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COLLEGE OF ENGINEERING

NEMINAGAR, CHANDWAD, DIST- NASHIK

NAAC ACCREDITED WITH "A" GRADE

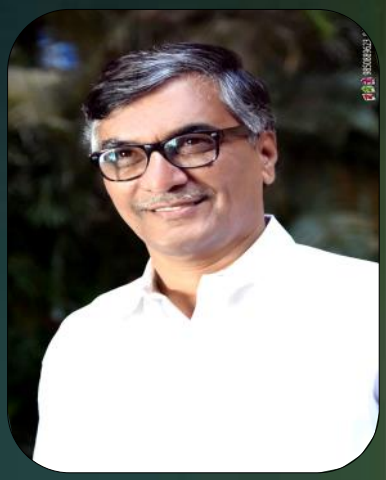
Founder

Poojya kakaji

Department of Mechanical Engineering

Yantra Veda

Year 2022-23



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.2022-23), 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 seventh issue. The magazinesignifies 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 7th edition.

Wishing everyone loads of success and bright future.

Dr.Prof.R.G.Tated

Message from Head of Department

I am pleased to know that our students are successful in bringing their seventh issue of magazine 'YANTRAVEDA' for this academic year 2022-23. 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 literary 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.Prof.S.D.Sancheti

VISION & MISSION STATEMENT

Vision:

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

Mission:

1. **To provide quality education among the students through the curriculum and industrial exposure**
2. **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

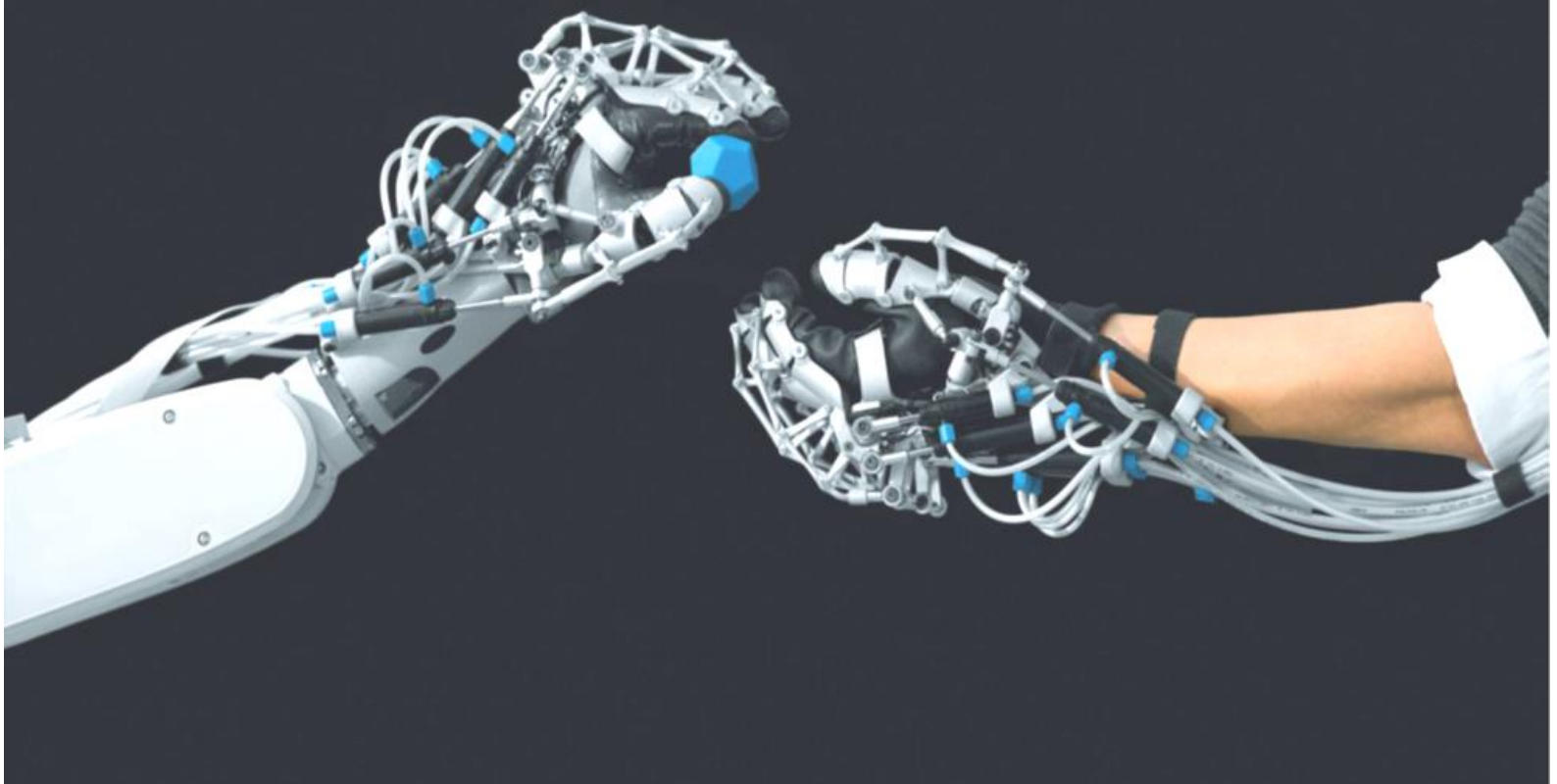
1. **Graduates will possess essential professional Mechanical Engineering skills to develop solutions for industrial and societal problems.**
2. **Graduates will engage and succeed in their professional careers through teamwork, professional ethics and effective communication.**
3. **Graduates will engage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

Program Specific Outcomes (PSOs):

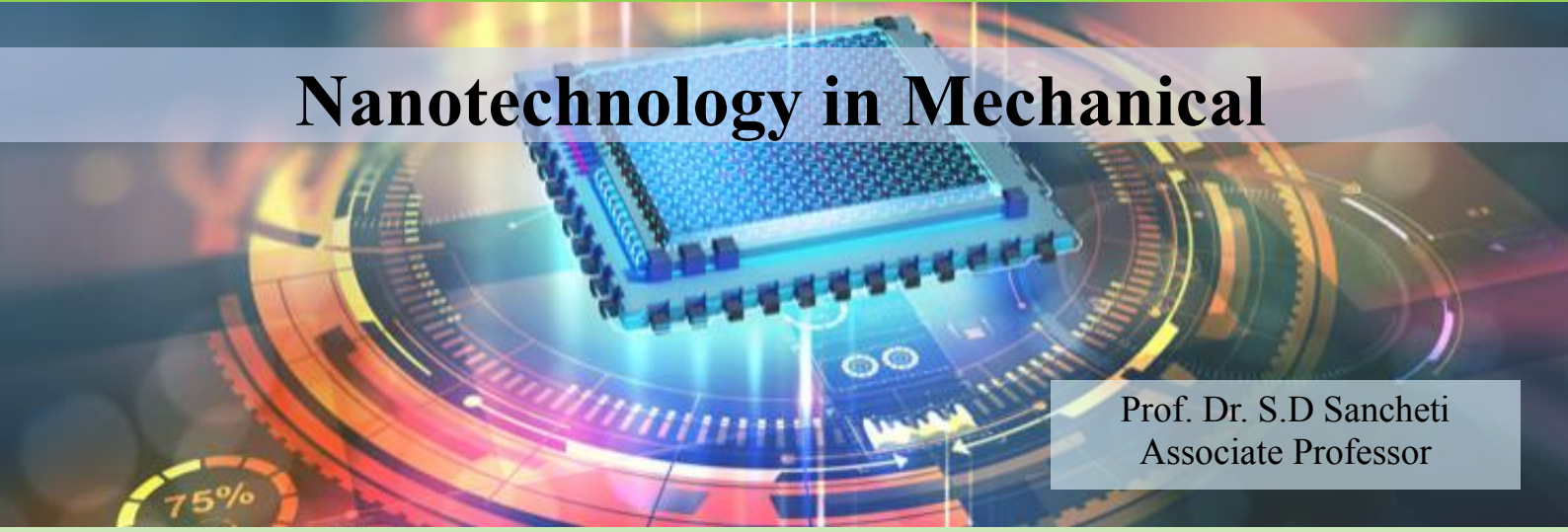
After graduation, Mechanical Engineering graduates will be able to

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



Nanotechnology in Mechanical



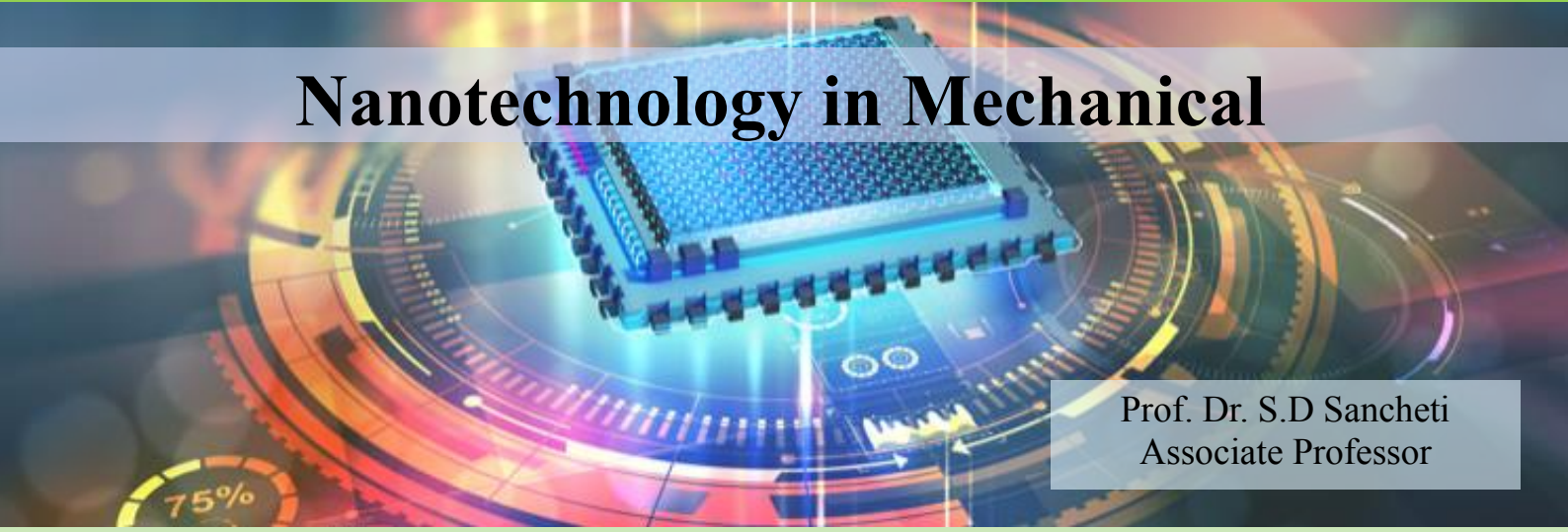
Prof. Dr. S.D Sancheti
Associate Professor

NANOTECHNOLOGY: A SMALL SOLUTION TO BIG PROBLEMS

Invisible particles that fight cancer cells, faster microprocessors that consume less energy, batteries that last 10 times longer or solar panels that yield twice as much energy. These are just some of the many applications of nanotechnology, a discipline with all the ingredients to turn into the next industrial revolution. Nanotechnology and its microscopic universe offer gigantic possibilities for contemporary science and industry. This field, which flourished between the 60s and 80s, has surged in the last two decades with a booming global market whose value will exceed 125,000 million dollars in the next five years according to the Global Nanotechnology Market (by Component and Applications) report by **Research & Markets which presents forecasts for 2024**.

