR Presentation. The presentation was up to the mark and even graced by the judges. After the CDR presentation, we had to prepare for the innovative competition. The team started researching new technologies and ideas that could be implemented in HPV.The team prioritized safety and went for "Crash Detection System" as an innovation for 2021.

Fortunately, at the time, the pandemic conditions were mitigated, and the team installed the crash detection system on "Philip"- Team Photon's 2020 HPV.

We presented and demonstrated our innovation system in HPVC INNOVATION PRESENTATION held on 4th April 2021 and the results were victorious. The team indeed faced challenges with online platforms and communicating with the members through it but in the end, the results were outstanding.

ACHIEVEMENTS:

ZARF-2021

- 12th Global rank in innovation
- 25th Global rank in CDR

Phonix-2020

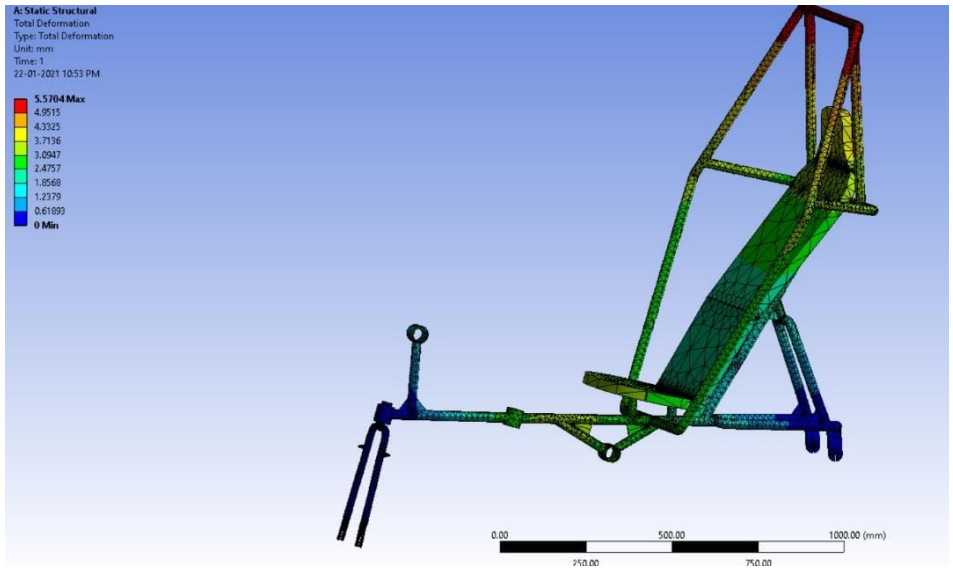
- 1st Prize in Overall Asia Pacific
- 3rd Prize in Endurance Event
- 3rd Price in Women's Speed Event
- 4th Place in Design Event

Philip-2019

- 1st in design event
- 4th in the overall Asia Pacific.

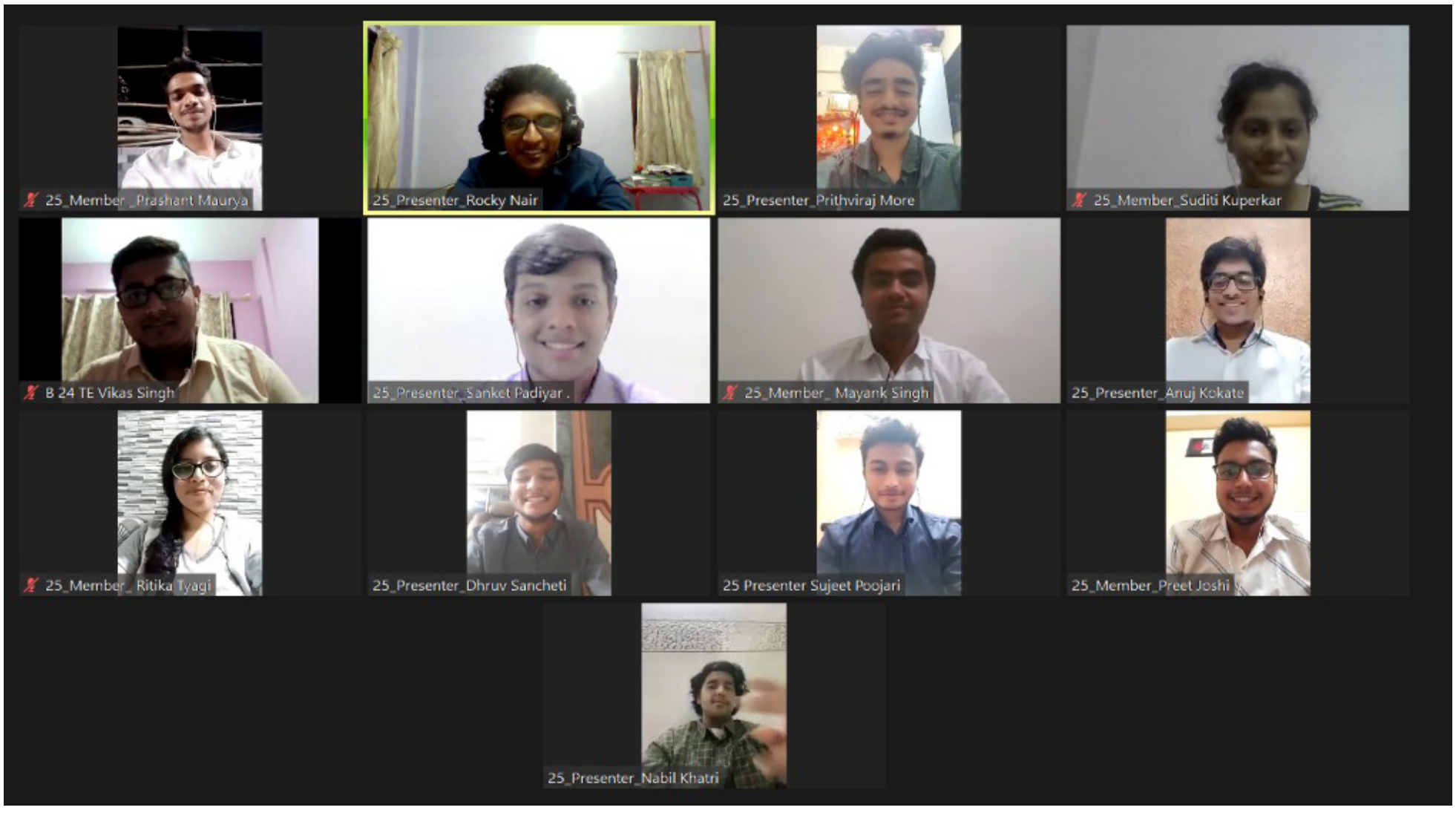
LEARNING OUTCOMES:

Our prior achievement was to learn and grow, participating in such a competition, allowing us to experience teamwork, negotiation, and problem-solving. Apart from designing, technical writing, CAD, members of the team enhanced their leadership, presentation, time management, and innovative skills. Even though we faced several hurdles with the support of all members, good leadership, and determination our team finally paved its way to success.



