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ACTUAL PROBLEMS OF RENEWABLE POWER ENGINEERING, CONSTRUCTION AND ENVIRONMENTAL ENGINEERING

Book of abstracts

Part I

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Table of Contents (with presentation of reports)

PROSPECTS FOR APPLICATION OF REGENERATOR WITH GRANULATED MATERIAL FOR DISPOSAL OF LOW-POTENTIAL HEAT

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During any technological process, there is an incomplete use of primary energy. Prospects for the utilization of secondary energy resources (SRE) provide the opportunity to obtain significant fuel savings and substantially reduce capital costs for the creation of appropriate energy-saving plants. Thermal SRE can be used both directly in the form of heat and for separate or combined production of heat, cold, and electricity in recycling facilities. According to the degree of concentration of energy distinguish sources of ESR: high-potential: first of all thermal high-temperature (400-1000°C), medium-potential: thermal flows with a temperature above 150°C; low-potential: temperature up to 150°C.

Currently, heat exchangers for the utilization of high-temperature and medium-temperature thermal emissions are well developed. The utilization of low-potential thermal emissions was considered irrational due to the low temperature head. This problem can be solved by using granular materials in the form of a dense layer. In this case, the heat transfer surface is much more developed, even in comparison with the finned surfaces.

As shown by their own research conducted in the Academy's laboratory, it is rational to design heat exchangers for the recovery of heat of regenerative type with granular nozzle. The granular nozzle falls asleep into the channel in the form of a dense layer through which the flow of exhaust gases passes. The schematically studied layer is presented in Figure 1.

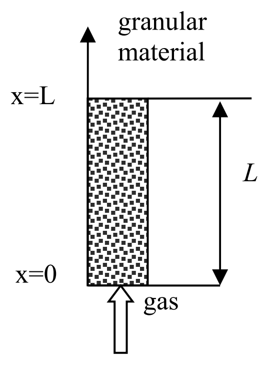

Fig. 1. *Scheme of the section of heat exchange between the flow of gas and granular material*

Figure 2 shows typical curves of temperature dependence on the duration of heating of a layer.

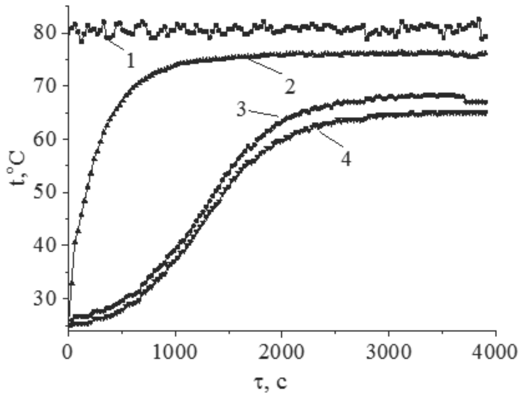

Fig. 2. *Change in temperature of air and expanded clay with time*

In Figure 2 the designation of the curves corresponds to the following parameters: 1 – air temperature at the entrance to the apparatus; 2 – material temperature at x = 0 m; 3 – air temperature at the outlet of the apparatus; 4 – material temperature at x = 0.52 m; filtration rate = 1.0-2.0 m/s: inlet air temperature t = 80°C; L = 0.52 m; mass of material in the apparatus m = 5.25 kg. Experiments have shown that it is advisable to limit the value of the final particle temperature to 80% of the gas inlet temperature.

It is obtained that the heat transfer coefficient for the non-stationary mode of heat exchange between the air flow and the material layer depends not only on the flow rate and the temperature head, but also substantially depends on the duration of heating.

Dense-layer regenerative heat exchangers can be used to heat living spaces and auxiliary areas.