Nanotechnology in mechanical engineering and production is extremely beneficial to the industry. Nanotechnology can be utilized to extend the life of car components and parts. Nanotechnology has the potential to improve a wide range of materials. Nanomaterial's have distinct physical and chemical features that improve manmade materials. There are improvements in magnetic characteristics, mechanical activity, and optical properties. Improvements are being made to improve the properties of the materials and to develop alternative precursors that can give the materials suitable features. Nanotechnology entails the ability to observe and control individual atoms and molecules; atoms make up everything on Earth.

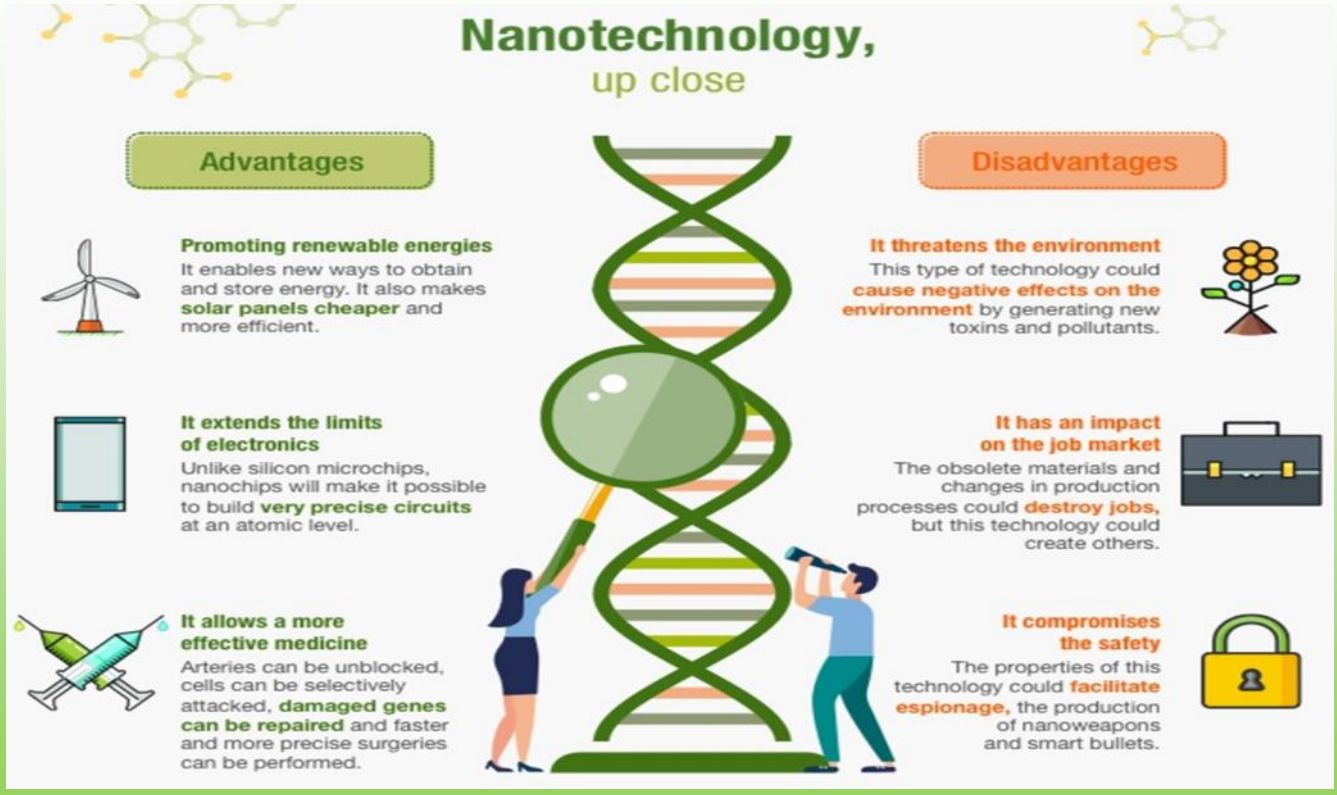
Nanotechnology in Mechanical



Prof. Dr. S.D Sancheti
Associate Professor

NANOTECHNOLGY IN THE FUTURE

There are bright and dark spots in the future of nanotechnology. On the one hand, the sector is expected to grow globally, driven by technological advances, increased government support, increased private investment and growing demand for smaller devices, to name a few. However, the environmental, health and safety risks of nanotechnology and concerns related to its commercialization could hamper market expansion. The United States, Brazil and Germany will lead the nanotechnology industry in 2024, with an important presence in the Top 15 Asian countries such as Japan, China, South Korea, India, Taiwan and Malaysia. The cosmetics sector will climb positions stealing third place from the biomedical sector in a ranking that will be led by electronics and energy, as it is now.



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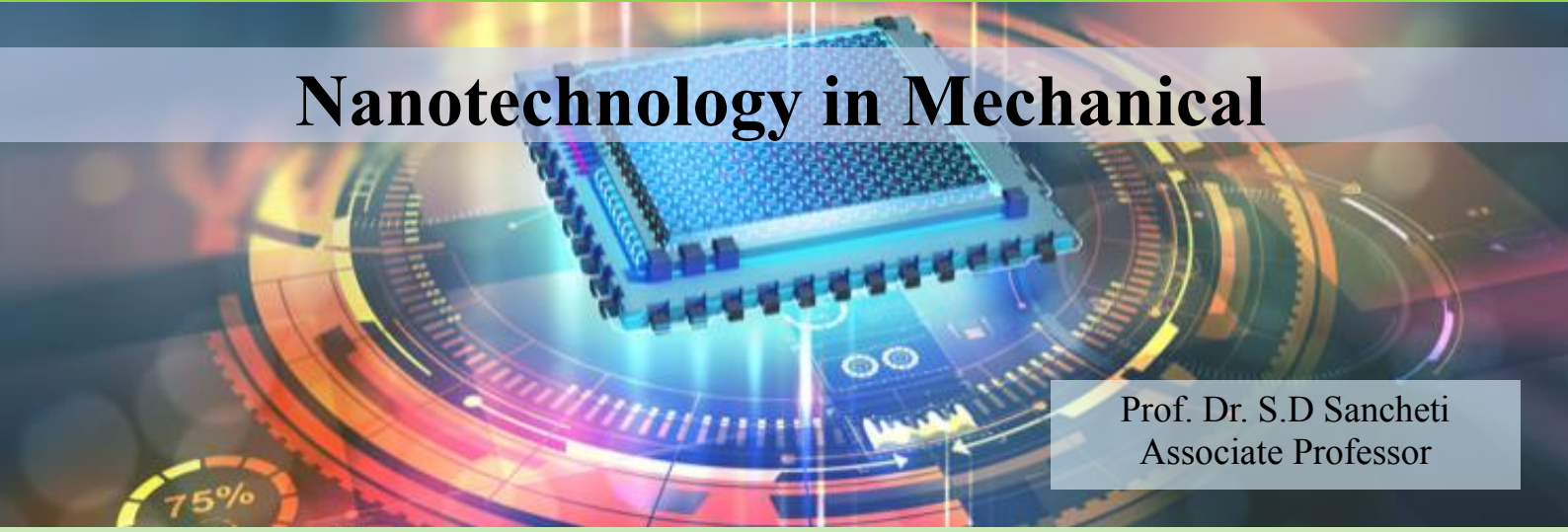


Prof. Dr. S.D Sancheti
Associate Professor

WHAT IS NANOTECHNOLOGY?

This technological branch manipulates the molecular structure of materials to change their intrinsic properties and obtain others with revolutionary applications. This is the case of grapheme — modified carbon harder than steel, lighter than aluminum and almost transparent — or nanoparticles used in areas such as electronics, energy, biomedicine or defense.