Sujit Poojari - Team Captain

Prof. Mahendra Shelar - Team Mentor



NIRMAAN HYPERLOOP

INTRODUCTION:

Elon Musk, CEO of Tesla and SpaceX, introduced the Hyperloop as a concept in a white paper in 2013. It is an ultra-high-speed land transportation system for passengers and goods. The system consists of sealed and partially evacuated tubes that connect mobility hubs in large metropolitan areas, as well as pressurised vehicles, commonly referred to as pods, that can travel at extremely high speeds thanks to contactless levitation and propulsion systems, as well as low aerodynamic drag. When compared to present connections, the door-to-door journey time for medium-range distances can be significantly reduced using this method. Furthermore, the system seeks to be climate-neutral by operating entirely on electricity. The whole system is energy efficient and very nature friendly as the pollution by this will be non-existential, where the pollution by the trains and airplanes are a big concern till date. This fifth mode of transport can cut travel time to a fraction of what is present today. A journey from Mumbai to Delhi could last a mere 70 minutes as opposed to the current 140 minutes possible via airplanes. That is half of what people have to wait before getting to their destination.

COMPETITION:

The SpaceX organization had taken up the initiative to organize and hold the Hyperloop Pod Competition, which provides a platform to student teams across the Globe to test and display their abilities to improve on the system and show their mantle. The Competition is held in Hawthorne, California, USA, where the elite few get an opportunity to run their test pods in the SpaceX test tunnel, where they get to experience real scenarios and test their pods feasibility. After open sourcing the idea of such a powerful system the SpaceX organization has held four competitions till now to see how enthusiastically the engineers all around the world can take up this opportunity to innovate something new in it. The only criteria to win the competition – come up with the fastest pod. And so, they did. Students from over 1500 universities across the world applied, out of which about 30 teams got selected to present their pod to the man himself, Elon Musk and race for the coveted prize of global domination. The competition was able to produce pods that ran over 480 kmph which is the highest ever achieved by any hyperloop test project.

THE TEAM:

The Nirmaan Hyperloop Team at Thakur college of engineering and technology is a student organization dedicated to furthering the collective research of the Hyperloop concept and our aim is to participate in competitions that attempt to bring in innovative solutions to crucial life problems and aim to implement science to its fullest. We are involved in the 2022 SpaceX Hyperloop Pod Competition and European Hyperloop Week, which was first initiated to accelerate the development of the Hyperloop concept and allows over 100 Hyperloop teams from across the world to test their pods and compete. The team "NIRMAAN HYPERLOOP" which has taken interest in the space technologies and innovations for a new better and brighter tomorrow could not step down from the opportunity to indulge in this one of a kind competition for the implementation of constructing a pod successfully and generate hope for the future of the technology by fulfilling all the necessary criteria required to win any competition, around the globe. We have had the opportunity to communicate with competition winners as well as industry leaders in the field of Hyperloop to get a better understanding of the systems.

VISION:

The organization was formed with Nirmaan Hyperloop being one branch of an entire pool of innovative endeavours. We aim to participate in various up and coming competitions which try to break stereotypes and bring about change that is required in the society. We aim to expose members to learning on a global scale which is rarely offered by any university less than the world leaders. This helps them gain practical knowledge which can be correlated with academics to create more substantial impact.

JOURNEY AHEAD:

We aim to come out stronger and put our best effort in every new endeavour that we pursue and vouch for innovation and strive to discover new paths to knowledge. The pandemic has had a huge toll on all of us, forcing us into isolation but this hasn't deterred the team spirits in the slightest, as our unofficial motto says "we worked around it!" We are racing to build the future; in this pursuit we aspire to contribute in different fields of science and make various technological advancements.

Aayush Agarwal - Team Lead

Amir Mehsaniya - Team Manager

Amir Mehsaniya - Mechanical Lead

Mayur Chavan - Electronics Lead

Pankaj Rawool - Faculty Mentor

TEAM SIFAR

VISION:

We aspire to become an august team, compete globally, maintain ethics and a shear learning environment.

MISSION:

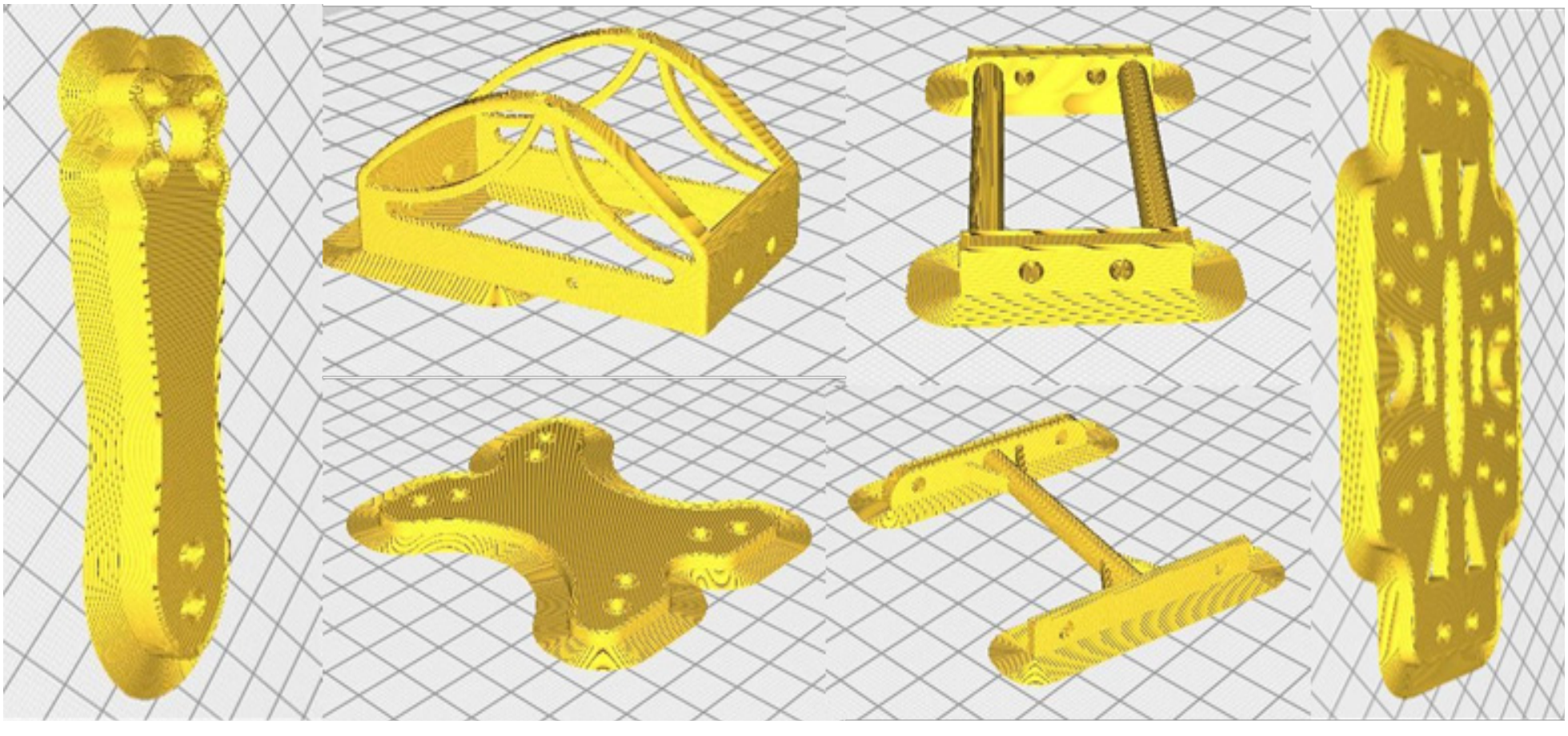
Building an unmanned aerial cargo vehicle with an innovative design, practicing additive engineering, and designing within given constraints. To be a responsible creator by developing research, project handling, fabrication, and learning life skills to combat real-life situations.

