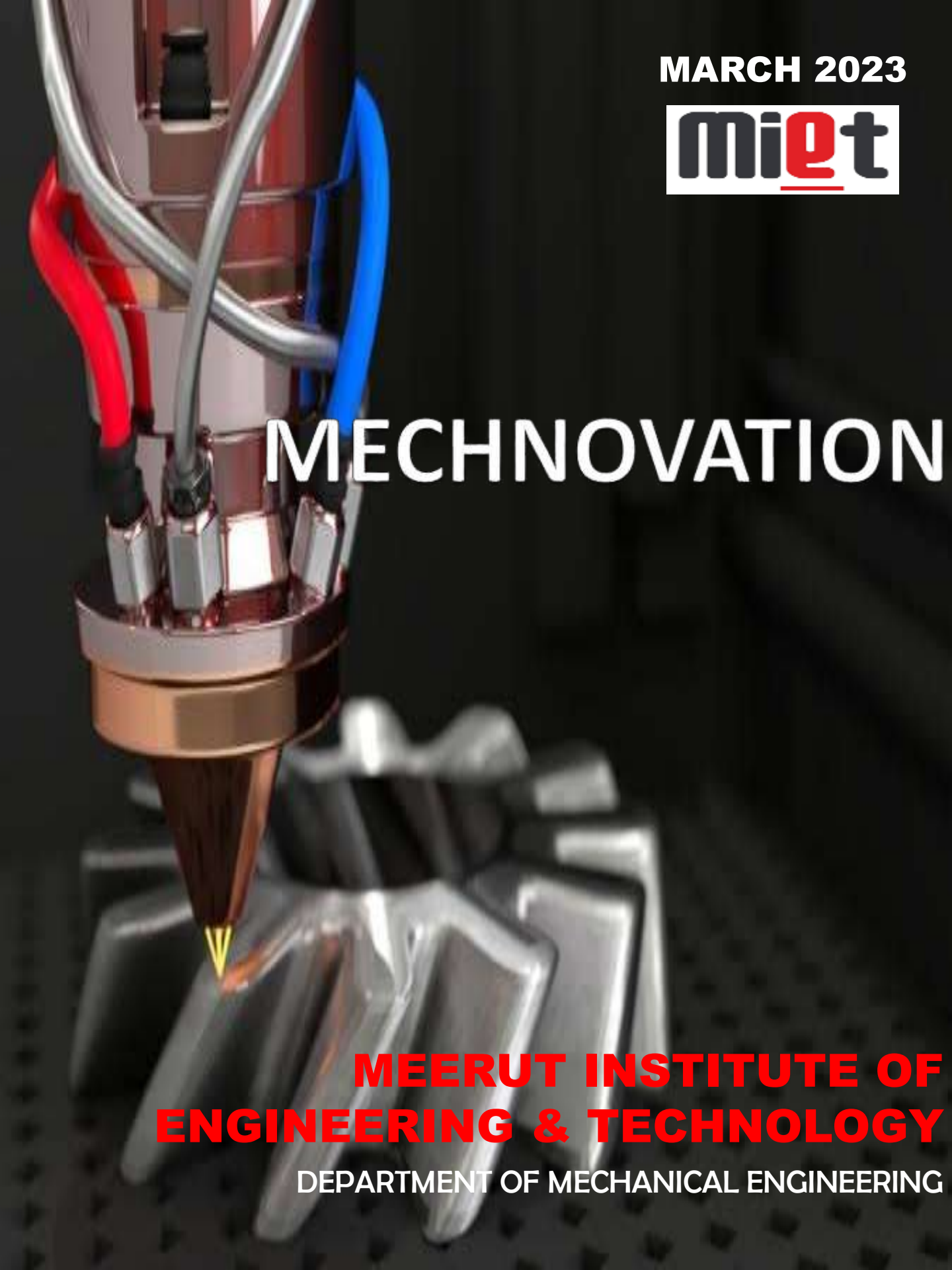

MARCH 2023

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MECHNOVATION

MEERUT INSTITUTE OF ENGINEERING & TECHNOLOGY

DEPARTMENT OF MECHANICAL ENGINEERING

PREFACE

This e-magazine is a quarterly magazine published by the department of Mechanical Engineering, MIET, Meerut. This edition includes research papers & other articles from the faculty members based on the latest technological advancement. Additionally, the magazine also provides space for various technical & cultural activities organized by the department during past three months.

