YANTRA VIDYA

DEPARTMENT OF MECHANICAL ENGINEERING

Department Magazine
Issue: September 2021

VIDYA PRATISHTHAN's KAMALNAYAN BAJAJ INSTITUTE OF ENGINEERING AND TECHNOLOGY, BARAMATI

DEPARTMENT OF MECHANICAL ENGINEERING

Department Vision

To inculcate Learning culture in Students and Faculties to meet the Current and Future Technological challenges of Industry and Society

Department Mission

- To impart the students with fundamental knowledge of mechanical engineering.
- To provide practical exposure by promoting students for training and internship in related industries.
- Holistic development of the students by inculcating ethical and moral values towards the society and environment.
- To develop association with premier educational institutions, industries and alumni for enhancement of faculty skill.

Principal's Message

Dr. R. S. Bichkar
Principal,
VPKBIET, Baramati.

I am pleased to hear that, Department of Mechanical Engineering is publishing the September 2021 issue of department magazine, 'Yantravidya'. The result of high intention, sincere efforts, and intelligent execution, always leads to excellence with choices not chances. The articles composed with these magazines will sow the seeds of ideas, germinate to the fullest extent possible, and this will lead to the success story. In the era of cut-through competition, the molding of tomorrow's technocrats happens to be all-round engineers, not only Mechanical Engineers. I am sure, the task force of Mechanical Engineering department has taken lead, to one of the best examples of not only the land of ideas but the forest of excellent products.

Vice-Principal's Message

Dr. S. B. Lande
Vice-Principal,
VPKBIET, Baramati.

I am delighted to announce that the Department of Mechanical Engineering is bringing their Technical Magazine for this academic year (2021-2022). It is a tool for faculty and students to develop productive technical materials and support skills. The most important thing you can get out of this fantastic effort is that it brings out the various technical and analytical skills of novice engineers. I am happy to welcome all the teachers, students who are more interested in bringing articles with more bright concepts and innovative ideas in the coming issues.

I wish the "Department of Mechanical Engineering" of this organization great success in all their endeavors. I congratulate the Head of the Department of Mechanical Engineering, the Editor and his dedicated committee for their invaluable efforts in bringing this issue to the fore. I wish them all success.

HoD's Message

Dr. S. M. Bhosle

Head of Department,

Mechanical Engineering

VPKBIET, Baramati.

The Mechanical Engineering Department at VPKBIET Baramati is dedicated to give experiential learning experience to students through hands-on-training, by well qualified and experienced faculty from world's reputed institutions. We believe the true learning experience from academic delivery can be achieved through teaching innovations, mentoring practice, and creation of knowledge from experiments.

The research opportunities available with us are not limited to faculty and masters students; our undergraduate students work alongside many faculty members. Our student-led emerging technology centers and design groups, under the guidance of faculty members, are always seeking opportunities from industry to collaborate on research and projects. This magazine is our humble attempt to share the views and contributions of the technocrats within and outside the institute for exchange of ideas. We are certainly eager to receive technology review articles from industry. I wish good luck and happy learning to the entire team and students. We look forward to your kind patronage to our magazine.

List of Articles

Research for Sustainable Development Goals

Dr. R. K. Shastri

Dean R&D,

VPKBIET, Baramati.

Research is a systematic investigation into and study of materials and sources to establish facts and reach new conclusions. Research nourishes our minds, gives us the latest information, and expands our knowledge. Research helps us in problem-solving and help the community by providing life-changing solutions, Currently, less than 1% of India's higher education institutions engage in research. It means the nation's faculty and students in higher education institutions are not involved with knowledge creation. Is it so dull? Is it not important? But it's a fact that there has been- a massive loss to India's research potential. India is a vast and leading country with many problems to address. The United Nations has put forth the 2030 agenda for sustainable development. This has been adopted by all United Nations Member States in 2015, provides a shared roadmap for peace and prosperity for people and the planet, now and into the future. It proposes 17 Sustainable Development Goals (SDGs), which are of the highest priority for action by all countries - developed and developing - in a global partnership. India secured a rank of 120 in SDG 2021 rankings.

