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LOW-POWER HEAT GENERATOR FOR COMBUSTION OF LOW-GRADE SOLID FUELS

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The construction of low-power layer heat generator (40 kWh) for combustion of low-grade solid fuels and their mixtures is created. Low-grade fuels burning grade investigations such as peat, wood waste and their mixtures and the developed method of ecologically clean their burning at the expense of the their efficient organization of aerodynamics of the combustion chamber and proportions of their mixing are given in paper. The process of two–stage combustion of such fuels, where in the primary chamber its gasification takes place, and in the secondary one afterburning of volatiles is done is investigation. The organization of the intermediate chamber in the area of high temperatures between the primary and post-combustion chamber has led to the improvement of the process of burning solid fuels and reducing harmful emissions. The counterflow of fuel and oxidizer has allowed effectively burning even low-grade fuels in a layer. Heating air supplied to the primary chamber, significantly improves the quality of the combustion process. The comparison made of ecological indices of the two-chamber and three-chamber combustion chambers of the created heat generator have shown that the organization of the intermediate chamber in the area of high temperatures between the primary and post-combustion chamber leads to reduction the of time of burning solid fuels (by 1,5 times) and reduction of harmful emissions (NO_x by more than 2 times).

Experimental investigations made of the influence of air heating at the inlet to the primary and secondary chamber have shown that the increase in air heating that is fed to the primary chamber, for the value from of 51 to 113°C (t_a = 400°C) significantly improves the quality of the combustion process and reduces emissions

of CO by 1,3...1,5 times while preserving a stable level of nitrogen oxides emissions.

Experiments have shown that the fractional composition of the fuel and mixing the waste wood to the peat substantially affect the quality of the combustion process. Investigations of the influence of wood additives during burning peat and lignite on the ecological indices have shown that the addition of 50% of wood reduces the fuel burning time and reduces emissions of CO by the value up to 30%, but does not change the concentration of nitrogen oxides.

Thus all these measures have allowed to improve the combustion process of low-grade solid fuels not only in relation to reducing nitrogen oxides emissions, but also CO and, in some cases, the addition of 50% of wood waste has reduced harmful emissions by half. Even in the heat generators of low the power the small low (up to 3 m) exhaust pipe overcomes the hydraulic resistance of the additional chamber and air heater. Adding to peat to 50...25% of waste wood has significantly reduced the concentration of carbon monoxide emissions. The equipping the proposed heat generator with the unit for continuous or periodic fuel loading will permit to recommend it for the wide application.