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APPLICATION OF NUMERICAL METHODS FOR REALIZATION OF MATHEMATICAL MODELS

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The paper analyzes the advantages and disadvantages of using numerical methods to implement computational and optimization mathematical models. The choice of methods for implementing mathematical models depends on the type of objective function and restrictions on the technical parameters of the modeled system.

Solving the problems of managing the resources of technical systems is reduced to solving the problems of minimizing (finding the maximum) values of the objective function, considering the constraints on the objective function and its parameters. This means that the objective function is built, and, based on the assumed characteristics of the technical parameters of the modeled systems containing the sources of physical fields, restrictions on the technical parameters of the system are formed [1]. When building mathematical models, only those factors that significantly affect the functioning of the system are considered, while other factors are neglected. Since, in practice, in most cases, mathematical models are based on nonlinear differential equations and nonlinear constraints on the parameters of the objective function are set, it is important to fulfill the conditions for the existence of a single solution to boundary value problems. In this case, applying methods from the traditional theory of existence and uniqueness of solutions to boundary value problems for differential equations, it is impossible to guarantee their correctness [2]. In the opinion of the authors of this study, it is more expedient to apply algorithms and methods from the theory of differential operators over the field of generalized slow power functions [3].

From the point of view of convenience in obtaining solutions to boundary value problems with differential equations, it is advisable to use approximate computing methods to solve boundary value problems on a computer using mathematical programs. This means that the mathematical model is specified in a form that can be implemented on a computer. The solution obtained in this way will be approximate and will take the form of a series of values of the objective function, but the values of individual system parameters will not be considered.

Despite the above advantages of approximate computing methods over analytical ones, the values of the objective function obtained afterwards should be analyzed for their relevance to the process under study. Thus, to improve the accuracy of the implementation of calculation and optimization mathematical models, it is more expedient to use analytical methods rather than approximate computing methods.

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MATHEMATICAL MODELS, AS A TOOL FOR OPTIMIZING TECHNOLOGICAL PROCESSES

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To improve the quality of the technological process of thermal impact on a technical system, the paper proposes mathematical models, computational methods for calculating and optimizing the technical parameters of emitters. This made it possible to develop an algorithm for controlling the consumption of resources in many technical and biotechnological systems that contain concentrated, discrete, moving sources of thermal load.

To optimize the parameters of technical systems that contain sources of physical