COMPETITION:

E-Fest IAM3D Global

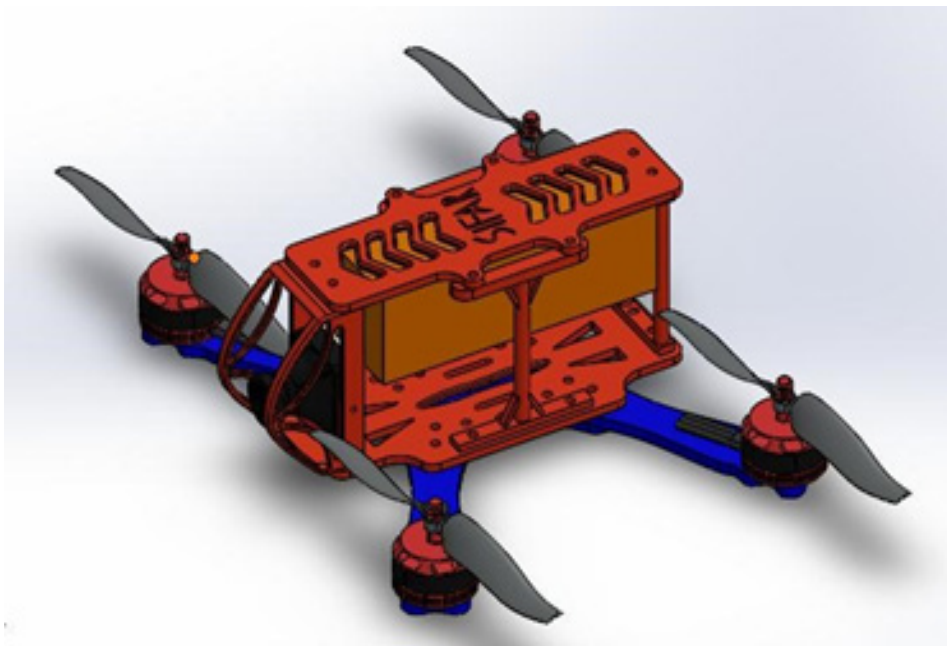
ACHIEVEMENTS:

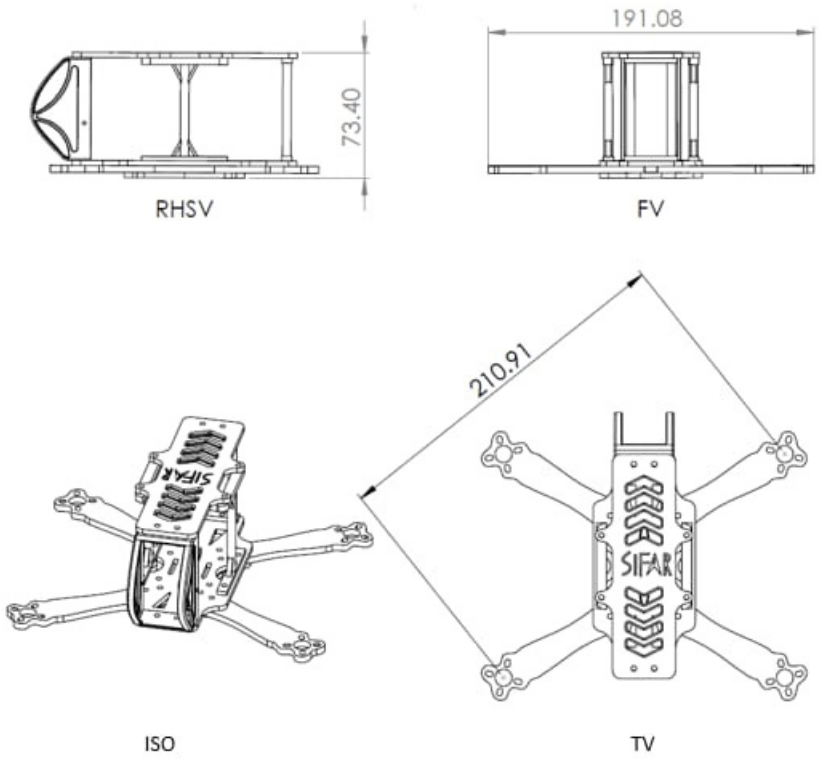
- 8th Overall Global Position
- 2nd Asia Pacific Ranking
- 5th Additive Manufacturing Learning



OUTCOMES:

Apart from the accomplishments, there were a lot of takeaways from these competitions. Students involved as team members enhanced their skills of Time Management, Teamwork, Planning, and Procurement. Some of the technical skills that were improved are Designing, Technical Writing, Manufacturing, and Fabrication processes. While experiencing a few moments of despair, we were compelled to learn the skills of problem-solving and team spirit.





Sifar Team-List:

Pratik Deokar
Rahul Parihar
Dhruv Chaturvedi
Harihar Attal
Abhishek Vishwakarma
Manish Choudhary
Ganesh Kasa
Jatin Kaul
Sameer Agrawal

Faculty Mentor: Mr. Rajeshwar Deshmukh

TEAM AERONIX

ABOUT:

Team Aeronix is an Aero designing unit initiated in TCET by aviation enthusiasts in the year 2020. The team aims to design, fabricate RC Aircraft and participate in Aeromodelling competitions.