Hope this magazine provides all the relevant information & encouragement to the readers.

Ms. Khushboo Sharma
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CONTENT

SKILL TRAINING WITH CONVENTIONAL EDUCATION

The world is changing rapidly and with it, the demand for skilled workers is also increasing. In order to keep up with this demand, it is important for individuals to not only have a formal education but also to have the necessary skills that are relevant in their chosen field. This is where skill training comes into play. Skill training can be defined as the process of acquiring specific skills that are necessary to perform a particular job or task.

Conventional education is the traditional system of education that involves attending school or college to obtain a degree or diploma. This system of education is based on academic knowledge and focuses on theoretical concepts rather than practical skills. While conventional education is important in laying the foundation for a successful career, it is not enough to prepare individuals for the demands of the workforce.

This is where skill training comes in. Skill training provides individuals with the necessary practical skills that are required in their chosen field. These skills can range from technical skills such as programming, engineering, and data analysis to soft skills such as communication, teamwork, and leadership.

Skill training can be obtained through various means such as apprenticeships, vocational courses, and on-the-job training.

The combination of conventional education and skill training can create a powerful combination that can enhance an individual's career prospects. Conventional education provides individuals with a strong academic foundation, which can be complemented by skill training to develop practical skills that are necessary in the workforce. This combination can make individuals more valuable to employers, increase their job opportunities, and enhance their earning potential.

Moreover, skill training can also help individuals to adapt to changing job requirements and industry demands. In today's fast-paced world, new technologies and techniques are being introduced at an unprecedented rate. Therefore, it is important for individuals to constantly update their skills to remain competitive in the job market. Skill training provides individuals with the flexibility to adapt to new challenges and to take advantage of emerging opportunities.

In conclusion, skill training is an essential component of career development. While conventional education is important, it is not enough to prepare individuals for the workforce. Skill training provides individuals with the necessary practical skills that are required in their chosen field. The combination of conventional education and skill training can create a powerful combination that can enhance an individual's career prospects. Therefore, individuals should consider pursuing skill training alongside conventional education to increase their job opportunities and enhance their earning potential.