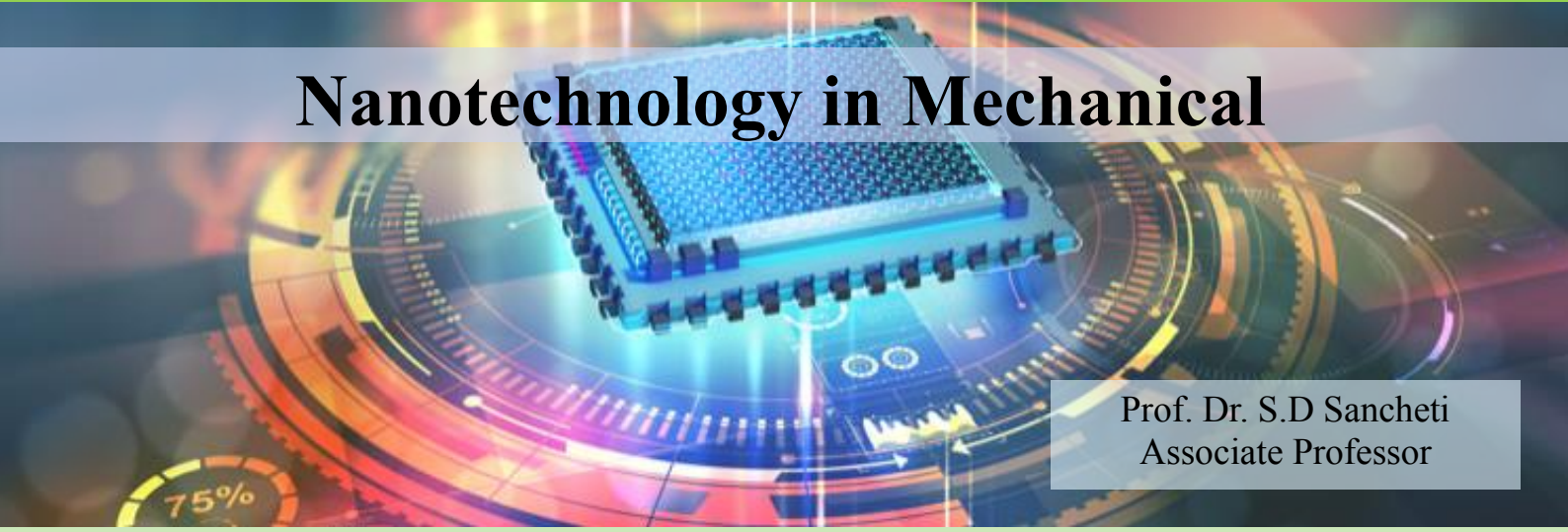
In 1959 the American Nobel prize and physicist Richard Feynman was the first to speak about the applications of nanotechnology at the California Institute of Technology (Caltech). With the 21st century, this area consolidated, was marketed and came into its own. It includes other areas such as micro-manufacturing, organic chemistry and molecular biology. In the United States alone, for example, more than 18 billion dollars were invested between 2001 and 2013 through the NNI (National Nanotechnology Initiative) to turn this sector into a driver of economic growth and competitiveness.

TYPES OF NANOTECHNOLOGY

The different types of nanotechnology are classified according to how they proceed (top-down or bottom-up) and the medium in which they work (dry or wet):

- Descending (top-down)
- Ascending (bottom-up)
- Dry nanotechnology
- Wet nanotechnology

Nanotechnology in Mechanical



Prof. Dr. S.D Sancheti
Associate Professor

EXAMPLES AND APPLICATIONS OF NANOTECHNOLGY

Nanotechnology and nanomaterial's can be applied in all kinds of industrial sectors. They are usually found in these areas:

Electronics

Carbon nanotubes are close to replacing silicon as a material for making smaller, faster and more efficient microchips and devices, as well as lighter, more conductive and stronger quantum nanowires. Grapheme's properties make it an ideal candidate for the development of flexible touchscreens.

Energy

A new semiconductor developed by Kyoto University makes it possible to manufacture solar panels that double the amount of sunlight converted into electricity.

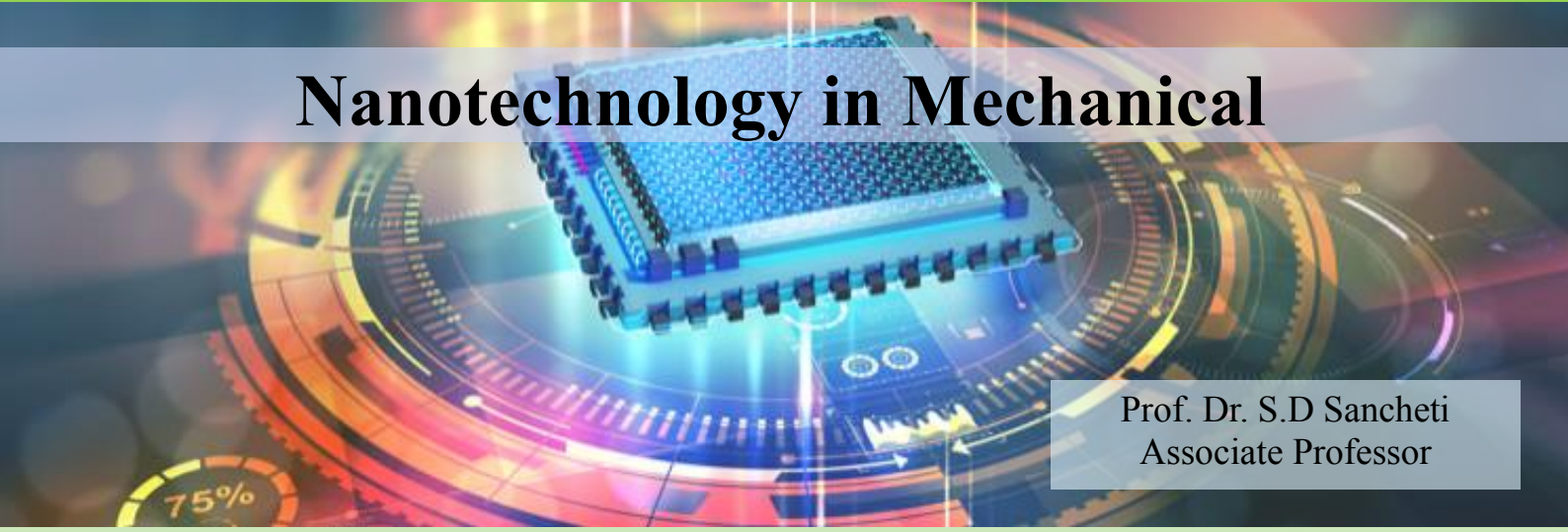
Biomedicine

The properties of some nanomaterial's make them ideal for improving early diagnosis and treatment of neurodegenerative diseases or cancer.

Environment

Air purification with ions, wastewater purification with Nano bubbles or Nano filtration systems for heavy metals are some of its environmentally-friendly applications. thermal resistance and decreasing oxygen transfer in packaged products.

Nanotechnology in Mechanical



Prof. Dr. S.D Sancheti
Associate Professor

Food

In this field, nano biosensors could be used to detect the presence of pathogens in food or nanocomposites to improve food production by increasing mechanical and thermal resistance and decreasing oxygen transfer in packaged products.

Textile

Nanotechnology makes it possible to develop smart fabrics that don't stain nor wrinkle, as well as stronger, lighter and more durable materials to make motorcycle helmets or sports equipment.

CONCLUSION

The world of materials is being transformed by nanotechnology. It has a significant impact on the development of a new generation of composites with improved functionality and a wide range of applications. The information on processing, characterization, and applications assists researchers in comprehending and applying the unique chemical and material principles underpinning these cutting-edge polymer Nano composites.

Although Nano composites have many important applications in a variety of industrial industries, there are a number of significant technological and economic impediments to general commercialization. These include impact performance, complex formulation interactions, and methods for obtaining and monitoring nanofiller dispersion and exfoliation in polymer matrices.

RENEWABLE ENERGY SECTOR IN INDIA

Prof. H.S Deore
Assistant Professor

Renewable Energy Sector in India Challenges and Opportunities

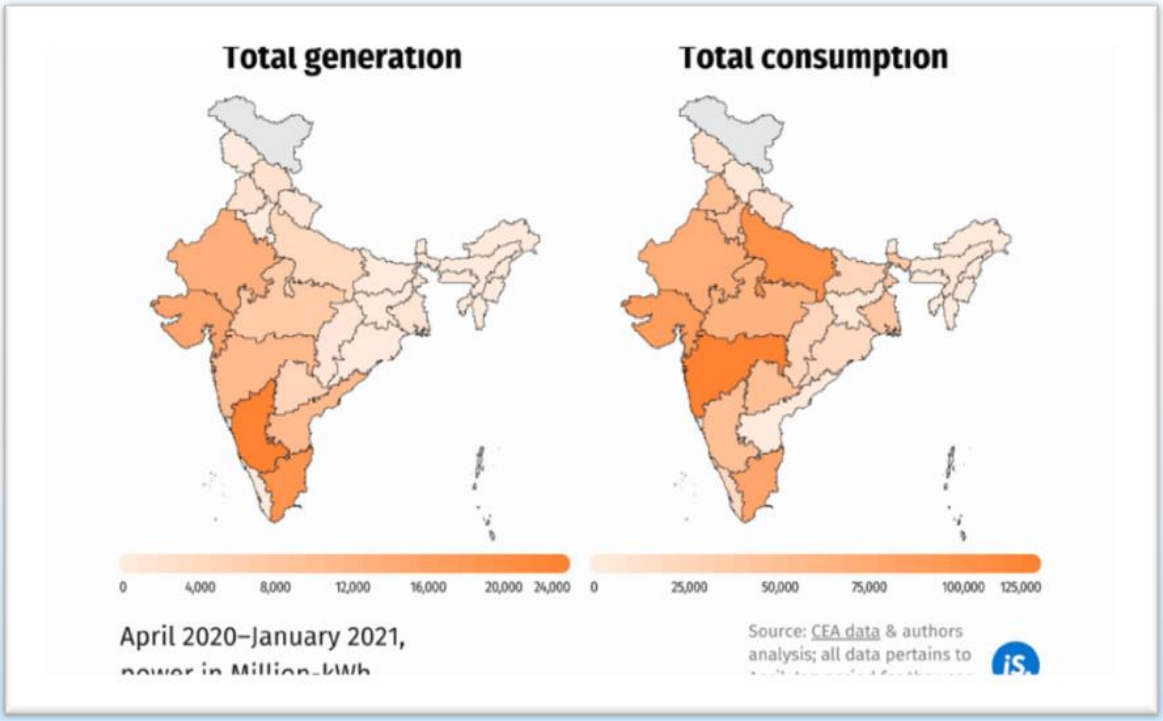
The renewable energy sector in India is growing rapidly, but there are several challenges that it faces. Here are some of the current challenges:

- Lack of adequate infrastructure: India's renewable energy sector lacks adequate infrastructure, including transmission lines and grid storage facilities, which can result in intermittent power supply and instability in the grid.
- Land acquisition: Land acquisition is a major challenge for renewable energy projects, as it requires large tracts of land. This can be a complex and time-consuming process, often involving multiple stakeholders and land-use issues.
- Financing and funding: Financing and funding renewable energy projects can be a challenge in India, as many banks and financial institutions are hesitant to lend to renewable energy projects due to perceived risks and uncertainties.
- Policy and regulatory challenges: The regulatory environment for renewable energy in India is complex, with different state and central policies and regulations, which can create uncertainty and hinder investment in the sector.
- Technological challenges: India's renewable energy sector is still heavily reliant on conventional technologies such as solar PV and wind turbines, which may not be optimal for the country's unique climate and topography. Additionally, emerging technologies such as energy storage and smart grids may require further research and development.

