

FRACTURES OF SPRINGS OF SPRING GROUP FOR TYPICAL BOGIES OF FREIGHT CARS AND RECOMMENDATIONS FOR IMPROVEMENT OF THEIR EQUAL STRENGTH

The paper relates to causes of fractures of springs of the spring group for typical freight car bogies and recommendations to enhance their equal strength. In recent decades, intensive efforts are underway to improve the individual assemblies and elements of bogies of the 18-100 model. In so doing, unretrofitted assemblies are received little attention. The purpose of this paper is to study the typical spring suspension bogie, to analyze statistics in fractures of springs and to make recommendations for their diminutions. The problem is solved by the application of statistical methods using computer simulations. The statistical analysis of spring fractures demonstrated that inner fractures of springs were 4 times more than the outer ones. The calculations demonstrated that stresses in an inner spring are 25% higher than in an outer spring, which may be one reason of spring fractures. Based on these studies and calculations of permissible stresses, two versions of variations in geometrical parameters of springs are proposed: an increase in the number of working coils of inner and outer springs from 5.5 to 7, an increase in an outer diameter of the inner spring from 100 mm to 110 mm. In accordance with the results of the simulation of freight car vibrations we can make the conclusion that the best option is to increase the outer diameter of the inner spring, as it improves the dynamic properties of the car. The research results demonstrate the need for more detailed studies of statistics of spring fractures as well as the effectiveness of variations in geometry of inner springs. This study is valuable for rail transport, primarily for the Ukrainian Railway, as reducing the number of fractures of springs will significantly cut the cost of car shed repair.

Keywords: spring fractures, spring group, freight car bogies, variations in spring geometry, equal strength of freight cars.

1. Cars (*in Russian*) / L. D. Kuzmich, A. V. Kuznetsov, B. A. Rzhavinsky et al. // Edited by L. D. Kuzmich. – Moscow: Mashinostroyenie, 1978. – 376 p.
2. Ponomarev S. D. Calculations of Elastic Members of Machines and Instruments (*in Russian*) / S. D. Ponomarev, L. Ye. Andreeva. – Moscow: Mashinostroyenie, 1980. – 326 p.