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MECHANICAL ENGINEERING

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EDITOR:
J PRAVEEN IV MECH

MEMEBRS:
D HARI PRASAD III MECH
P SUNIL IV MECH B SEC

FACULTY ADVISORS:
P.KARUNYAMOORTHY
V.ARAVIND RAM SHARMA

DEPARTMENT VISION

TO BECOME A CENTRE OF EXCELLENCE IN MECHANICAL ENGINEERING STUDIES AND RESEARCH.

DEPARTMENT MISSION

- Provide congenial academic ambience with necessary infrastructure and learning resources.
- Inculcate confidence to face and experience new challenges from industry and society.
- Ignite the students to acquire self-reliance in State-of-the-Art Technologies.
- Foster Enterprising spirit among students.

MESSAGE FROM HOD

I feel ecstatic to introduce you to Department of Mechanical Engineering, which is the foundation of Engineers. Department of Mechanical Engineering strives for increasing the knowledge, enhancing the critical thinking, ability to change information into knowledge and power of analyzing the things technically of each and every individual of ever changing society through students.

We always intend to impart knowledge through a closed knit family of highly competent faculty. Department of Mechanical Engineering plays a vital role in an engineering college catering to the teaching of Mechanical and Humanities courses for engineering students.

Our Laboratories have been very well established not only to cover complete syllabus but to motivate students to learn beyond the syllabus which definitely develops complete knowledge of the subject (both the practical and theoretical depth of knowledge) and develop skill sets of students to become promising engineers in future.

I would like to conclude with the words of Thomas Friedman who has rightly opined “World is flat opportunities are immense. It’s just a question of identifying opportunities and making the best of them”. I wish a very best of luck to the students.

MESSAGE FROM EDITOR

The Magazine “MECHZINE” team works to bring out the annual official student-publication of department of Mechanical Engineering. Each year, our team works extensively to bring out the technical report writing skills of the students.

The final publication reflects and encompasses the creative technical presentation skills inherent to the academic and upcoming areas in the field of Mechanical Engineering.

The magazine’s primary focus has been geared at covering articles reflecting the student’s knowledge and associations with latest and leading edge-technologies.

The magazine continues to expand its reach to achieve its vision of being a truly representative student publication.

I am thankful to all the staff and students of MECH department for their contributions in making of “MECHZINE” and I hope to build on this ethos just as much during the upcoming academic years.

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THE 3-D PRINTING REVOLUTION

MR. PRAVEEN
IV MECH A SEC

Industrial 3-D printing is at a tipping point, about to go mainstream in a big way. Most executives and many engineers don't realize it, but this technology has moved well beyond prototyping, rapid tooling, trinkets, and toys. "Additive manufacturing" is creating durable and safe products for sale to real customers in moderate to large quantities.

Render of a small 3d Printer

The beginnings of the revolution show up in a 2014 PwC survey of more than 100 manufacturing companies. At the time of the survey, 11% had already switched to volume production of 3-D-printed parts or products. Among the numerous companies using 3-D printing to ramp up production are GE (jet engines, medical devices, and home appliance parts), Lockheed Martin and Boeing (aerospace and defense), Aurora Flight Sciences (unmanned aerial vehicles), Invisalign (dental devices), Google (consumer electronics), and the Dutch company LUXeXcel (lenses for light-emitting diodes, or LEDs). Watching these developments, McKinsey recently reported that 3-D printing is "ready to emerge from its niche status and become a viable alternative to conventional manufacturing processes in an increasing number of applications."

ADDITIVE'S ADVANTAGES

It may be hard to imagine that this technology will displace today's standard ways of making things in large quantities. Traditional injection-molding presses, for example, can spit out thousands of widgets an hour. By contrast, people who have watched 3-D printers in action in the hobbyist market often find the layer-by-layer accretion of objects comically slow. But recent advances in the technology are changing that dramatically in industrial settings.

Some may forget why standard manufacturing occurs with such impressive speed. Those widgets pour out quickly because heavy investments have been made up front to establish the complex array of machine tools and equipment required to produce them. The first unit is extremely expensive to make, but as identical units follow, their marginal cost plummets.

A big part of the additive advantage is that pieces that used to be molded separately and then assembled can now be produced as one piece in a single run. A simple example is sunglasses: The 3-D process allows the porosity and mixture of plastics to vary in different areas of the frame. The earpieces come out soft and flexible, while the rims holding the lenses are hard. No assembly required.

