

Energy and Environmental Indicators of the Combustion of High-moisture Fuels Based on Typical Municipal and Industrial Wastes

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In this paper, the analysis of the nomenclature and volumes of a number of industrial and municipal wastes is carried out. The compositions of fuel slurries based on wastes (sawdust, straw, cardboard, sewage sludge, oil residues, and waste petrochemical production), as well as coal dust, were developed.

The characteristics and conditions for the ignition and combustion of the slurries were determined experimentally. It was found that the difference in the maximum temperatures of the surface of the studied fuels during their combustion was about 60–95 °C. The difference in the specific heating value of the considered slurries was 1.3–4.15 MJ/kg. By the criterion of combustion heat, fuels based on sawdust, straw, cardboard cannot compete with coal-water slurry, even with the addition (10% wt.) of high-calorific petrochemical waste. In this work, the slurry based on straw, cardboard, wastewater and heavy oil was characterized by the lowest ignition temperature (≈ 330 °C). The coal water slurry had the highest ignition temperature (≈ 375 °C).

It has been established that combustion of industrial and municipal wastes in slurry composition is more environmentally friendly than high-temperature combustion of coal dust. Relative indicators of ecological, economic, energy efficiency of combustion of the studied fuel slurries are 1.2–12.58 times higher than of coal and fuel oil. Advantages are achieved due to low emissions of harmful gases and low cost of the components. According to the results obtained, it is possible to recommend the use of various wastes (wastes of technological and urban water treatment, straw, sawdust, cardboard, petrochemical waste, oil sludge, etc.) as additional components of slurry fuels.

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