VISION:

Being an Aero designing team, we focus on coming up with ingenious ideas that would not only enhance our learnings in the field of aviation but also reflect as a step of development in the emerging aviation future. We aspire to stand as a source of impetus and vector through which all the current, as well as future members, learn and soar.

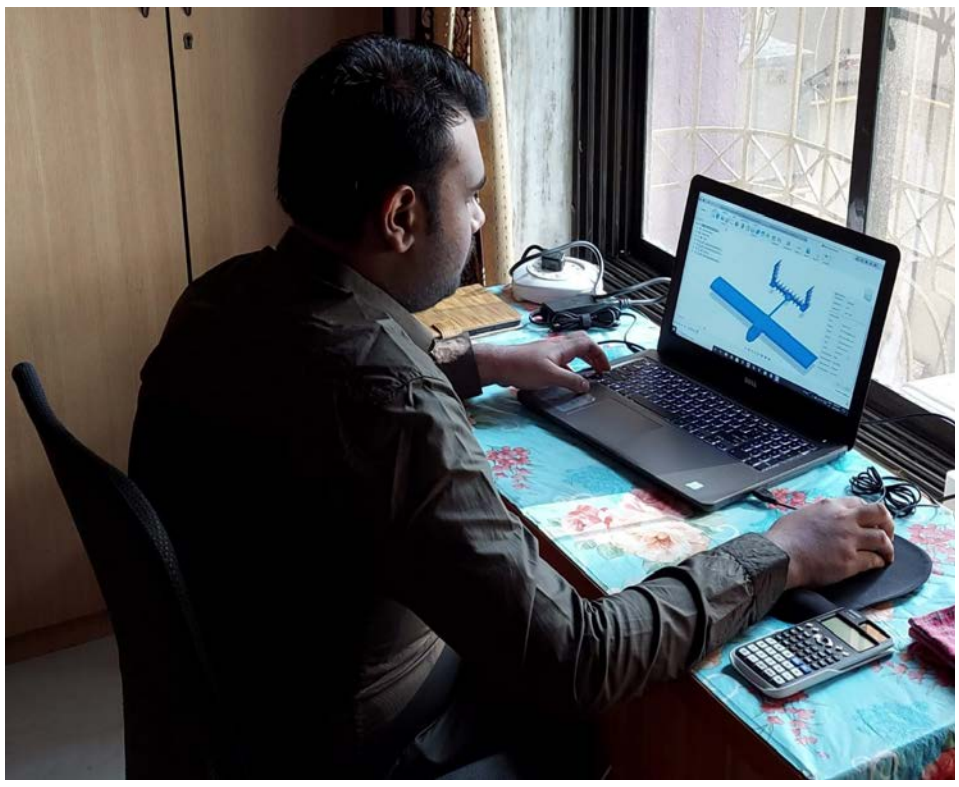
AIM:

We aim to expand the team by maximizing the learning potential, creating a productive team atmosphere, harvesting in, and gliding high. Additionally, our goal is to participate in Aero designing competitions of all levels and fly high as our aircraft.

PROGRESS:

The team boarded onto this new flight of Aeronix amidst the pandemic. The zeal and motivation to do something of our interest ignited, and then we began with our teamwork of designing the aircraft. Being a budding team, a lot of work and things were there to cope up with, we kept working, and eventually, everything was at a smooth pace. From team building to research work, to learning designing and analysis software, and seeing our aircraft on screen, the team gradually grew.
Being an aeromodelling team, our study revolves around aerodynamics of flight, designing of the aircraft, along with propulsion and fabrication system.

Every member of the team aims to put in different ideas to come up with something innovative in our aircraft design. We continue to learn and gain different aspects of aviation that would help in our future projects.



The team participated in an Aircraft design competition conducted by MIT in online mode (Aug 2021). The main criteria of the competition was to design a commercial aircraft considering the current scenario faced by the aviation industry, to develop sustainable aviation. The team made all the efforts and worked with a zeal, which proved fruitful as the team bagged Rank 1 & Rank 2. It was a moment of great happiness thus the team is now more enthusiastic about our future competitions.

FUTURE PLANNING:

The team initially began with the aim to participate in RC Aircraft designing competitions, but as we are diving into the aviation content, we also aim to step into the emerging aviation ideas. This would not only grow our knowledge but also help the future members of the team to expand. We aim to keep learning, growing, and soaring. Aviation is a huge field, and we are on our way to explore more and participate in many more competitions. Above & Beyond Always.

Arya Bansode - Team Captain
Mr.Rajeshwar Deshmukh - Team Mentor

INTERVIEW

INTERVIEW WITH:

"AVINASH GUPTA

ENTREPRENEUR

Avinash Gupta-founder of PowerZest, is a graduate of Batch of 2018, from Mechanical Engineering, TCET. He was the Vice-Chairperson of ASME-TCET-(A.Y.2016-2017). He is an entrepreneur, researcher, and renewable energy enthusiast. His deep understanding of technology and a keen interest in the mechanical field led him to work with one of the premium sports car brands 'Porsche'. His venture Powerzest is a green tech company with a mission to make the benefits of renewable energy accessible to the masses. Currently, he handles all major operations and business activities of PowerZest in India.

Firstly I would like to ask you about your experience in TCET, since you are the Alumni of TCET, how was your journey throughout this year?

My journey in TCET was quite wonderful. For the entire four years, I was busy doing projects, projects, and projects. Starting from the second year I did some amazing projects and I got selected in some good committees. I represented those committees fairly well. After that, it was time for the final year project where I had some good ideas along with my team. We got some good ideas. From that, I started working. Took part in Smart India hackathon & it was the first time for TCET to win in smart India hackathon and from there a journey took on. It was the same project which I did in my final year and I have taken it as a startup. That project has been supported by IIT Roorkee as well as we are currently in talks with other government agencies. Also the teachers, the mentors were very friendly by nature. They helped me a lot. Many times I used to miss some lectures because of this project. So remedial was the biggest issue but in that process what happened was the connections which I had made with teachers, they understood me. Since I was working on projects they used to give some compensation on behalf of the project. It was quite a wonderful journey.

Can you tell us about different committees and teams which you had joined?

Second-year was the first time where we got the chance to join the committee. I was part of the NSS unit. After that, I was part of the PRO in the technical team. Then there was a committee selection for ASME, in the 3rd year I was part of ASME, I was selected as vice-chairperson of ASME & I also represented a technical fest which is zephyr as a Head of PRO over there. In the 4th year, we again got a chance to represent a project in IIT Guwahati, in the Smart India Hackathon along with other members. Along with this, I was also part of the development cell of our college. So these were the major committees.