Printing parts and products also allows them to be designed with more-complex architectures, such as honeycombing within steel panels or geometries previously too fine to mill. Complex mechanical parts—an encased set of gears, for example—can be made without assembly. Additive methods can be used to combine parts and generate far more interior detailing. That's why GE Aviation has switched to printing the fuel nozzles of certain jet engines. It expects to churn out more than 45,000 of the same design a year, so one might assume that conventional manufacturing methods would be more suitable. But printing technology allows a nozzle that used to be assembled from 20 separately cast parts to be fabricated in one piece.

PRO'S OF 3D PRINTING

This production process offers a range of advantages compared to traditional manufacturing methods. These advantages include those related to design, time and cost, amongst others.

1. Flexible Design

3D printing allows for the design and print of more complex designs than traditional manufacturing processes. More traditional processes have design restrictions which no longer apply with the use of 3D printing.

2. Rapid Prototyping

3D printing can manufacture parts within hours, which speeds up the prototyping process. This allows for each stage to complete faster. When compared to machining prototypes, 3D printing is inexpensive and quicker at creating parts as the part can be finished in hours, allowing for each design modification to be completed at a much more efficient rate.

3. Print on Demand

Print on demand is another advantage as it doesn't need a lot of space to stock inventory, unlike traditional manufacturing processes. This saves space and costs as there is no need to print in bulk unless required.

The 3D design files are all stored in a virtual library as they are printed using a 3D model as either a CAD or STL file, this means they can be located and printed when needed. Edits to designs can be made at very low costs by editing individual files without wastage of out of date inventory and investing in tools.

4. Strong and Lightweight Parts

The main 3D printing material used is plastic, although some metals can also be used for 3D printing. However, plastics offer advantages as they are lighter than their metal equivalents. This is particularly important in industries such as automotive and aerospace where light-weighting is an issue and can deliver greater fuel efficiency.

Also, parts can be created from tailored materials to provide specific properties such as heat resistance, higher strength or water repellency.

5. Fast Design and Production
Depending on a part's design and complexity, 3D printing can print objects within hours, which is much faster than moulded or machined parts. It is not only the manufacture of the part that can offer time savings through 3D printing but also the design process can be very quick by creating STL or CAD files ready to be printed.

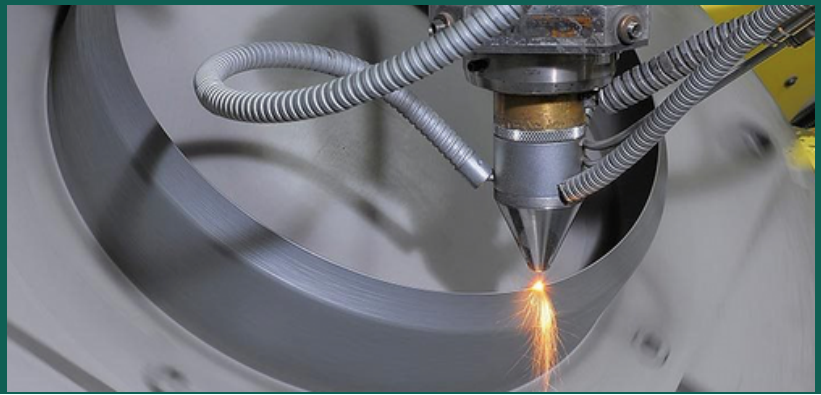
6. Minimising Waste
The production of parts only requires the materials needed for the part itself, with little or no wastage as compared to alternative methods which are cut from large chunks of non-recyclable materials. Not only does the process save on resources but it also reduces the cost of the materials being used.

7. Cost Effective
As a single step manufacturing process, 3D printing saves time and therefore costs associated with using different machines for manufacture. 3D printers can also be set up and left to get on with the job, meaning that there is no need for operators to be present the entire time. As mentioned above, this manufacturing process can also reduce costs on materials as it only uses the amount of material required for the part itself, with little or no wastage. While 3D printing equipment can be expensive to buy, you can even avoid this cost by outsourcing your project to a 3D printing service company.

8. Ease of Access
3D printers are becoming more and more accessible with more local service providers offering outsourcing services for manufacturing work. This saves time and doesn't require expensive transport costs compared to more traditional manufacturing processes produced abroad in countries such as China.

9. Environmentally Friendly
As this technology reduces the amount of material wastage used this process is inherently environmentally friendly. However, the environmental benefits are extended when you consider factors such as improved fuel efficiency from using lightweight 3D printed parts.

