ESTD - 1928

SNJB

SNJB's
LATE SAU. K. B. JAIN
COLLEGE OF ENGINEERING

NEMINAGAR, CHANDWAD, DIST- NASHIK

NAAC ACCREDITED WITH "A" GRADE

Founder

Poojya kakaji

Department of Mechanical Engineering

Yantra Veda

Year 2019-20

Shri.
Dineshji
Lodha

Shri.
Zumbarlalji
Bhandari

Shri.
Sunilji
Chopda

Message from Honourable Management

We feel delighted to observe that yearly Technical Magazine "YANTRAVEDA" from department of Mechanical Engineering is to coming out in this year (A.Y.2019-20), thanks to efforts of the faculty and the students of the department. The "YANTRAVEDA" is truly the reflection of the interest of the students, involved in technical endeavors.

As a parting message to students of Mechanical Engineering, We wish them a pleasant and prosperous future and advise them to develop deep in their career and come out with the pearl of name and fame ,both for themselves and their future.

Message from Principal

I am proud to announce the release of 'YANTRAVEDA' magazine's fourth issue. The magazine signifies the writer's penmanship and also allows them to share their ideas. I acknowledge the efforts of students and staff of Mechanical department who have taken the initiative to promote the writing and publishing skills of the students. This helps the students to share and express their ideas in an articulate manner. Students and staff achievements have also been presented which will be a motivational factor for the other students to achieve the standard of excellence. Glad to say that we have achieved our aim of turning this into reality. I would like to congratulate all the students, teachers, alumni and everyone involved in bringing out its 4th edition.

Wishing everyone loads of success and bright future.

Dr.Mahadeo Kokate

Message from Head of Department

I am pleased to know that our students are successful in bringing their fourth issue of magazine 'YANTRAVEDA' for this academic year 2019-20. YANTRAVEDA, the departmental magazine has the prime objective of providing aspiring engineers a wide platform to showcase their technical knowledge and to pen down innovative ideas.

This magazine is intended to bring out the hidden literacy talents in the students and teachers to inculcate strong technical skills among them.

I congratulate and thank all the students and faculty coordinator who have made untiring efforts to bring out this magazine. I wish them all the very best for releasing more such magazines in future.

Dr. Santosh Sancheti

SNJB

LATE SAU. KANTABAI BHAVARLALJI JAIN COLLEGE OF ENGINEERING

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DEPARTMENT OF MECHANICAL ENGINEERING

VISION

- To impart quality technical education in the field of Mechanical Engineering for the benefits of society

MISSION

- To provide quality education among the students through the curriculum and industrial exposure.
- To develop a learning environment leading to innovations, skill development and professional ethics through curricular and extracurricular activities for societal growth.

PEO'S AND PSO'S

Program Educational Objectives (PEOs):

After industrial experience of 4 to 5 years, Mechanical Engineering graduates will be able to

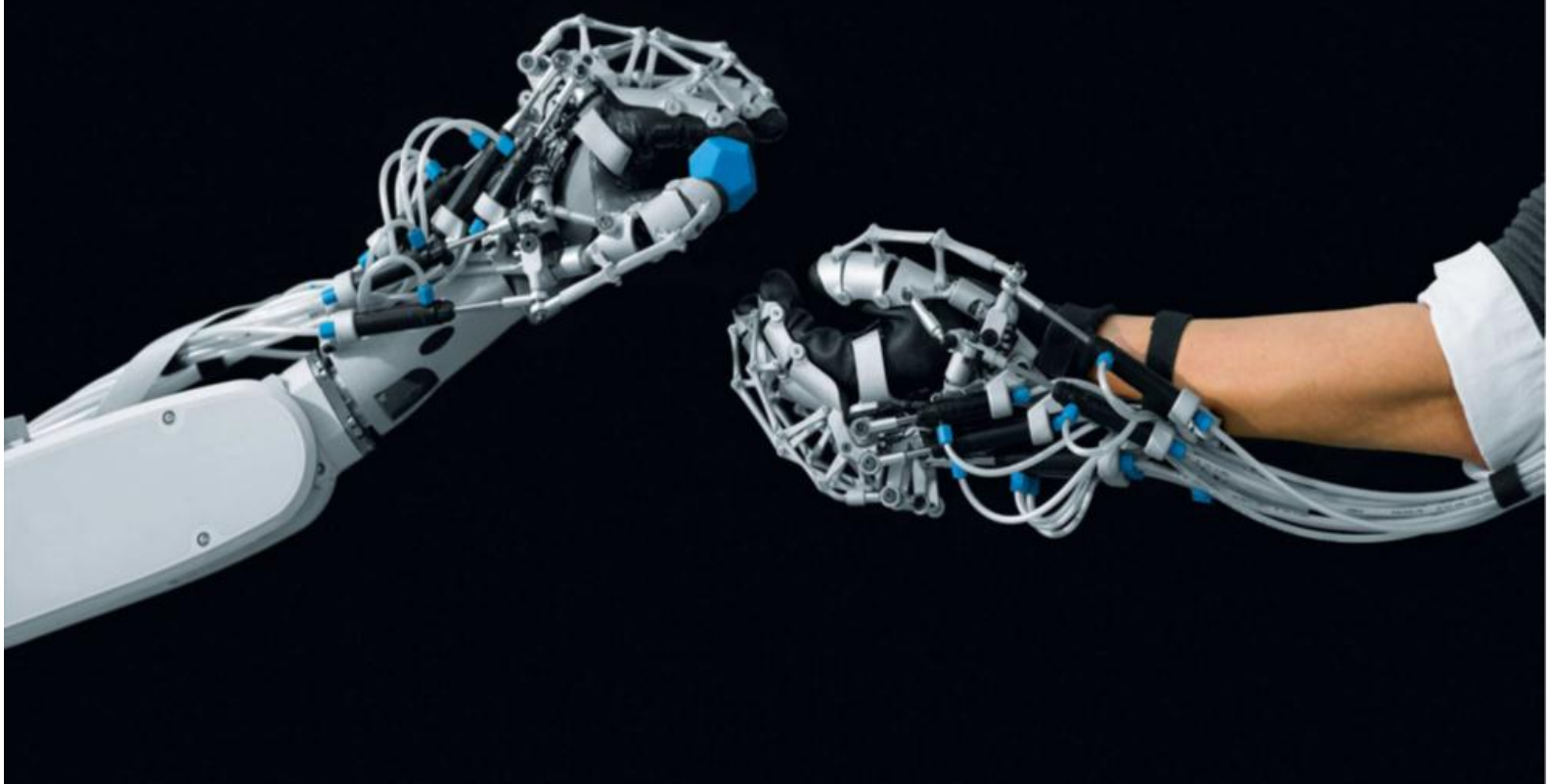
1. **Graduates will possess essential professional Mechanical Engineering skills to develop solutions for industrial and societal problems.**
2. **Graduates will engage and succeed in their professional careers through teamwork, professional ethics and effective communication.**
3. **Graduates will engage in lifelong learning, career enhancement and adapt to emerging technologies for the benefits of society.**

Program Specific Outcomes (PSOs):

After graduation, Mechanical Engineering graduates will be able to

1. **Graduates will have an ability to identify, analyse, and develop appropriate solution(s) to Mechanical Engineering Problems.**
2. **Graduates will be able to use modern engineering tools for analysing and solving practical problems of industry and society.**
3. **Graduates will be able to learn and grow constantly, with good technical, spiritual, and ethical values with a zeal for life-long learning.**

Faculty Articles



Domestic Energy Conservation

Dr. M. M. Rathore

Lighting

- ⇒ Switch off lights when it is not needed
- ⇒ Replace existing GLS with CFL. CFL produce the same amount of light by using 1/4 of the electricity. Plus, they last for more years.
- ⇒ Replace tubes with electro-magnetic choke with energy efficient tubes (like the 23 W, 28 W electronics choke).
- ⇒ Adopt light colored walls and ceilings
- ⇒ Use LED lighting , wherever possible

Refrigerator & Water Heater

- ⇒ Ensure correct vacuum in the condenser. The condenser of a refrigerator not to be installed in high temperature zone or where there is no proper ventilation to carry heat away from the coils.
- ⇒ Use Solar Water Heaters: saves costly electricity.
- ⇒ Do full loads when washing or drying clothes
- ⇒ Air Dry your clothes using a clothes line or a hanging rack inside
- ⇒ Wasting water leads to wastes to electricity. Why? Because the biggest use of electricity in most cities is for pumping and supplying water.

SOME REMEDIES

- ⇒ Use energy efficient motors
- ⇒ Minimize wastage in operations
- ⇒ Use energy Star rated equipment