Dr. Shailendra Kumar
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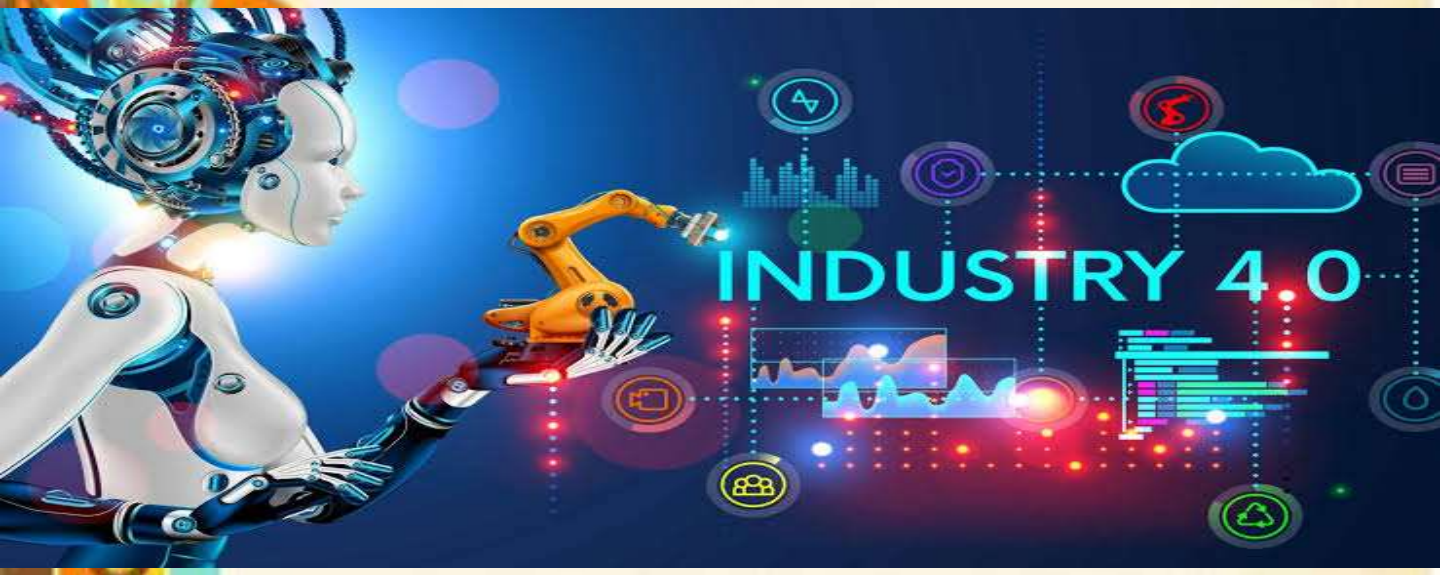
Future of Mechanical Engineers in Fourth Industrial Revolution



After in-depth analysis of the market, I have no hesitation in saying that Industry 4.0 will heavily depend on Mechanical Engineers for its evolution, in its attempt to connect physical world with digital world, and in its endeavor towards efficiency and sustainability. I have seen there is a general confusion around the role of mechanical engineers in the ongoing (Fourth) industrial revolution powered heavily by digitization, which is often mistakenly attributed to be the domain of IT & Electronics alone. Despite the buzz around Cloud Computing, Big Data, AI (Artificial Intelligence), Cyber Security, and IOT (Internet of Things), it is necessary to realize that Industry 4.0 in its true sense is a manufacturing revolution and by that nature, its

successful implementation and evolution will hinge greatly on mechanical engineers (their skills, their adaptation to digitization and their innovative approach in design and manufacturing.)

To give you a broad perspective, Mechanical Engineers will not only be useful in the smart factories, but also in diversity of tasks differing from traditional methods. Industries will need personnel having deep understanding of the products, processes, machines and systems to connect them to the digital world, because digitization is the grand essential of Industry 4.0.

As per the requirements of Industry 4.0, knowledge of only one core discipline of engineering is definitely inadequate. A truly multidisciplinary approach, namely Mechatronics, an integration of Mechanical Engineering, Electrical Engineering, Electronics Engineering, Computer Science & Control Technologies has thus become popular and it comprises of the fundamentals for designing intelligent machines and systems.

Talking about mechanical engineers, since the study of manufacturing is covered in their coursework; every mechanical engineer is well equipped with key-skills needed at the first step of “creating anything for human welfare”. To put some of those notable skills, Design, Additive Manufacturing, Advanced Robotics are rapidly evolving.

Opportunities are vast for mechanical engineers with strong knowledge base in their field along with a good hand in Automation, IOT, AI, Cloud Computing & Big Data, Virtual Reality, Simulation, etc.

So surely, the present as well as future of Mechanical Engineers is definitely bright! All we need is to keep learning as per the basic requirements of Industry 4.0.

Himanshu
Assistant Professor,
Mechanical Engineering Department
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MECHANICAL ENGINEERING SHAPING THE CIVILIZATION

Mechanical engineering is one of the oldest and most fundamental engineering disciplines, playing a significant and crucial role in shaping modern civilization from the Industrial Revolution to the present day. Mechanical engineering involves the design, development, and operation of machines and systems, and has been instrumental in driving progress across a range of industries, including transportation, manufacturing, and energy. From the construction of ancient structures like the Pyramids of Giza to the development of modern autonomous machines, mechanical engineering has contributed to countless advancements and innovations throughout human history.

