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INFLUENCE OF COMBINED COAL AND BIOMASS CO-FIRING IN PULVERIZED FUEL BOILERS

(ABSTRACT)

PhD Thesis
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ABSTRACT

The paper presents the identification and technical offer for the following operational problems associated with combined firing of coal and biomass in pulverized fuel boilers:

- definition of combustion kinetics of the biomass particles compared to the combustion kinetics of coal dust particles and scientific description of recommendations for the coal and biomass granulation for PF boilers,
- examine the relationship between properties (grain size, chemical composition) of coal and biomass and the resulting characteristics of the fly ash,
- investigate the influence of coal and biomass co-milling on the granularity of coal dust,
- determine the influence of biomass share on the quality of fly ash from the point of view of their utilization,
- examine the low-temperature and high-temperature corrosion risks,
- determine the effect of co-firing of solid biofuels on PF Boiler efficiency due to slagging and fouling and changes in flue gas composition,
- determine the influence of biomass co-firing on emissions of NO_x, SO_x and CO in boilers equipped with the NO_x reducing installations.

The solution of listed above operational problems will not only reduce the risks but improve the operation of PF boilers co-firing biomass, both in terms of efficiency and availability. From a scientific point of view it is important and original to understand the differences between the combustion kinetics of coal dust and biomass. Presented research results of the mechanism of the co-milling complex processes of organic substances with coal in a ring-ball mills will be useful for boilers users, as well as the explanation of the corrosion phenomena by biomass co-firing. For the first time were also tested a new type of convective tube banks resistant to non-uniform deposition of ash (from coal and biomass combustion). Practical result of the conducted research in this dissertation is to provide technical recommendations for improving the operation of PF Boilers firing different types of biomass, using both direct and indirect fuel feeding system.