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PASSENGER CAR WHEEL PROFILE FOR THE OPERATION ON THE UKRAINIAN AND EUROPEAN RAILWAYS

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The relevance of this work stems from the urgent need for the modern development of the Ukrainian railway transport and the acceleration of Ukraine's integration into the European railway transportation. Currently, the most effective way to travel across borders between countries with different track gauges is the use of gauge-changeable wheelsets, a system that can change from one gauge to another when moving through special gauge changing facilities. The use of cars with gauge-changeable wheelsets on the Ukrainian and European railways calls for assuring a good compatibility of the wheel-rail pair on tracks of both gauges.

The goal of this work was to develop a unified wheel profile for the operation on the domestic and European railways and predict the safety of cars with that wheel profile, the ride quality, and processes of wheel-rail dynamic interaction for tracks with different parameters.

Use was made of methods of deformable solid mechanics, statistical dynamics, and numerical integration.

A family of wheel profiles was constructed, and the effectiveness of their use in passenger car wheelsets on the Ukrainian (1520 mm gauge) and European (1435 mm gauge) railways was evaluated. For each profile, the spatial problem of wheel-rail contact was solved, and the interaction parameters were analyzed, including the dimensions and location of the contact patches. Calculations were also made for a car negotiating a circular curve of a small radius ($R = 300$ m) and moving at different speeds on tangent track sections. The choice among the constructed profiles was made according to two criteria: wheel flange wear and car dynamic stability.

Based on the studies conducted, a new wear-resistant wheel profile, ITM-73EP, was proposed. Its use in gauge-changeable wheelsets of passenger cars will provide reasonable indices of wheel-rail interaction both on the Ukrainian and on the European railways without sacrificing car dynamic performance.

Keywords: *fast gauge changing facilities, wheel profile, dynamic performance, interaction processes, wheel and rail wear.*

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