10. Advanced Healthcare
3D printing is being used in the medical sector to help save lives by printing organs for the human body such as livers, kidneys and hearts. Further advances and uses are being developed in the healthcare sector providing some of the biggest advances from using the technology.



HOW INDUSTRY 4.0 TECHNOLOGIES ARE CHANGING MANUFACTURING

MR. HEMANTH
IV MECH A SEC

Industry 4.0 is revolutionizing the way companies manufacture, improve and distribute their products. Manufacturers are integrating new technologies, including Internet of Things (IoT), cloud computing and analytics, and AI and machine learning into their production facilities and throughout their operations.

These smart factories are equipped with advanced sensors, embedded software and robotics that collect and analyze data and allow for better decision making. Even higher value is created when data from production operations is combined with operational data from ERP, supply chain, customer service and other enterprise systems to create whole new levels of visibility and insight from previously siloed information.

This digital technologies lead to increased automation, predictive maintenance, self-optimization of process improvements and, above all, a new level of efficiencies and responsiveness to customers not previously possible.

- Developing smart factories provides an incredible opportunity for the manufacturing industry to enter the fourth industrial revolution.
- Analyzing the large amounts of big data collected from sensors on the factory floor ensures real-time visibility of manufacturing assets and can provide tools for performing predictive maintenance in order to minimize equipment downtime.

- Using high-tech IoT devices in smart factories leads to higher productivity and improved quality. Replacing manual inspection business models with AI-powered visual insights reduces manufacturing errors and saves money and time.
- With minimal investment, quality control personnel can set up a smartphone connected to the cloud to monitor manufacturing processes from virtually anywhere. By applying machine learning algorithms, manufacturers can detect errors immediately, rather than at later stages when repair work is more expensive.
- Industry 4.0 concepts and technologies can be applied across all types of industrial companies.

From steam to sensor: historical context for Industry 4.0

First industrial revolution

- Starting in the late 18th century in Britain, the first industrial revolution helped enable mass production by using water and steam power instead of purely human and animal power. Finished goods were built with machines rather than painstakingly produced by hand.

Second industrial revolution

- A century later, the second industrial revolution introduced assembly lines and the use of oil, gas and electric power. These new power sources, along with more advanced communications via telephone and telegraph, brought mass production and some degree of automation to manufacturing processes.

Third industrial revolution

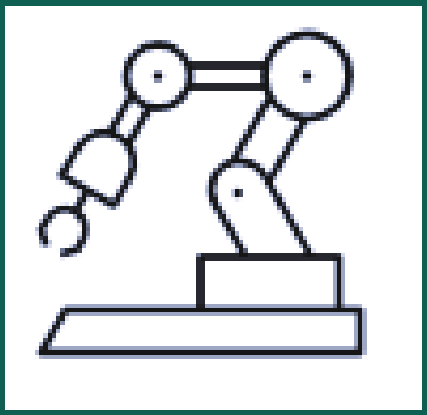
- The third industrial revolution, which began in the middle of the 20th century, added computers, advanced telecommunications and data analysis to manufacturing processes. The digitization of factories began by embedding programmable logic controllers (PLCs) into machinery to help automate some processes and collect and share data.

Fourth industrial revolution

- We are now in the fourth industrial revolution, also referred to as Industry 4.0. Characterized by increasing automation and the employment of smart machines and smart factories, informed data helps to produce goods more efficiently and productively across the value chain. Flexibility is improved so that manufacturers can better meet customer demands using mass customization—ultimately seeking to achieve efficiency with, in many cases, a lot size of one. By collecting more data from the factory floor and combining that with other enterprise operational data, a smart factory can achieve information transparency and better decisions.

WHAT TECHNOLOGIES ARE DRIVING INDUSTRY 4.0?

Internet of Things (IoT)



The Internet of Things (IoT) is a key component of smart factories. Machines on the factory floor are equipped with sensors that feature an IP address that allows the machines to connect with other web-enabled devices. This mechanization and connectivity make it possible for large amounts of valuable data to be collected, analyzed and exchanged.

Cloud computing

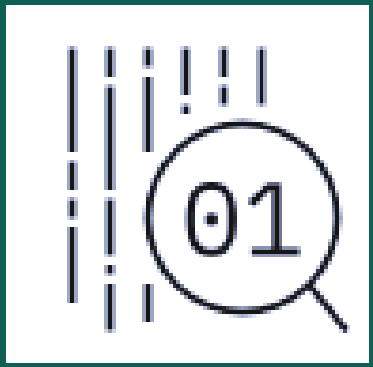
Cloud computing is a cornerstone of any Industry 4.0 strategy. Full realization of smart manufacturing demands connectivity and integration of engineering, supply chain, production, sales and distribution, and service. Cloud helps make that possible. In addition, the typically large amount of data being stored and analyzed can be processed more efficiently and cost-effectively with cloud. Cloud computing can also reduce startup costs for small- and medium-sized manufacturers who can right-size their needs and scale as their business grows.