Domestic Energy Conservation

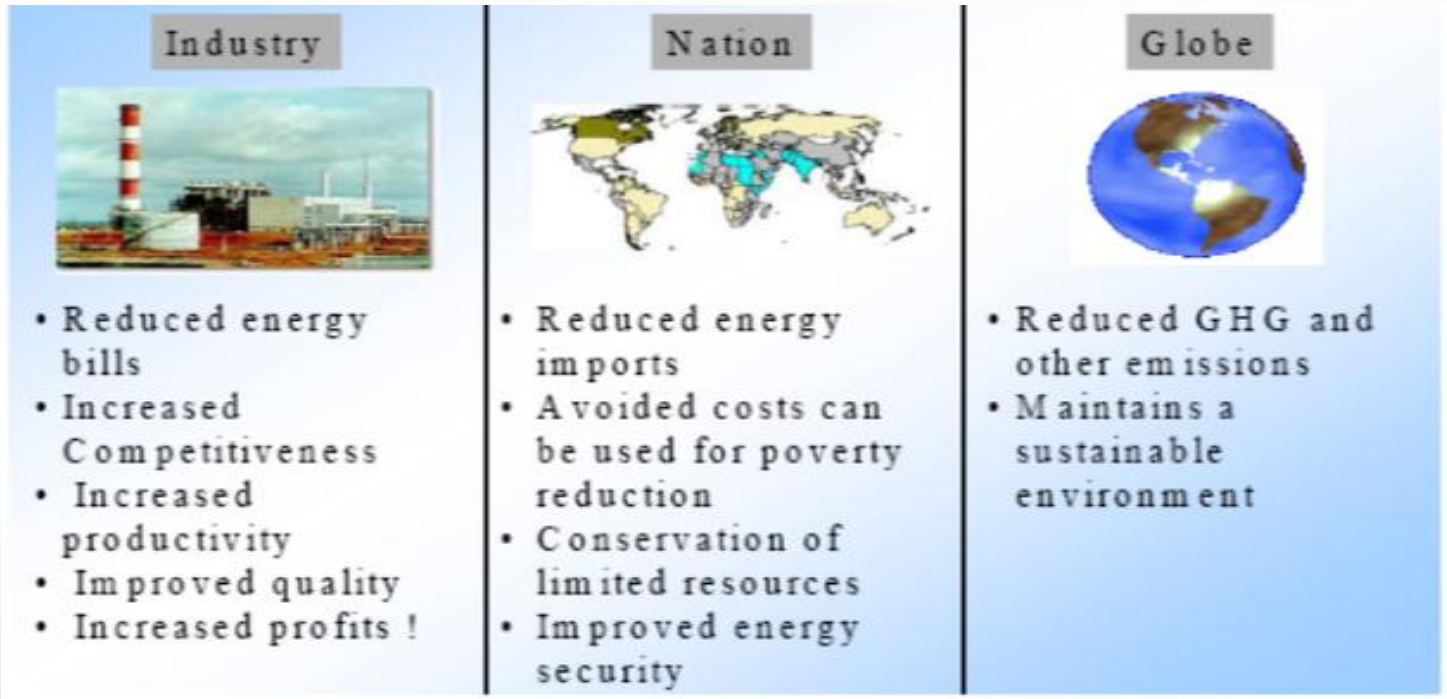
Dr. M. M. Rathore

- ⇒ Shift from conventional fuels to alternative fuels.
- ⇒ Explore natural resources
- ⇒ Keep power factor nearer to 1 in electrical utilities
- ⇒ Use Green Buildings

Fuel Saving Tips for your car

- ⇒ Don't drive like a devil on wheels! Quick accelerations reduce fuel efficiency and put wear and tear on your transmission.
- ⇒ At 100 km/h, with windows open reduces fuel average by the same amount as having A/C running at full blast.
- ⇒ Under 90 kph having the windows open is a reasonable alternative to using the A/C.
- ⇒ Ensure the belts tight, fans running and filters clean in order to get the best fuel average out of your vehicle.

Advantages of Energy Efficiency

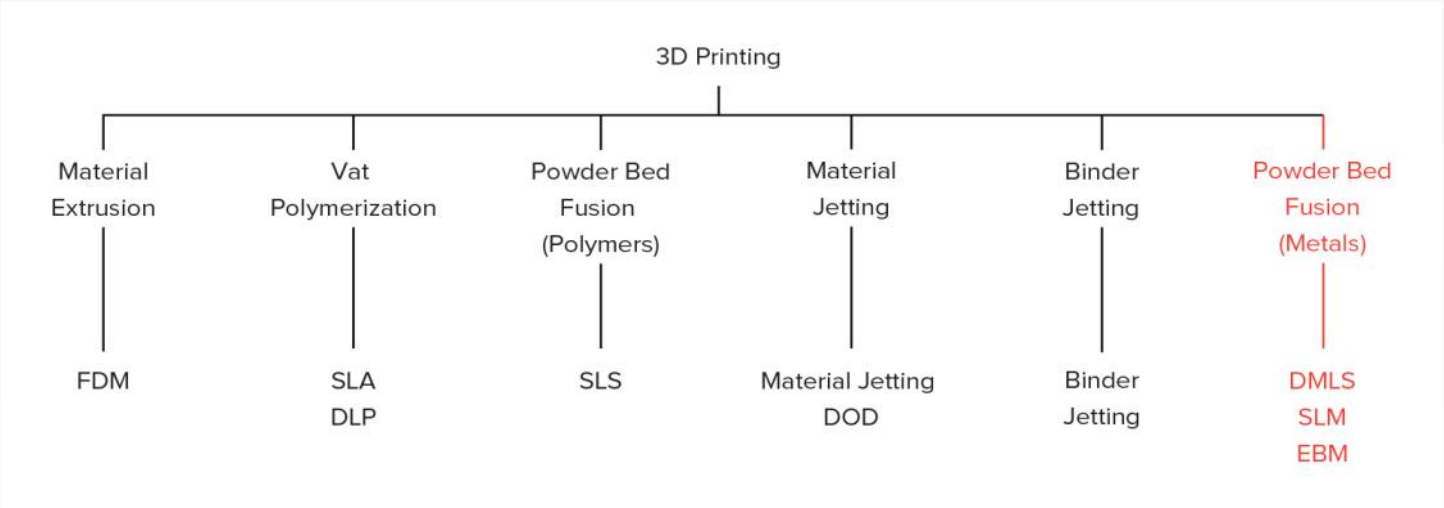


Additive Manufacturing for Metal

Prof. R. M. Sonar

Additive manufactu.webp

SLM & DMLS: what's the difference?



Selective Laser Melting (SLM) and Direct Metal Laser Sintering (DMLS) are two metal additive manufacturing processes that belong to the powder bed fusion 3D printing family. The two technologies have a lot of similarities: both use a laser to scan and selectively fuse (or melt) the metal powder particles, bonding them together and building a part layer-by-layer. Also, the materials used in both processes are metals that come in a granular form.

The differences between SLM and DMLS come down to the fundamentals of the particle bonding process (and also patents): SLM uses metal powders with a single melting temperature and fully melts the particles, while in DMLS the powder is composed of materials with variable melting points that fuse on a molecular level at elevated temperatures.

Essentially:

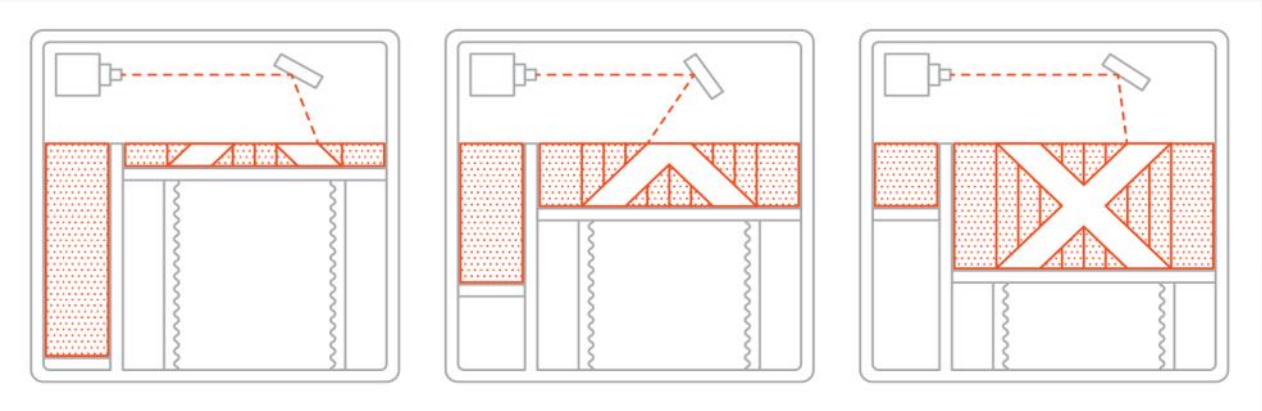
SLM produces parts from a **single metal**, while DMLS produces parts from **metal alloys**.

Both SLM and DMLS are used in industrial applications to create end-use engineering products. In this article, we use the term metal 3D printing to refer to both processes in general and we describe the basic mechanisms of the fabrication process that are necessary for engineers and designers to understand the benefits and limitations of the technology.

There are other additive manufacturing processes that can be used to produce dense metal parts, such as Electron Beam Melting (EBM) and Ultrasonic Additive Manufacturing (UAM). Their availability and applications are limited though, so they won't be presented here.

Additive Manufacturing for Metal

Prof. R. M. Sonar



The SLM/DMLS printing process

How does metal 3D printing work?

The basic fabrication process for SLM and DMLS are very similar. Here is how it works:

1.The build chamber is first filled with inert gas (for example argon) to minimize the oxidation of the metal powder and then it is heated to the optimal build temperature.

2.A thin layer of metal powder is spread over the build platform and a high power laser scans the cross-section of the component, melting (or fusing) the metal particles together and creating the next layer. The entire area of the model is scanned, so the part is built fully solid.

When the scanning process is complete, the build platform moves downwards by one layer thickness and the recoater spreads another thin layer of metal powder. The process is repeated until the whole part is complete. When the build process is finished, the parts are fully encapsulated in the metal powder. Unlike polymer powder bed fusion process (such as SLS), the parts are attached to the build platform through **support structures**. Support in metal 3D printing is built using the same material as the part and is always required to mitigate the warping and distortion that may occur due to the high processing temperatures. When the bin cools to room temperature, the excess powder is manually removed and the parts are typically heat treated while still attached to the build platform to relieve any residual stresses. Then the components are detached from the build plate via cutting, machining or wire EDM and are ready for use or further post-processing.

Additive Manufacturing for Metal

Prof. R. M. Sonar

Characteristics of SLM & DMLS

The metal powder in SLM and DMLS is **highly recyclable**: typically, less than 5% is wasted. After each print, the unused powder is collected, sieved and then topped up with fresh material to the level required for the next built.

Waste in metal printing though comes in the form of **support structure**, which are crucial for the successful completion of a build but can increase the amount of the required material (and the cost) drastically.

Layer adhesion

Metal SLM and DMLS parts have **almost isotropic** mechanical and thermal properties. They are solid with very little internal porosity (less than 0.2 - 0.5% in the as-printed state and close to none after thermal processing).

Metal printed parts have **higher strength and hardness** and are often **more flexible** than parts that are manufactured using a traditional method. However, they are more prone to fatigue.