RENEWABLE ENERGY SECTOR IN INDIA

Prof. H.S Deore
Assistant Professor

- Public awareness and education: Finally, there is a need for greater public awareness and education about the benefits of renewable energy and the importance of transitioning to a low-carbon economy.



Overall, addressing these challenges will require a concerted effort from policy-makers, industry stakeholders, and civil society to create an enabling environment for renewable energy to flourish in India.

RENEWABLE ENERGY SECTOR IN INDIA

Prof. H.S Deore
Assistant Professor

Here are some potential career opportunities in the renewable energy sector in India:

1. Renewable Energy Project Manager: Project managers are responsible for overseeing the development, implementation, and operation of renewable energy projects. They work closely with engineers, contractors, and other stakeholders to ensure that projects are completed on time, within budget, and to a high standard.
2. Renewable Energy Engineer: Engineers in the renewable energy sector are responsible for designing and developing renewable energy systems, such as solar panels, wind turbines, and geothermal systems. They work closely with other engineers, researchers, and product managers to develop innovative and efficient technologies.
3. Renewable Energy Analyst: Analysts in the renewable energy sector are responsible for analyzing data on energy production, consumption, and market trends to inform decision-making and policy development. They use tools such as GIS mapping, economic modeling, and statistical analysis to develop insights and recommendations
4. Renewable Energy Sales and Marketing Manager: Sales and marketing managers are responsible for promoting and selling renewable energy products and services to businesses and consumers. They work closely with product managers and marketing teams to develop effective sales and marketing strategies.

RENEWABLE ENERGY SECTOR IN INDIA

Prof. H.S Deore
Assistant Professor

5. Renewable Energy Researcher: Researchers in the renewable energy sector are responsible for conducting research on emerging technologies and trends in the sector. They work closely with other researchers, engineers, and product managers to develop innovative solutions to energy challenges.
6. Renewable Energy Policy Analyst: Policy analysts in the renewable energy sector are responsible for developing and analyzing policies and regulations related to renewable energy. They work closely with policymakers, industry stakeholders, and civil society to develop effective policies that support the growth of the sector.
7. Solar Engineer: Solar engineers are involved in the design, installation, and maintenance of solar power systems, including solar panels and other related components. They work with other engineers, technicians, and project managers to ensure that solar power systems are installed and maintained efficiently and safely.
8. Wind Energy Engineer: Wind energy engineers are responsible for the design, installation, and maintenance of wind turbines and other wind power systems. They work with other engineers and technicians to ensure that wind power systems are installed and maintained efficiently and safely.
9. Energy Storage Engineer: Energy storage engineers are involved in the development and implementation of energy storage technologies, such as batteries and fuel cells. They work with other engineers and scientists to develop and improve energy storage technologies, and to ensure that they are safe and efficient.

Industry 4.0

Prof. R.S. Chaudhari
Assistant Professor

The Role of Industry 4.0 in the Mechanical Industry

The industrial revolution has been the driving force behind economic growth for centuries. The fourth industrial revolution, also known as Industry 4.0, is transforming the way we manufacture products by integrating advanced technologies into the manufacturing process. This article will discuss the role of Industry 4.0 in the mechanical industry and how it is changing the future of manufacturing.

What is Industry 4.0?

Industry 4.0 is the integration of advanced technologies such as the Internet of Things (IoT), artificial intelligence (AI), robotics, and big data into the manufacturing process. It is characterized by the use of smart factories that are connected and communicate with each other, creating an efficient and flexible production system. The main goal of Industry 4.0 is to create a smart and connected factory that can operate autonomously, with minimal human intervention.

How is Industry 4.0 Changing the Mechanical Industry?

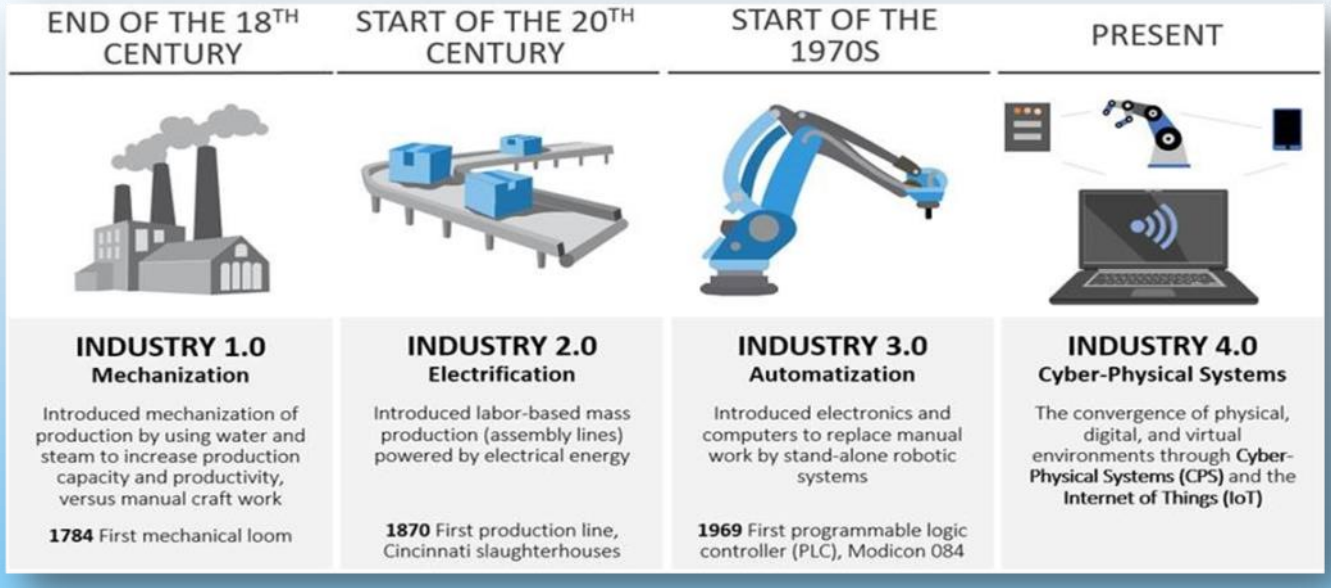
The mechanical industry is seeing significant changes due to Industry 4.0. The integration of advanced technologies is making manufacturing more efficient, productive, and cost-effective. Here are some of the ways that Industry 4.0 is changing the mechanical industry.

Industry 4.0

Prof. R.S. Chaudhari
Assistant Professor

Smart Factories:

Smart factories are a key component of Industry 4.0. They are factories that use advanced technologies to automate and optimize the manufacturing process. Smart factories are connected and communicate with each other, providing real-time data that can be used to make data-driven decisions. The integration of IoT devices allows manufacturers to monitor machines in real-time, detect and diagnose issues, and schedule maintenance. This reduces downtime, improves production efficiency, and lowers maintenance costs.



Industry 4.0

Prof. R.S. Chaudhari
Assistant Professor

Customization:

One of the main advantages of Industry 4.0 is the ability to customize products to meet specific customer needs. The integration of advanced technologies such as AI and machine learning allows manufacturers to collect data on customer preferences and use that data to design and manufacture products that meet those preferences. This allows manufacturers to differentiate themselves from competitors and provides a competitive advantage in the market.

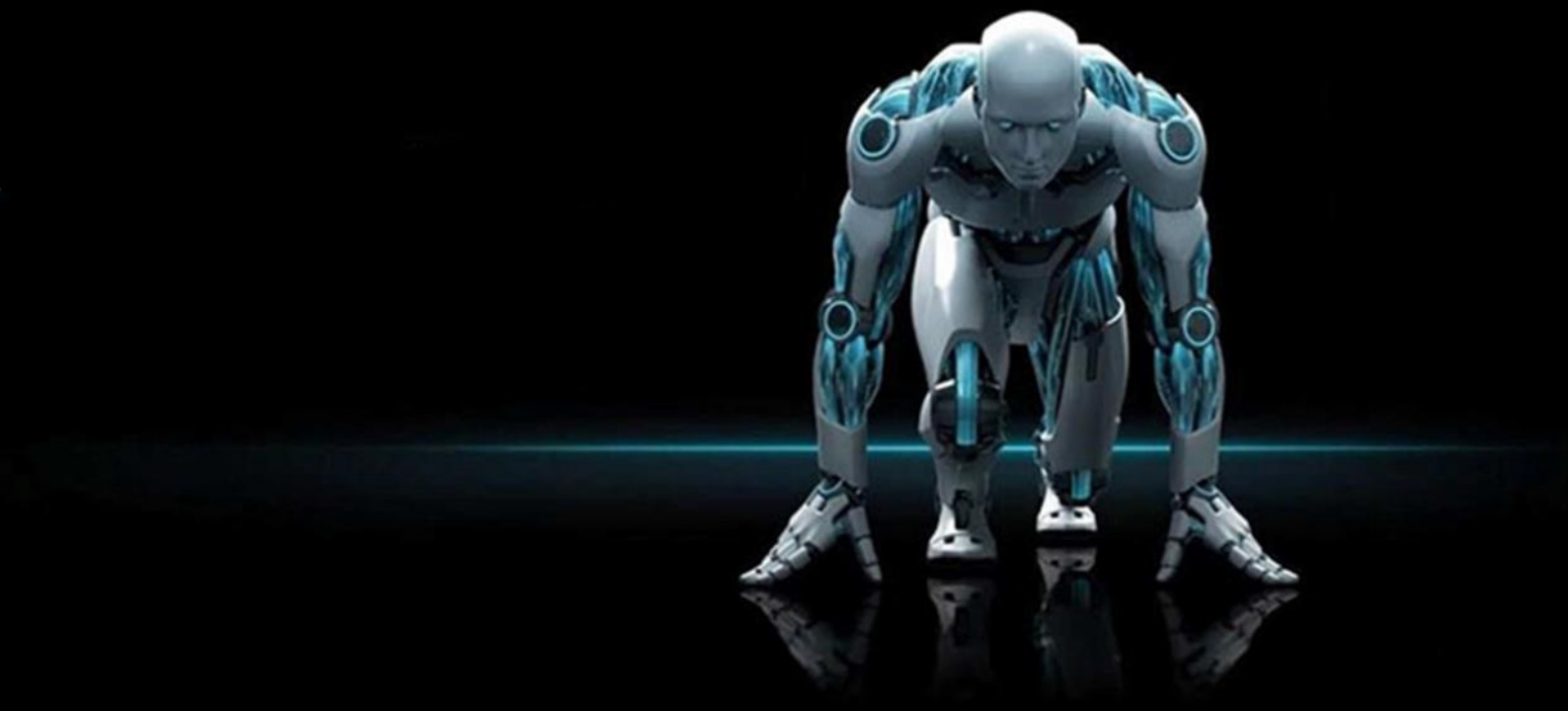
Improved Product Quality:

Industry 4.0 is improving product quality by providing real-time data on the manufacturing process. Smart factories can monitor the production process and detect defects, reducing the likelihood of defective products being shipped to customers. This improves customer satisfaction and reduces product returns.