It impacted the civilization in several aspects some of them are illustrated below:

Manufacturing: Mechanical engineering has played a significant role in the development of modern manufacturing processes, enabling the mass production of goods and materials. From assembly lines to automated machines, mechanical engineers have designed and built systems that make it possible to produce high-quality products at scale.

Infrastructure development: Mechanical engineering has been instrumental in the development of infrastructure, including roads, bridges, tunnels, and buildings. Civilizations throughout history have relied on mechanical engineering principles to build structures that are safe, durable, and able to withstand the test of time.

- Transportation: The development of transportation systems, including automobiles, e-vehicles, airplanes, trains, and ships, has been a key area of focus for mechanical engineers. These transportation systems have transformed the way people and goods are moved across the globe, making it easier and more efficient to travel long distances and transport large quantities of goods.

 Robotics and automation: Robotics and automation have revolutionized many industries, including manufacturing, healthcare, and transportation. Mechanical engineers have played a key role in designing and building robots and automated systems that are capable of performing tasks that were previously done by humans, increasing efficiency and productivity.

 Aerospace and defense: Mechanical engineering has played a critical role in the development of aerospace and defense technologies, including spacecraft, missiles, and defense systems. These technologies have been essential for national security and have helped us explore the far reaches of space.

Energy production: Mechanical engineers have been at the forefront of developing new and innovative energy production methods, including nuclear power, wind turbines, and solar panels. These energy sources have the potential to reduce our reliance on fossil fuels and mitigate the impact of climate change.

Overall, mechanical engineering has played a significant role in shaping civilization as we know it today. From infrastructure development to transportation, manufacturing, energy production, robotics, and aerospace, mechanical engineers have contributed to countless advancements and innovations that have made our lives easier, safer, and more prosperous. As we move forward, the role of mechanical engineering in civilization is likely to become even more important. As we face new challenges such as climate change and the need to develop sustainable technologies, mechanical engineers will play a crucial role in developing innovative solutions that can help us meet these challenges and will continue to be a driving force behind progress and innovation.

Dr. Shailendra Kumar
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B.Tech 2 year, MED

MECHANICAL ENGINEERING IN THE ERA OF ARTIFICIAL INTELLIGENCE

Mechanical engineering is a branch of engineering that involves the design, development, and manufacture of machines and mechanical systems. In the era of artificial intelligence (AI), the role of mechanical engineering is becoming more critical. With the rise of automation and intelligent machines, mechanical engineers are playing a vital role in developing the hardware and software needed to support these systems. One of the primary areas where mechanical engineering is critical in the era of AI is in the development of robots. Robots have become increasingly sophisticated over the years, and they now perform a wide range of tasks in manufacturing, healthcare, and other industries. Mechanical engineers are responsible for designing and building the physical components of robots, such as their frames, motors, sensors, and actuators.

In addition to designing the physical components of robots,

mechanical engineers also play a key role in developing the software needed to control these machines. This software must be able to interpret data from sensors, make decisions based on that data, and then send commands to the various mechanical components of the robot. Mechanical engineers work closely with computer scientists and other experts to develop this software, ensuring that it is reliable, efficient, and easy to use.

Another area where mechanical engineering is critical in the era of AI is in the development of autonomous vehicles. Self-driving cars and trucks are becoming increasingly common, and they require sophisticated mechanical systems to operate safely and efficiently. Mechanical engineers are responsible for designing the physical components of these vehicles, including their engines, brakes, steering systems, and suspension systems. They also work closely with software engineers to develop the algorithms needed to control these vehicles, ensuring that they can navigate roads safely and avoid accidents.