For example, take a look at the mechanical properties of the **AlSi10Mg EOS** metal 3D printing alloy and the **A360 die cast alloy**. These two materials have a very similar chemical composition, high in silicon and magnesium. The printed parts have superior mechanical properties and higher hardness compared to the wrought material.

Due to the granular form of the unprocessed material, the as-built **surface roughness** (Ra) of a metal 3D printed part is approximately 6 - 10 µm. This relatively high surface roughness can partially explain the **lower fatigue strength**.

	AlSi10Mg (3D printing alloy)	A360 (Die cast alloy)
Yield Strength (0.2% strain) *	**XY :** 230 MPa **Z :** 230 MPa	165 MPa
Tensile Strength *	**XY :** 345 MPa **Z :** 350 MPa	317 MPa
Modulus *	**XY :** 70 GPa **Z :** 60 GPa	71 GPa
Elongation at break *	**XY :** 12% **Z :** 11%	3.5%
Hardness **	119 HBW	75 HBW
Fatigue Strength **	97 MPa	124 MPa

Support structure & part orientation

Support structures are always required in metal printing, due to the very high processing temperature and they are usually built using a lattice pattern.

Support in metal 3D printing serves 3 different functions:

- They offer a suitable **platform** for the next layer to be built upon.
- They **anchor** the part to the build plate and they prevent warping.

They act as a **heat sink** drawing heat away from the part and allowing it to cool at a more controlled rate.

Parts are often oriented at an angle to minimize the likelihood of warping and maximize part strength in critical directions. However, this will increase the amount of required support, the build time, the material waste and (ultimately) the total cost.

Warping can be also minimized using **randomized scan patterns**. This scanning strategy prevents the buildup of residual stresses in any particular direction and will add a characteristic surface texture to the part.

Since the cost of metal printing is very high, simulations are often used to predict the behavior of the part during processing. **Topology optimization algorithms** are also used not only to maximize the mechanical performance and create lightweight parts but also to minimize the need of support structure and the likelihood of warping.

A metal bracket before support removal oriented in a 45^{o} angle. Courtesy: Concept Laser

Hollow sections & lightweight structures

Unlike polymer powder bed fusion processes like SLS, large **hollow sections** are not commonly used in metal printing as support structures cannot be easily removed.

For **internal channels** larger than Ø 8 mm, it is recommended to use diamond or tear-drop cross sections instead of a circular, as they require no support structures. As an alternative to hollow sections, parts can be designed with skin and cores. Skin and cores are processed using different laser power and scan speed, resulting in different material properties. Using skin and cores is very useful when manufacturing parts with large solid section, as they significantly reduce the print time and the likelihood of warping and produce parts with high stability and excellent surface quality.

Using a **lattice structure** is also a common strategy in metal 3D printing for reducing the weight of a part. Topology optimization algorithms can also aid in the design of **organic light-weight form**.

The Electric Vehicle

Prof. A.S.Gujarathi

Electric Vehicle (EV) History

The first electric vehicle (EV) was built between 1832 and 1839, the exact year is not known, in Scotland by Robert Anderson, who created the first crude electric carriage. It was not until 1895, after A.L. Ryker built an electric tricycle and William Morrison built a six passenger wagon, that America paid attention to the electric vehicle. In 1902 Wood created the Electric Phaeton, which was more than an electrified horseless carriage and surrey. “The Phaeton had a range of 18 miles, a top speed of 14 mph and cost $2,000” .

The decline in use and production of the electric vehicle occurred in the 1920s. Causes of the decline in production include: a better road system, reduced price of gasoline by the discovery of the Texas crude oil, invention of the electric starter, and the mass production of the internal combustion engine vehicles]. According to the *History of Electric Vehicles*, “In 1912, an electric roadster sold for $1,750, while a gasoline car sold for $650”. By 1935, electric vehicles completely disappeared. In the 1960s and 1970s electric vehicles reappeared because internal combustion vehicles were creating an unhealthy environment for the people in America at that time.

Description of an Electric Vehicle

The electric vehicle (EV) is propelled by an electric motor, powered by rechargeable battery packs, rather than a gasoline engine. From the outside, the vehicle does not appear to be electric. In most cases, electric cars are created by converting a gasoline-powered car. Often, the only thing that clues the vehicle is electric is the fact that it is nearly silent .

Under the hood, the electric car has:

-An electric motor.

- A controller.

- A rechargeable battery.

The electric motor gets its power from a controller and the controller gets its power from a rechargeable battery. The electric vehicle operates on an electric/current principle. It uses a battery pack (batteries) to provide power for the electric motor. The motor then uses the power (voltage) received from the batteries to rotate a transmission and the transmission turns the wheels [3].

Four main parts make up the electric vehicle: the potentiometer, batteries, direct current (DC) controller, and motor. See Figure 1.

The Electric Vehicle

Prof. A.S.Gujarathi

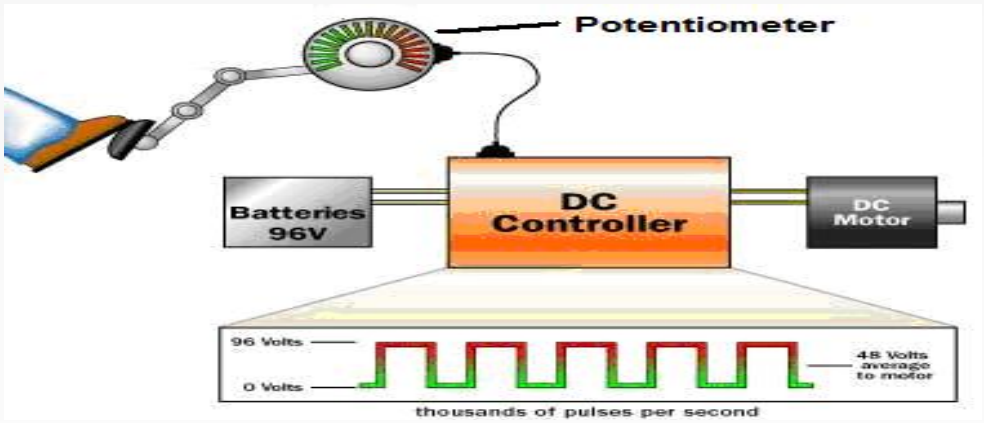


Figure 1. Parts of an electric vehicle .

Description of Parts and their Functions

Potentiometer. It is circular in shape and it is hooked to the accelerator pedal. The potentiometer, also called the variable resistor, provides the signal that tells the controller how much power is it supposed to deliver.

Batteries. The batteries provide power for the controller. Three types of batteries: lead-acid, lithium ion, and nickel -metal hydride batteries. Batteries range in voltage (power).

DC Controller. The controller takes power from the batteries and delivers it to the motor. The controller can deliver zero power (when the car is stopped), full power (when the driver floors the accelerator pedal), or any power level in between. If the battery pack contains twelve 12-volt batteries, wired in series to create 144 volts, the controller takes in 144 volts direct current, and delivers it to the motor in a controlled way. The controller reads the setting of the accelerator pedal from the two potentiometers and regulates the power accordingly. If the accelerator pedal is 25 percent of the way down, the controller pulses the power so it is on 25 percent of the time and off 75 percent of the time. If the signals of both potentiometers are not equal, the controller will not operate.

Motor. The motor receives power from the controller and turns a transmission. The transmission then turns the wheels, causing the vehicle to run.

Theory of Operation for EV

When the driver steps on the pedal the potentiometer activates and provides the signal that tells the controller how much power it is supposed to deliver.

The Electric Vehicle

Prof. A.S.Gujarathi

There are two potentiometers for safety. The controller reads the setting of the accelerator pedal from the potentiometers, regulates the power accordingly, takes the power from the batteries and delivers it to the motor. The motor receives the power (voltage) from the controller and uses this power to rotate the transmission. The transmission then turns the wheels and causes the car to move forward or backward. If the driver floors the accelerator pedal, the controller delivers the full battery voltage to the motor. If the driver takes his/her foot off the accelerator, the controller delivers zero volts to the motor. For any setting in between, the controller chops the battery voltage, thousands of times per second to create an average voltage somewhere between 0 and full battery pack voltage.

Description of a Hybrid Vehicle

The hybrid vehicle (HV) is powered by both a gasoline engine and electric motor. The HV runs using power from an internal combustion engine and electric motor. The engine provides most of the vehicle's power, and the electric motor provides additional power when needed, such as accelerating and passing. The hybrid vehicle operates on a gasoline and electric energy principle. A hybrid car features a small fuel-efficient gas engine combined with an electric motor that assists the engine when accelerating. The electric motor is powered by batteries that recharge automatically while you drive.

Five main parts make up the hybrid vehicle: the battery, internal combustion engine (ICE), generator, power split device, and electric motor. See Figure 2.

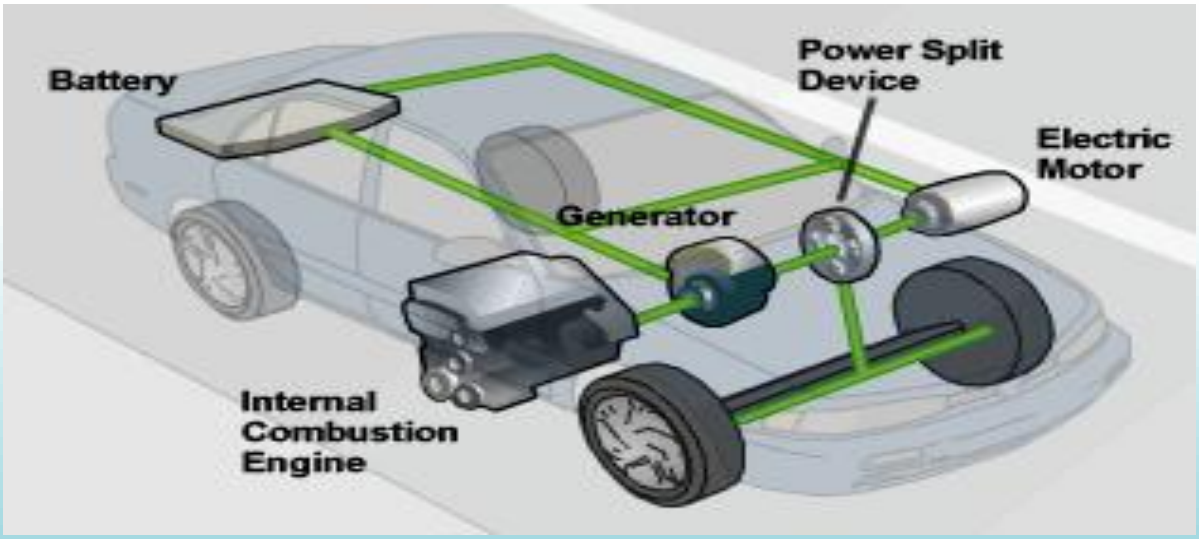


Figure 2. Parts of a hybrid vehicle.