Workforce Augmentation:

Industry 4.0 is not about replacing humans with machines, but rather augmenting the workforce with advanced technologies. The integration of robots and automation can help reduce the amount of manual labor required in manufacturing, allowing workers to focus on more complex tasks such as quality control, maintenance, and data analysis.

Student Articles



Digital Manufacturing

Mr. Chetan Aher, BE

The **digitalization of manufacturing** is an imperative for realization of Industry 4.0. Success, measured as production excellence, is achieved with a digital thread connecting product development through product production all the way to product utilization, supported by robust, integrated manufacturing software solutions. This is digital manufacturing.

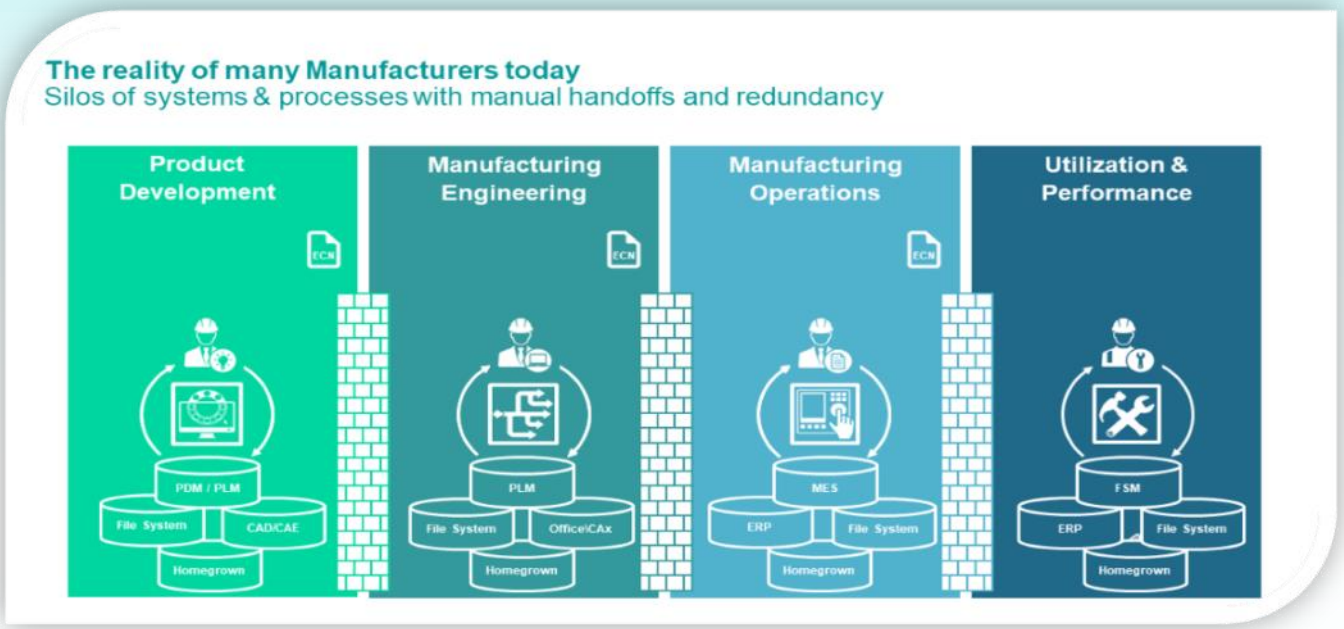
When we think of manufacturing, the image that often comes to mind is a product being made in a factory – the operations executed on equipment during production. However, there is a critical bridge between running production on the shop-floor and product design. This is the result of a much more involved process that starts, and ends, with engineering. Manufacturing matters – manufacturing engineering and operations details, that is. More importantly, digital manufacturing matters, as the means to build that bridge.

Many companies today are still organized in a siloed manner, especially when it comes to engineering disciplines. In many cases, information flow still consists of manual handoffs and notifications to align adjacent departments. More and more manufacturers note the fragility of relying on skilled talent, access to physical space, and centralized factories to produce goods.

At the same time, sensors, machine learning, robotics, cloud computing and other advanced technologies have proven to increase supply chain resiliency for manufacturers who adopt it.

Digital Manufacturing

Mr. Chetan Aher, BE



Digital Manufacturing Capabilities

A comprehensive digital manufacturing portfolio offers many capabilities that will enable its users to develop their digital enterprise. And this is critical to Industry 4.0 achievement. There is far too much that manufacturing, controls, facilities and industrial engineers must do in their daily work to support modern production systems today and it is no longer acceptable to rely on resident experts and tribal knowledge to keep pace with innovation and disruptive market pressures.

Smart manufacturing operations with real-time data intelligence

This digital manufacturing portfolio helps remove the barriers to Information Technology (IT) and Operational technology (OT) collaboration via seamless interoperability and purpose-built apps for role-based, actionable insights.

Digital Manufacturing

Mr. Chetan Aher, BE

These role-based, purpose-built apps, users are given control for actionable insights tailored to their domain of responsibility. Operational data is collected through field devices, such as sensors, PLCs, and CNC controls, Edge devices and SCADA systems, all coordinated through manufacturing operations management (MOM) processes for product and process context.

Context-driven data intelligence, for product, process, machine, people and business, sets the stage for advanced data analytics towards predictive and prescriptive manufacturing insights and a culture of effective data-driven decision making.

Digital Manufacturing

Mr. Chetan Aher, BE

Integrated manufacturing applications that enable the Digital Enterprise

Such a broad and comprehensive portfolio is not just a collection of developed and acquired software tools. Rather, they are tightly integrated solutions that enable a seamless flow within the portfolio.

For manufacturing engineering, whether transforming raw materials into components or assembling those components into sub-assemblies and complete products, this integrated set of tools supports activities related to the planning, design, simulation and validation of the manufacturing processes and required production equipment. All are managed on a common backbone that has been tuned to support manufacturing information. For the past few decades, leading industrial companies have leveraged this type of managed environment to enable solutions for product development practices that address the complexity of new products and the engineering required to design them. Likewise, pioneers in manufacturing have reaped the benefits of these integrated manufacturing engineering solutions for practices that address the complexity of production systems and the engineering required to design them.

Tooling and processes

There are many different tooling processes that digital manufacturing utilizes. However, every digital manufacturing process involves the use of computerized numerical controlled machines This technology is crucial in digital manufacturing as it not only enables mass production and flexibility, but it also provides a link between a CAD model and production.. These processes allow machines to address every element of a part no matter the complexity of its shape.

Nanotechnology In Agriculture

Miss. Divya Ahire, TE

Nanotechnology is emerging out as the greatest imperative tools in recent agriculture and predictable to become a driving economic force in the near future. At the same time Nanotechnology employs different chemical agents and novel delivery systems to implement crop productivity and potentials to decrease use of bulk agrochemicals, Nanotechnology may afford keener solutions for the current problems in the field of agriculture.

Direct applications of nanotechnology in agriculture include delivery of agrochemicals and nutrition, pesticides, Nano-scale carrier, smart packing, Nano-sensors, veterinary care, fisheries and aquaculture, detection of nutrient deficiencies.

Nowadays Nano-fertilizers are increasingly been used as alternates to bulk fertilizers and reduce pollution of soil and water by different agrochemicals. Nano-fertilizers facilitate the slow and steady release of nutrients and thereby reduce the loss of nutrients and enhance the nutrient use efficiency.

Nanotechnology improves the nutrient use efficiency and reduces costs of environmental protection, slow-release fertilizers are the excellent replacement to soluble fertilizers.

This work focused on the applications of nanotechnology in agriculture sector improvement, especially in the area of plant nutrition and plant protection.

Nanotechnology In Agriculture

Miss. Divya Ahire, TE

What is nanotechnology?

Nanotechnology is a new scientific approach that includes the use of materials and equipment capable of using physical and chemical properties of a substance at molecular levels to explore the biological and material worlds in nanometer-scale and use it in various carriers from medicine to agriculture. Nanotechnology is the science and technology of tiny things, the materials that are less than 100 nm in size. One nanometer is 10 - 9 meters; Nano-technology combines solid state physics, chemistry, chemical engineering, biochemistry, biophysics, and materials science.

Nanoparticles:

Nanoparticle is defined based on the size at which fundamental characters different from those of the corresponding bulk material Nanoparticles overlap in size with colloids, which ranges from 1 nm to 1 mm in diameter also, the physical properties of nanoparticles are different from the properties of the bulk material.

The properties of nanomaterial for agricultural applications:

The model Nanomaterial's for agricultural applications are supposed to have the following properties:

1. Providing actual concentration and controlled release of fertilizers or pesticides in response to certain conditions (TiO2 Nano particles used as plant fertilizer for Mung bean to enhance crop production)
2. Improved targeted activity
3. Lower Eco harmful with safe and relaxed transport.

Nanotechnology In Agriculture

Miss. Divya Ahire, TE

Methods of Nanoparticle Production:

"Top-down" systems: where tiny manipulations of little number of atoms or molecules fashion elegant patterns, through mechanical-physical methods like grinding, milling and crushing for producing nanoparticles, this method use for producing Nano composites and Nano-grained bulk materials like metallic and ceramic nano-material's in extensive size distribution (10 - 1000 nm) as shown in figure 1.