In addition to robots and autonomous vehicles, mechanical engineering is also critical in the development of other intelligent machines, such as drones and smart appliances. Drones are becoming increasingly important for tasks such as surveying, mapping, and monitoring, and they require sophisticated mechanical systems to operate smoothly and reliably.

In conclusion, the role of mechanical engineering in the era of AI is becoming increasingly important. Mechanical engineers are

responsible for designing and building the physical components of robots, autonomous vehicles, drones, and other intelligent machines, as well as developing the software needed to control these machines. As automation and intelligent machines continue to reshape our world, the role of mechanical engineering will only become more critical.

Dr. Shailendra Kumar
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Navneet
B.Tech 3 year, MED

IMPACT OF MECHANICAL ENGINEERING : THE FUTURE WORLD

Mechanical engineering is the study of physical machinery involving force and motion. It is a type of engineering that blends engineering physics and mathematics with materials science to design, analyze, construct, and maintain mechanical systems. It is one of the oldest and most diverse engineering disciplines.

Across all platforms and industries, machines are quickly occupying space. Virtual reality, robotics, and artificial intelligence—once thought of as science fiction—now permeate our daily lives. Although technology has a long way to go, every time something innovative and new is created, it similarly strikes us. There is still much to be done in this area, but mechanical engineering will soon rule the world of the future.

Gone are the days when developing new systems or tools necessitated a plethora of testing and prototypes. The design process has been improved and hastened as technology has advanced. Bulk items and data can also be generated in less time. This demonstrates how a significant revolution has occurred in the subject of mechanical engineering.

Mechanical engineering is a discipline that is rooted in the past, alive in the present, and prepared to tap into the future for new research that will have a positive impact on the globe. As the impact of machines in our daily lives grow, and so does the need for well-trained and experienced mechanical engineers who can create breakthrough technologies for this industry, streamline the processes involved, and enhance production.

Vanshika Bhadoria
B.Tech 3 year, MED

PUBLICATIONS

Scopus®

Effect of welding speed and wire feed rate on arc characteristics, weld bead and microstructure in standard and pulsed gas metal arc welding.

Journal: Journal of Adhesion Science and Technology
Indexing: SCI, SCOPUS
Impact factor: 2.4

Dr. Husain Mehdi

ABSTRACT

Standard and pulsed gas metal arc welding (GMAW) were performed at a constant welding speed of 300, 600, and 1000 mm/min with eight different wire feed rates (WFR). The effect of input parameters on arc stability, metal transfer mode, penetration depth, hardness, and microstructure was discussed. Voltage and current transients recorded by oscilloscope were used to analyse the arc stability and metal transfer mode by plotting probability density distribution (PDD) graphs of arc voltage and welding current. With an increase in WFR, standard GMAW transformed from bimodal to unimodal (due to the absence of short-circuiting mode and activation of pulsed mode) and the pulsed GMAW graph transformed from multimodal to bimodal (due to faster droplet detachment and lowered background current duration). In addition, a nonlinear mathematical model was generated to adequately predict bead profile parameters. For both standard and pulsed GMAW, maximum penetration depth was achieved at the lowest welding speed and highest WFR. But deeper penetration was achieved in pulsed G compared to the standard for the same input parameters. Hardness and the number of non-diffusional phases in the weld and heat-affected zone (HAZ) increased with welding speed.

