TEMPERATURE CONTROL OF THERMOELECTRIC MODULES IN COGENERATION PLANTS

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Depletion of natural reserves of traditional energy resources (oil, gas, coal that) stimulates scientific developments relating to alternative energy, co-generation of electricity from waste heat and receive thermal energy from electrical current. Such energy conversion can be implemented using thermoelectric converters.

It should be noted that the environmental and economic benefits of introducing such elements can not be overemphasized: they allow safe environment to generate electricity from heat losses nuclear and thermal power plants, metallurgical and chemical industry, internal combustion engines, which will help save the traditional 20-25 % energy.

The study **aims** to study and develop the control algorithm-temperature thermoelectric modules in systems cogeneration electricity from heat loss through simulation of mathematical modeling to improve their energy efficiency and operational reliability.

Materials and methods of research. The most promising at present is the use of low-temperature thermoelectric semiconductor converters (modules) with a working temperature of hot surfaces 150-200 ° C, which, compared with other types, have better performance and higher energy efficiency.

This allows more efficient use of heating generators in cogeneration plants for the purpose of electricity from heat loss, which in most cases are low-gradient.

In such systems need to ensure the highest possible temperatures as the hot surface of the module, and the maximum temperature difference between its hot and cold surfaces for some modules of 100 - 150 ° C.

So to ensure the effective operation of thermoelectric generator is necessary to achieve the maximum temperature difference between the surfaces of the module. In addition, the value of electrical resistance load is closer to the value of the internal resistance of the generator module in operation.

Research results. Our studies thermoelectric generator (TEG), built in generator, which runs on solid biofuel, made it possible to establish that the temperature difference on the surfaces of the module depends on many factors related to both the characteristics of thermal power biofuel heat generator technical parameters and size turned on the current load.

In this connection it is necessary to control temperature conditions of the said equipment and ensure their limits. A typical way to solve such problems is to install temperature sensors on the hot and cold surfaces of the module (thermocouples) and use their signals to control system actuators, ensuring the maintenance of thermal conditions of a given module. However, based on the design features and construction generator modules spite of adverse temperatures on a hot surface and instability in the event of their location several elements to the longitudinal flow of heat flow direction, complicated control process temperatures and reduced reliability due to the need for multiple sensors.

The algorithm for determining the temperature of the hot surface of the module for its electrical parameters - output voltage and load current.

Developed simulation model experimental system based on thermoelectric module to study the modes of its work. This model reproduces the system of temperature modes thermoelectric generator in idle and loaded modes in which can be set different temperature conditions and characteristics of the load.

Simulation modes of operation of pilot plant. Deviations calculated value of the real temperature due to temperature changes in the walls of ceramic module fed due to changes in heat capacity, and is not essential, because it reflects the actual temperature thermocouple junctions of semiconductor components, which is lower than the temperature of hot surfaces.

Conclutions

The results of simulation mathematical modeling modes of research settings received depending on the hot surface of the load resistance for Sustainable fed thermal power and temperature of the cold surface and deviation calculated value of the hot surface of the module on the load current, which enables to manage-

temperature thermoelectric module developed algorithm with an error not exceeding 3 %, the use of which in CHP enables to increase their energy efficiency and operational reliability.