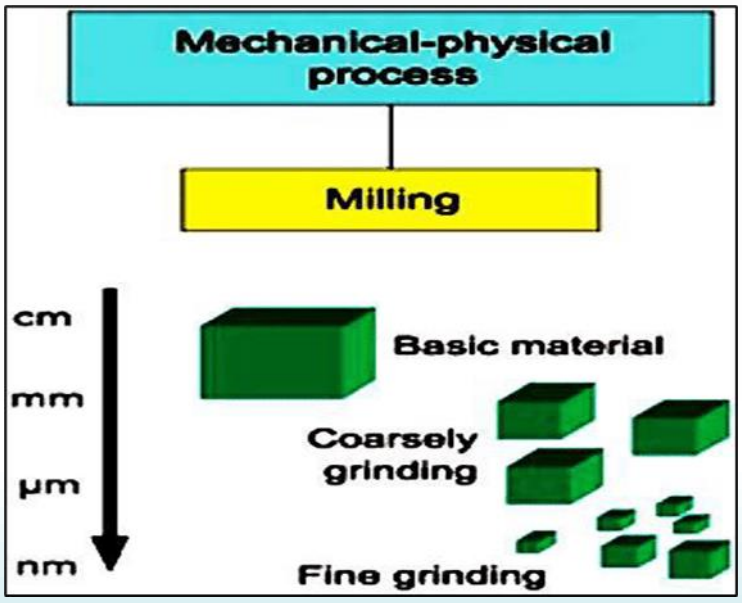


fig.1 Schematic diagram for preparing nanoparticles by mechanical process.

Nanotechnology In Agriculture

Miss. Divya Ahire, TE

Bottom-up system: in 'Bottom-up' building up, numerous molecules self-assemble in parallel steps, as a function of their molecular recognition characters, this processing produces more complex structures from atoms or molecules, also, this method produce a uniform controlling sizes, shapes and size ranges of Nano materials (Figure 2).

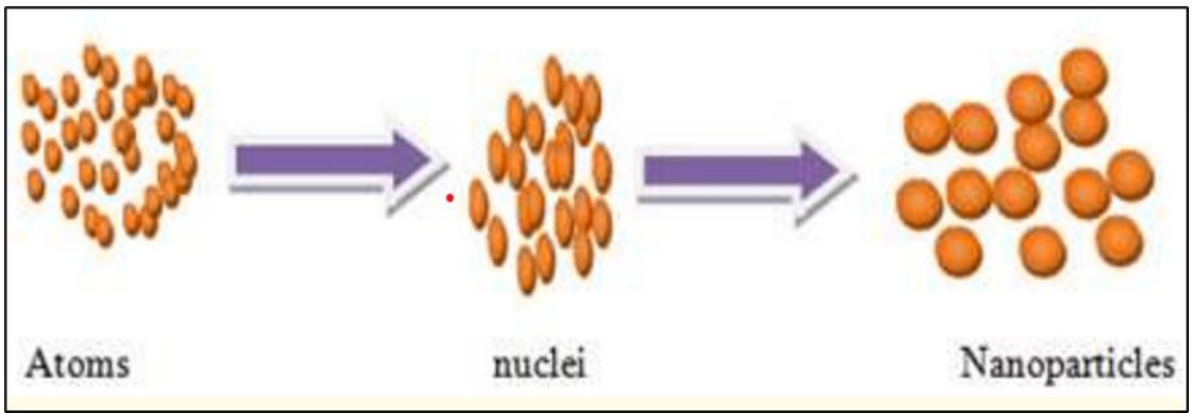


Fig.2 Structures of Nano Practical are fabricated by chemical procedures.

Usually this method used for preparing most of the Nano-scale materials (1-100 nm), it is plays an essential role in the production nanostructures and nanomaterial's. Also, there are some other methods for produce Nanomaterial's like attrition and pyrolysis, and biological synthesis of nanoparticles.

Nanotechnology In Agriculture

Miss. Divya Ahire, TE

Nanomaterial's sage in Agriculture:

Nanomaterial's have many usages in all stages of agricultural production, in different forms and various procedures such as:

1. Nano-fertilizer for balance crop nutrition
2. Crop improvement (Zinc Nano fertilizer used to enhance crop production of Pennisetum americium)
3. Plant protection ingredients (pesticides, fungicides, weedicides)
4. Weed management.
5. Nano pesticides
6. Nano sensors
7. Post-Harvest Technology

Some applications of Nanotechnology in Agriculture

Crop improvement

Increase efficient fertilizers and pesticides

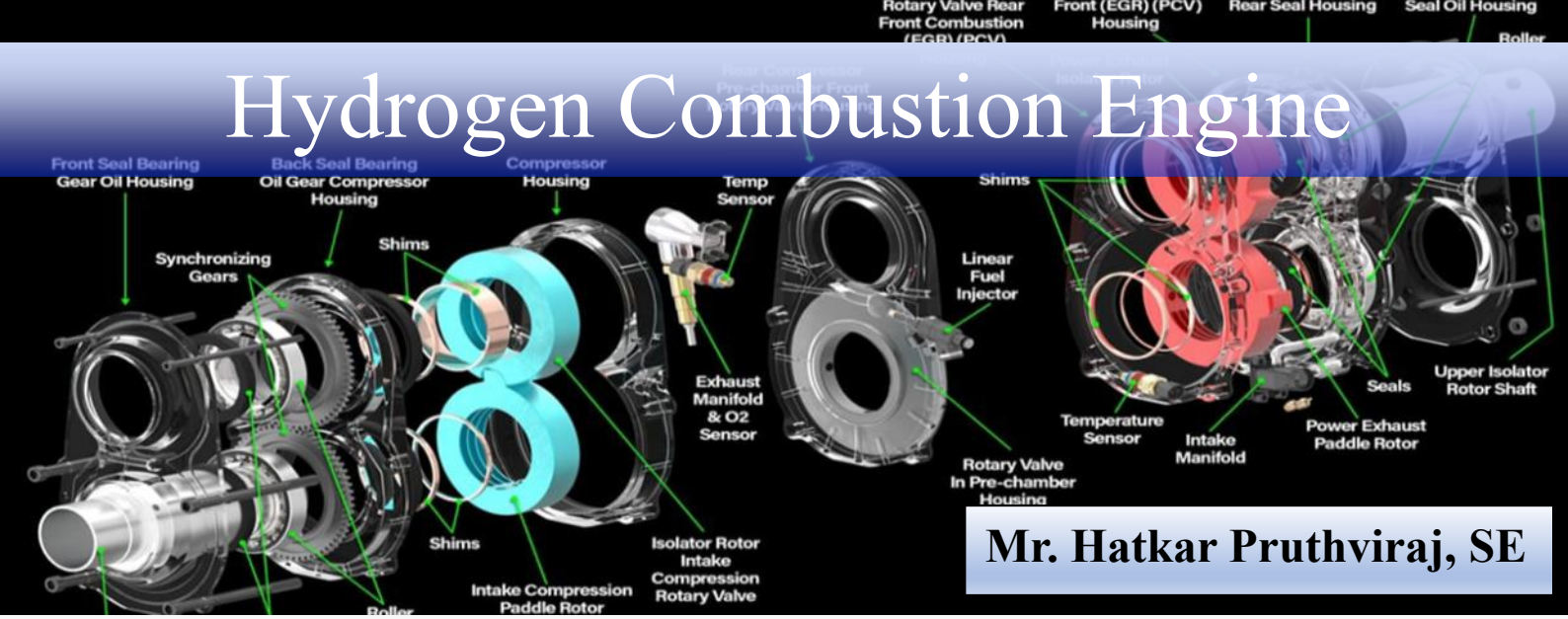
Soil management.

Plant disease detection.

Water management

Analysis of gene expression and Regulation

Hydrogen Combustion Engine



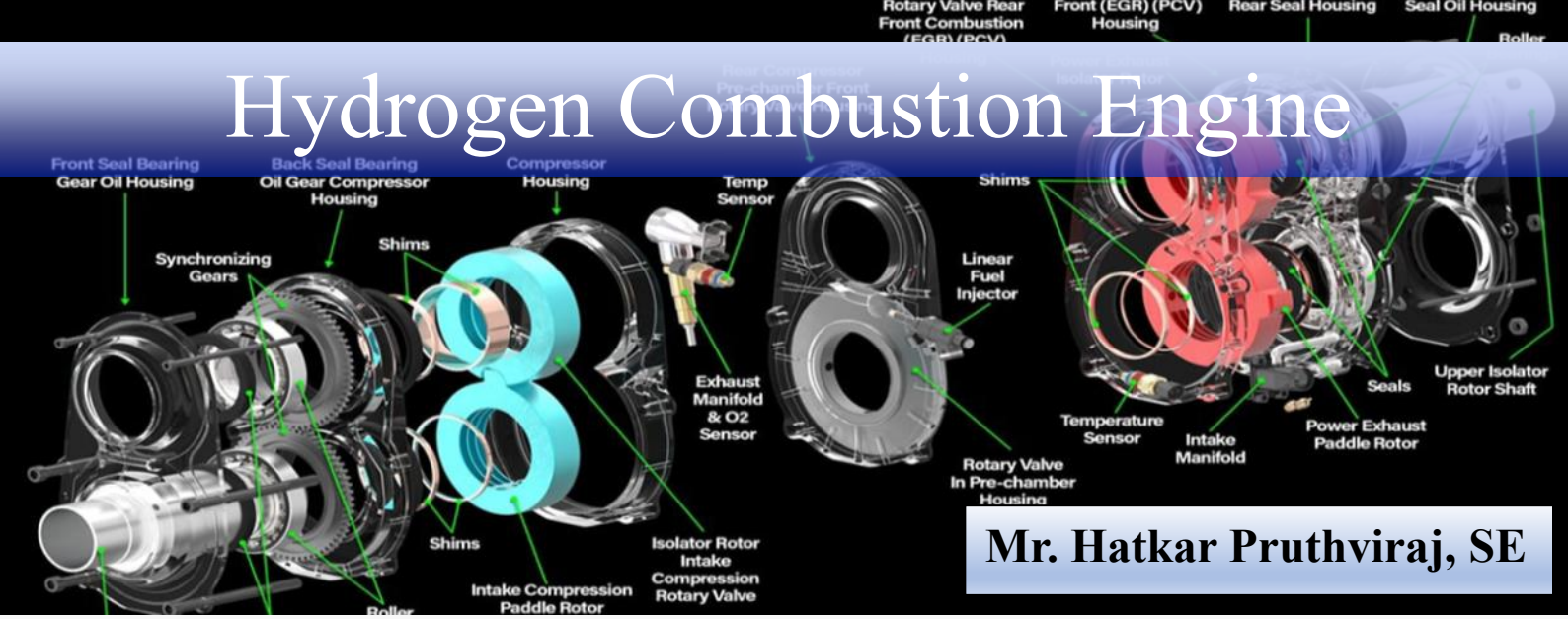
Mr. Hatkar Pruthviraj, SE

The first direct hydrogen combustion engine. A single 16 kg engine develops 160 hp and 170 lb.-ft of torque when idling at 1000 revolutions per minute (rpm) and reaching a redline of 25,000 rpm. All of the power of a single-engine is multiplied by the number of engines that may be placed end-to-end. For example, 5 engines will produce 160 hp x 5 = 800 hp, weighting 35 lb. x 5 = 175 pounds (79 kg). This is an incredibly high power to weight ratio.

