OPTIMIZATION OF ENERGY SYSTEMS BY TOPOLOGICAL MODELS

B. Draganov

Optimization of any energy-saving system is the variation of structure and parameters in order to minimize capital and operating costs in the relevant technical and resource constraints, the protection of the environment, the availability of materials and the creation of conditions of operational reliability and low cost of maintenance.

The purpose of research - to develop a method for optimization of energy systems based on the topological models, as part of graph theory.

Materials and methods of research. In the study of complex technical systems must perform structuring of the object as a system of interrelated elements, taking into account their own specific characteristics and processes, provide a list of possible problems and analyzed the dynamics of the individual elements of the system.

It should be noted that the feature of energy systems is that the totality of the phenomena has a dual nature (deterministic and stochastic), manifested in the application of stochastic features of the hydrodynamic conditions in the machine, the mass and heat transfer processes.

The general formulation of the problem of identification of the test process is characterized by an n-dimensional state vector, r-dimensional control vector, m-dimensional vector of observations (the number of instruments), and the meter readings are imposed both its own instrument losses, and losses due to onset events .

Solution of the problem of identification includes: determining the structure of the equations of state.

Check adequacy and operator identification is performed based on the theory of inverse problems of mathematical physics, the identification and assessment of the state parameters of dynamic systems.

One solution is to formalize the procedures based on the principle of a topological description of the system. To improve the efficiency of the structure under study is necessary to establish a special methodological approach.

This methodological approach has been developed based on the concept of energy flows and driving forces that determine the structure of the generalized dissipative function system that takes into account the energy system on the course of irreversible processes of all kinds.

Any power system can be represented as an ordered set of physical components connected to each other by points (poles) connection. Each simple physical component corresponds to a certain branch of the graph is called a pole graph of this physical component.

To solve the problems of mathematical modeling, analysis and optimization of energy systems refer to a topological model of the system. They allow you to establish a relationship between changes in the technological interconnection topology and quantitative characteristics of the system being studied by the input variables affecting the system.

There are four groups of streaming graphs of energy-saving systems: parametric flow graph (BCP), the material flow graph (MPG), the heat flow graph (TPG) and eksegreticheskie flow graph (EPG). In solving the optimization problem for the energy-efficient systems in the first place will appeal to the parametric and exergy flow graph.

The graph can be represented by the matrix. Matrix representation of graphs allows you to display the structural features of the graph.

The advantage of graph models is their flexibility, a wide variety of features and applications. Graph-theoretic algorithms and based on these search procedures governing decisions are in many cases much more efficient than others.

System optimization is aimed at selection of the parameters of the system (technology, design, and so forth.), Which would provide optimal or near-optimal values of the efficiency criterion.

To achieve the objectives to be merged into a single unit exergetic analysis methods energy conversion systems with mathematical methods of graph theory. This approach has been called eksergotopologicheskim.

The results of research. The algorithm for determining the loss of exergy in the energy system is edit the following basic steps:

I. We construct the corresponding system of the exergy flow graph, incidence matrix and calculate the exergy flows on the arcs.

II. For all the elements to define the incoming and outgoing flows, calculate the amount and flow of exergy elements and their degree of thermodynamic perfection.

III. Calculate the total losses of exergy.

Based on the foregoing eksergotopologicheskogo optimization method is an example of optimizing the energy system.

Conclusions

In solving optimization problems it is recommended to use the method based on the position of the graph theory. The advantage of this method lies in the fact that a significant number of possible options and it allows you to determine the one that best meets the criterion of optimization.