What motivated you to choose mechanical engineering and how did you keep yourself motivated during this four-year engineering journey?

First thing is, what matters is interest, from 11th and 12th I was clear that I want to do mechanical engineering. I was sure about my mechanical engineering choice. Whenever I see a train, I wonder about the technology behind its working. Machines always fascinate me and that was the thing which motivated me to go for mechanical.

Fortunately, I sat for an interview in Porsche, I got selected over there, I almost worked there for about a year. In the process I had this idea in my mind and from thereafter about one year I left the job and began my mechanical related startup. Now the question is 'Is a mechanical job an easy job as compared to other branches?' The answer is No. You have to sacrifice many things. Like in an IT job you have weekend holidays but in a mechanical job you probably don't get that but it is very interesting your work in front of a machine and that's what motivates you to choose mechanical apart from other branches.

Most of the mechanical engineers go away from core branches to grab a job, so what is your opinion on this topic and how can we overcome that?

Initially what I think is that as a mechanical engineer, it is very tough to get placed in a company because the losses in Mechanical Engineering is quite high, for a single project we have theoretical knowledge but don't have practical knowledge and that probably is a drawback in a system or the curriculum, so what I think is any mechanical engineer who is inclined towards a mechanical job should join any company or a smaller company with probably lower pay scale and once you join there you will learn many things. In solid works it is very easy to make a certain model but when the model is made into a real one, the real challenges come. So how we can overcome this issue is by doing technical projects. Once you take up the project you get a lot of difficulties in the process and over there you probably learn how it is done. One of the other alternatives is to connect with some of the industrialists or some of the people who are currently working in an industry because they are the people who currently understand the problems which we currently have and can build the students to this level. This will provide the edge over other students.

What was your call to execute the idea behind your startup Powerzest and also what does that name particularly signifies?

So I will first talk about the name Powerzest, which means a group of people who are energetic and want to bring some revolutionary change in the field of renewable energy. So that was the thing that came to mind which took the name as Powerzest. Answering the next question about execution-Thinking or taking any idea is very easy but when it comes to execution a lot of people fail, probably over here the most important thing is A TEAM. So if you have a good team of people who can help you up then it's obvious for you to go ahead. In my case what happened was probably me and Raj who was working on the project. So raj was also one of the same batch. We were classmates. We identified a few groups of people who were good in terms of mechanical aspects. In the process, we approached Omkar, Deepak, and Meet Lakhani. What we know about these people is that omkar is someone very good at design, so he would help us in design aspects. Deepak is very good with calculation work or theoretical knowledge, he will help us with that. Meet is someone who can work with us without complaining, so anytime you give him certain work he will do that work. And that's how we made a great team. And this helped us to execute the idea ahead. Now when we see a challenge which we are facing is that all the people are not in India. I am currently handling the on-ground work. So when it comes to execution you have to find a lot of try and error methods to go ahead.

When was the time you realized that this is the idea I want to execute now, this is the right time?

What I recommend is for anyone who wants to do a startup, you should have some industry knowledge and that's what I did. The time when I decided to start this journey is, I almost pitched this idea in front of 30-40 people and they suggested me to carry this project ahead because they thought that this project is something which can bring a revolution in green energy. You should start your venture, you should not keep the idea for a long time because keeping any idea for a long time means that the idea will somehow be diminished and it could not benefit the people. So after pitching it up to 30-40 people and getting certain feedback, after doing a certain short analysis, I started my journey along with the group of people.

As we all know that starting a new business is always intimidating so who were the people who stood by you and motivated you in this journey.

I will not name a single person because many people helped me in the journey, so the most important thing in this journey is to build trust in the minds of people. So once you build trust in the mind of people although the idea is not so dashing then also people will help you. What people will believe while funding you is the kind of person who is aspiring to the journey. Any investor or any agency will never fund the idea, Idea might be very appealing but execution matters.

As you are an entrepreneur, Do you think that there is some pattern or technique to follow to be successful in that way?

For the last 2 years, each day has been challenging for me. It is really really hard, like running a business or making a certain amount of people contribute is not so easy. Since you are paying them, hence constantly you have to think about the work you allot to them. You have to think about all those things in the back of your mind. If you are aspiring to this journey, the first thing which you have to change is your habits, the way you eat, the way you sleep, the way you talk, the way you make friends, the way you meet people, the way you greet them. Those things are very important in this journey. There are a lot of habits and a lot of things which you have to learn. So one of the good habits which I have included in my life is exercising every day, every morning. It keeps you healthy, it keeps you energetic since you are the leader you have to be energetic. You should think of every time which you are spending so these are the few habits which every aspiring entrepreneur should practice.

How did you think about this idea that you want to work in the field of Renewable energy since it is not much used in India.

First and foremost thing is, Renewable is a very growing field, currently the market is growing very much, the sectors which are unfocused like wind energy, solar energy is not so properly used in India, so currently those are the markets which are open in coming time you will see a lot of wind energy and solar energy in many places but what we are doing differently is, we have to build a turbine which can work in lowest of the wind condition, and which an individual household owner can buy. Let's say a turbine which costs you around 1 lakh 80 thousand and using this turbine you can carry out almost every operation like lighting, fan and most of the electricity needs of your house. That's what we are doing. And what we think is in the coming days, we can capture a lot of markets such as EV, in some area where there is the problem of electric shortage this type of product can change a lot of in terms of electricity because it can offer electricity at the very low wind and that probably can help us to do well in the market.

If you get a chance to start your career once again, what would you do differently ?

If I get a chance to start my career again, my plan would be like this:- In the third year of engineering, I would have joined a certain company that is into this sector itself. If I had known that after the completion of my engineering I would be starting my own company in a renewable field, I would join a certain company that is into the renewable sector. And that would have made a lot of impact on my journey. Also, one of the things which I probably would do differently was the basics of engineering. I would have done the basics of engineering in a better way because every product which you know is just the basics of engineering which we did in the first, second and third year, nothing is much more than that. Once your basics are strong, probably everything you can do.

How important is it to have a team that has a similar vision as yours and what is your opinion on it?

There are many situations where you have a certain idea but you do not have a proper team to work with that idea, in that case probably you have to start alone, in the process you get certain teams. You tell them about your idea, you tell them your vision so all that takes place but the most important thing for a startup, mostly a hardware startup is, it is very important to have a team. A team is very important so that someone can handle production and others can handle marketing. Having a team always helps you. Starting alone requires a lot of guts unless you have some back support like a family business.

Describe your experience working for a premium sports car brand Porsche.