A hydrogen-based energy system is regarded as a viable option for delivering energy service in an efficient, clean and safe manner while meeting sustainability goals. Hydrogen can be produced from carbon-free resources or from fossil fuels combined with carbon separation and sequestration. The basic methods of obtaining hydrogen are: steam reforming of methane, partial oxidation of hydrocarbons, gasification of biomass, coal and wastes, thermal cracking, and electrolysis . Most of those methods, except electrolysis and thermal cracking, produce carbon dioxide as a greenhouse gas, increasing he footprint of obtained hydrogen. Due to well-established production methods and the wide availability of substrates, hydrogen appeared as a possible carrier of energy and has been recognized as a fuel with some highly desirable properties for application as a fuel in vehicles, such as high gravimetric energy density.

This approach needs to make hydrogen production more eco-friendly. Contemporary development utilizing renewable sources such as solar energy, wind power and geothermal energy may produce more energy than is required.

Hydrogen Combustion Engine



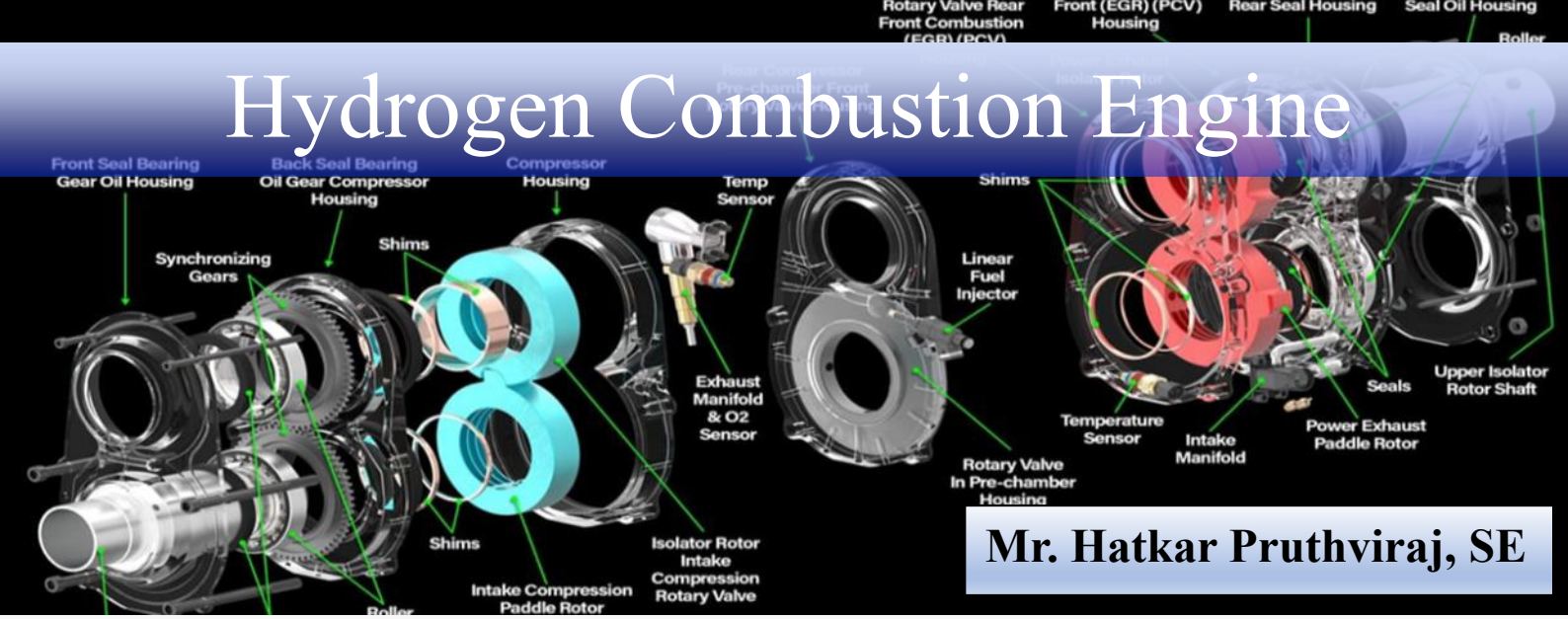
Mr. Hatkar Pruthviraj, SE

The first direct hydrogen combustion engine. A single 16 kg engine develops 160 hp and 170 lb.-ft of torque when idling at 1000 revolutions per minute (rpm) and reaching a redline of 25,000 rpm. All of the power of a single-engine is multiplied by the number of engines that may be placed end-to-end. For example, 5 engines will produce 160 hp x 5 = 800 hp, weighting 35 lb. x 5 = 175 pounds (79 kg). This is an incredibly high power to weight ratio.

A hydrogen-based energy system is regarded as a viable option for delivering energy service in an efficient, clean and safe manner while meeting sustainability goals. Hydrogen can be produced from carbon-free resources or from fossil fuels combined with carbon separation and sequestration. The basic methods of obtaining hydrogen are: steam reforming of methane, partial oxidation of hydrocarbons, gasification of biomass, coal and wastes, thermal cracking, and electrolysis . Most of those methods, except electrolysis and thermal cracking, produce carbon dioxide as a greenhouse gas, increasing he footprint of obtained hydrogen. Due to well-established production methods and the wide availability of substrates, hydrogen appeared as a possible carrier of energy and has been recognized as a fuel with some highly desirable properties for application as a fuel in vehicles, such as high gravimetric energy density.

This approach needs to make hydrogen production more eco-friendly. Contemporary development utilizing renewable sources such as solar energy, wind power and geothermal energy may produce more energy than is required.

Hydrogen Combustion Engine



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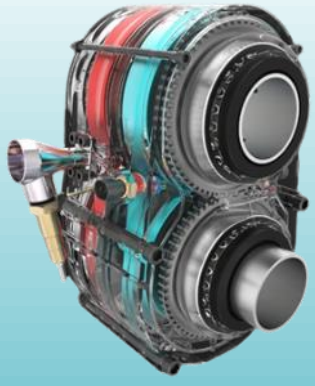
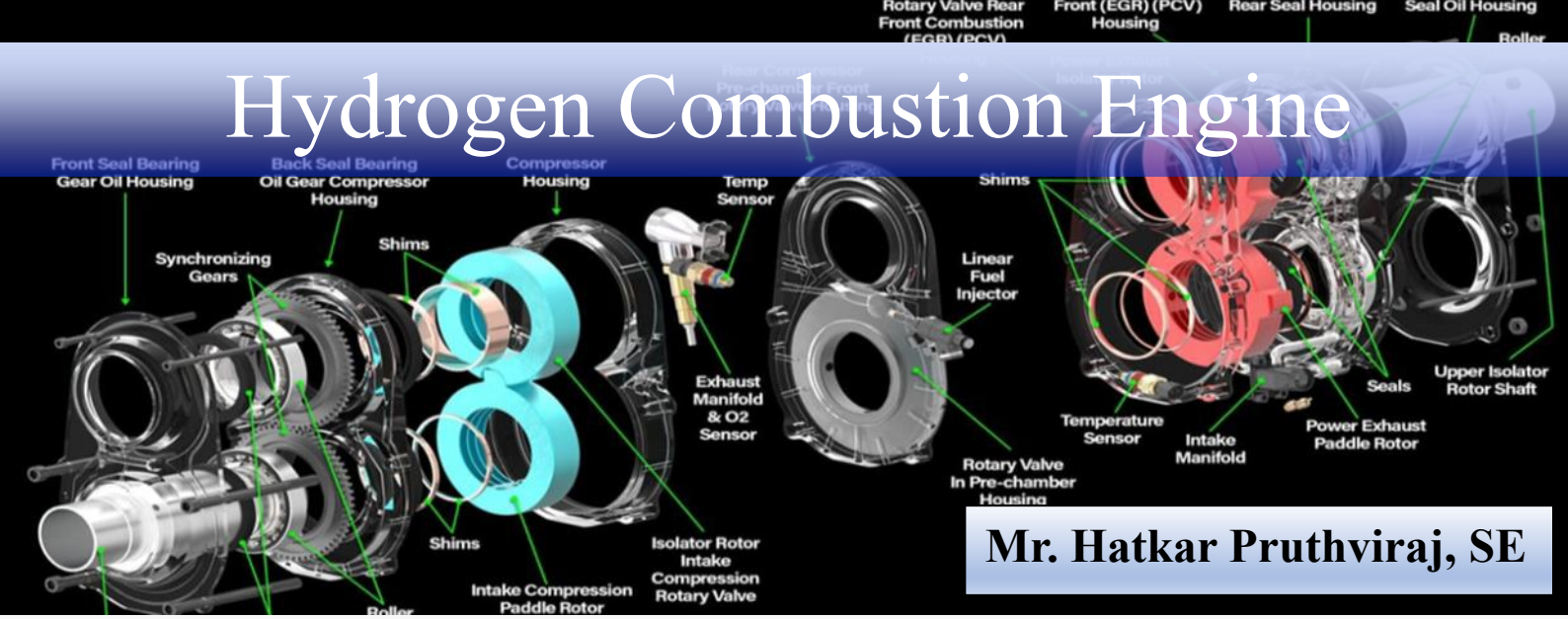
Material used

Titanium will be utilized to reduce weight in aviation engines first, but it is expected to be employed in nearly every internal combustion engine application imaginable. Aluminum will be used in situations where cost is an issue. A wide range of industries might benefit from this technology, including commercial and recreational vehicles as well as generators and commercial trucks. If it works as advertised as a range extender for electric cars, then why bother with electric vehicles in the first place? To keep up the momentum, the united team has a wealth of expertise in the automotive sector as well as in machining, engineering, and product development. They have a working prototype, but there is still a long way to go.



