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AUTOMATION AND HEAT CONTROL  
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## A Software System Used for Load Distribution at a Combined Heat and Power Plant with the Complex Mix of the Equipment and Complex Schemes of Heat and Electric Power Supply

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**Abstract**—The authors describe various approaches to construction of an algorithm for the solution of the problem of load distribution at a combined heat and power (CHP) plant with the complex mix of the equipment and complex schemes of heat and electrical energy supply on the basis of which the software system has been developed. Methods of obtaining energy characteristics of the equipment used for solving the problem of load distribution were studied. The results of the implementation of the software system for load distribution at the CHP-23 plant belonging to OAO Mosenergo are given. Realization of recommendations on maintaining an operational mode of the equipment with due regard for its optimal loading makes it possible to obtain fuel savings of up to 1%.

**Keywords:** software system, distribution of heat and electrical loads, energy characteristics, fragmentation and equivalentation of the power plant equipment

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A rich variety of both theoretical and experimental investigations, for example, [1–4], has been devoted to the problems of the optimization of operation of the equipment of thermal power plants. The problem of the optimization can be solved most simply as applied to condensing thermal power plants, but it becomes much more difficult for combined heat and power (CHP) plants with different types of the equipment (both unitized and non-unitized), which serves several outlets for electrical and heat loads.

The present paper deals with an approach to construction of such a problem, an algorithm for solving it, as well as the outcomes of its software implementation. The goal function of the optimization is the minimization of fuel consumption by a CHP plant. It is suggested that the mix of the equipment (the number of turbine sets and boilers in the section of the plant with a common steam line and the number of power units) involved in the process of generation of heat and electrical power, has been preassigned on the basis of the technical condition of this equipment and the schedule of planned repair. The operational mode of the equipment, such as the number of stages of network water heating for each turbine set, technological limitations on the load ranges, type of fired fuel, etc., has also been determined. On the basis of the given algorithm the software system has been developed as

applied to the CHP-23 plant belonging to OAO Mosenergo.

### THE ALGORITHM FOR SOLVING THE PROBLEM OF LOAD DISTRIBUTION AT A CHP PLANT WITH THE COMPLEX MIX OF THE EQUIPMENT

With a different-type mix of the equipment and complex, cross-connected outlets for heat and electrical loads of a CHP plant, the suggested approach to solving the problem of the optimization of their distribution is based on preliminary interrelated processes of fragmentation and equivalentation of the plant equipment. The purpose of these procedures is to represent a scheme of the power plant in the form that is simplified for carrying out optimization computations.

The fragmentation procedure consists in dividing the generating equipment of a power plant (for the equipment with the common steam line only, turbine sets are considered) into groups connected to one of the outlets for the electrical load and to one of the outlets for the heat load.

The need for the fragmentation is due to the fact that for the direct solution of the optimization problem formulated here it is required to work with a complex system of equations involving energy characteris-