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METHODOLOGICAL APPROACH TO ASSESSING THE EFFICIENCY OF USING WOOD PELLETS FOR ELECTRICITY AND HEAT GENERATION

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The article deals with the issues of efficiency of using alternative fuels - obtained from wood pellets - for the production of electricity and heat. The heat content (enthalpy) of pellet combustion products depends primarily on their temperature after the combustion chamber at the entrance to the power plant. In turn, this temperature is determined mainly by the heat balance of the combustion process. It has been shown that the beneficial part of the balance consists of the lower heat of combustion of the working mass of pellets (determined in an isoperibolic calorimeter according to DSTU ISO 1928:2006) and the total enthalpy of pellets and air at the entrance to the combustion chamber. In this case, the heat of combustion is ≥ 99.8 % of the total amount of the revenue part. The resulting heat is used to heat the combustion products, i.e. the consumable part of the balance (with an accuracy of heat losses to the environment) is the enthalpy of the products obtained. The calculation of the pellet combustion process was performed, on the basis of which the calorimetric temperature of the combustion products (about 1050 °C) and their practical temperature (578 °C) were determined. The final temperature of the combustion products at the outlet of the power plant is 139 °C, which is 100 °C higher than their dew point, which was also determined by calculating the combustion process.

Under such conditions, to obtain the maximum possible amount of electricity, the specific consumption of pellets per 1 MW of electric power is 1.14 tonnes of working mass per hour. It has been determined that with the combined generation of electricity and heat with the highest possible thermal efficiency, the specific consumption of pellets increases slightly - up to 1.43 t/hour. But at the same time, the overall thermal efficiency of the power plant increases from 73.1 to 84.3 %.

Keywords: small-scale energy, alternative fuels, renewable sources, wood pellets, electricity, thermal energy, cogeneration units.

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