Hydrogen Combustion Engine



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Working

Aerodynamic forces are eliminated since the engine is air-cooled, rotating shafts encircle the engine openings, and both upper and lower shafts counter-rotate. The colorful rotors on the intake and compression side of the engine, and the red rotors on the power and exhaust side, are the engine's principal power-producing components. The intake air is compressed and travels through a rotary valve to a pre-chamber between the rotors, where fuel is injected, and when it enters the power side rotor, it ignites, driving the rotor, and then leaves through the exhaust port. They recommend using hydrogen as a fuel for the engine, and the emissions will be nearly negligible. Watch the videos and pause periodically to observe the process in action, and you'll have an idea of how it all works.

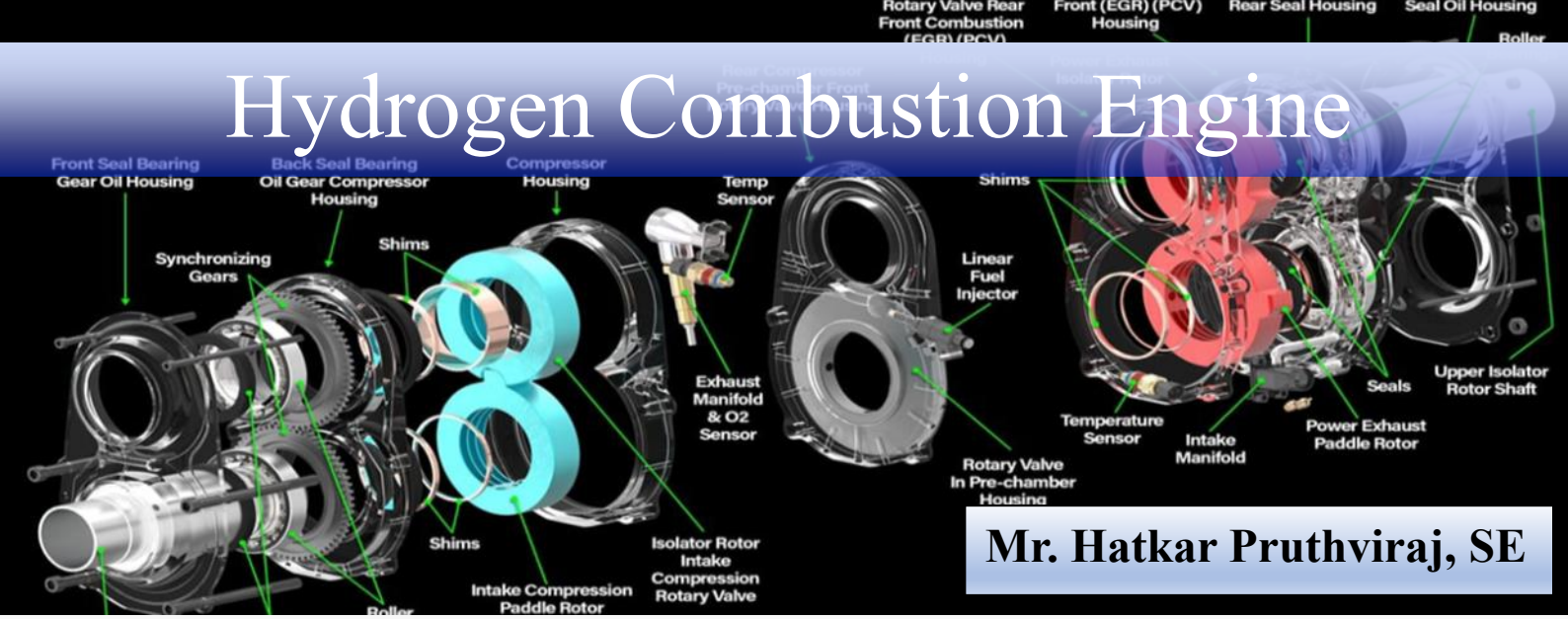
Pollutant emissions

The combustion of hydrogen with oxygen produces water vapor as its only product:

$2H2 + O2 \rightarrow 2H2O$

However, air hydrogen combustion can produce oxides of nitrogen, known as NOx. In this respect, the combustion process is much like other high temperature combustion fuels, such as kerosene, gasoline, diesel or natural gas. As such hydrogen combustion engines are not considered zero emission. Hydrogen has a wide flammability range in comparison with other fuels. As a result, it can be combusted in an internal combustion engine over a wide range of fuel-air mixtures.

Hydrogen Combustion Engine



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Efficiency

Main article: Engine efficiency

The thermal efficiency of an ideal Otto Cycle depends on the compression ratio and improves from 47% to 56% when this is raised from 8 to 15. Engines in practical vehicles achieve half to three quarters of this. About 60% is suggested as an unlimited-cost limit. This reference is unique in suggesting that the maximum efficiency of internal combustion engines is not limited by the Carnot cycle, that it is an open cycle engine with a theoretical efficiency limit of 100%. In comparison, the efficiency of a fuel cell is limited by the Gibbs free energy, which is typically higher than that of Carnot. The determination of a fuel cell's performance depends on the thermodynamic evaluation. Using hydrogen's lower heating value, the maximum fuel cell efficiency would be 94.5%.

Conclusion

Although it has a lot of potentials, we've seen a lot of promising engines throughout the years, and whether it can advance to the next level will decide if it can succeed on a bigger scale. It will be an uphill battle to gain support and attention for this initiative in the current electrics-only era. You can't get your point through if no one is willing to listen. The development of internal combustion engines continues, as do the efforts of inventors with new concepts, and those who believe that the future belongs solely to electric vehicles should re-evaluate their beliefs.

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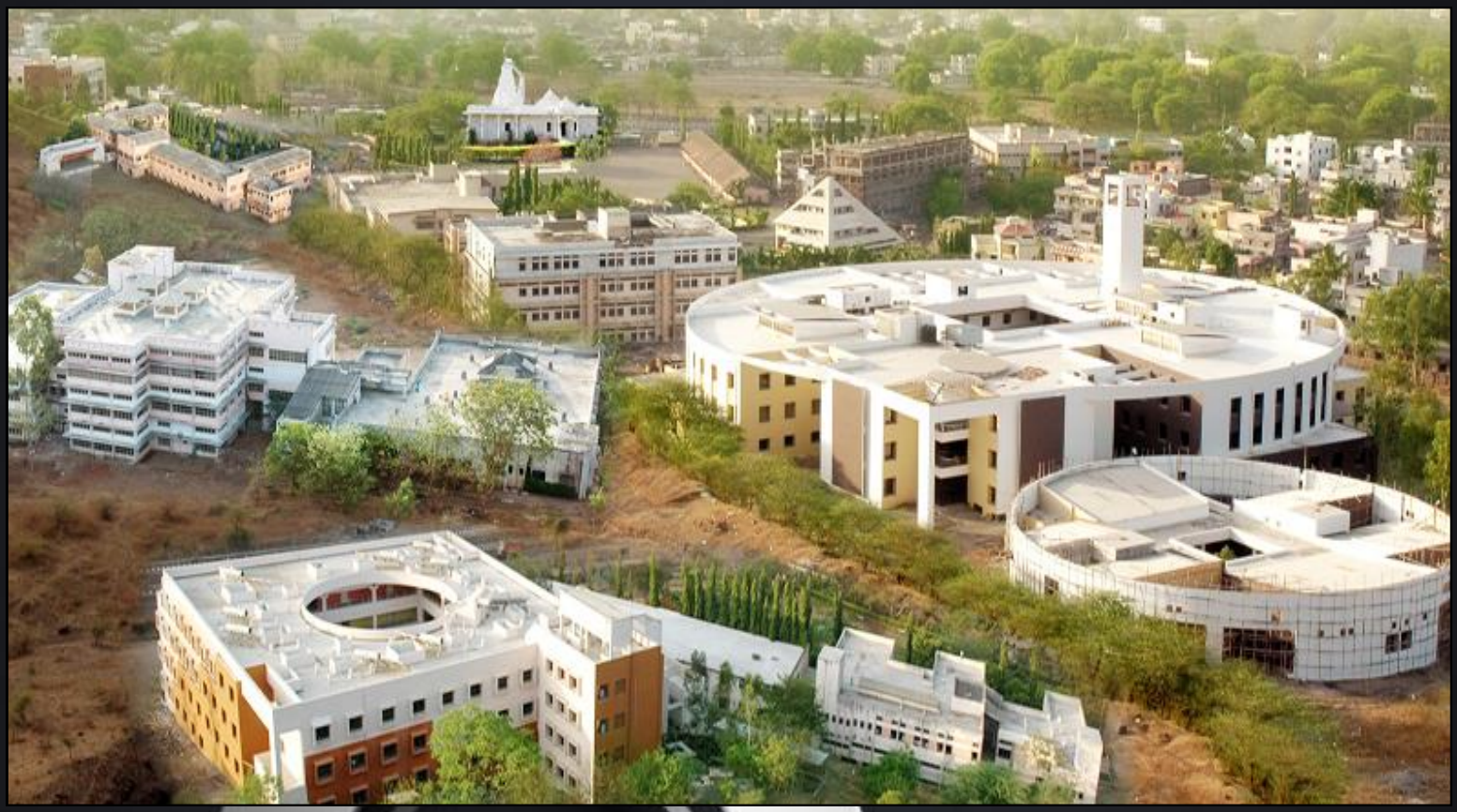

Address

SNJB's

Late.Sau K.B. Jain

College of Engineering

Department of Mechanical Engineering

Neminagar, chandwad 423101

Website: www.snjb.org

Email: hodmechcoe@snjb.org

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