The Electric Vehicle

Prof. A.S.Gujarathi

Description of Parts and their Functions

Battery. The batteries in a hybrid car are the energy storage device for the electric motor. Unlike the gasoline in the fuel tank, which can only power the gasoline engine, the electric motor on a hybrid car can put energy into the batteries as well as draw energy from them.

Internal Combustion Engine (ICE). The hybrid car has an ICE, also known as a gasoline engine, much like the ones found on most cars. However, the engine on a hybrid is smaller and uses advanced technologies to reduce emissions and increase efficiency. Receives its energy from the fuel tank where the gasoline is stored.

Generator. The generator is similar to an electric motor, but it acts only to produce electrical power for the battery.

Power Split Device. The power-split-device resides between the two motors and together with the two motors creates a type of continuously variable transmission.

Electric Motor. The electric motor on a hybrid car acts as a motor as well as a generator. For example, when needed, it takes energy from the batteries to accelerate the car. But acting as a generator, it slows the car down and returns energy to the batteries.

Theory of Operation for Hybrid

When the driver steps on the pedal the generator converts energy from the engine into electricity and stores it in the battery. The battery then provides power to the electric motor. The internal combustion engine and electric motor work simultaneously and each provide power to the power split device. The power split device combines both powers and uses it to turn the transmission. The transmission then turns the wheels and propels the vehicle.

The energy used when braking is converted into electricity and stored in the battery. When braking, the electric motor is reversed so that, instead of using electricity to turn the wheels, the rotating wheels turn the motor and create electricity. Using energy from the wheels to turn the motor slows the vehicle down. When the vehicle is stopped, the gasoline engine and electric motor shut off automatically so that energy is not wasted in idling. The battery continues to power auxiliary systems, such as the air conditioning and dashboard displays.

Comparison of Combustion Engine, Hybrid and Electric

Now that there is an established concept of how the internal combustion engine, hybrid, and electric vehicle function, their efficiency, speed, acceleration, maintenance, mileage and cost are compared in Table 1. The following abbreviations are used: ICE (internal combustion engine), HV (hybrid vehicle), and EV (electric vehicle).

Table 1. Comparison between the ICE, HV, and EV

The Electric Vehicle

Prof. A.S.Gujarathi

	ICE	HV	EV
Efficiency	Converts 20% of the energy stored in gasoline to power the vehicle.	Converts 40%, of the energy stored in gasoline to power the vehicle.	Converts 75% of the chemical energy from the batteries to power the wheels .
Speed (average top speed)	124 miles per hour (mph)	110 mph	30-95 mph
Acceleration (on average)	0-60 mph in 8.4 seconds	0-60 mph in 6-7 seconds	0-60 mph in 4-6 seconds
Maintenance	-Wheels/tires -Engine - Fuel/gas - Bodywork/paint - Electrical - Lights -Dash/instrument warning lights	Same as ICE.	Does not require as much maintenance because it does not use a gasoline engine. No requirements to take it to the Department of Environmental Quality for an emissions inspection
Mileage	Can go over 300 miles before refueling. Typically get 19.8 miles per gallon (mpg).	Typically get 48 to 60 mpg.	Can only go about 100 to 200 miles before recharging
Cost (on average)	$14,000 to $17,000.	$19,000 to $25,000.	Extensive range, $6,000 to $100,000

The Electric Vehicle

Prof. A.S.Gujarathi

Emissions

Compared to gasoline powered vehicles, electric vehicles are considered to be ninety-seven percent cleaner, producing no tailpipe emissions that can place particulate matter into the air.

Global Warming: Ozone Layer

The process of carbon dioxide emitted into the atmosphere, also known as global warming, diminishes the Earth's ozone layer, which is what occurs at this time. A factor that makes electric vehicles clean is their ability to use half the number of parts a gasoline powered vehicle does, including gasoline and oil.

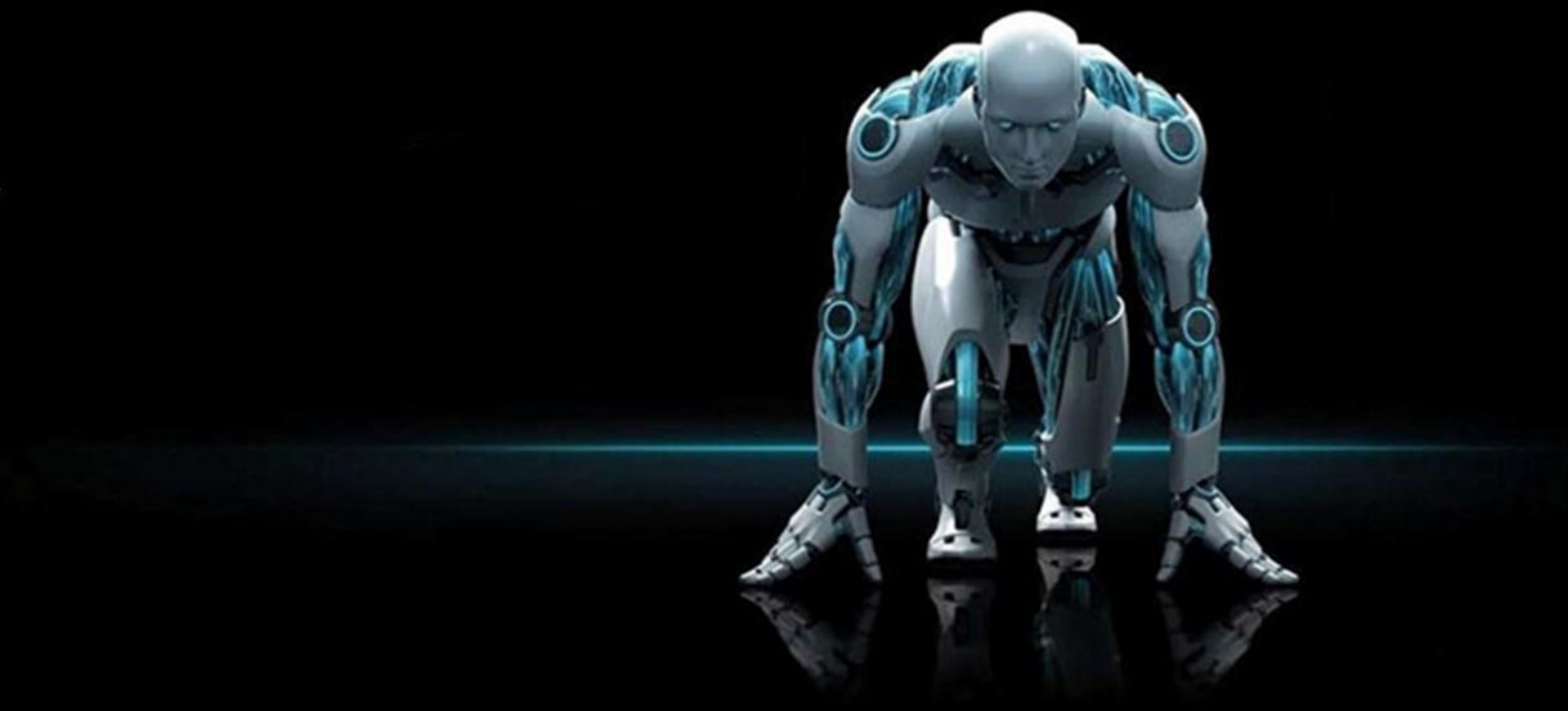
Affected People: Sickness

Particulate matter, carcinogens released into the atmosphere by gas-powered vehicles, "can increase asthma conditions, as well as irritate respiratory systems". The carbon dioxide released into the atmosphere by internal combustion vehicles reduces the ozone layer, which absorbs ninety-seven to ninety-nine percent of the sun's high frequency ultraviolet light. According to *Ozone Layer*, "Every one percent decrease in the earths ozone shield is projected to increase the amount of UV light exposure to the lower atmosphere by two percent". Ultraviolet light, produced by the sun, is extremely harmful to life on Earth. UV light damages the skin, causing skin cancer. It also hurts the eyes and the marine life.

Future of the EV

Future electric cars will most likely carry lithium-ion phosphate (LiFePO4) batteries that are now becoming popular in other countries. The LiFePO4 batteries are rechargeable and powerful and are being used in electric bikes and scooters. Electric cars will most likely adopt this technology in the future. Another technology that is likely for future electric cars is the increased use of supercapacitors and ultracapacitors for storing and delivering electrical charge. Many of these batteries are currently being used in conjunction with hybrid car prototypes, so these are expected in the electric car future markets as well.

Student Articles



The Solar Collector

Mr. Amol Harde, BE

Solar collectors transform solar radiation into heat energy and transfer that heat to a working medium. It collects, or captures, solar energy and uses that energy to heat water in the home for bathing, washing and heating, and can even be used to heat outdoor swimming pools and hot tubs. The solar collector collects the sun radiation and direct it on to absorber or receiver, where heat is absorbed and transferred to working fluid. The carrier fluid flows through an absorber (or heat-carrying pipe).