Modification of Microstructure and Mechanical Properties of AA6082/ZrB2 Processed by Multipass Friction Stir Processing

Journal: Journal of Materials Engineering and Performance
Indexing: SCI, SCOPUS
Impact factor: 2.03

Dr. Husain Mehdi

ABSTRACT

The present work accomplished homogenously disseminated ZrB_2 reinforcement particles and very fine grain structure by multipass friction stir processing (MPFSP) of AA6082. They observed the influence of reinforcement particle ZrB_2 on the microstructure and tensile properties of the MPFSP. The coarse dendrite structure of the base material AA6082 was studied using ZrB_2 nanoparticles. The MPFSP/ZrB_2 successfully shattered these coarse and dendrite clusters, resulting in a uniform microstructure in the stir zone. The MPFSP has observed material flow around the cluster's redistribution. At increased ZrB_2 concentration, SEM and EBSD examinations demonstrated that ZrB_2 reinforcement particles strongly inhibited grain boundary migration, resulting in a continual reduction in grain size and HAGBs fraction. The tensile properties and microstructure of the MPFSP/ZrB_2 of AA6082 were enhanced using a rotational tool speed of 1120 rpm, welding speed of 125 mm/min, and tilt angle of 2°. The reinforcement particles ZrB_2 were fragmented completely and uniformly disseminated in the 4th FSP pass. As the FSP increases, the ZrB_2 agglomeration reduces. The base metal AA6082's ultimate tensile strength (UTS) was 191 ± 8 MPa with a % strain of 20 ± 0.8. After MPFSP/ZrB_2 on AA6082, the UTS was increased as the FSP pass increased. The higher UTS (266 ± 5) was observed at the 4th FSP pass.

An ISM and AHP-Based Analysis of Barriers to Healthcare 4.0

Dr. Shailendra Kumar

Journal: Journal of Industrial Integration and Management
Indexing: SCOPUS

ABSTRACT

Healthcare 4.0 (H4.0) is the term corresponding to Industry 4.0 (I4.0). Like other industries, the healthcare industry has also gone through several technological changes and got nourished with them. The health care system of many countries is not mature enough to swiftly transform from its current state to the H4.0 state. Even the matured healthcare systems are facing several challenges while adopting H4.0 practices. The implementation of H4.0 has many challenges (or barriers) to be overcome. This paper has attempted to understand and analyze the challenges that the current Indian hospital management system faces while implementing H4.0. This study uses an integrated approach to the decision-making process to understand the importance of these barriers from the perspective of the Indian health care system. With the help of the Analytical Hierarchy Process (AHP), Interpretative Structural Modeling (ISM) and MICMAC analysis, the paper has mapped the importance of barriers which need to be overcome for to make implementation of H4.0 possible.

Influence of SiC microparticles and multi-pass FSW on weld quality of the AA6082 and AA5083 dissimilar joints.

Dr. Husain Mehdi

Journal: Silicon

Indexing: SCI, SCOPUS

Impact factor: 2.94

ABSTRACT

In the current research, the influence of multi-pass (one, two and three passes) of friction stir welding and SiC microparticles on the tensile strength, microhardness and %strain of dissimilar reinforced joints of AA6082 and AA5083 was examined. Tool rotating speed of 900 rpm, transverse speed of 45 mm/min, tool tilt angle of 2º and 8% volume percentage of SiC microparticles were considered as constant parameters for multi-pass FSW. The finding demonstrated that increasing the number of FSW passes from one to three augmented the dispersion pattern of Sic microparticles. The grain refinement of multipass reinforced joints was achieved by the pinning effect of SiC microparticles and dynamic recrystallization. The three-passes FSWed reinforced joint exhibited the highest tensile strength (247.17 MPa), %stain (13.1%) and microhardness (126.6 HV) due to the higher grain refinement.

A study on the metallurgical characterization of the longitudinally sampled friction stir processed TIG welded dissimilar aluminum joints.

