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ANALYSIS OF THE EFFICIENCY OF THE GAS-AIR AIR HEAT RECOVERER OF THE HEAT RECOVERY SYSTEM OF THE GLASS FURNACE

In the work a gas-air heat exchanger with membrane panels arranged in a checkerboard and corridor order along the flue gases in a heat recovery system for a glass melting furnace was considered. Analysis of the efficiency of the heat exchanger was carried out using methods of exergy analysis [1; 2]. For this heat exchanger, a system of exergy, heat, and material balance equations

has been compiled, supplemented by heat transfer equations. Based on the indicated system of equations, the functional dependence of the exergo-technological efficiency criterion on the input parameters of the heat carriers and the design parameters of the heat exchange surface of the heat exchanger is obtained. The obtained dependence makes it possible to estimate the degree of influence on the efficiency of the heat recovery of such characteristics as the degree of dustiness of the heat exchange surface by the flue gases of a glass melting furnace and the Reynolds number for flue gases. At all stages of dustiness of the heat exchange surface, the efficiency of a gas-air heat recovery with a checkerboard arrangement of pipes in a bundle is higher compared to the efficiency of a heat recovery with a corridor arrangement. Moreover, the difference in the values of the exergo-technological criteria of efficiency increases with rising the degree of dustiness of the heat exchange surface (20.5%, for clean pipes and 40.9% for the most dusty pipes). In both cases, an increase in the Reynolds number from 7000 to 15000 leads to an increase in the efficiency of the heat recovery. The degree of influence of the Reynolds number on the efficiency of the heat recovery increases as the degree of dusting of the surface increases. Thus, as the tube bundle becomes dusty, the advantages of a checkerboard layout of pipes increase compared to the corridor one. Moreover, starting from a dusting coefficient of 0.012 for a chess bundle and from a value of 0.008 for a corridor bundle, there is a sharp decrease in the efficiency of the heat recovery. In the flue gas environment of glass melting furnaces, the degree of dusting of the heat exchange surface, corresponding to 0.008, is achieved, on average, in two weeks, and the degree of dusting of 0.012 - in 15-20 days of operation of the heat recovery. In this case, loose dust deposits are formed on the gas exchange surface from the gas side, which must be removed [3]. Thus, within the specified time, the heat exchange surface of the heat recovery must be cleaned using a special cleaning system.

References

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