



## EDITOR-IN-CHIEF'S WORD

Dear Readers,

Engineering today stands at the forefront of addressing the critical challenges of energy efficiency, environmental sustainability, and technological advancement. This issue of *Engineering Power* reflects this imperative by presenting original scientific and technical contributions that align with the global demand for smarter, more sustainable systems and practices.

The papers featured in this edition are representative of the international and interdisciplinary scope of contemporary engineering research. They highlight the evolving role of engineering not only as a driver of innovation but also as a key enabler of energy transition, resource optimization, and climate resilience. Across diverse sectors—including energy systems, manufacturing processes, and thermal technologies—these contributions emphasize the need for integrated solutions based on rigorous analysis, novel design approaches, and a deep understanding of physical principles.

By fostering dialogue between academic research and practical application, *Engineering Power* continues to support the mission of the Croatian Academy of Engineering to promote excellence, encourage collaboration, and address the pressing technical issues of our time. We trust that this issue will inspire further research, critical thought, and real-world innovation in the pursuit of engineering solutions that contribute to a more sustainable and efficient future.

Editor-in-Chief

Vedran Mornar, President of the Croatian Academy of Engineering



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Dear Readers,

The new issue of *Engineering Power* journal, edited by Prof. Neven Duić, PhD, brings us three papers from the SDEWES conference series. The broad spectrum of topics related to environmental protection, which is typical for the SDEWES conference series is also reflected in the original scientific papers in this issue. Heat recovery devices, energy-efficient and sustainable solutions in the printing process and cold storage are topics which may be of interest to you. We hope you enjoy reading this issue.

Editor

Bruno Zelić, Vice-President of the Croatian Academy of Engineering



## FOREWORD

With a broad vision of integrating various systems for long-term sustainability, the international conference series on the sustainable development of energy, water, and environmental frameworks was launched at the beginning of the 21st century. Now in its third decade since the first gathering in Dubrovnik, Croatia, which set the foundation for the series in 2002, the need for this integrated perspective has never been more pressing. Utilizing surplus from one system as a resource for another at the right moment is one of the most crucial challenges in preserving the Earth's essential support systems. Enhancing the efficiency of interconnected systems—spanning electricity, heating, cooling, transportation, water management, waste treatment, industrial operations, construction, forestry, and agriculture—serves as a key strategy for reducing environmental

impact while allowing development to progress. This holistic approach to sustainability offers significant opportunities for accelerating efforts toward reducing carbon emissions and tackling climate change.

The field of engineering is well-positioned to address sustainability challenges, but it must move beyond rigid disciplinary boundaries and embrace the need for equipping future professionals with diverse competencies. The technical solutions required to lower environmental impact while retaining the conveniences of modern life are inherently interdisciplinary, drawing from electrical, mechanical, information, civil, chemical, food-related, and other engineering disciplines, as well as architecture, economics, agriculture, and forestry.

This edition presents three forward-looking innovations in technology and methodology for assessing sustainability that could contribute to a more environmentally responsible way of life.

The first case examines the windcatcher [1], a natural ventilation system with a dual-channel rotating air scoop for airflow in all wind conditions. It integrates passive energy solutions and a heat recovery system, achieving 95% airflow retention and 15% efficiency.

The second study addresses sustainability in flexographic printing, introducing a life-cycle-based methodology to analyze energy flows and improve environmental impact assessments for optimized energy use [2].

The final study explores cold thermal storage, evaluating capsule arrangements for energy efficiency [3]. The face-centered cubic layout boosts packing density by 22% and reduces charging duration by 21%, enhancing thermal transfer.

References:

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- [3] Y. Zhang, X. Zhai, Z. Zhou i X. Wang, »Numerical Exploration of Flow and Thermal Performance in Packed-Bed Cold Storage Enhanced by Structured PCM Capsule Layouts,« *Engineering Power*, svez. 19, br. 3, 2024.

Guest Editor

Neven Duić, University of Zagreb, Faculty of Mechanical Engineering and Naval Architecture