Dr. Husain Mehdi

Journal: Part E: Journal of Process Mechanical Engineering
Indexing: SCI
Impact factor: 1.86

ABSTRACT

The joining of dissimilar materials is required in many engineering and defense applications, and the conventional fusion welding often results in defective welds. The friction stir welding has minimized the welding defects, but not completed. This work focuses on the effect of friction stir processing on TIG-welded joints with filler ER 5356 to improve the mechanical properties of TIG-welded joints. In this paper, the FSP tool pin rotates on an already welded joint by TIG welding to lower the welding load and improve the weld quality by adjusting the processing parameters of friction stir processing. After analyzing the mechanical properties of TIG + FSP-welded joint, computational fluid dynamics-based numerical model was developed to predict the temperature distribution and material flow during TIG + FSP of dissimilar aluminum alloys AA6061 and AA7075 by ANSYS fluent software. The minimum compressive residual stress 18 MPa, maximum tensile strength (281.1 MPa) and hardness (107 HV) were located at the nugget zone of the TIG + FSP weldment at tool rotation speed of 1300 rpm, traverse speed of 30 mm/min and tilt angle 2°. The predicted peak values of temperature at the weld region were calculated and the maximum temperature (505 °C) and maximum heat flux (2.93×10^6 w/m^2) were observed at a tool rotation of 1300 rpm.

A Comparative Study of the Reduction of Iron Ore Pellets Using Different Reductants: A Statistical Approach.

Dr. Swapan Suman

ABSTRACT

Utilization of biochars can become an emerging technology and better option for replacing and sustaining premium-quality coking coal for metallurgical purposes. This study includes the characterization and comparative study of reduction of iron ore pellets using different reductants, i.e. sugarcane bagasse char (SBC), coconut husk char (CHC), and wooden dust char (WDC).

Statistical method has been used for experimental design to determine the effect of each reductant and different variables and their interactional effect on the reduction of iron ore pellets. Thus, CHC and WDC can play an important role in sustaining the premium quality of coking coal reserves and become an important source of carbon and energy for reduction to occur in blast furnaces

Comparative leaching of spent fluorescent lamp for extracting yttrium and europium: kinetics and optimization studies.

Dr. Swapan Suman

Journal: **Geosystem Engineering**
Indexing: SCOPUS

ABSTRACT

Electronic (e-)waste viz. the spent fluorescent lamps can be a rich source of rare earth elements (REEs) for the secondary supply of them. This article reports a comparative study on mineral acid leaching and, then, compared an alkali diffusion-acid leaching process for higher efficiency of yttrium and europium. Using a direct acid leach process, 2 M HNO_3 yielded a better dissolution efficiency of REEs at the moderate temperature of 60°C and in the presence of H_2O_2in comparison to 91% and 87% leaching efficiency with 2.0 M H_2SO_4. On the other hand, the alkali-fused phosphor mass leached in 2.0 M H_2SO_4 without H_2O_2 addition showed remarkable progress in dissolution efficiency, yielding >99% and >98% of yttrium and europium in the leach liquor. Furthermore, the leaching kinetics of the alkali-diffused phosphor showed the best fit with the logarithmic rate law. The apparent activation energy was calculated to be 43.3 kJ/mol and 35.1 kJ/mol for yttrium and europium, indicating two different mechanisms during the leaching process by following the chemical- and diffusion-controlled reactions, respectively.


ACHIEVEMENTS
REWARD THE TRIUMPH OF SKILL

COLLABORATION

Department of Mechanical Engineering, MIET Meerut & DN Polytechnic, Meerut.

Honoured by Research Excellence Award from Delhi Technological University in 2022, and 2023.
Dr. Husain Mehdi (Faculty of Mechanical Department)

Navneet Kumar (Mechanical branch ,3rd year) participated in AKTU Technical fest and got third position in Drone Flying Category.

Navneet Kumar, Aditya Singh and Arjun Garg of Mechanical Engineering 3rd year , MIET got 1st position in Technical Fest held at IIT Roorkee.


DEPARTMENT
ACTIVITIES

Student of Mechanical Engineering, MIET visited Auto Expo at Greater Noida

B.Tech students (Department of Mechanical engineering, MIET) ISHRAE, Students Chapter at International Maritime Institute, Greater NOIDA

CREATIVE CORNER

ARJUN GARG
MED, 3rd year
MIET, Meerut


SAFETY FIRST
SAFETY
WARNING


MOKING