Working with Porsche was a completely different experience. It was enquiring to work with people precise in their approach towards their job. They always follow a systematic layout to carry a task. Their work ethic of handling their customers, maintaining great relations with them, and presenting their organization is great and these are the cultures that I wish to bring to my startup as well. Their cars are already manufactured according to German standards with great features that people aspire to own.Working at Porsche made me understand the work standards and customer's ideology. It gave me a sense of liveliness to inculcate similar great features in my product as well.

As a National Level winner with a successful startup and a great start with Porsche, how do you define success?

I don't define success by my job at a premium company or by my work experience. As an entrepreneur what makes me different is that our success lies in the product's effectiveness. Success would be to create a great and useful product for the people. We wish to help people through innovative products that can improve their lifestyles. For me when people will use my products and provide feedback would be the biggest success. We will be launching our product in the next 4-5 months. Firstly, We will be launching a pilot product in Mumbai to test gather and analyze the data to understand the performance of the product.

How did you financially manage your startup?

When I started my journey I already had funding that I received in my 4th year through Smart India Hackathon that we had saved. We invested it into the idea and calculated how long that would sustain my business. We also got funding from IIT and the USA through our business partner Raj oak. Money is a constraint in a hardware business and hence you should learn how to acquire better funding.

What is your next goal After a successful product launch?

My next goal is to tie up with IIT Roorkee to work on the second product design. The first product that I am launching is generating energy from wind turbines. The next product that we are planning is to design innovative technologies to generate solar energy and energy from seawater. The project to generate energy from seawater has already been taken up at IIT Roorkee where they have installed a turbine into the Ganga canal.

Can we still consider Mechanical as an evergreen branch with all the emerging technologies?

Yes, I believe that mechanical is an evergreen branch because when you design a product, working closely with all the machines and technologies you realize that yes, this is a branch that I aspire to be in. Everything is upon you. It is important to stay stable and take the opportunity to work at a company and learn. I know that it is difficult to join a mechanical company because that corresponds with our ideologies but the experience gained in the next few years would be extremely beneficial. You just need to stay patient and work hard. Approach people into the industry, learn, and grow with them.

Is it important to have a strong economic background to build a startup?

No, it is not important to have a strong economic background to start. You just need to have a vision and know how to pitch it. Companies invest in your hard work and dedication towards your startup. Your limitation is only in your mind.

We have the government and a lot of funding agencies that would help you in the form of grants. I received help through IIT Roorkee where I have a major office space to carry out my ideas. If you have any idea you just need to approach certain authorities or agencies that would help grow your idea in the form of grants or funding. Funding involves equities and you would have to give a certain percentage of the equity to the agency which can be compensated through product sales.

Why do you think people are more interested in startups than a company job? What is the reason behind this shift in the industry?

I think the reason why most people are probably starting their journey of self-employment is the flexibility of the work style and the ability to focus on an idea as it approaches. I believe that not working on your idea or something that fascinates you is a crime. Everyone with a market feasible idea should definitely work on it. The outcome behind a startup journey can be beneficial. One outcome is money and the second is the creation of technologies that can benefit the people. A startup is a risk and one needs to brainstorm their product to manage the finances.

What message would you like to give to graduate students who want to be entrepreneurs in the future?

Have patience and create a team that shares your vision and helps you to take the idea ahead. Make people believe in your idea and start with cofounders to share the responsibilities of the startup. Have friends that support you and build better relations in the industry. Collaborate with people and expand your network. It will help you to establish your business.

FORESIGHT 2025

SEAWAVE POWER GENERATOR

TURNS SEAWAVE INTO POWER

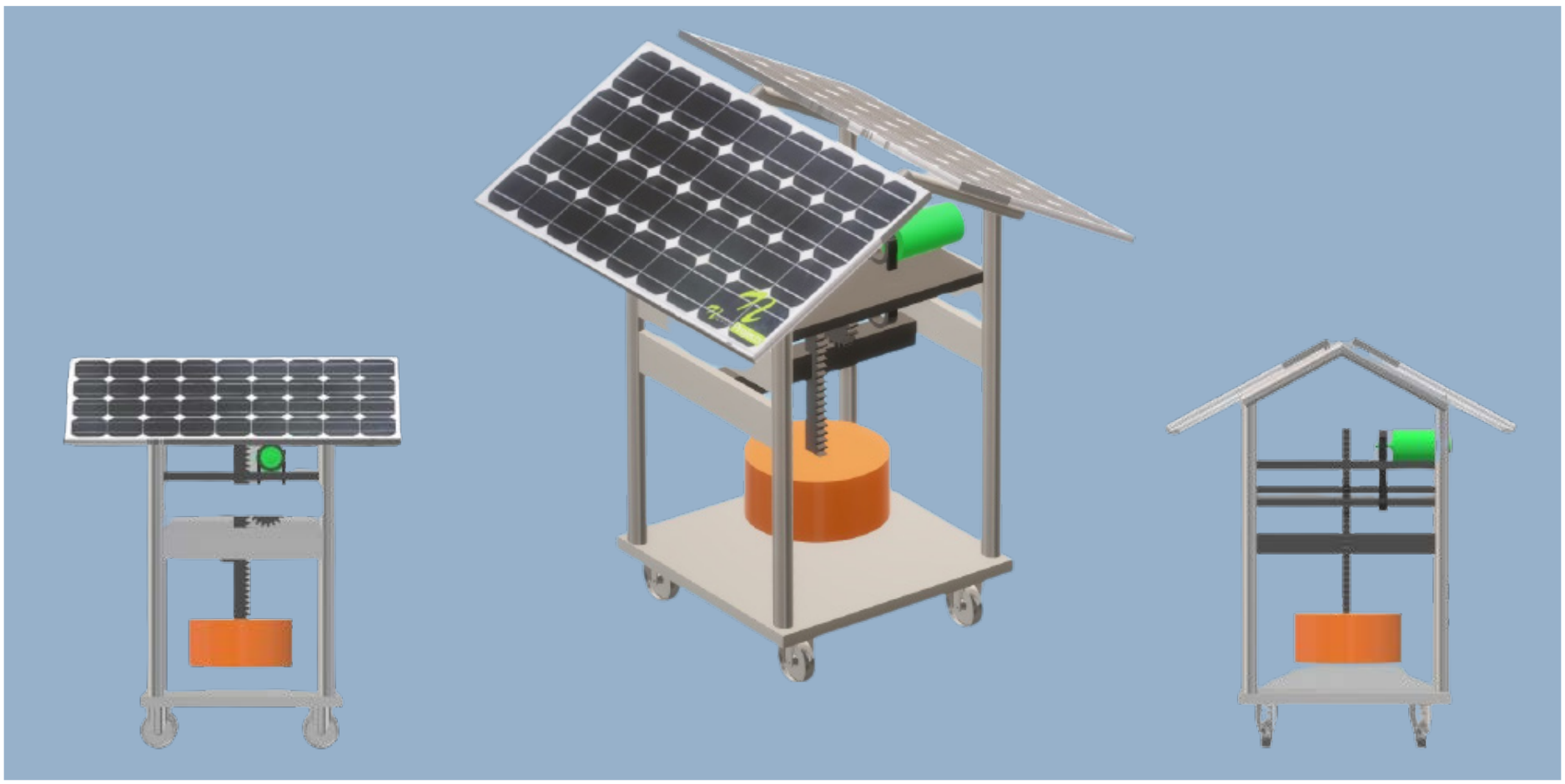
While we look at solar and wind power as two of the main sources of renewable power, we are ignoring another huge source of renewable energy on planet earth. Sea waves or tidal power is another immense power source we are missing out on.Well here we propose a dual power generator that utilizes solar as well as sea wave power to generate unlimited energy using sea waves.