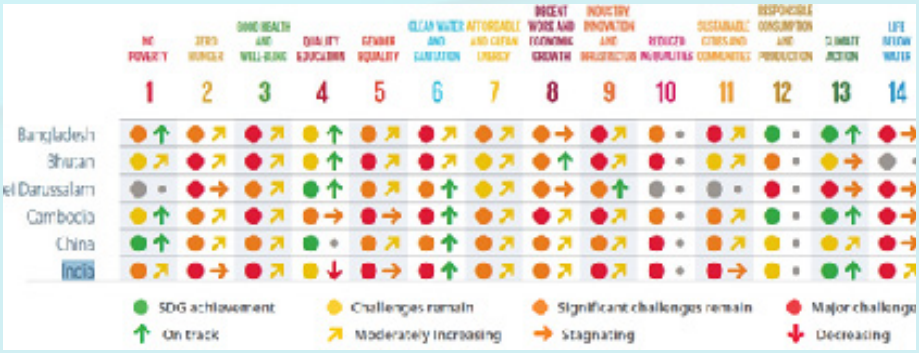
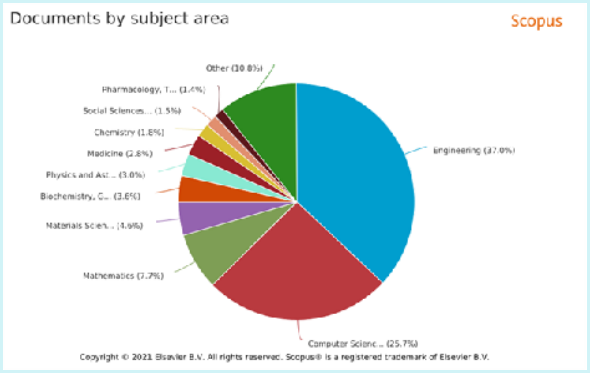
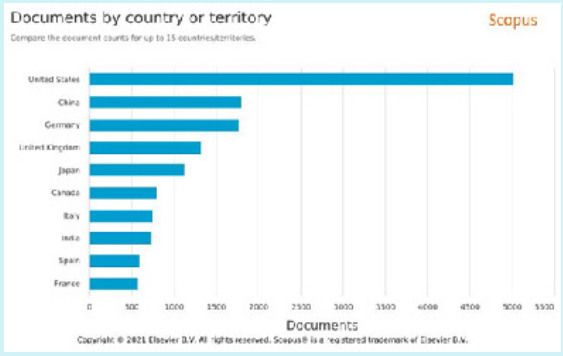


Figure: SDG Ranking

Societal challenges that India has today, such as access for all its citizens clean drinking water and sanitation, quality education and healthcare, social equity, improved transportation, sustainable infrastructure, elimination of poverty, air quality, clean energy, quality of life on land and underwater and reversing climate change and its negative impact. This will require the implementation of approaches and solutions from engineers and technocrats. Facing and addressing these challenges will need high-quality, interdisciplinary research across fields, which must be conducted in India and cannot be imported.



Research outcomes are measured in terms of publications and patents. India has been doing somewhat better in terms of publications, showing steady growth in its output, and taking India's share of scientific publications from 3.1% in 2009 to 4.4% in 2013 to 4.8% in 2016. However, a 2018 compilation of Science and Engineering indicators by the U.S. National Science Foundation showed that the USA (17.8%) and China (18.6%) published approximately four times as many articles as India in 2016. Here the example of the field "Robotics and Automation." is taken into consideration to publication search. The following figures show statistics from Scopus search for "Robotics and Automation." The contribution of engineers worldwide in the field of Robotics and Automation is 37% in Scopus databases. India stands in 8th position in publications in Robotics and Automation, which need to be improved by all of us. Though in terms of the total number of publications, India stands at the 5th position globally, in terms of the citation impact, India is much lower at the 11th position. Only 15.8% of the total publications are in the top 10 journals, e.g., 27.6% in China and 36.2% in the U.S. The overall quality of our research and innovation is currently not up to current global standards. India lags other nations in the number of patents produced. According to the World Intellectual Property Organization (WIPO) 2017 report, as many as 13,81,584 patent applications were made by China, and 6,06,956 by USA, but a mere 46,582 by India - of which non-resident Indians made approximately 68%. To achieve better research outcomes regarding patents and publications, we need to emphasize developing students' mindsets through experiential learning and consistent questioning. Frequent brainstorming sessions are required for idea generation to achieve sustainable development goals by empathizing. We need to enforce "Think Globally Act Locally" and contribute to solving local problems or sustainable development targets through interdisciplinary projects. Various online learning platforms are available to develop knowledge and skills required for research which should be utilized to the fullest. Students should use centers of excellence and research labs to get an opportunity to work on real-life problems. The outcomes of research need to be published primarily in terms of patents and papers and convert them into startups. It is also well-understood that a research culture across disciplines enables a nation to adapt and apply relevant research from abroad quickly. Let's join brains together for multidisciplinary projects to make India leading.



References:

1. Report of United Nations on Sustainable development goals, 2021
2. Report of National Research Foundation 2019.
3. Scopus Document Search (Accessed on 13th Sept. 2021)

