# ANALYSIS OF POWER SYSTEMS EFFICIENCY BY GRAPH BUILT

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One of the most pressing problems of our time is to save energy in industrial processes and in the home. Continuously increasing costs of energy production and related global environmental challenges require the development of energy saving technologies based on the latest achievements of science.

Effective means to solve this problem is to optimize the use of energy structures and parameters in order to minimize capital and operating costs in the related technical and resource constraints.

**The purpose of research** - to develop a method for determining the energy efficiency of the heat exchanger.

**Materials and methods of research.** In solving optimization problems is convenient to use a method based on graph-theoretic constructions.

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.

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.

Exergy concept as the maximum performance is useful when considering the degree of perfection of the different processes in terms of energy conversion.

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, called the pole graph of this physical component.

To solve the problems of analysis and synthesis of energy-saving systems of greatest interest is the incidence matrix.

**The results of research.** Optimization of the system under study - the definition of the best of all possible variants of the system relative to the chosen criterion of its effectiveness. Integrated, 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.

It is easily seen that the above condition is the optimization of multi large-discrete nonlinear programming problem, complicated constraints.

This method is based on a well-developed mathematical apparatus of graph theory, allow you to analyze and get the optimal layout of simply not giving at the same time on the strictness of the mathematical approach and generality of the results to other mathematical models and methods.

The following is an algorithm exergic termo economical and analysis of power systems.

The algorithm for determining the loss of exergy in the energy system consists of the following steps:

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

II. For all the elements to define the incoming and outgoing flows, calculate the amount of exergy flow 1's elements and their degree of thermodynamic-cal perfection.

III. Calculate the total losses exergy

The basis of the analysis of heat-exchange systems should be put place in the mathematical model are physical processes. This allows the communication characteristics of the input parameters of the heat exchange apparatus (e.g., the temperature of the input process stream) from the output stream parameters and characteristics of the state of heat exchangers with account of technological connections there between.

Considered shell and tube, single pass heat exchanger pipes located bellhops.

## Conclusions

Optimization of any energy system is search circuitry (primarily, modification of the structure) and the relevant parameters in order to minimize the energy consumption

given the constraints and requirements of the energy (environmental, reliability and stability of action, reliable control operating mode during operation ).

Exergy system has certain technological structure, ie consists of a series of interconnected elements, characterized by the set parameters, it interacts with the environment.

The method of graph-theoretic constructions has the advantage that the structure under study are presented in graphic form and is convenient to choose possible solutions. Algorithms for solving such problems.