WORKING:

The machine includes a buoy that is used to float and move with the sea waves in vertical motion. The buoy allows the transfer of sea wave power to the generator motor using a rack and pinion arrangement. The power transferred to this shaft is now transferred to the motor using a pulley system for efficient power transfer. The machine uses a second power source that is solar to generate an additional 50 watt of power for a reliable power generation. The machine is made portable with wheel structure so that it is easily portable.

ADVANTAGES:

- No Dependency on Solar or Wind For Generation
- Efficient use of sea waves to generate tidal power
- Portable machine for ease of transportW
- Dual power generation for guaranteed power generation in all climates
- Lightweight and anti-rust design for long term usage



SAPHONIAN TURBINE

BLADELESS TURBINE

Various innovations are now being carried out to improve a design's efficiency. It helps us to increase the utilization of renewable energy resources and reduce the strain on fossil fuels and non-renewable sources of energy. A green startup Saphon Energy has created a new bladeless wind turbine. The design is inspired by the sail of the ships in ancient times.

It promises to generate electricity at double the efficiency of the traditional system and lower down the costs. Currently the company has developed a second prototype of the system.

The bladeless turbine has a funnel or bowl-shaped design. The design also aims to reduce noise and ensure bird safety. The Saphonian Turbine has patented a Zero-Blade Technology that channels the wind in a back and forth motion and generated energy using pistons.

The piston produces hydraulic pressure which is then converted into electricity. It increased energy efficiency. The company's vision is to bring the turbine system into the market in the next two years, only then it can truly be verified if the design lives up to the expectations.

ADVANTAGES:

- Reduce noise turbulence
- Increases energy efficiency
- Decreases cost and environment friendly

SMOG VACUUM CLEANER

TURNS
AIR POLLUTION
INTO
JEWELLERY

Smog and air pollution are notorious problems in various cities around the world. Beside impeding vision, smog has various health effects on people.

Artist and designer Dan Roosegaarde has created a product that not only helps clean up the air in cities but also repurposes the smog into gemstones. This smog free tower is helping cities and their citizens breathe clean air again.

The Smog-free tower filters out the smog in the surrounding air to create healthier cities.The Smog-free Tower is a massive Vacuum Cleaner. Towering at seven meters the tower sucks in smog in the surrounding area using positive ionization technology.

It sucks the smog in from the top of the tower and releases the filtered air via the six sided vents. Using no more energy than a water boiler, the smog free tower can essentially clean more than 30000 cubic meters of air per hour.

Using this same smog collected in its vents the air purifier turns that smog into wearable “Smog Gemstones”. The tower takes the carbon particles collected and condenses them, creating fashionable little cubes that can be embedded in various pieces of traditional jewellery. Every cube created contains 1000 cubic meters of air.