Flat-plate Collectors

A typical flat-plate collector is a non-concentrating and have the same area for intercepting and for absorbing solar radiation. It consists of an absorber, transparent cover sheets, and an insulated box. Usually a low iron glass is used as a transparent cover, as it transmits a great amount of the short-wave light spectrum.

Flat-plate collectors are the most widely used kind of collectors in the world for domestic water-heating systems and solar space heating/cooling. In flat-plate collectors there is no optical concentration of sunlight and they are generally stationary. They converts the radiant solar energy from the sun into heat energy using the well-known greenhouse effect. Their outlet temperature capability is below 100 °C. The salient features of a flat plate collector are

Flat-plate collectors are used typically for temperature requirements up to 75°C, although higher temperatures can be obtained from high-efficiency collectors.

These collectors are of two basic types based on the heat-transfer fluid:

Liquid type: where heat-transfer fluid may be water, mixture of water and antifreeze oil, and so on

Air type: where heat-transfer medium is air (used mainly for drying and space heating requirements)

Components of FPC

Glazing: one or more covers of transparent material like glass, plastics, and so on. Glazing may be left out for some low-temperature applications.

Absorber: a plate with tubes or passages attached to it for the passage of a working fluid. The materials used for absorber plates may include copper, aluminum, stainless steel, galvanized steel, plastics, and rubbers, with tubes or the flow passage either integral or attached. The absorber plate is usually painted flat black or electroplated with a selective absorber. It absorbs the incident solar radiation and transfers to working fluid.

Headers (or manifolds): to facilitate the flow of heat-transfer fluid.

Insulation: These are some materials such as fiberglass and they are placed at the back and sides of the collector to reduce heat losses. The insulated box reduces heat loss from the back or the sides of the collector. *Container*: box or casing.

The Solar Collector

Mr. Amol Harde, BE

Cover Plate. It reduces convective and radiative heat losses from the absorber, one or two transparent covers are generally placed above the absorber plate. They usually be made from glass or plastic. Glass will allow short wave radiation to pass through it but prevents long wave radiation heat escaping.

Enclosure. A box that the collector is enclosed in holds the components together, protect them from weather, facilitates installation of the collector on a roof or appropriate frame.

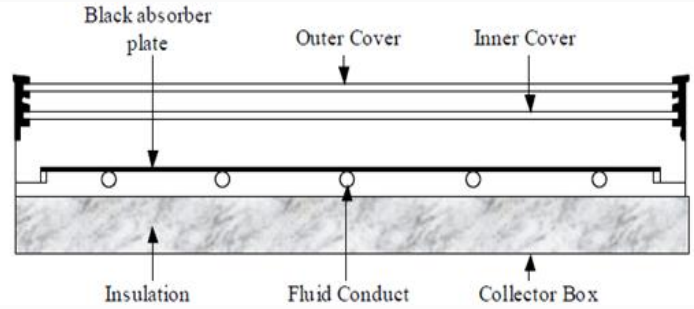


Fig.1. Components of a FPC

Fig.2. Solar water heater using FPC

How Flat plate collector Works

In active systems, the pumps circulate the heat transfer fluid through the collectors. The water is heated and then flows into the home. They are popular in climates prone to freezing temperature.

In Passive solar water heating systems, Water flows through the system when warm water rises as cooler water sinks. The collector must be installed below the storage tank so that warm water will rise into the tank. They are typically less expensive than active systems, but they're usually not as efficient. However, passive systems can be more reliable and may last longer.

Evacuated-tube solar collectors

Evacuated (or Vacuum) Tubes are solar panel built to heat fluid effectively. **The air is evacuated from the space between the two glass tubes to form a vacuum,** reduce convective and heat conduction losses (vacuum is a heat insulator). Different construction types are available:

The Solar Collector

Mr. Amol Harde, BE

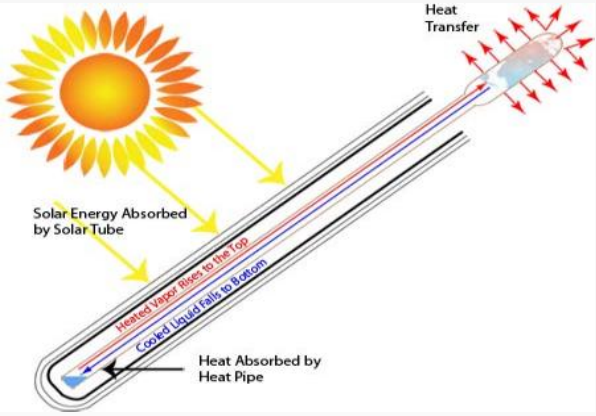


Fig.3. Evacuated Tube construction

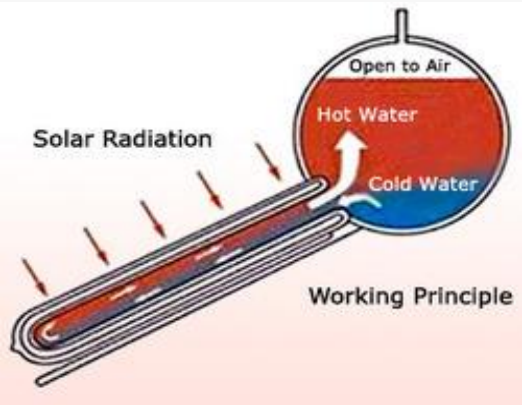


Fig.4. Working of ETC tube

- Heat pipes or direct flow
- All glass tubes
- With or without concentrator

Glass evacuated tubes are the key component of the Evacuated Tube Heat Pipe solar collectors. Each evacuated tube consists of two glass tubes. The outer tube is made of extremely strong transparent borosilicate glass that is able to resist impact from hail up to 25mm in diameter. The inner tube is also made of borosilicate glass, but coated with a special selective coating, which features excellent solar heat absorption and minimal heat reflection properties.

Several single tubes, serially interconnected, or tubes connected to each other via manifold, make up the solar collector. A heat pipe collector incorporates a special fluid which begins to vaporize even at low temperatures.

Working of ETC tubes

The water on upper side of Vacuum Tube becomes hot and thus lighter, so it starts moving upwards in the tank. At the same time cold water, which is heavy, comes downward from the tank and is stored at the bottom. The phenomenon is called as natural Thermo-syphon circulation, which occurs in every tube.

Advantages of ETC System

- Solar Water Heaters have several advantages over conventional water heating systems
- It reduces electricity bills by 40% of an average.
- It saves interior space:
- Quick payback
- Protect the environment

The Solar Collector

Mr. Amol Harde, BE

CONCENTRATING TYPE SOLAR COLLECTORS

The concentrating solar collectors are normally sun-tracking systems with concave reflecting surface directs concentrated solar radiation on the smaller area (receiver) located at the focus thus increasing energy flux. The working fluid in the receiver absorbs sensible and latent heat.

Concentrating solar collectors have a concentration ratio (*C*), that can vary from unity to high values of the order of 10 000. With increase in concentration ratio, the temperature of heat delivery is increased. However, with high temperature at the receiver, the radiation heat loss becomes dominating along with convection heat losses. Further, with higher concentration ratio, they can use only direct component of solar radiation since most types cannot concentrate the diffuse component.

PARABOLIC TROUGH COLLECTORS

Further, parabolic concentrating systems, direct concentrated sun energy at the line focus, thus make them suitable for steam generation for thermal applications and power generation. Parabolic troughs are devices that are shaped like the letter “u”. The troughs concentrate sunlight onto a receiver tube or heat pipe that is positioned along the focal line of the trough. A parabolic dish or solar furnace is a large reflector that concentrates thermal energy into a single focal point. Sometimes a transparent glass tube envelops the receiver tube to reduce heat loss.

A fluid acts as a thermal sink as it passes through receiver tubes along the focal point. Parabolic troughs are used to generate electricity but are susceptible to seasonal changes

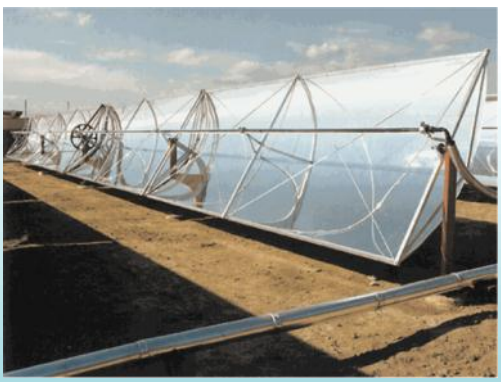


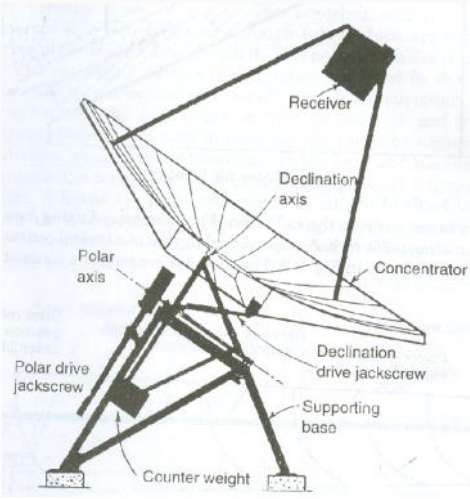
Fig.5 Parabolic tough collector

The Solar Collector

Mr. Amol Harde, BE

PARABOLID DISH

Point focus concentrating solar system reflects concentrated heat flux at a single point using single or multiple reflectors. It attains higher stagnation temperature at the receiver, thus they offer faster cooking speed competing with conventional cooking appliances and are gaining popularity due to their capability to deliver many operations like frying, roasting, stewing steaming and baking along with boiling.



