

## PREDICTION OF CHANGES IN WHEEL PROFILE OF RAILWAY VEHICLE DUE TO OPERATIONAL WEAR

The investigation objective was to develop the technique for predicting railway vehicle wheels wear and changes in their profiles in operation. Methods of mathematical and computer simulation, numerical integration, oscillation theory, statistic dynamics are employed.

The paper discusses the technique for predicting wheels wear and changes in their profiles based on the early developed 3D mathematical model of interactions between the railway vehicle and the track resulting in the determination of the position and sizes of non-elliptic contact spots, including the conform contact, and distribution of normal and tangential forces of interaction using these spots.

The developed mathematical software is employed in the analysis of 3D oscillation of the open wagon with comprehensively retrofitted trucks and the ITM-73 wheel profile. Prediction of wheel wear with the flange of the thickness of 31mm and 29 mm (the flange thickness of an unworn wheel is 32 mm) is made. Comparison between predicted and measured profiles of worn wheels is carried out. Predicted and measured profiles agree closely.

We can make the inference that the technique proposed allows prediction of wheels wear and changes in their profiles in operation at the stage of the design of the rolling stock vehicles and the development of new wheels profiles.

**Keywords:** *railway vehicle, prediction of changes in wheel profiles, rail-wheel contact.*

1. *Ushkalov V. F. Mathematical model of interactions between railway vehicle and track considering distribution of contact forces on contact spot (in Russian) / V. F. Ushkalov, T. F. Mokriy, I. Yu. Malysheva // Tekhnicheskaya Mekhanika. – 2015. – No 2. – P. 79 – 89.*
2. *Ushkalov V. F. The Creep Force Model for Different Conditions of Wheel-Rail Rolling Contact / V. F. Ushkalov, A. I. Alexandrov // Rail Transportation : Winter Annual Meeting of the American Society of Mechanical Engineers. – New York, 1989. – P. 189 – 196.*
3. *Shnekht V. New information about wear of freight car wheels (in Russian) / V. Shnekht // Zheleznye Dorogi Mira. – 1988. – No 10. – P. 11 – 19.*
4. *Complex retrofitting running gears of freight cars (in Russian) / V. F. Ushkalov, T. F. Mokriy, I. Yu. Malysheva, I. A. Mashchenko, S. S. Pasichnik // Vagonnyi Park. – 2007. – No 2.– P. 18 – 22.*