

Preface

Special Issue on Up-to-Date Problems in Modern Railways and Optimization in Engineering Structures

The current issue is the fifth part of the Special Issue series in Acta Polytechnica Hungarica, the scientific journal of the University of Óbuda. In the first four issues altogether, 62 papers are available; in the current issue, 17 papers have been published. The authors cover two continents, Europe and Asia, and more than twelve different countries.

Addressing the sixth issue, railways' functions in the century at hand are highlighted as a crucial element of the transport sector, which is both flexible and ecologically friendly. With the expansion of cities and the increase in the world population, the demands for the railways' capacity, environmental protection, and safety levels are on the rise. The papers in this collection present cutting-edge research and innovative solutions to meet these challenges. Topics include laboratory investigations into the performance of hardened rail materials, offering insights into durability and safety under various operating conditions, and studies on rail surface geometry to mitigate wear and prolong service life. Other contributions examine the interaction of the various components of the railway track, aimed at achieving optimal design and selection of roadbed and ballast materials with increased sustainability and ease of maintenance tasks. Some advanced methodologies, such as ballast breakage testing and the development of indices for material performance, are also a part of the feature, which could assist in the management of infrastructure.

Concurrently, the problem draws attention to the use of technological advances such as AI and deep learning in maintenance prediction or risk-based tasks such as crack detection in structures like tunnels. This economy of computational resources not only helps to improve safety but also contributes to the goals for sustainable development through better utilization of resources and minimizing negative impacts on the environment. Furthermore, the collection accentuates the role of construction innovation, illustrating strategies for achieving cost-effective and robust structures of bridges and other elements of railway construction. In combination, these inputs stress the continuous significant role of railways as a means of sustainable transport and increasing importance in the context of a range of challenges of contemporary society.

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Plans are already underway to continue this series, with additional volumes currently in preparation for future publication in Acta Polytechnica Hungarica.

*Dragan Marinkovic, Dmytro Kurhan, Mykola Sysyn,
Majid Movahedi Rad and Szabolcs Fischer*

Guest Editors