WHIRLPOOL TURBINE

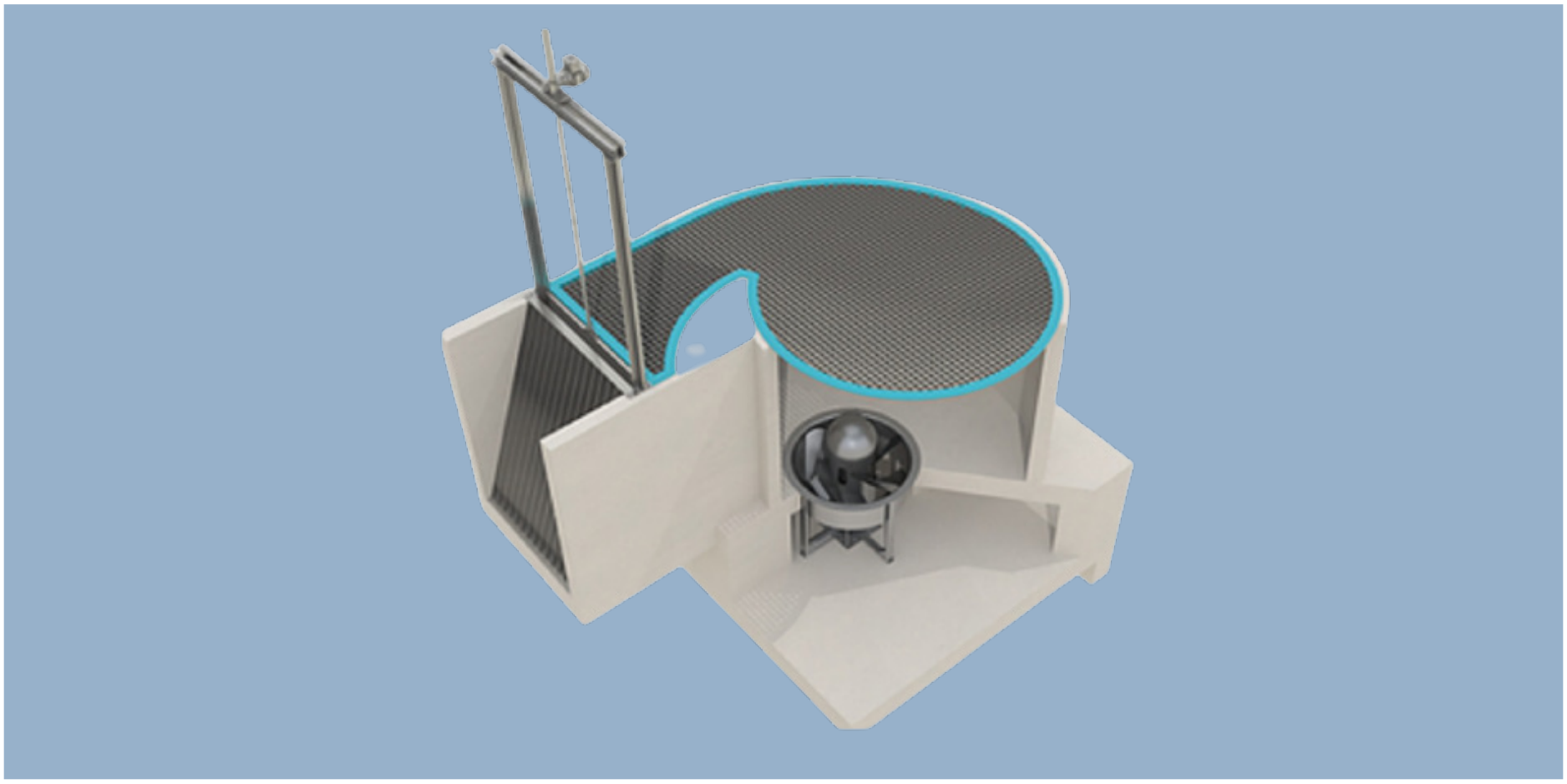
FISH FRIENDLY TURBINE

Turbulent's whirlpool turbine can be installed in most canals or rivers, harnessing flowing water to generate power for as many as 60 homes.The clean, fish-friendly energy source can operate at night and during the day.This technology works well in rural areas, as long as there's a river nearby.

The turbines don't harm the environment and are easy to install-that to in a week.The whirlpool turbine makes use of small rapids or waterfalls to harness energy.A generator and impeller goes inside the basin. Then a river wall is lifted so some of the river water will pour into the basin, getting the turbine going.

Turbulent says the turbine possesses just a single moving part, so it can have a longer operating life and doesn't require much maintenance. A self-cleaning screen captures large debris. The company says the life of the concrete basin is 100 years, and fish won't be harmed in the turbine.Unlike large dams, their low-pressure turbine requires a height difference of roughly five feet to function effectively.

Tested in rivers throughout Belgium, the device can be scaled up to generate 15, 30, and 100 kilowatts.



CHARGING STATION

CHARGE
MOBILE
&
LAPTOP

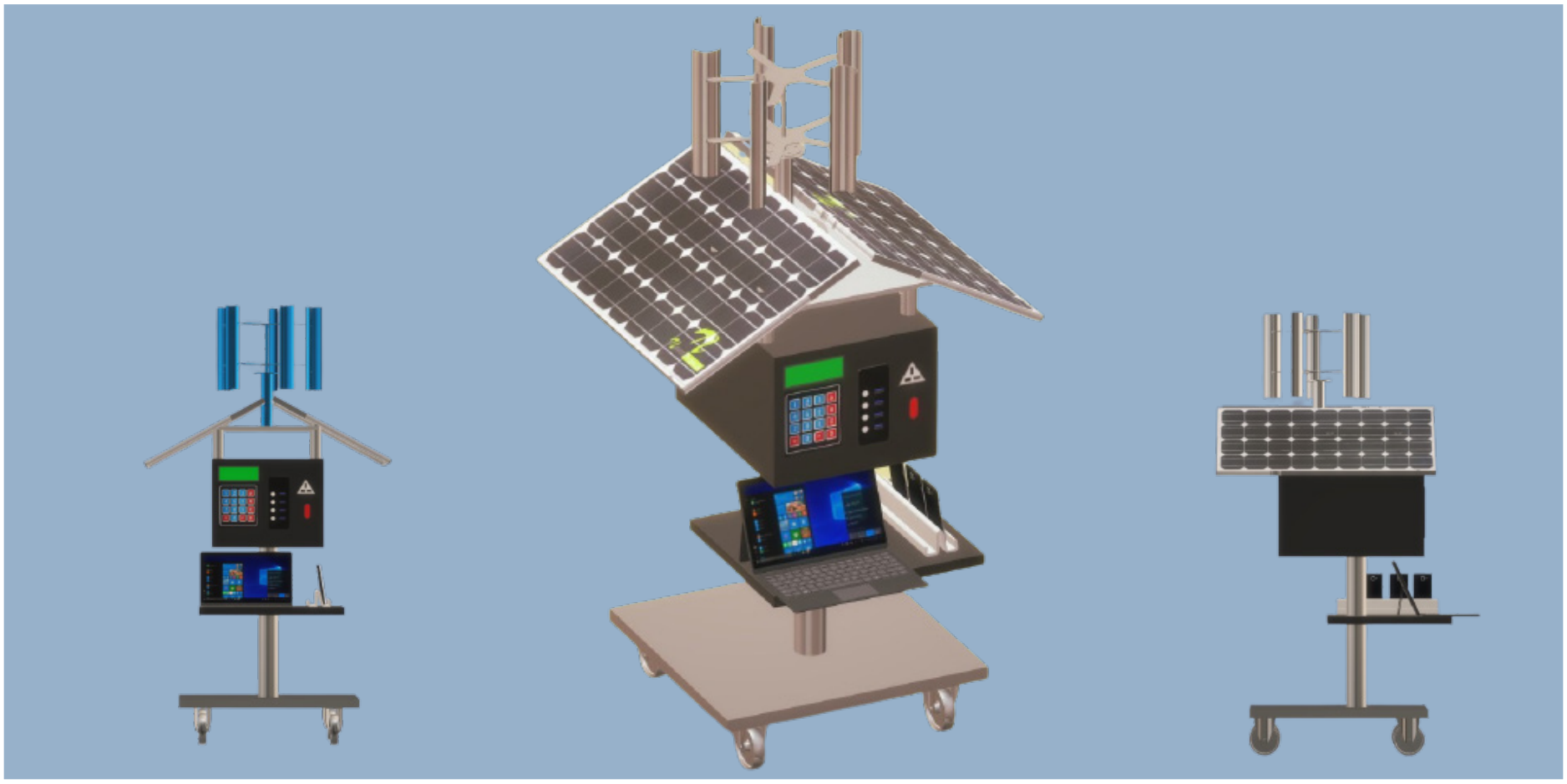
People usually run out of phone and laptop charging while travelling. At such times there is literally no way of charging your phone laptop in an outdoor environment. Well we hereby solve this problem with a green energy system using a dual power generator solar plus wind energy charging system for mobile phones and laptops.The charging station is a portable charging station so that it can be easily moved with an anti-theft feature to prevent any theft or mischief with the charging station.

WORKING:

The system makes use of a battery to store the energy generated by both the power generators. This battery supply is now connected through the inverter for usage. The system provides 2 types of outputs. 4 USB outputs for 4 x 5V DC mobile charging ports and 1 x 230V AC port with current limitation for charging laptops only.

ADVANTAGES:

- Dual Power generation Solar plus Wind Energy
- Inbuilt Inverter and charge controlling circuitry
- Anti-Theft Feature – Alert Buzzer Alarm in case of Station Robbery/Damage Attempt



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