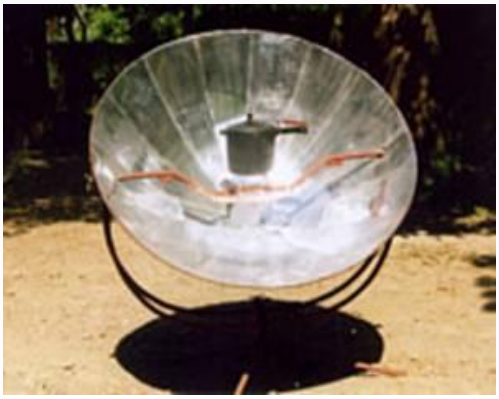


Fig.6. Parabolid Collectors

This geometry may be used in solar furnaces and solar power plants. There are two key phenomena to understand in order to comprehend the design of a parabolic dish.

One is that the shape of a parabola is defined such that incoming rays which are parallel to the dish's axis will be reflected toward the focal point. The second key is that the light rays from the sun arriving at the Earth's surface are almost completely parallel. So if dish can be aligned with its axis pointing at the sun, almost all of the incoming radiation will be reflected towards the focal point of the dish. There may be losses due to imperfections in the parabolic shape and imperfect reflection. Further, since receiver attains relatively higher temperature, thus the radiation heat losses from the receiver surface is dominating along with convection heat losses.

The Solar Collector

Mr. Amol Harde, BE

3. POWER TOWER

A power tower is a large tower surrounded by small rotating (tracking) mirrors called heliostats. These mirrors align themselves and focus sunlight on the receiver to concentrate it located at the top of tower. The collected heat is transferred to a power station. Focal point contains salt that when molten generates electricity in a steam generator for large scale energy production Capable of producing electricity over a 24 hour cycle due to salt's ability to retain heat

Fig.7. Solar Power Tower

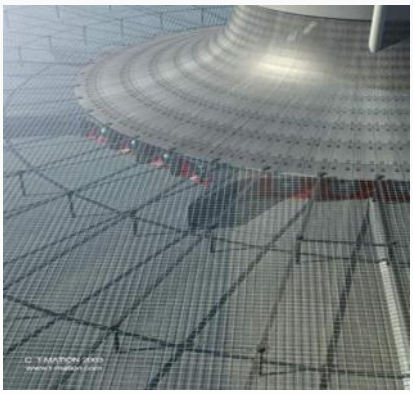


Fig.8. Solar Chimney

Solar Chimney

Ambient air collected within the chimney rises as it is heated though solar radiation and drives the turbine and that generates electricity.

Base captures heat through absorption of a black surface and trapped by a greenhouse interface

Very inexpensive solar collector technology

The Solar Collector

Mr. Amol Harde, BE

Advantages of concentrating collectors

Very high temperatures reached. High temperatures are suitable for electricity generation using conventional methods like steam turbine or some direct high temperature chemical reaction

Good efficiency. By concentrating sunlight current systems can get better efficiency than simple solar cells.

A larger area can be covered by using relatively inexpensive mirrors.

Concentrated light can be redirected to a suitable location via optical fiber cable. For example illuminating buildings.

Heat storage for power production during cloudy and overnight conditions can be accomplished, often by underground tank storage of heated fluids. Molten salts have been used to good effect.

Disadvantages of concentrating collectors

Concentrating systems require sun tracking to maintain Sunlight focus at the collector.

Inability to provide power in diffused light conditions. Solar Cells are able to provide some output even if the sky becomes a little bit cloudy, but power output from concentrating systems drop drastically in cloudy conditions as diffused light cannot be concentrated passively

Role of Technology in Agricultural

Mr. Sagar Thakare, BE

Agriculture remains to be a great player in the generation of revenue and a source of food for many people all over the world. Over the past years, this sector has seen a lot of changes and advancement in the different farming approaches and techniques. For example, nowadays, there is the use of inorganic fertilizer, the consumption of reduced amounts of pesticides, the use of different tractors and machinery. The availability of such inputs has seen the need for the use of natural resources and process with aim of improving agricultural output and reducing costs. The use of modern technology in agriculture comes with a lot of benefits. Read this article to get a glimpse of what the importance of the adoption of modern technology in agriculture.

Technology adoption in Agriculture

Technology in agriculture can be used in different aspects of agriculture such as the application of herbicide, pesticide, fertilizer, and improved seed. Over the years, technology has proved to be extremely useful in the agricultural sector. Presently, farmers are able to grow crops in areas where they were thought could not grow, but this is only possible through agricultural biotechnology. For example, genetic engineering has made it possible to introduce certain trains into other genes of crops or animals. Such engineering boosts the resistance of the crops to pests and droughts. Through technology, farmers are in a position to electrify every process for efficiency and improved production.

There has been a limitation on how to speed the process of modern technological adoption in agriculture. This can be attributed to the fact that speeding up this concept involves a lot of knowledge and the understanding of some of the elements that influence the decision of farmers to adopt modern technology in farming. Institutional, social and economic are some of the factors that influence how fast or slow agricultural technologies are adopted. The land size, cost and benefits of technology, are some of the economic factors that determine the rate of agricultural technology adoption. Farmers' education level, age, social groupings, and gender are some of the social factors that influence the probability of a farmer to adopt modern agricultural technologies.

Small scale farmers face both internal and external challenges as far as the adoption of modern agricultural technologies is concerned. This aspect accounts for the slow rate at which such technologies are adopted. Regardless of the challenges, what matters is whether modern technology has any value in the agricultural sector. The following section highlights the significance of modern technology in agriculture.

Role of Technology in Agricultural

Mr. Sagar Thakare, BE

Use of Technology in Agriculture

There are various uses of technology in agriculture including the following.

Farm machines

One of the challenges that farmers face nowadays is the need to satisfy labor. There is an increasing cost of labor, which calls for better approaches to ensure less cost on labor. The introduction of combined harvesters and planters simplifies the process. Production and time are some of the important elements in agriculture. It is important, therefore, to plant early, harvest in time, as well as ensure that the yield is stored within the right time. The use of modern technology in agriculture ensures that farmers grow vast food within the shortest time possible.

GPS technology has been used in the development of autopilot sprayers and tractors that do not require any driver. Such technology is important in agriculture in that it promotes better and more efficient farming practices. For example, the autopilot tractors and sprayers are equipped with tracking systems that eliminates human error and in the end save on fuel and equipment.

Crop sensors

Role of Technology in Agricultural

Mr. Sagar Thakare, BE

Effective application of fertilizers and pesticides remains to be a big challenge in agriculture especially when it comes to the determination of what fertilizer works best for different plans, when to apply, as well as what quantities. The use of crop sensors can make it easy for farmers to effectively apply fertilizers and pesticides just as much as the crops need. Variable rate technology becomes useful in such cases. Such technology gives you the opportunity to sense how your plants are feeling and subsequently help you reduce the probability of leaching or surface runoff. Crops sensors are designed in a manner that they dictate to the application machinery the amount of the resource that a given crop needs, and at what time.

Use of GPS in fields documentation

GPS is becoming a common technology in agriculture. For example, modern agriculture involves the use of GPS to document the status of the farmland. Through the GPS, it is easy to determine and document the yields from a given farm, as well as record the application rates. Such technologies are useful in that the farmers can rely on the collected and recorded data for reference when making any decisions. The recommendable documentation technology is the yield map, which can be used to offer a summary of entire year's activities. Such maps are highly useful as they can give a wide range of information about just anything such as the status of the drainage system in your field.

Role of Technology in Agricultural

Mr. Sagar Thakare, BE

Biotechnology

Biotechnology is also referred to as genetic engineering and the process of improving the genes of a given crop. In most cases, genetic engineering is carried out to increase the resistance of certain crops to farm inputs such the application of herbicides. Through biotechnology, farmers can plant on areas that were otherwise considered dry or deserts. A reduced farm input implies that the farmer as well saves on the cost of farm resources.

Modern agricultural technology hopes to achieve among others, two important goals – profitable economy and better output. It is therefore, important to be careful with the goals and objectives that you set aiming upon the implementation of different technologies in agriculture. Some of the aspects that you should look at include how to apply and organize fertilizer, irrigation, theatre, intensive tillage, monoculture, and the application of other resources. However, in order to achieve these goals, farmers need to understand the concept of modern farming and the use of technology.

IC Engine with 2-stroke/4-stroke

Mr. Amit Athavale, BE

The engine with proposed improvements is capable of doubling the engine output power and of holding it up for a certain period (time depends on a type of the engine) without overheating. This feature allows increasing the vehicle power-to-weight ratio when it is necessary in accordance with the changing vehicle operation and road conditions.

Eligible areas of activity for the proposed innovations are: (1) combat tank diesel engines, (2) combat vehicle and heavy army truck diesel engines, (3) heavy truck diesel engines, (4) special purpose vehicles diesel engines (emergency vehicles, fire trucks and others), and (5) engines in electrical generator sets.

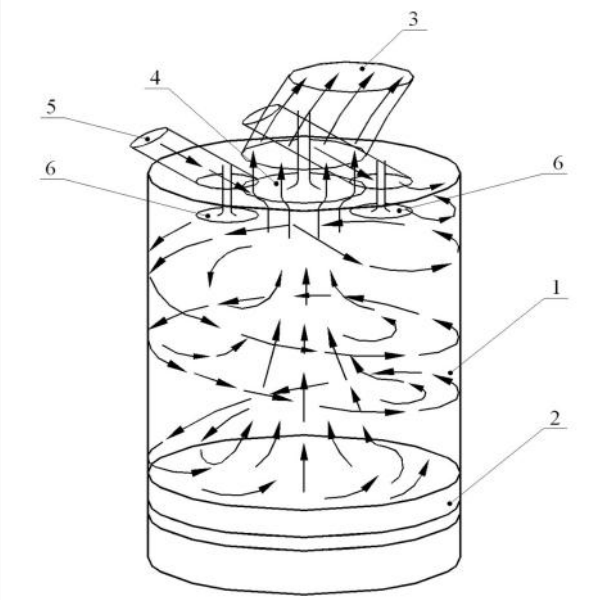
The essence of the innovation is to improve gas exchange during the two-stroke mode of engine operation. Four-stroke gas exchange is performed like in ordinary four-stroke diesel engine. Two-stroke gas exchange is performed through the inlet and exhaust valve unlike scavenging ports in conventional two-stroke diesel engine.