AI and machine learning

AI and machine learning allow manufacturing companies to take full advantage of the volume of information generated not just on the factory floor, but across their business units, and even from partners and third-party sources. AI and machine learning can create insights providing visibility, predictability and automation of operations and business processes. For instance: Industrial machines are prone to breaking down during the production process. Using data collected from these assets can help businesses perform predictive maintenance based on machine learning algorithms, resulting in more uptime and higher efficiency.

Edge computing

The demands of real-time production operations mean that some data analysis must be done at the "edge"—that is, where the data is created. This minimizes latency time from when data is produced to when a response is required. For instance, the detection of a safety or quality issue may require near-real-time action with the equipment. The time needed to send data to the enterprise cloud and then back to the factory floor may be too lengthy and depends on the reliability of the network. Using edge computing also means that data stays near its source, reducing security risks.



WHAT IS GREEN MANUFACTURING AND HOW CAN IT BE BENEFICIAL TO YOU

MR. PAVAN
III MECH

Green manufacturing establishes renewable production processes and environmentally friendly practices in manufacturing businesses. The processes help limit a manufacturer's impact on the plant, enact positive change, and encourage other businesses to follow suit.

How Can a Business Practice Green Manufacturing?

There are a number of different ways a business can practice green manufacturing:

Use of Renewable Energy – Manufacturers often consume vast amounts of energy to create products. Businesses can find renewable sources for their energy, placing less strain on the energy supply and reducing the impact on the environment.

Boost Energy Efficiency – Not only can businesses change their source of energy, but they can also make improvements to the amount of energy it takes to manufacture products.

Pollution Reduction – Limiting the amount of pollution a business creates can make a big impact on the environment. This can be done through recycling and developing new technology to stop pollution.

Conserve Natural Resources – Big manufacturing plants often come at the expense of nature, so manufacturers can give back to the environment by committing to protecting natural areas.

Benefits of Green Manufacturing

Public Relations
If a company makes an exceptional effort to practice green manufacturing, then it's only right that they are rewarded and spoken about. The planet needs more and more businesses to become green, and one of the ways we encourage them to do this is by rewarding their efforts.

Employee Motivation and Recruitment
Public relations doesn't just help you sell more products. A positive image can give your employees extra motivation because they feel like they are working for a good company and that they're making a difference.

Tax Benefits
Many state and national governments offer incentives to companies that use green manufacturing methods. The move to go green can have significant upfront costs, but there are lots of incentives to help you make a start.

Bottom Line

Green manufacturing is clearly good for the environment, and it's something many manufacturers aspire to achieve, but at the end of the day, it's got to work for your bottom line. Lots of people depend on your business for jobs, and you can't afford to lose huge amounts of money by going green.

There are lots of reasons why moving to green manufacturing can actually save you money, though. Technology has improved green manufacturing processes greatly, and the public's buying preferences are being influenced more and more by sustainability.

Couple this with the fact that governments are eager to encourage manufacturers to go green, and it is possible to make changes while improving your bottom line.

Going green isn't something you can do overnight, but it is something you can achieve, and it's possible to start making your first steps now.

NANOTECHNOLOGY

MR. HARI PRASAD
III MECH

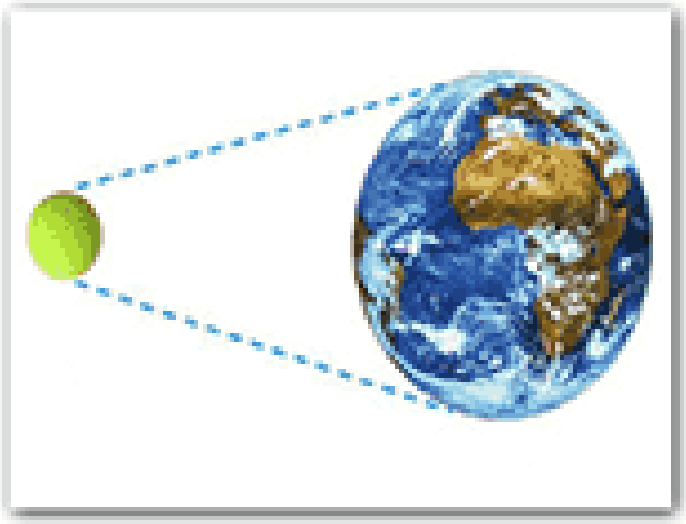
What Is Nanotechnology

Nanotechnology deals with the understanding and control of matter at dimensions between approximately 1 and 100 nanometers, where unique phenomena enable novel applications.

