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Engineering Power

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EDITOR-IN-CHIEF'S WORD

Dear readers,

It is a privilege to introduce this issue of Engineering Power, a publication that reflects the Croatian Academy of Engineering's commitment to knowledge, responsibility, and progress.

The journal serves as an important meeting point for research, professional experience, and new ideas. It gives visibility to work that can influence technological advancement, public policy, economic development, and the quality of life. Through this role, Engineering Power also strengthens the presence of engineering in wider social debate.

The Croatian Academy of Engineering brings together leading experts from different fields and encourages them to contribute to matters of national and international importance. Its task is not only to recognise achievement, but also to support cooperation, sound professional judgement, and the responsible application of technology.

The contributions in this issue illustrate how engineering can respond to complex contemporary needs through creativity, precision, and collaboration across disciplines. I trust that they will encourage further thought and provide useful perspectives to our readers.

Editor-in-Chief
Vedran Mornar, President of the Croatian Academy of Engineering

EDITOR'S WORD

Dear readers,

It is my great pleasure to present the new issue of the Engineering Power journal, edited by Prof. Neven Duić, PhD. The papers in this issue are related to the SDEWES conference, held under the auspices of the Croatian Academy of Engineering. In this issue, you will have the opportunity to read about the use of vortex generators on the blades of a vertical-axis current turbine, a smart charging strategy for electric vehicles used in Italy, and the comprehensive remediation of polluted waters using a compact composite layered material. I 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.

Rahuna et al. show, through CFD simulations, that rectangular vortex generators on NACA 0021 turbine blades delay stall, reduce drag, and improve lift-to-drag performance [1]. The optimal design increased the predicted power output of a vertical-axis marine current turbine by about 7.5%, demonstrating a simple method for improving turbine efficiency.

Aleotti et al. propose a real-time, forecast-free charging strategy for electric vehicles in Italian Renewable Energy Communities [2]. By coordinating charging with local photovoltaic generation, the approach increased shared energy by about 47% and community incentive revenues by about 50%, while maintaining normal vehicle availability.

The third paper presents a clay-birnessite/buserite composite capable of simultaneously removing heavy metals and organic pollutants from water. The study highlights its high adsorption capacity, low cost, and potential as a scalable and sustainable solution for advanced water treatment [3].

References

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