UDC 519.2

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COMBINATORIAL PLANS OF MULTIFACTOR EXPERIMENT
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Experimental research methods are widely used in the branches of mechanical engineering, instrument making, and the chemical industry in search of calculations for the optimal technology, optimal instrument configuration, the most advantageous system characteristics, recipe ratios, and the best time for technological processes. Therefore, the systematization of experimental studies aimed at obtaining adequate mathematical models of processes is of great importance. At the same time, it is natural for experimenters to strive to optimize the parameters of production processes and systems with minimal time and cost costs.

The experiment planning method is one of the most effective methods that allow one to obtain statistical mathematical models of processes. The use of experiment planning makes the behavior of the experimenter purposeful and organized, significantly contributes to increasing the productivity of his work and the reliability of the results obtained.

The modern method of planning an experiment is intended to expand the technology of industrial planning of an experiment and consists of integrated methods and tools for planning, performing and analyzing an experiment [1].

The most promising are the methods of planning an active experiment, which are characterized by universality and suitability for use in many areas of research. The order of alternation of levels of factor change has a significant effect on the cost of the experiment. With an active experiment, the experimenter can change the values of the factors according to a given program by changing the order of the experiments.

To improve the efficiency of experimental studies, it is of great importance to develop a strategy for optimal planning of the experiment. The analysis performed showed that the existing methods for optimizing multifactor experiment (MFE) plans are effective for a small number of factors, and it is necessary to develop new methods to solve this problem.

Optimal design of experiments requires a complex ordering of experiments in accordance with the levels of factors, which is based on the use of combinatorial schemes. Experiment plans based on combinatorial schemes are also called combinatorial experimental plans. Combinatorial experimental plans are widely used in various studies. In technological research - the search for multicomponent materials and the development of formulations for their production [2].

A method has been developed for constructing optimal combinatorial plans that take into account the cost of changing the levels of factors. The solution of the stage-by-stage tasks of the method is considered: generation of a set of transformations of experimental plans, evaluation of the characteristics of MFE plans obtained as a result of transformations, and formation of a set of different representatives [3].

For automation of researches and construction of experiment optimum plans specialized hardware-software complex is developed. The application of the proposed method will simplify the process of constructing MFE plans close to optimal for a large number of factors.

References

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