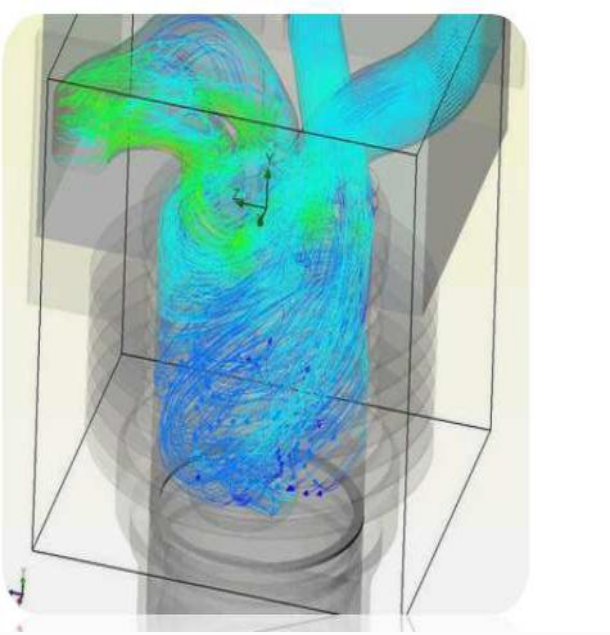
The schematic gas exchange is shown in 0. 2+4 Stroke Gas Exchange.jpg. Inlet valves 6 are located on periphery of the cylinder head; exhaust valve 4 is along the cylinder axle or with a small offset. The fresh air, preliminary compressed in the engine turbocharger and additionally compressed and cooled in the supercharger with inter-cooler, is supplied into the working cylinder 1 through tangential inlet passages 5 placed at a certain angle to the cylinder head surface. Then the fresh air starts swirling as a dense bed along cylinder walls and displacing to its center and wrings exhaust gases from the cylinder walls to its axle. When the fresh air stream reaches the bottom of piston 2 it turns and expels exhaust gases, concentrated along the cylinder axle, through exhaust valve 4 into the exhaust passage 3.

To lower residual gases ratio and to cool hot surfaces, cylinder scavenging, accompanied by the discharge of some amount of fresh air charge into the exhaust system, is performed. Phases of gas exchange are typical of two-stroke conventional IC engines. Supercharger of any appropriate type with inter-cooler is complemented to conventional IC engine, the arrangement of both the inlet valves and exhaust valve on the cylinder head as well as the valve-operating system are changed in order to provide a four-stroke and a two-stroke engine mode of operation. The fuel pump is selected and adjusted to provide fuel supply in correspondence with the number of working strokes. Unlike the conventional two-stroke IC engine (especially two-stroke Diesel engine), there are no scavenging ports in the proposed design and no losses of burnt oil through them. It provides the same harmful emission as the emission in conventional diesel engines.

Role of Technology in Agricultural

Mr. Amit Athavale, BE





1. Working cylinder 2. Piston 3. Exhaust Passage 4. Exhaust Valve 5. Inlet Passages 6. Inlet Valve

Fields of implementation of the innovation in details

Combat tanks

Average characteristics of modern combat tanks: a vehicle with the weight ~60 tons; max speed 72 km/h; and acceleration 0-36 km/h for 6 sec. These travel parameters are provided by 1,500 hp power plant, which is either a diesel engine or a gas turbine. The inconsistency of a tank power plant is that the maximum power is required only for a short time of a combat tank life span – mainly during a combat or occasionally in other cases, while usually tank uses only 700-800 hp for a plain moving its weight at a constant speed and favorable moving conditions. The proposed innovation provides:

- The use of a suitable 1,000-1,500 hp diesel engine produced by any diesel engine manufacturers as a prototype for the power plant of a prospective combat tank. The engine prototype with proposed improvements produces 2,000-3,000 hp for a short time and doubles its power-to-weight ratio during a combat operation;
- The avoidance of designing the entirely new two-stroke diesel engine from scratch;
- Design a combat tank with the highest power-to-weight ratio and dominant manoeuvrability;
- The possibility of installing an additional fuel tanks inboard to increase the vehicle range without refueling

Role of Technology in Agricultural

Mr. Amit Athavale, BE

Combat vehicles and army heavy trucks

Main US Army combat vehicles IFV M2 A1 and A2 “Bradley” are equipped with Cummins diesel engines VTA903-T500 with power 500 hp and VTA903-T600 with power 600 hp respectively. The implementation of the proposed improvements in these diesel engines increases M2A1 and M2A2 manoeuvrability at the expense of doubling power-to-weight ratio. Moreover, the new Cummins VTTA903-T750 and T800 also can be “boosted” by the proposed innovation.

Trucks

It is possible to use the proposed improvements for civilian truck diesel engines. There is large market for the trucks with the “boosted” diesel engines like in Latin America, China, India and Southeast Asia (except Japan) countries. The truck with “boosted” diesel engine gains the ability to reach the given speed 1.7 times faster than with the conventional one. This feature is mostly useful when the truck outstrips the up-front vehicle on a counter traffic lane as well as overcomes the rise without switching the gear and slowing down vehicle speed.

The technology background includes:

1. Patents applications (both PPA and FPA) ready for submission
2. System to compute main characteristics of a targeted engine after its modification
3. Different Solid Works models of designs, Solid Works COSMOSFIoWorks results, etc.

TATA MOTORS
Connecting Aspirations

Tata Motors Group (Tata Motors) is a $44 billion organisation. It is a leading global automobile manufacturing company. Its diverse portfolio includes an extensive range of cars, sports utility vehicles, trucks, buses and defence vehicles. Tata Motors is one of India's largest OEMs offering an extensive range of integrated, smart and e-mobility solutions

Part of the USD110 billion Tata group founded by Jamsetji Tata in 1868, Tata Motors is among the world's leading manufacturers of automobiles. We believe in 'Connecting aspirations', by offering innovative mobility solutions that are in line with customers' aspirations. We are India's largest automobile manufacturer, and we continue to take the lead in shaping the Indian commercial vehicle landscape, with the introduction of leading-edge powertrains and electric solutions packaged for power performances and user comfort at the lowest life-cycle costs. Our new passenger cars and utility vehicles are based on Impact Design and offer a superior blend of performance, driveability and connectivity.

Our focus on connecting aspirations and our pipeline of tech-enabled products keeps us at the forefront of the market. We have identified six key mobility drivers that will lead us into the future – modular architecture, complexity reduction in manufacturing, connected & autonomous vehicles, clean drivelines, shared mobility, and low total cost of ownership. Our sub-brand TAMO is an incubating centre of innovation that will spark new mobility solutions through new technologies, business models and partnerships.

Our mission - across our globally dispersed organisation – is to be passionate in anticipating and providing the best vehicles and experiences that excite our global customers

TATA Motors Plant

PRODUCTS

Design

Inspired by your dreams, we design our cars to translate them into reality. From sporty looks to sleek lines to bold accents, we passionately create machines that are futuristic, stylish and a sight to behold right from the first look.

Connectivity

Our infotainment solutions are engineered to ensure the best in entertainment experience. With our up-to-the-minute technology in connectivity, we drive experiences that stay with you forever.

Safety

We focus on safety first and forever. Our commitment to ensure a safe drive is backed by superior features inside and outside our cars that provide an unshakeable experience. At Tata Motors, we are driving safety at an unprecedented speed.

GRAND INAUGURATION

OF

ATV
IRONHIDE 3.0
Team Crew

EFFICYCLE
ULTRON 2.0
Team Avengers

GO KART
WARHAMMER 2.0
Team Spartans

On

Date: 18 Jan 2020, Saturday at 09.30 AM

By Auspecious Hands of

Hon. Shri. Bebilalji Sancheti
Chairman, SNJB Prabandh Samiti

Mr. Dineshkumarji Lodha
Coordinator
SNJB CoE

Mr. Zumbarlalji Bhandari
Coordinator
SNJB CoE

Mr. Sunilkumarji Chopda
Coordinator
SNJB CoE

Mr. Rushabh Baldota
International Author
Cleared ACP CAPF UPSC 2018

Mrs. Nivedita Pagar Dharrao
WEAA India Award
2020 Winner


THE CREW
IRONHIDE 3.0

ACHIEVEMENTS

Felicitation of Mr Sagar Thakare, (BE Mech) for his achievement in State level Avishkar-19 project competition by Hon.Nitin Karmalkar (VC, SPPU) on SPPU foundation day in Pune.

ACHIEVEMENTS

StartUp & Innovation Cell Team.

Congratulations to
Amol Harde (BE Mech)
Amol Gaikwad (BE Mech)

Secured 1st Rank with Prize Money 50,000/-at I-2-E Cluster Level Competition 2019-20 conducted by Centre of Innovation, Incubation & Enterprise, SPPU

ACHIEVEMENTS

SNJB'S LATE SAU. KANTABAI BHAVARLALJI JAIN
College of Engineering
Website :- http://www.snjb.org/engineering/
ESTD 1928
SNJB

SMART MAIZE PLANTER

Avishkar 2019-20
14th Maharashtra State Inter-University Research Convention
Hosted by University of Mumbai