Business Stability through Technological Interface in HR Processes

Mr. Sadashiv B. Patil Asso. V.P.- HR, IR & Admin. Bharat Forge Ltd., Baramati

Dr. Dinesh B. Hanchate Dean, IIIC Comp. Engg.,VPKBIET, Baramati

There is great momentum across nearly every industry as organizations embrace automation. It combines recent trends in advanced technology which is useful for making processes automatic to manage and improve business processes. That's why it becomes today's demand for a digital workplace for engaging employees in all the services to have advanced and technological facilities available to the employees at work. This digital work- place enables easy retrieval and collection of data which leads to better analytical information. This provides informed insight in the company's operating system. It helps to perform employee's jobs more and more accurately and precisely with technological automation. Some important HR functional tools are shown below. It gives rise to work faster and more efficiently for business sustainability. 1) HRMS (Human Resource Management System 2) Performance Management system (PMS). 3) Artificial Intelligence in Recruitment, on boarding, Training and Retention. 4) Payroll software. 5) Performance Evaluation, Compensation and Benefits management. 6) Employee engagement. 7) Reducing bias in HR decision making. 8) Measuring return on Investments. Such technological advancement, Information and Communication can greatly contribute to the fulfilment of Human Resource strategies that can propel the path to digital Human Resource function for business sustainability. The availability of AI tools for employees and HR makes the environment technological and accurate result oriented. Hence, HR will certainly become more technological adaptable to make themselves technical oriented. Thus HR tasks can be more efficiently done. Their decision power makes them go on the correct path. It is advisable to the students of Mechanical Engineering to get trained on such emerging technologies related to data management for functional efficiency. Our best wishes to VPKBIET Baramati's Mechanical Engineering department for this magazine issue, Happy learning.

Prepare Yourself for Automotive Sector in Germany

Mr. Mahesh C. Baravkar

M.Engg. Electrical Engineering & Informatics

University: Technical Hochschule Ingolstadt, Bayern, Germany

Position: Technical Risk Analysis Moderator

Company Name: PREH GmbH

Electro Mobility will disrupt automotive industry and by 2035, the global automotive markets will go electric. As an automotive professional, I would like to say that today the automotive industry without EVs is no longer imaginable. The fulfilled success factors after extensive research offers breeding ground for the EV market. Therefore, EVs are rapidly becoming a mainstream in vehicle product lines. Today all major OEMs offer at least one EV. More models will follow in the near future. Therefore, OEMs are confronted with growing challenges to succeed and become market leaders in the EV market.

Educating Budding Engineers through Operational Technology for Industry

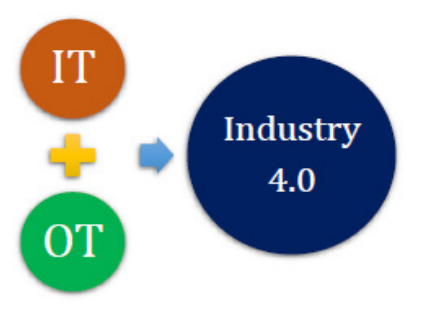
Mr. Anand Joshi (Alumni of 2012-13)

Senior Project Associate

Leadership For Equity, Pune

Manufacturing has emerged as one of the high growth sectors in India. India is expected to become the fifth largest manufacturing country in the world by the end of 2020. The sector's contribution to the country's GDP stood at 16 51 per cent in 2016 Micro, Small and Medium Enterprises (contribute nearly 8% of the country's GDP, 45% of the manufacturing output and 40% of the exports. The present era is Industry 4.0, the fourth industrial revolution which is based on information technology and operational technology. To make progress in such an era, the MSMEs must be made even more efficient and ready with necessary technologies. Lean Manufacturing is a set of techniques, based on various minor to major breakthroughs that help in reducing cost and hence increase productivity.

Since many years, the number of sick MSMEs has been increasing year after year in India. Various schemes were launched and are still being launched by the Government of India to increase the competency of MSMEs. They are helping in all respects but still there is a wide scope to take the lean awareness and its benefits up to the ground level. Industry 4.0 is a new phase of the industrial revolution, in which existing factory automation is being integrated with IT networks and systems. It essentially represents the application of the latest advanced digital information technologies to industrial activities. The term Industry 4.0 derives from the belief that this is the next (i.e. fourth) major disruption in the manufacturing value chain.



In general, there are four types of technologies that will come into play as we enter the next industrial revolution:
•Data, compute, and connectivity (including "Big Data," IoT/Machine to Machine (M2M), and Cloud)
•Analytics and Artificial Intelligence (AI) including machine learning and advanced analytics applied to large datasets.
•Human-machine interaction (UI, touchscreens, virtual reality, augmented reality)
• Digital-analog/physical conversion - the interface between the digital and physical realms; includes 3D printing and additive manufacturing, advanced 3D scanning, advanced robotics, and energy storage and harvesting (i.e. conversion of physical to electrical and back).

It's our responsibility to make the students aware of this. According to the joint report of NASSCOM and FICCI, by 2022, 37% of the Indian workforce will be engaged in different job roles and 7% of the workforce will be doing the jobs which do not even exist today.

It has been noticed that units are so engaged in the day to day management issues that they don't have time and resources to dedicate for a strategic understanding of the need and acquiring means of various techniques which would help them in enhancing their productivity and hence being competitive in the world. Lean Manufacturing is a set of techniques, which have evolved over a long period and are based on various minor to major breakthroughs that help in reducing cost and hence increase productivity.

Lean is also the major backbone of the Industry 4.0 revolution. The fourth Industrial revolution is based on 2 major technologies: Information Technology and Operational Technology. Therefore, Lean philosophy plays a major role in it. If we want our industries to get ready for this 4 th revolution, we must imbibe the culture of Lean within them. The major challenge now for the higher educational institutes is about how to make the budding engineers ready for this Industry 4.0. Also, it is equally important to get to know that along with Information Technology, Operational Technology is something where skill-based training and support needs to be provided to the budding engineers at the institute level.

