Chapter 8
Vibration Field Formation for Transport and Techno Objects Using Variation Approach

ABSTRACT

The concept of a generalized lever as an approach to the formation of the vibration field of technical objects of transport and technological purpose is discussed. The issues of safety and dynamic quality of vibration processes, as well as the tasks of dynamic interaction of technical facilities are considered. Special attention is paid to changing the dynamic states of a mechanical oscillatory system by changing the coupling coefficients of kinematic disturbances. It is proposed to use variational principles to find these coefficients and ensure that the frequencies of zeroing the oscillation amplitudes coincide with the natural frequencies of the system.

CHANGE IN THE DYNAMIC STATES OF A MECHANICAL OSCILLATORY SYSTEM WITHIN THE FRAMEWORK OF THE CONCEPT OF A GENERALIZED SYSTEM LEVER.

Currently, significant attention is paid to the issues of ensuring the safety of technical facilities under conditions of intense vibration loads. In terms of a systematic approach, safety issues are very complex, complex, interdisciplinary and other features. At the same time, from a local point of view, the safety issues of technical facilities under conditions of intense loads can be correlated with the tasks of machine dynamics, vibration interactions, vibration protection and vibration isolation. Of particular note are the issues of ensuring the dynamic quality of vibration

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processes implemented in technical facilities operating under vibration loads. Along with the security problem, the tasks of dynamic interactions of technical objects can be considered. Along with the safety tasks of technical objects, dual tasks can be considered, which are associated with intense vibration loads, but display the "useful" side of vibration loads and are rather associated with the effects occurring in technical objects under conditions of vibration loads. From that point of view, a technical object under conditions of vibration loads is considered not from the side of safety threats, but from the side of the usefulness of certain useful dynamic effects that are of great importance for the processes of transportation, hardening, separation of materials, separation of bulk materials into different fractions, orientation of parts in space and much more. Thus, it can be noted that the safety issues of technical objects under vibration loads pay attention to the tasks of assessing, forming and correcting the dynamic states of technical objects from a certain general point of view, where safety is a summary characteristic.

Along with the generalized safety characteristic, local assessment of dynamic states is considered as an assessment of dynamic interactions of individual elements of technical objects. Thus, the safety of technical objects under vibration loads implies the development of methods that allow conducting system studies to assess, form and correct the dynamic states of technical objects. At the same time, the dynamic states of technical objects are associated with the idea of the vibration states of technical objects in the so-called technical states. Thus, the dynamic state itself has sufficient specificity when considering dynamics problems. However, for a number of assumptions, the dynamic state can be fairly accurately characterized and assumed.

In particular, the range of problems of machine dynamics is known when the design scheme is a mechanical oscillatory system with a finite number of degrees of freedom. A certain part or link of the technical system can also be considered, which in turn also has a design scheme in the form of a mechanical oscillatory system. For a number of technical objects under conditions of intense vibration loads, it can be assumed that the vibrations in question are small and occur near the position of static equilibrium or a steady-state form of motion. For such systems, options are possible when external kinematic disturbances are interconnected. An example of connected perturbations are kinematic perturbations transmitted to an object from a swinging platform. For a wide class of technical objects, it can be assumed that external disturbances are in-phase harmonic disturbances.

Thus, in the tasks of evaluating, forming and correcting dynamic states of technical objects, it can be assumed that the dynamic state is understood as the established form of small forced vibrations of the generalized coordinates of the mechanical vibrational system.

To solve the problems of assessment, formation and correction of dynamic states, a structural approach has spread, within the framework of which a structural

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