

EXPERIMENTAL ANALYSIS OF NEW METHODS FOR DIAGNOSTICS OF DEFLUIDIZATION PROCESSES DURING FLUIDIZED BED COMBUSTION OF BIOMASS

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Generally [1], [2] temperature measurements of a bed, space above the bed and pressure drop in a bed are taken for the identification of defluidization. However, such methods of defluidization diagnostics allow to establish the fact of defluidization when it is too late for timely intervention into the process.

Bed agglomeration must influence the statistical characteristics of a random process of pressure drop in a bed [3]. However, some approaches for determination of statistical characteristics of a random process of pressure fluctuations in a bed described in the following papers [3] are suitable only for small values of gas flow rates, beds of small particles and have not been proved under real conditions of technological procedures.

The method for diagnostics of the defluidization process, based on the comparison of values of dimensionless amplitude of pressure fluctuations in a bed, obtained at various moments of technological procedures, is proposed. It is shown that while the dimensionless amplitude of fluctuations is less than 0.1 the bed remains in a fluidized condition and defluidization does not occur. The method is experimentally verified for the fluidized bed combustion of straw pellets in a specifically developed for these purposes boiler. We used straw pellets in the experiments, as the most problematic fuel. Low melting point of ash and high ash content are promoting the agglomeration and fast accumulation of slag in bed.

Reliability of the offered method is proved by means of known methods for diagnostics of defluidization: by taking into account the changes in fractional composition of the bed material, flue gas temperature measurements outside the boiler, and measurements of O₂ and CO concentrations in flue gases. These measurements were taken during the boiler operation at the workload equal to 50, 75 and 100% of the nominal.

References

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