The question which may arise in the mind is "Why Operational Technology? Does it have any correlation with the Industry 4.0 technologies?" The answer is "Yes", lean tools are serving as the backbone for the Industry 4.0 technologies, that too in terms of providing the necessary thought process in their development.

Future of Automobile Industry

Mr. Rahul G. Awargand (Alumni of 2012-13)

Assistant Manager Research & Development,
Sujan ContiTech AVS Pvt. Ltd., Pune.

It is not for the first time that we are seeing electric vehicles running on the roads. The technology is not new for us. It was tried and tested decades ago. Then why is the electric vehicle market emerging exponentially in recent days? Well, all of us may be aware of this but many of us are not. Today is not just an era of electric vehicles but also of technologies which are emerging along with it. Well, driverless cars or autonomous vehicles are not a new thing too. Many of the major companies like GM, Google, Tesla etc. have tested their vehicles a decade before. The revolution of the telecom industry, artificial intelligence (AI), connectivity, internet of things (IoT) etc. have brought up application of these technologies one step ahead. In many cases the concepts are similar however the technology is upgraded in a much better way. Still there are many technologies which have a huge potential to grow in the future, such as artificial intelligence (AI).

Talking to someone at a distance of some kilometres was also a dream which became reality after invention of the cell phones and the satellite communication technologies. In a similar way the day will come when artificial intelligence will grow at its peak. The rolling of AI robots is not a faraway dream. AI is that powerful tool that can bring fully driverless vehicles on the road and we will see within the upcoming 10 to 15 years. As per the TOI report, in 2019, in road accidents around 1.5 lakh lives were lost. Interconnectivity, GPS or LPS, AI etc. will assist the driver to protect against the accidents. For example, today we see an alarm by vehicle when we do not wear a seat belt or the door is open. In future the vehicle will understand the drivers' emotions and automatically will switch to the autopilot mode. For example, it will sense sleepiness, anger, hyper-excitement etc. and will adjust the vehicle speed, detect

the edges and turns of the road, other vehicles and its speed, other obstacles in its path using GPS, LPS and navigation systems and will prevent mis happenings. To develop such things a vehicle needs more and more data, vehicle interconnectivity to record the behaviour, regular paths, emergency locations etc. for which it needs storage space where the AI cloud storage technology will play a big role. We will not wonder if a driver suddenly had a medical emergency, for example, he/she had a heart attack, the vehicle will automatically detect unanimous behaviour and will switch to the autopilot mode and bring its owner to the nearest hospital by beeping the emergency lights and sounds outside the hospital. Similarly, it will notify regarding the low fuel/battery scenario and automatically suggest nearest fuel/charging station. The digital revolution will go on improving and our next generation will adapt to it too quickly as we can see that our previous generation is still facing an issue to handle the computer or smartphones, however our generation got used to it and it is no more surprising for us.

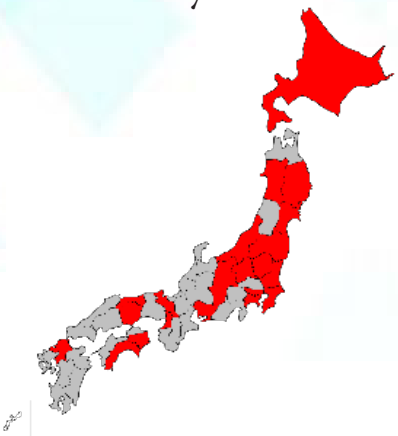
The discussed technologies are relatively new to us and has a long way to go to grow at its full potential. A special kind of infrastructure is needed to make this possible. For example, smart highways using IoT and AI, charging stations with minimal charging time and longer range etc. The first innovation era always comes at higher cost and as the technology penetrates over the period of time the things will get cheaper. Electric vehicles are the future of the automobile industry and the research has shown that electric cars are better for the environment. The dream of breathing in fresh air will become reality over a period of time. The only thing is that most of the charging stations should use renewable energies like solar, wind etc. instead of coal produced electric energy. The E-waste management will become a critical issue if we fail to dispose of the e waste using better disposal ways. The future is great, what we need is better planning today.

Germany & Japan Calling !

Mr. Rohan Taware
BE-Mechanical (2019-20)

Imagine you need a plumber or electric wiremen for some house work, and have to take appointment of these guys in advance. It sounds ridiculous in India, but its reality in Germany. According to German experts, there would be approximately 400k less skilled workers than required in Germany. These skilled workers include doctors, engineers, and semi-skilled workers. Germany offers even more for skilled engineers with great opportunities and a very good lifestyle. Same goes with Japan. Japan is facing a shortage of skilled personnel and has loosened gates for foreign workers. This is a very nice opportunity for Indian engineers and other skilled people to work in foreign countries.

