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MODERNIZATION OF STRUCTURAL SOLUTIONS OF CONDENSATION TYPE HEAT-RECOVERY EXCHANGERS FOR BOILER PLANTS

The results of studies on the effectiveness of the use in heat-recovery technologies for gas-fired heating boilers of advanced condensation heat-recovery exchangers of the exhaust-gases of boilers are presented. The proposed heat-recovery exchangers are designed for heating water in heating systems, chemical water-purification systems and other needs by cooling exhaust-gases, in some operating modes below the dew point of water vapor, contained in gases [1-5]. The heat exchange surface of recovery-exchangers is composed of bundles of finned bimetallic pipes (steel base and aluminium fins) with structural features, namely: with intensification of heat transfer on the inner surface of these pipes [6]. In this case, exhaust-gases blow round the fin surface, and the movement of water, which is heated, is carried out inside the pipes. Such a constructive solution makes it possible to enhance heat transfer inside the pipe and, as a result, to intensify the process of condensate formation in the deep cooling zone of exhaust-gases (condensation part of the heat-recovery exchanger). For this zone, the rational geometric parameters of the pipes and flow turbulators on the inner surface were determined from the condition that the thermal resistance from the exhaust-gas and water in the condensation zone of the heat-recovery exchanger is equal. The studies were carried out using experimental data on heat transfer and hydrodynamics during deep cooling of the exhaust-gases of boiler plants and in pipes with ring flow turbulators for typical modes of heat-recovery equipment of boiler plants. Based on the results of the studies, the optimal ratios of the parameters of the steel base of the pipe and the flow turbulators are determined, which provide a significant intensification of heat transfer with a relatively moderate increase in aerodynamic resistance in the condensation part of the tube bundle of the heat-recovery exchanger.

Conclusions. It is shown that the use of the proposed pipes improves heat transfer by slowing down the process of scale formation due to turbulization of the near-wall layer of heated water. The data on the thickness of deposits on the inner surfaces of the pipes of the heat-recovery exchanger, which is composed of pipes with and without flow turbulators, are compared. It is shown that the relative decrease in the thickness of deposits for pipes with flow turbulators increases with time and can exceed 2.

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