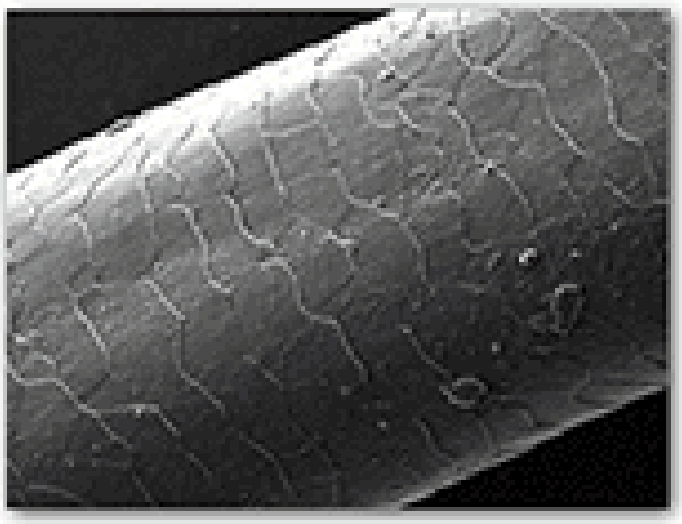
More specifically, nanotechnology is the imaging, modeling, measuring, design, characterization, production, and application of structures, devices, and systems by controlled manipulation of size and shape at the nanometer scale (atomic, molecular, and macromolecular scale) that produces structures, devices, and systems with at least one novel/superior characteristic or property.

The Nanoscale – How Small Is Nano?

Dimensions between approximately 1 and 100 nanometers are known as the nanoscale.
To see where 'nano' fits on the scale of things, check out our metric prefix table with examples and an interactive tutorial: View the Milky Way at 10 million light years from the Earth. Then move through space towards the Earth in successive orders of magnitude until you reach a tall oak tree. After that, begin to move from the actual size of a leaf into a microscopic world that reveals leaf cell walls, the cell nucleus, chromatin, DNA and finally, into the subatomic universe of electrons and protons.



1 nm is to a tennis ball what a tennis ball is to the Earth



A human hair is 50,000 to 100,000 nm thick

Who Coined the Term Nanotechnology?

The term was coined in 1974 by Norio Taniguichi of of Tokyo Science University to describe semiconductor processes such as thin-film deposition that deal with control on the order of nanometers. His definition still stands as the basic statement today: "Nano-technology mainly consists of the processing of separation, consolidation, and deformation of materials by one atom or one molecule."
Many argue that the history of nanotechnology starts with Richard Feynman's classic talk in December 1959: There's Plenty of Room at the Bottom - An Invitation to Enter a New Field of Physics:

The Significance of the Nanoscale – Why Does Nanotechnology Matter

Unusual physical, chemical, and biological properties can emerge in materials at the nanoscale. These properties may differ in important ways from the properties of bulk materials and single atoms or molecules.
The bulk properties of materials often change dramatically with nano ingredients. Composites made from particles of nano-size ceramics or metals smaller than 100 nanometers can suddenly become much stronger than predicted by existing materials-science models.

For example, metals with a so-called grain size of around 10 nanometers are as much as seven times harder and tougher than their ordinary counterparts with grain sizes in the hundreds of nanometers. The causes of these drastic changes stem from the weird world of quantum physics. The bulk properties of any material are merely the average of all the quantum forces affecting all the atoms. As you make things smaller and smaller, you eventually reach a point where the averaging no longer works.

The properties of materials can be different at the nanoscale for two main reasons:

Surface Area

First, nanomaterials have a relatively larger surface area when compared to the same mass of material produced in a larger form. This can make materials more chemically reactive (in some cases materials that are inert in their larger form are reactive when produced in their nanoscale form), and affect their strength or electrical properties.

Quantum Size Effects

Second, quantum effects can begin to dominate the behavior of matter at the nanoscale – particularly at the lower end – affecting the optical, electrical and magnetic behavior of materials. This effect describes the physics of electron properties in solids with great reductions in particle size. This effect does not come into play by going from macro to micro dimensions. However, it becomes dominant when the nanometer size range is reached.