The major obstacle is the requirement of Japanese or German language competency which looks difficult, but not as much as it looks. Rather in the current digital revolution it's very easy to learn these languages even without spending any rupee. There are many online learning platforms which provide opportunities to learn these languages. Learning German language also opens doors to other countries like Austria and Switzerland. Japan government provides engineering students an online internship-'METI Japan Internship Program' of 4 months wherein students can work either from home or from selected cities of India. These opportunities are not only for meritorious students but are also for average students ("so called") who sometimes struggle to find a good career track in India. There are plenty more opportunities calling from these two countries but, lack of awareness is the main reason students don't opt for such a career track. It would be great if Indian students from tier II, III colleges take this opportunity and make a successful career….



Collaborative Research

Dr. V. B. Gawande
Assistant Professor,
Dept. of Mech. Engg.

Collaborative research can be defined as research that is conducted by more than one researcher, or research team, either within their institution or with colleagues in other institutions towards a common goal. Successful collaboration requires that all the participating members work together towards a common goal that has been agreed upon by all the parties. Each member of the team is considered an important part of the team and that they understand their role and the expectations from their activity. The interactions are based on trust, respect, good communication, and the ability to compromise.

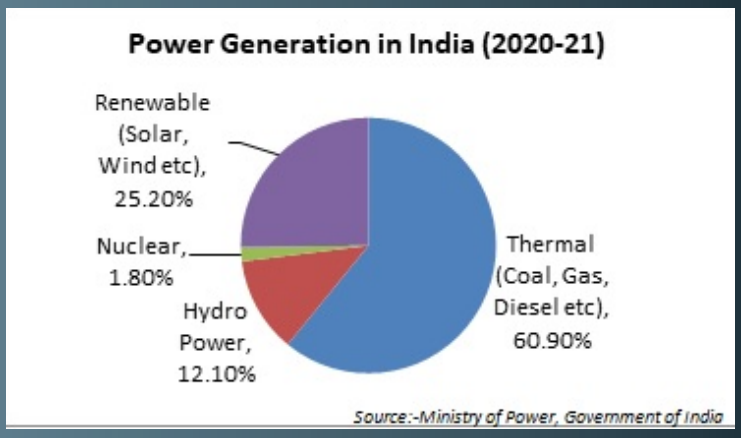
It is important to have a clear understanding and agreement on the roles and responsibilities of each member. This should include a clear understanding of the Leadership and Team Members. Discuss issues related to publications arising from the collaborative research in advance and document the agreements
The benefits of collaboration are undeniable, and collaboration is in the best spirit of science. Establishing a collaboration can leave scientists vulnerable to the actions or inactions of their collaborators. In choosing collaborators, trust and credibility are essential values. Choosing collaborators must be based not only on scientific considerations but also on the likelihood of a respectful, even amicable, a relationship in which lines of communication can be kept open.

*Reference:- Harvard Responsible Conduct of Research, January 15, 2016.

Opportunities in Energy Sector

Mr. A. H. Kolekar
Assistant Professor,
Dept. of Mech. Engg.

Nowadays, energy has become an essential requirement for human existence and development. The gap between available energy and energy demand is widening day by day. Considering the whole world, this need is expected to increase by almost 60% in the next 30 years. In a developing country like India, energy demand is expected to grow by more than 130%. To meet this need, we have to find alternative energy sources and not rely on conventional energy sources such as thermal energy. As on today, the share of electricity generated in India from thermal energy, i.e. coal, gas and petroleum is 60 to 65%. The remaining 30 to 35% of energy is getting from hydropower, non-conventional energy sources such as solar energy, windmills, biofuels etc. India has focused on nuclear as well as non-conventional energy sources to meet future energy demand. Nuclear energy generation is reached 6780 MW in 2020 under India's Atomic Energy Program. The country has set ambitious renewable energy goals – 175 GW by 2022 and 450 GW by 2030. The share of Non-conventional energy sources which is 40% will increase up to 80% of the energy available at that time in the year 2035.



By 2050, 90% of India's energy infrastructure will be in the non-conventional energy sector. This change will require skilled manpower. Number of jobs will be created in the energy sector in the near future. Also, in the current situation, it is necessary to save the energy that is available by planning it properly. The industrial sector needs experts for this.

As a result, a graduate and post graduate in this field, an Energy Engineer, can work with the power generation sector to provide green, economical and pollution-free energy. This engineer can play various roles in the industry such as designing and testing of machinery (engines, boilers, turbines, etc.), as well as improving existing industrial processes, developing nonconventional energy sources, which are still in their infancy.

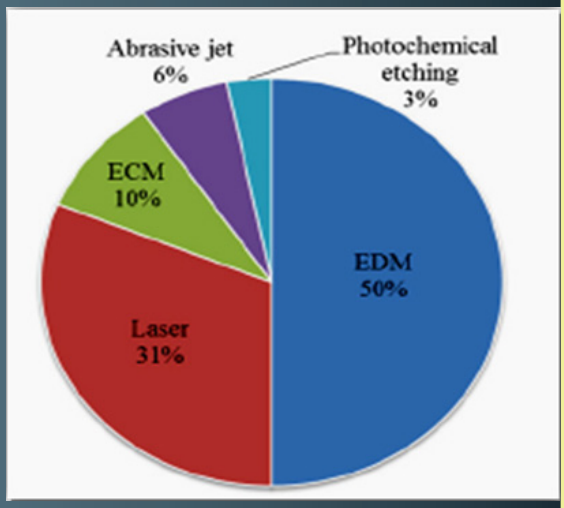
Opportunities are available for Energy Engineer in the following industries

Power generation and distribution, Nuclear energy and related industries, Unconventional energy sector, Automotive and generator industry, Petroleum refining and distribution, Boiler and cold storage industry, Chemical industry, Pharmaceutical industry, Paper and pulp industry, Bio-industry And research institutes and so on.

