

Probabilistic Methods in the Problems of Dynamics, Strength and Failure-free of Railway Vehicles

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Some aspects of the application of probabilistic methods in the problems of dynamics, strength and reliability of rail crews are consistently outlined. Methods for generating random perturbation and solving problems about random oscillations of crews with linear and nonlinear characteristics of spring suspension are considered. It is shown that random oscillations of nonlinear systems are non-stationary and to determine their probabilistic characteristics it is necessary to apply the averaging procedure for a set of implementations.

When solving the problems of static and fatigue strength, taking into account the random nature of the current stresses and the frequency of loading modes, determined by the speeds of movement. For this, a model for the operation of rail crews in the form of a state graph is proposed. A method for predicting the destruction process of the bearing parts of rail crews based on linear mechanics of destruction is proposed.

The problems of predicting reliability were solved on the basis of taking into account the random nature of the strength properties of metals, as well as random values of spring stiffness and coefficients of attenuation of oscillation dampers and changes in the spread of the latter with operating time. At the same time, the failure was taken to exceed the permissible level of quality indicators. For such indicators, the maximum permissible values of body acceleration and dynamics coefficients in the stages of spring suspension, as well as coefficients static or fatigue margin. In addition, the appearance of a fatigue crack of the final length was taken for failure. The satisfactory convergence of the design characteristics of the reliability of the bogie frames with data on the failures of these frames in operation is shown.

The monograph is intended for scientific and technical workers, scientists and graduate students dealing with the dynamics and strength of rail crews.

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