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Intelligent Manufacturing and Mechatronics

Selected Articles from iM3F 2023, 7–8 August, Pekan, Malaysia

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Preface

The fourth edition forum of the Innovative Manufacturing, Mechatronics and Materials Forum 2023 (iM3F 2023) organized by Universiti Malaysia Pahang Al-Sultan Abdullah through its Faculty of Manufacturing and Mechatronic Engineering Technology was held on 7 and 8 August 2023. The main field focuses on Manufacturing, Mechatronics as well as Materials.

About 95 submissions were received during iM3F 2023 and were reviewed in a single-blind manner, and 48 papers were advocated by the reviewers to be published in this Springer Proceedings of Materials. The editors would like to express their gratitude to all the authors who submitted their papers. The paper published in this proceeding has been thoroughly reviewed by the appointed technical review committee which consists of various experts in the field of materials and manufacturing engineering.

The conference had brought a new outlook on cutting-edge issues shared through keynote speeches by Assoc. Prof. Ir. Dr. Haji Nik Mohd Zuki Nik Mohamed, Prof. Eng Hwa Yap and Prof. Gian Antonio Susto.

Finally, the editors hope that readers find this volume informative as we thank Springer Proceedings in Materials for undertaking this volume publication. We also would like to thank the conference organization staff and the international program committees' members for their hard work.

Pekan, Pahang, Malaysia
November 2022

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Hybrid Machining: A Review on Recent Progress

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Abstract

Hybrid manufacturing, a pioneering concept in modern industry, combines various manufacturing methods to achieve unparalleled performance and versatility. By seamlessly integrating diverse technologies, it overcomes limitations of individual techniques while leveraging their strengths. This review explores recent progress in hybrid manufacturing, including trends, performance outcomes, and challenges. Notably, there is a substantial trend towards combining traditional and additive manufacturing (59%). Processes like WAAM, LMD, SLM, FFF, and FDM gain traction, especially for materials like ferrous metals, non-ferrous metals, and composites. Performance outcomes are substantial. WAAM improves part performance, geometry control, efficiency, surface quality, and environmental impact. LMD integration enhances feature addition, stability, precision, and resource efficiency. SLM combined with subtractive methods enhances surface quality, mechanical properties, and intricate part feasibility. FFF combined with subtractive techniques addresses anisotropy, surface roughness, and geometric accuracy.

Laser-assisted methods like LOMM and LAM enhance material removal, surface quality, and machining efficiency. Vibration-assisted techniques boost material removal rate, surface quality, and overall machining performance. However, challenges in hybrid machining are evident across multiple categories, including workpiece materials, machine tool development, process understanding, monitoring systems, heat affected zones, equipment costs, productivity, environmental impact, qualification procedures, and technology transfer. Overcoming these challenges requires interdisciplinary collaboration, innovative solutions, and technological advancements. Effectively addressed, hybrid machining has the potential to revolutionize manufacturing, significantly improving efficiency, precision, and sustainability.

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