Least Well-Known Non-Conventional Machining Process

Mr. H. P. Borate
Assistant Professor,
Dept. of Mech. Engg.

The modern highly cutthroat industrial environment demands machining and production processes resulting in exceptional quality and precision. Nonconventional machining processes differ from conventional ones, as they make use of alternative types of energy, such as thermal, electrical, and chemical, to form or to remove material. Commonly, the energy source has high power density, while the process features phenomenal accuracy, and the capability to produce and handle demanding shapes and geometries. Examples of non-conventional machining processes are electrical discharge machining (EDM), electrochemical machining (ECM), laser processing, and laser-assisted machining. Abrasive processes like grinding, lapping, polishing, and super finishing are constantly developing and allow for obtaining a fine surface finish along with high efficiency.



Photochemical machining is one the suitable process for fabrication of micro channels using different materials. However very limited works have been reported on photochemical machining of materials as well as on the fabrication of micro channels using photochemical machining. Therefore, there is a definite scope for work in this area in order to establish this technique for manufacturing of micro channels.

The PCM industry presently plays a vital role in the production of a variety of precision parts viz. micro fluidic channels, silicon integrated circuits, copper printed circuit boards and ornamental items. It is mainly used for manufacturing of micro-components in various fields such as electronics, aerospace and medical.

There is an increased scientific and commercial interest in in-depth understanding, and further development of the aforementioned photochemical precision machining processes. Research is moving forward through experimental studies, as well in the field of modeling and simulation, exploiting the increased available computational power. As their wider use by the industry swiftly grows, research has to be focused on them, not only due to the academic and scientific interest, but also for the possible financial gain.

Sensors in Everyday Life

Mr. D. D. Rupanwar
Assistant Professor,
Dept. of Mech. Engg.

We use sensors everywhere in our routine life. Sensors are all around us and knowingly or unknowingly, the sensors are involved in our so many routine tasks. From writing a message to someone from our mobile phone to getting a cup of coffee from a coffee vending machine and from opening the automatic doors in a shopping mall to parking a car in designated parking areas, sensors play a vital role in helping us directly or indirectly.

So, what is a sensor basically? A sensor is a device, module, machine, or subsystem whose purpose is to detect events or changes in its environment and send the information to other electronics, frequently a computer processor. Thus, in sensors one form of energy is converted into another form of energy. A sensor is always used with other electronics devices like signal conditioning devices, analog to digital converters (ADC) etc. The events detected by the sensor or the changes in environment are known as input to the sensor and the information sent by the sensor is known as output of sensor. e.g., For a thermocouple sensor temperature or change in temperature is input while emf induced by thermocouple is the output.

In our everyday life, we use sensors every time, we come across any advanced instrument/ gadget. When we are writing something on the screenof a smartphone, basically we are using a tactile sensor. Similarly, a capacitive sensor can be used to lock or unlock the smartphone. A capacitive or resistive sensor can be used in the touch pad of a laptop. In refrigerators we use temperature sensors to start/stop the compressor. In automobiles we use Tachometers to measure the speed of the vehicle. For car parking systems we can use ultrasonic sensors.

In public places and offices there are numerous applications of sensors. We can use a variety of proximity sensors to detect the presence of human beings when opening or closing an automatic door in supermarkets or shopping malls. Similar kinds of sensors can be used to start/stop the staircases. Sensor taps can be used to control the flow of water in toilets. A coffee vending machine installed in public places uses a position sensor to dispense the exact amount of coffee.

In essence sensors have captured all aspects of human life and the presence of the sensors can be felt everywhere around us. Sensors is a vast field and with the growing demand for automated systems one can try to learn the basics of sensors to develop future AI based systems and IoT based automation technologies.

