DETERMINATION OF OPERATIONAL RELIABILITY INDICATORS OF VIBRATION PLATFORM BASED ON FUZZY LOGIC

Penkova Kateryna Mykolaivna
Student of the Faculty of Automation and Information Technologies
Kyiv National University of Construction and Architecture

SUPERVISOR:

Maksym Delembovskyi
Ph.D., Associate Professor of the Department of Machines and Equipment Technological Processes
Kyiv National University of Construction and Architecture

UKRAINE

Vibrating machines are widely used in the construction industry in the manufacture of concrete and reinforced concrete products. The dominant place among vibrating machines is occupied by vibration platforms. The effectiveness of their work largely depends on a sufficiently specific consideration of the operating forces of the system and the reliability of the elements of vibrating machines. Improving the reliability and efficiency of vibrating machines is achieved by implementing a set of measures at all stages of creation (designing, constructing, manufacturing and operating) of vibrating machines. One of the important aspects of ensuring the reliability of vibrating machines is the determination of developments on the failure of machine elements at the stage of operation and the development of appropriate recommendations on this basis. At the same time, at the present stage, recommendations on the reliability of vibration equipment are practically absent. Therefore, the study of reliability at the stage of operation of vibrating machines is an urgent task, which is the subject of research data [1-7].

During the work on modeling the reliability assessment of vibratory machines, on the basis of a fuzzy model, it is necessary to present in the form of fuzzy networks, elements and aggregates of elements of which implement various components of fuzzy models and stages of fuzzy output. [6]

As a result of the study, a fuzzy knowledge base was determined, presented in the form of certain rules (Picture 1).

To create a failure assessment methodology, it is necessary to develop an expert system that would be implemented in the form of a fuzzy inference system and allow determining the amount of risk based on subjective assessments of all failure levels. For further modeling of this kind of system, Fuzzy Logic Designer software tools are used, which is an extension package MATLAB b2020, which contains tools for designing fuzzy logic systems.
To display the selected fuzzy subsets of linguistic variables, we will use them. The parameters of the input functions of the affiliation are shown in Picture 2.

The scheme of the described fuzzy output system implemented in the MATLAB environment is shown in Picture 3.
When performing the corresponding calculation, it can be previously assumed based on certain studies and observations that we have input data, namely:

1. Engine - probability of failure 0.2
2. Bearings – probability of failure 0.7
3. Cardan shafts – probability of failure 0.7
4. Rama (vibration stand) – probability of failure 0.1
5. Couplings – probability of failure 0.4
6. Synchronizer - Probability of failure 0.25

Thus, given the corresponding coefficients, we get the results of constructing fuzzy logic, which in this case will be based on the certain 27 rules, according to which the total coefficient of failure of the vibration platform will be 0.624 (Picture 4).

Accordingly, based on this range of values, it can be argued that the level of occurrence of vibration platform failure is at a "sufficiently high" level.

Pic. 4. Results of calculation fuzzy logic for 27 rules

The implementation considered in this work in the MATLAB environment, namely using the Fuzzy Logic Designer module, a fuzzy model for assessing the detection of failures in the work of a vibration platform is an urgent task, since the physical processes that occur during the operation of these sites affect their working condition. Failure to work the vibrating platform leads to downtime of the entire technological line and damage to the concrete mix that has already been fed to the line [7]. In turn, this approach generally gives a clearer idea of which constituent
elements need to be paid more attention during the repair and maintenance of vibration platforms.

So, summing up, we can say the following: in this example, the main emphasis should be paid to such components of vibration platforms as cardan shafts and bearings. This can significantly improve the performance of the equipment as a whole. But for a more accurate calculation, it is necessary to more clearly select parameters for those conditions and specific equipment that works directly in the workshop of this enterprise.

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