

DETERMINATION OF CONTENT AND LEVEL OF FORCES AFFECTING A SIDE FRAME CANTILEVER PART IN OPERATION OF FREIGHT CAR

The paper deals with the study of additional lateral and longitudinal forces affecting the side frame cantilever part with its dynamic interaction with an axle box assembly of the wheel pair. The effects of additional forces that are not taken into account in the strength calculation by our standards may significantly reduce the fatigue life of side frames and result in their fractures. The work goal was to analyze the content and level of forces affecting the cantilever part of the side frame in operation of a freight car. To attain this, a three-dimensional model for coupling the jaw opening of the side frame with the axle box assembly has been built, and possible versions of their interaction has been analyzed. Based on the analysis presented, the existing mathematical model of a freight car has been updated. The motion of the freight car on the straight track and curved track of 300 m radius at different speeds has been simulated. According to the results, the dependences of the values of additional forces affecting the cantilever part of the side frame on the car motion speed have been derived. The analysis of the results of the calculations conducted allowed the determination of the content and level of forces affecting the cantilever part of the car side frame that are not taken into consideration using the existing procedures. The results obtained can be used in further studies with the aim of refining a stressed-strained state of the side frame and developing recommendations for improving its design.

Keywords: *freight car, fractures of side members, additional forces affecting cantilever part of side frame.*

1. *Komissarov A. F.* Analysis of failure of side frames of freight car bogies (*in Russian*) / *A. F. Komissarov* // Vestnik Instituta Problem Estestvennykh Monopoliy. Tekhnika Zheleznikh Dorog. – 2012. – No 1. – P. 65 – 68.
2. *Sergeenko O.* Constructively. Failures of side frames cannot be prevented but they can be result in minimum (*in Russian*) / *O. Sergeenko* // Gudok. – 2013. – Issue 8 (25443).
3. Standards for Calculating and Designing Cars of MPS Railways with Gauge of 1520 mm (Non-Self-Propelled) (*in Russian*). Moscow: GosNIIV-VNIIZhT, 1996. – 319 p.
4. Simulation of contact interactions for problems of dynamics of bodies systems (*in Russian*) / *Pogorelov D. Yu., Pavlyukov A. E., Yudakova T. A., Kotov S. V.* // Transactions: Dynamics, Strength and Reliability of Transport Machines / Edited by *B. G. Keglina*. – Bryansk : Publishing House BGTU, 2002. – P. 11 – 23.