Department of Mechanical Engineering

1ST PLACE

First Place among 20 Universities

Winner

STATE LEVEL AVISHKAR 2019-20
AT UNIVERSITY OF MUMBAI

ACHIEVEMENTS

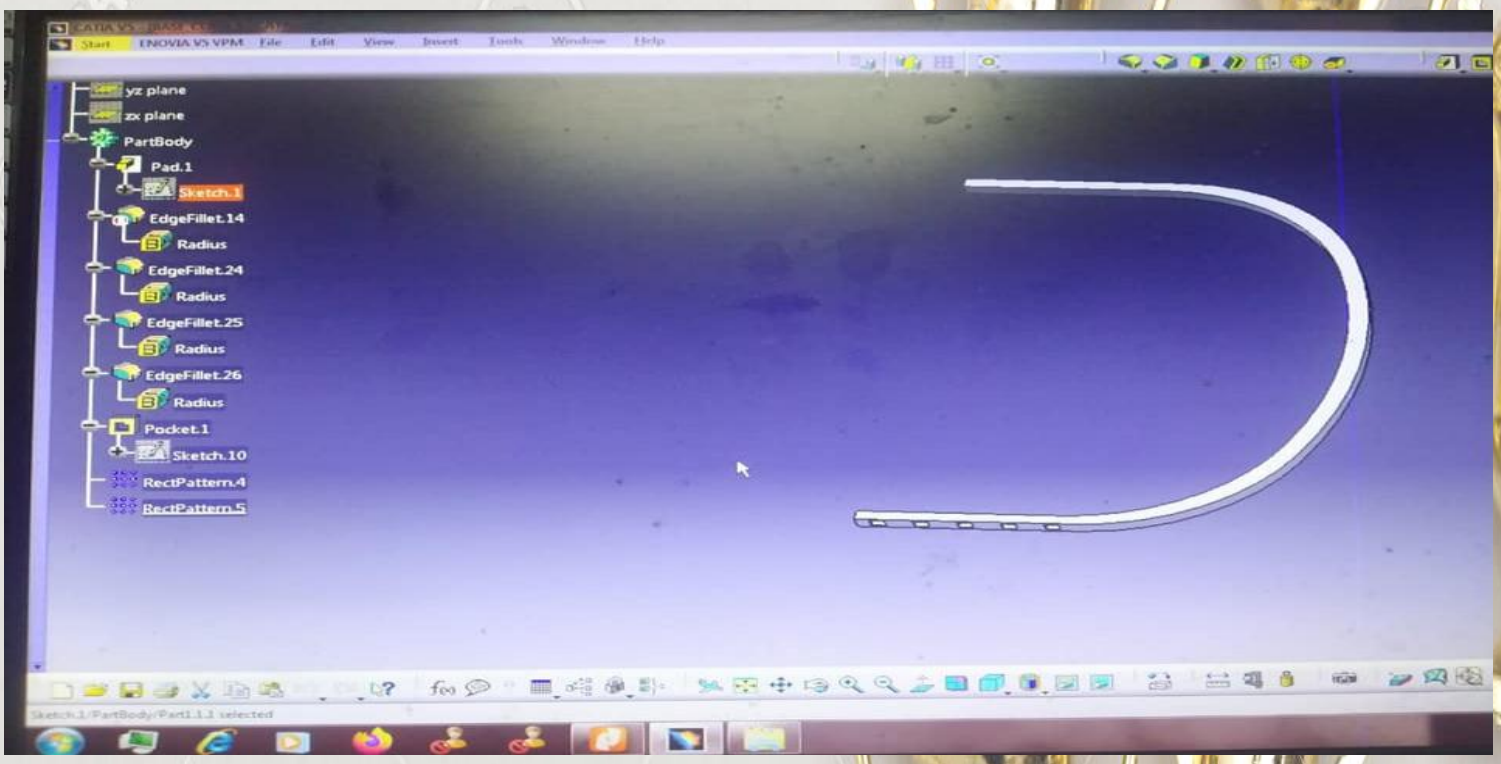
Team The Spartans won 3 Awards at 'Auto india Racing Championship -4' 2019-20 held at Pune

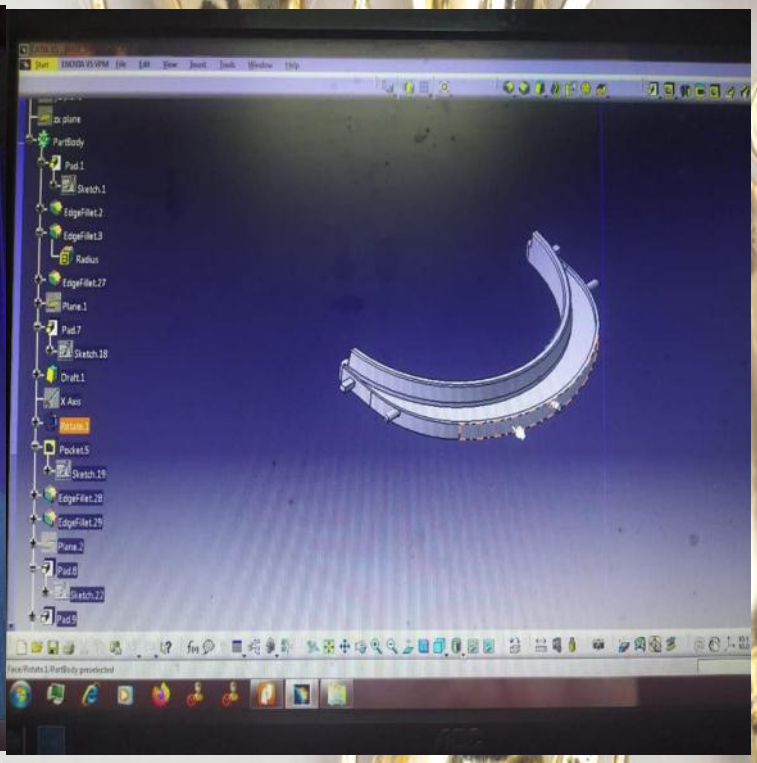
ACHIEVEMENTS

The team of ‘Agro Abhiyanta's’ won the second prize in the competition held at AICTE Head-quarters in Delhi.

The award consists of a souvenir certificate and Rs. 31000 / -Team was felicitated by Re-spected Rameshji Pokhariyal Hon'ble Minister, Ministry of Human Resource Development, Government of India) and other dignitaries.

ACHIEVEMENTS





Mr. Amit Athawale (BE Mech). created Face Mask Design to manufacture with 3D printer.

ACHIEVEMENTS

In "NASHIK OPEN KICKBOXING CHAMPION-SHIP 2020" 2 February, Sunday at Minatai Thakre stadium, Nashik.

Roshan Gavali

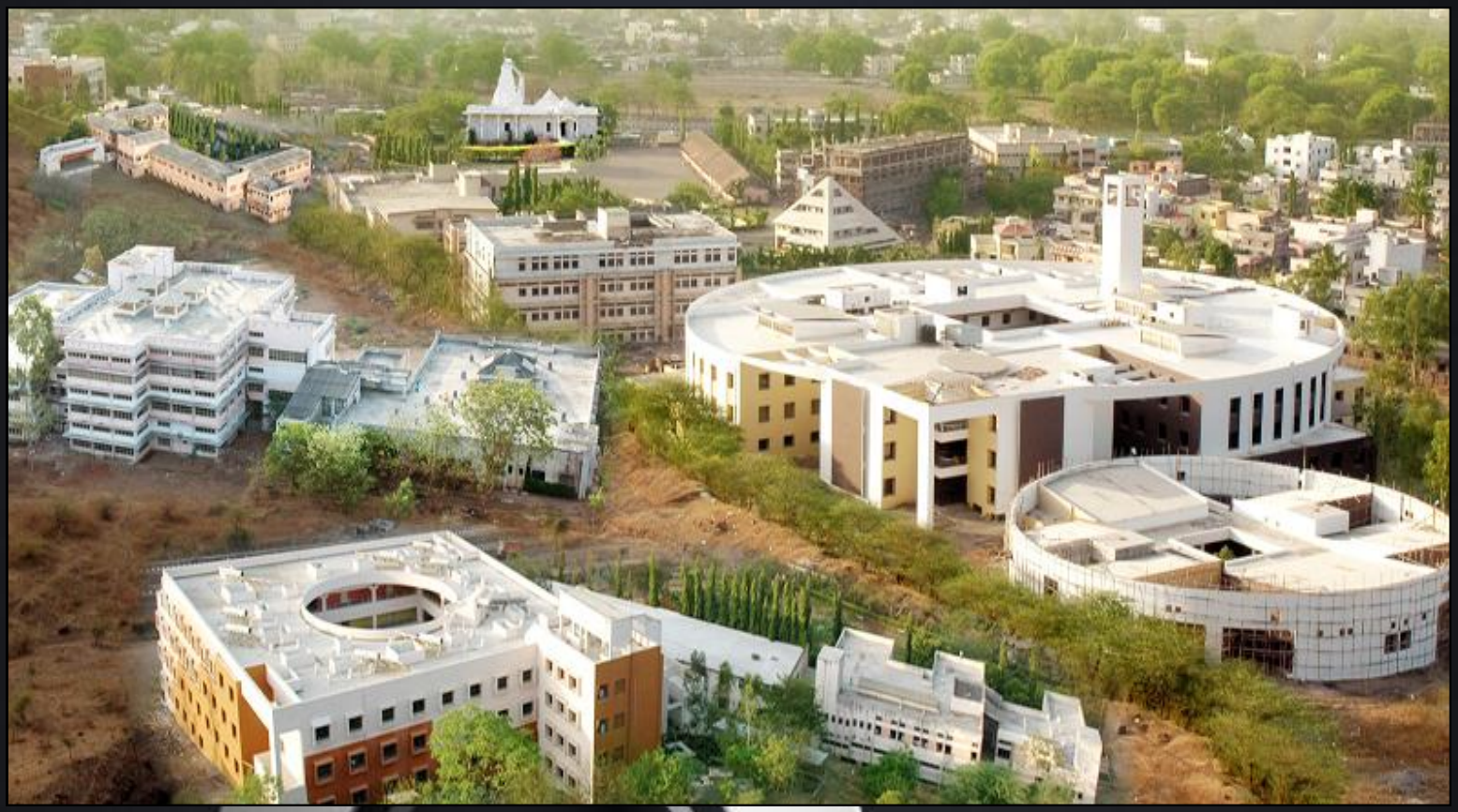
BE Mech Gold Medal

And He is selected for the "WAKO INDIA SOUTH-WEST ZONE KICKBOXING CHAMPI-ONSHIP 2020" (NATIONALS) on 7-9 February at Shirdi Ahemadnagar.

Team Coach: *Rushikesh Kasliwal* BE Mech

COVID-19 Awareness

SNJB's Late Sau K.B Jain College of Engineering



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Email: hodmechcoe@snjb.org