Editorial

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India is one of the top countries desired for manufacturing destination, attracting many leading global industries to set up their manufacturing plant in India. Mechanical and materials engineering plays a significant role in the research and development of the manufacturing sector. Modern manufacturing is burgeoning at a very fast rate requiring constant advancement in technologies to keep up with the customer demands. The current customer-specific requirements are pressurizing the manufacturing industries to opt for an interdisciplinary approach to fulfil these demands. Industries are investing their time and money in technological advancements so that they will be able to match up with current and future customer-specific demands. The two main challenges that industries face are the selection of optimum technology and material selection for the manufacturing processes. This requires in-depth knowledge in mechanical and material engineering. The interdisciplinary approaches such as thermal-manufacturing, fluid-manufacturing, biology-manufacturing, and material-manufacturing have opened many doors for technology innovation.

The advancement in technology refers to improving the efficiency of conventional processes by reducing resource input. A good amount of research has been going on to improve the current technology and make them future-ready. Materials like smart materials, nanomaterials, stannine, and graphene are also helping to improve the efficiency of processes. The manufacturing community has

aligned itself with current customer demands and is trying to deliver products with lesser flaws. This issue titled as “Advancements and Futuristic Trends in Mechanical & Materials Engineering” contains 12 peer-reviewed papers on hybrid machining, welding, composites, nanomaterials, and forming areas.

The paper “*Analysis of Causes and Remedy of Chattering in the Aluminum Four stand Tandem Cold Rolling Mill: A Case Study*” provides a case study based on four stand aluminium cold rolling mills. An online monitoring of vibrations is installed, which detects chatter and prevents further damage. The causes and remedies are discussed, and the most influential factors that enable the chatter are addressed. After applying optimum values of the most influential active control factors, the final results show an improvement but not up to the desired level.

The paper “*Designing Nanostructured Materials through Self-Assembly and their Applications*” describes a review of the self-assembled structures, various forces of interactions leading to self-assembly, their effect on physical properties and applications.

The paper “*Analysis of Discharge Gap using Controlled RC based Circuit in μ EDM Process*” describes the extraction of information on the material removal rate (MRR) and overcut at various discharge gaps, set in terms of open circuit voltage in a controlled RC-based μ EDM setup. A DAQ system is used to capture the real-time discharge voltage data and corresponding amperage at a high sampling rate to estimate the discharge energy. The results obtained for MRR and overcut are in good agreement with logical reasoning.

The paper “*Loose Coupled Simulation Method for FEA of Electromagnetic Forming of Muffler*” provides experiments that are carried out for near-net-shape manufacturing

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of automobile mufflers. A loose coupled FEA model is developed to study large strain rates, large deformations, and high velocities. The FEA results match 94% with experimental results.

The paper “*The Small Punch Test a Viable Alternate for In-service Components Preserved Strength Estimation*” summarizes the latest developments made in popular graphical and analytical approaches for non-irradiated ductile iron 65–45–12 material which is extracted from the in-service general-purpose mechanical system. This research paper also discusses the challenges and potential scope of improvement for the SPT technique.

The paper “*Investigations on the Effect of Sheets Positioning in Advancing & Retreating Side for Dissimilar FSW of DH36 Steel and Aluminum Alloy 6061*” describes the joining of shipbuilding grade steel, i.e. DH36 steel with aluminium alloy 6061 (AA6061) using the friction stir welding (FSW) technique. The microstructural study revealed significant grain refinement and grain elongation in the stir zone (SZ) and thermomechanically affected zone (TMAZ), respectively. The tensile strength of welded joints improved by placing the AA6061 at the retreating side (RS) and DH36 steel at the advancing side.

The paper “*Finite Element Modeling of Thermal Residual Stresses generated during EDM of AISI 1018 Steel*” describes a study on the prediction of temperature and stresses produced during spark discharges on AISI 1018 steel surface with the aid of a finite element model. The developed model can predict the peak temperature and stresses generated on the workpiece surface after EDM cutting. Compressive and tensile stresses are also observed on the machined surface.

The paper “*Determination of Material Dependent Parameters and Friction in Ultrasonic-Vibration Assisted Turning by Inverse Modelling*” proposes an inverse method to estimate the material-dependent parameters and friction based on the cutting force measurement. The inverse model predictions are compared with the classical optimization sequential quadratic programming (SQP) method with constraint and unconstrained problems and experimental results. The cutting forces and coefficient of friction estimated by the proposed inverse method are in good agreement with experimental data.

The paper “*Microstructure and Microhardness of Mg/SiC Metal Matrix Composites Developed by Microwave Sintering*” demonstrates the development of Mg alloy/SiC metal matrix composites through microwave sintering. The AZ91 alloy is used as the metallic matrix and SiC as the reinforcement with a weight percentage of 5, 10, and 15. The developed composite revealed that density and microhardness increased with the increasing percentage of

reinforcement; consequently, the porosity decreased with the addition of SiC percentage.

The paper “*Numerical Computation and Analysis of Cutting Forces during Nanometric Scratching of Silicon Carbide*” describes a numerical model of nanometric scratching of difficult-to-machine SiC based on the finite element method to understand the ultra-precision machining process. The cutting and thrust forces generated from the simulations agree with the published experimental values.

The paper “*Optimization of Electroless Nickel Tungsten Composite Coating on 3D-Printed ABS Substrate for Maximum Tungsten Content*” presents a study on the electroless Ni–P–W composite coating on the 3D printed acrylonitrile butadiene styrene (ABS) substrate using polyjet technology. Structural morphology, composition, and phase structure of the coating are studied. Results showed that the low level of pH and sodium tungstate in the bath leads to the maximum percentage of tungsten in the coating with higher hardness.

This issue contains papers on advanced topics and recent research in materials and manufacturing processes. These papers will be useful for researchers, practicing engineers, and senior professional students to know about current cutting-edge technologies and new materials. Some of the papers contain information that will help the manufacturing industries to improve their process efficiency and product quality. Innovation in technology and materials is always an ongoing process and these advancements will help the manufacturing sector fulfil the current and future customer demands continuously.

As a Guest Editor, I have a great feeling to edit this special issue on “*Advancements and Futuristic Trends in Mechanical & Materials Engineering*” in this esteemed “*Journal of The Institution of Engineers (India): Series C*”. I greatly appreciate the support from the Editor-in-Chief, Prof Gautam Biswas, the Reviewers and the Editorial Team of the Institution & Journal for their sincere and timely support to bring out this Special Issue. It was a good experience and good learning to work with this efficient team. Many people have contributed to this special issue including authors and reviewers. We sincerely acknowledge their time and efforts contributed to bringing out this special issue. Finally, I wish this special issue to be successful, popular and useful to the engineers, scientists and researchers in the fields of mechanical and materials engineering. We are sure that this special issue will provide valuable information to the readers.

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