DOI: 10.15587/978-617-7319-49-7.INTRODUCTION

INTRODUCTION

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Technological technical systems occupy a leading place in many technological processes in various sectors of the national economy. The classification features and the proposed criteria have been determined, according to which the assessment of the design and technological parameters of the existing technical systems of industrial engineering has been carried out. A method for studying technical systems for technological purposes has been developed, which provides for the implementation of analytical studies and the rational use of the regularities of changes in the internal properties of the machine-medium system based on the joint use of models with discrete and distributed parameters.

The study of the dynamic parameters of the vibration crusher has been carried out and the dependences of the influence of the ratio of vibration masses on the grinding process have been established, and algorithms for calculating the parameters of a vibration three-mass crusher have been formulated.

The physical and mathematical model of the screen is substantiated, on the basis of which the equations of motion of the material over the sieve are compiled and the distribution of the amplitude of oscillations of the material particles from the oscillation frequency of the sieve is obtained. The influence of the vibration frequency and the angle of inclination on the sorting efficiency have been established. An algorithm and method for calculating the main parameters of a vibration screen have been developed.

It has been determined that the use of a vibration concrete mixer makes it possible to reduce the duration of mixing by 2.5–3 times in comparison with conventional free mixing concrete mixers. It has been proven that the process of preparing hard concrete mixtures and improving the quality of concrete mixtures occurs due to the destruction of defective aggregates and a more uniform distribution of the binder throughout the mixed mixture.

An algorithm and method for calculating the main parameters of a vibration concrete mixer have been developed.

A model of the hybrid system «vibration plant – medium» is proposed, in which active and reactive resistances to wave coefficients are taken into account. The results of calculations of changes in the parameters of vibration machines for the processes of compaction of concrete mixture confirm the implementation of accounting for the reactive and active resistance of the concrete mixture.

Predictive mathematical models have been created to determine the stress state of the soil during compaction at characteristic points of the massif under the pipelines, which make it possible to obtain rational values of the parameters of the working bodies for soil compaction. An algorithm and method for calculating the main parameters of vibration systems for compaction of working media have been developed.

The assessment and substantiation of methods for studying the parameters of acoustic treatment of technological media have been done. The functional relationships between the acoustic parameters of the cavitation apparatus and the rheological properties of the processing technological media have been revealed. The process of staged acoustic treatment of technological media is described. Analytical dependences are obtained for determining the main parameters of the cavitation apparatus and the regularities of the processes of staged acoustic treatment of technological media under conditions of energy minimization are established. An algorithm for substantiating the rational choice of the structural-parametric system «acoustic apparatus – technological medium» is proposed.

The main states of reliability of a technical system and its elements are investigated by the example of vibration platforms for compacting concrete mixtures. A model for assessing reliability based on fuzzy logic, implemented in the MATLAB b2020 medium, has been developed. When processing statistical data on the MTBF of the propeller shafts of vibration platforms, the Weibull distribution law was established and the possibility of failure-free operation of such structural elements was determined.

In the course of the research, finite element models of vibration machines were developed to implement the transmission of energy in the vertical direction with a fixed frequency, with a polyphase direction of the action of external forces, with the spatial direction of movement in the vertical and horizontal planes.

Investigations of the nature of distribution and numerical values of stresses and strains in the forming structure of the unit are carried out, depending on the angle of instantaneous action of the external force of vibrators and variable frequencies.

Stress concentrators in structural elements of machines for technological purposes are determined, taking into account the workloads.

The static and dynamic loads of the support contour of a truck crane have been investigated.

The obtained research results are taken into account for making further design decisions when creating such machines.