

NUMERICAL RESEARCH OF DYNAMIC OPERATING MODES OF TUBULAR HEAT EXCHANGERS

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The control of thermal operations, which include a surface tubular heat exchangers, requires knowledge of the static and dynamic characteristics of all parts the object of automatic control. This is due to the fact that the adjustable object and the heat exchanger (or devices) are inextricably linked with the elements of the automatic control system, which mutually influence each other. Therefore, knowledge of the transient characteristics of heat exchangers is necessary for the design of optimal heat and power and heat technology installations operating under varying loads or production process parameters. In addition, in some cases, the heat exchanger is not a separate link in the circuit, but an independent object of regulation.

The main task of rationalizing the operating modes of heat exchangers is to ensure the highest possible efficiency of the main equipment (boiler, gas furnaces, etc.) or a heat production scheme, where the heat exchanger is a working one, or an adjustable element of automatic control and monitoring.

In most cases, the stationary mode of operation is conditional, since there are always changes in the parameters of the coolant at the inlet, and, accordingly, at the outlet. Determination of the dynamic characteristics of the air heater makes it possible to predict what these changes will be, or to build effective control systems to maintain an unsteady mode within the framework that is closest to a profitable operating mode.

The analysis of the state of the problem of determining the dynamic characteristics of recuperative heat exchangers, which made it possible to establish the relevance of research in this area to control the thermal circuits of power plants (gas turbines, steam generators) and heat production facilities. It is shown that only taking into account the distribution of parameters is it possible to fully determine the dynamic characteristics of thermal processes and give recommendations on the analysis and design of the object and system.

A review of domestic and foreign sources on transients in recuperative heat exchangers of the «gas-gas» type has been performed, which made it possible to establish that mathematical modeling based on the latest achievements of applied mathematics in the field of numerical analysis is the current area of research in the dynamics of heat exchangers.

It is established that mathematical research methods based on the numerical integration of differential equations that describe the transient processes of recuperative heat exchangers are the main direction for determining dynamic characteristics in the development of automatic control systems for thermal links of power facilities.