Fuel cell

In the last few years, the most fascinating question for everybody was “Will Hydrogen be ever used as a fuel in vehicles?” The answer to this question is, yes. Fuel Cell is the solution to this problem. In the world where the consumption of common fuel like gasoline and diesel is touching the skies, car manufacturers like Tesla came up strongly setting an example of being an option to enjoy the drive and save the environment at the same time. The Electric Vehicles, or also known as The EVs started to rule the market in Western countries, engineers also started to look for an option for the ‘option’. We have been reading or at least hearing this term called ‘Fuel Cells’ for a while now. Fuel Cells are actually the Galvanic Cells, consisting of an anode, a cathode and an electrolyte using Hydrogen and Oxygen. In chemistry, the very basic reaction everyone learned was $2H_2 + O_2 = 2H_2O$. The additional product of this reaction is Energy. So, the reaction becomes $2H_2 + O_2 = 2H_2O$ + Energy. This basic reaction is used in Fuel Cell. Now, there are various types of Fuel Cells available and more understudies. The very basic types are:

1) Polymer Electrolyte Membrane Fuel Cell(PEMFC)
2) Solid Oxide Fuel Cell (SOFC)
3) Direct Methanol Fuel Cell (DMFC)
4) Molten Carbonate Fuel Cell (MCFC)
5) Alkaline Fuel Cell (AFC)
6) Phosphoric Acid Fuel Cell (PAFC)

Mr. Hrishikesh Dixit
BE-Mechanical (2020-21)

Fuel Cells use electrolyte to convert hydrogen and oxygen into their respective ions. After reading all this I hope you’ve got an idea about what Fuel Cells are and how they work. Let me tell you about a car running on roads using this very technology. Yes, there is a car running on this technology; the Toyota Mirai. It is in the name, we all know that Toyota is a Japanese motor company, well Mirai in Japanese means The Future. Yes, the future of cars, the revolution in the automobile sector and the enjoyment of the environment for our future generations is possible using the most abundant element on this planet-Hydrogen.

Beauty of Clouds

Mr. Chetan Bankar
(BE-Mechanical 2020-21)

Have you ever had fun just looking up at the clouds and seeing what forms they take? Have you ever wondered how they form and how many different types they have? Well, let's find out! What is the cloud? "Cloud" is a visible group of water droplets floating in the atmosphere above the surface of the earth. When billions of water droplets are grouped, they become visible clouds! Clouds form when warm air containing water vapor rises. Warm air rises because it is lighter than the surrounding air. When it moves upwards, it gets lower and lower pressure and expands, and that makes it colder.

As it cools, water vapor condenses out of the air as tiny water droplets. (To condense means to change from a gas or a vapor to a liquid). These tiny droplets of water are packed together so tightly that the sunlight cannot penetrate far into the cloud before it is reflected out. This gives a cloud its characteristic white color. Under certain conditions, droplets may combine to produce larger droplets. These large droplets may then combine to form very large droplets, large enough to fall as rain. Clouds can be divided into two general categories, viz. Layered clouds and Convective clouds. Layered clouds are called Stratus clouds whereas convective clouds are known as Cumulus clouds. Stratus means layer and cumulus means piled up. These two cloud types are further divided into three more groups by their altitude or how high the cloud is. The classification is as follows: Low clouds, mid-level clouds, and high clouds. Low clouds have bases below 2 km. Mid-level clouds have bases between 2 to 6 km. High clouds have bases above 6 km. Within these different altitude ranges, several different types of clouds can exist. To remember their names easily, you can think of them as players on a team and each team member has a different name.

Low cloud team	Mid-level cloud team	High cloud team
Stratus, Nimbostratus, Cumulus, Stratocumulus,Cumulonimbus, Fog	Altocumulus Altostratus	Cirrus, Cirrocumulus, Cirrostratus Contrails

1) Stratus Cloud

2) Nimbostratus Cloud

3) Cumulus Cloud

4) Stratocumulus Cloud

5) Cumulonimbus Cloud

6) Altocumulus Cloud

7) Altostratus Cloud

8) Cirrus Cloud and Contrail

9) Cirrocumulus Clouds

10) Cirrostratus Cloud with Halo

*All images are photographed by the author.

1. Stratus: Grey, flat, and boring! Drizzle may fall. Called hill fog on high ground.
2. Nimbostratus: Thick. dark stratus. Giving rain, which often heavy and prolonged. Difficult to photograph.
3. Cumulus: Small cumulus have a cotton wool shape. Often grow to bunch together. No rain.
4. Stratocumulus: Common. sometimes covering the whole sky. Sometimes more like flattened cumulus.
5. Cumulonimbus: Cumulus grown tall and dark. Thunderstorm. The top can be very high. Sometimes feathery or flat.
6. Altocumulus: Broken into small flat clouds. often regularly arranged. No rain or snow.
7. Altostratus: Thicker than cirrostratus. Sun visible as a disc. No shadows or halo.
8. Cirrus: Sometimes delicate, hair-like strands. Sometimes thicker blobs.
9. Cirrocumulus: Not a common type. Sometimes dappled or rippled. Sun visible.
10. Cirrostratus: A veil of thin white clouds. Sun visible with shadows. Often with a halo.

Clouds not have all those amazing shapes, but they also have a variety of different colors. The color of a cloud tells us what is going on inside the cloud. Here is something for you to think about! Consider how much easier it is to see through heavy rain than a heavy fog. It has to do with how much light can transmit between water droplets. The interaction of light with cloud particles of different sizes causes the array of shades, from white to gray and even black. Other colors can occur naturally in clouds. A blue bright color is the result of light scattering within the cloud. A greenish color occurs when sunlight is scattered by ice. A cumulonimbus cloud showing a greenish tint is a pretty good predictor of heavy rain. Now you are a cloud expert! So the next time when you are looking at the clouds, identify them by their real names!

