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# Analysis of the effect of wheel–rail pair contact surface wear on the oscillations of a freight car with an increased axle load

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At present, nearly all countries of the world develop and implement measures aimed to increase the competitiveness and efficiency of their railways. One of the priority lines is to increase the carrying capacity of freight trains. In Ukraine, 18-9817 trucks of axle load 25 tf were developed and adopted as basic ones for new-generation freight cars, and the ITM-73-03 wear-resistant wheel profile of flange thickness 32 mm was developed for them too.

The aim of this paper is to study the effect of in-service variation in the wheel and rail profile shape on the spatial oscillations of a freight car with 18-9817 trucks and the ITM-73-03 wheel profile.

The paper estimates the effect of in-service variation in the wheel and rail profile shape on the dynamic stability and ride performance of the car under consideration. The wear of wheels with the new profile is predicted by solving the geometrical problem of wheel–rail interaction with account for the mutual horizontal lateral displacements of the wheel and the rail, the wheelset angle of attack and angle of roll, the nonlinearity of the contacting surfaces, and the possibility of their conformal contact. The results of calculation of the spatial oscillations of the car in tangents and curves are presented.

It is shown that wear-caused variation in the wheel and rail profile shape has little effect of the dynamic performance of a new-generation freight car with 18-9817 trucks with an increased axle load and the ITM-73-03 wear-resistant wheel profile, its dynamic stability and ride performance remaining at a high level. The use of the above car on the Ukrainian railways fully meets the objectives of home rolling stock renewal: vehicle ride performance improvement, running gear life extension, and vehicle and track wear reduction.

***Keywords:*** *rolling stock renewal, new-generation freight car, prospective truck with increased axle load, wheel–rail contact pair wear, dynamic stability, ride performance.*

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