RISE OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING IN MECHANICAL ENGENEERING

Mr. Ajinkya Chavan
SE-Mechanical (2021-22)

The sector of Mechanical Engineering is the primary consumer of Artificial Intelligence as a technology. Machines and equipment bring AI-technologies as embedded Artificial Intelligence to a variety of customers and industrial. Mechanical engineering builds on its experience in efficient technology integration and in responsible design of human-machine cooperation- for example in robotics, automation or sensor technology. Artificial intelligence and machine learning are really ubiquitous and exciting technologies, and I really view them as another Really important tools for mechanical engineers. Because, what's the role of the mechanical engineers? We build the physical devices you that interact with, whether or not it's car, it's your Nest thermostst, it's medical devices that your Surgeon's using. As we saw during the pandamic, AI helped researches develop COVID-19 treatments and vaccinations at speeds previously unheard of. And what artificial intelligence is going to let mechanical engineering do is to take it to the next level to develop a better device, to better understand that physical phenomenon.

It is more than any other industry; it is consumed the most in Mechanical design or engineering works. Section of Mechanical Engineering like Robotics, Automation, or sensor technology,uses Artificial Intelligence as a technlogy. So it is easy to say that Mechanical Engineering disseminates the application and uses of AI in the eco-system.

Many processes in the manufacturing industry requires Mechanical Engineering to be done with components, products, processes, etc. Artificial Intelligence is currently used in similar processes of Mechanical Engineering. Whether in components, products, or processes. it is making sure about its presence being felt. There are many other processes and technologies which are becoming easy -fast and efficient with the help of Artificial Intelligence . Machine's which can do more work than human tendancy and that too with least efforts of human into it is the main goal here.

Mechanical Sensors

Ms. Sakshi Shiraskar
SE Mechanical (2021-22)

Now a days Sensors are the most important part of Technology. They are in phones, cars, planes, trains, robots, mills, power plants, packaging lines etc. Modern technology could not exist without sensors. Mechanical sensors are sensitive to changes in mechanical properties ,they are based on resistive materials or structures . Most popular mechanical sensors such as cantilevers and acoustic sensors play an important role in molecular detection. Some important type of sensors which are used in mechanical Acoustic, sound, vibration Automotive , Chemical, Electric current, electric potential, magnetic, radio, Environment, weather, moisture, humidity, Flow, fluid velocity, Navigation instruments, Position, angle, displacement, distance, speed, acceleration, Optical, Pressure, Force, density, level, Thermal, heat, temperature, Speed sensor.

A Chemical sensor is an analyzer that has to respond to a particular analyte in a selective and reversible way, transforming a chemical concentration into an electric signal, with its key element being the sensing material. Gas Sensor are used for detecting a wide range gaseous substances in the atmosphere, including pollutants, toxins and combustible gases. Thermal Sensor built into the clothing provide a warning to fire-fighters of critical temperatures that will cause heat stress and burn. A Pressure Sensor are the pressure probe inserted radially into the flow upstream of the rotor to the mean radius indicates a flow angle of the axial direction.

Sensor/Detectors/Transducers are electrical, opto-electrical, or electronic devices composed of specialty electronics or otherwise sensitive materials, for determining if there is a presence of a particular entity or function. Many types of sensors, detectors, and transducers are available including those for detecting a physical presence such as flame, metals, leaks, levels, or gas and chemicals, among others. Some are designed to sense physical properties such as temperature, pressure, or radiation, while others can detect motion or proximity. They operate in a variety of manners depending on the application and may include electromagnetic fields, or optics, among others. Many applications over a wide range of industries use sensors,detectors, and transducers of many kinds to test, measure, and control various processes and machine functions. With the advent of the Internet of Things (IoT), the need for sensors as a primary tool to provide enhanced automation is increasing.

Editor's note . . .

Mr. K. M. Jadhav
Assistant Professor
Dept. of Mech. Engg.
VPKBIET, Baramati.

Dear readers,
We are delighted to unveil our department's technical magazine 'Yantra Vidya' on the occasion of Engineer's day. Our magazine will be available in print, mobile and digital edition that makes our content easier to explore and engage with.

As a technical magazine, it is going to cover many issues related to emerging technologies in mechanical engineering, career opportunities, technological innovations, overall development and much more.

We aim for inspiring our readers by keeping them updated with the latest technological developments. Also, we aim for motivating our writers and content providers by giving them a platform for sharing their views.

We highly appreciate and thank our talented writers, who have allowed us to share their views and stories. We are glad to present our magazine's September 2021 Issue, which features clean and thoughtful layout and new approach for reader's experience.

Lastly, I would like to sincerely thank the editorial team who have helped by creatively putting all the things together.

Let us know, what you think,
your suggestions are highly appreciated!!!
Thanks for your time!!

You can contact us at: keshav.jadhav@vpkbiet.org

EDITORIAL TEAM

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THE MORE YOU REALIZE THE BOX NEVER EXISTED ...