

Aglomeracja paliw w kotłach z rusztem wibracyjnym

Praca doktorska

Mgr inż. Krzysztof Rosenberger

Promotor:

Prof. dr hab. inż. Janusz Kotowicz

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ABSTRACT

Legal and strategy for renewable energy development in recent years has led to increased interest in grate boilers as objects fully capable of combustion and co-combustion of biomass. High fuel flexibility makes the vibrating grate boilers perfectly suited as a low power energy facilities dedicated to distributed power industry, heat engineering and industry. The content of alkaline elements in the biomass causes to lower the softening point of ash providing some complications operating due to the bed agglomeration process. Boilers with a vibrating grate due to the characteristics of their work, provide secure fuel burning forest biomass and herbaceous. The paper presents a detailed identification of the agglomeration process by carrying out the following tests:

- Carrying out chemical analysis of fuel and ash from: coal, forest biomass, herbaceous biomass and waste from chicken farms and processed biomass such as DDGS.
- Conducting thermogravimetric analysis for selected fuels.
- Determination of melting ash temperature.
- Set a value to a tendency to ash slagging.
- Study of the bed temperature profile on the grid at a standstill and running vibration.
- Analysis of the resulting sintered Properties. Determination of oxides in the agglomerates.
- Determination of characteristic melting temperature of slaggs generated during the combustion tests.
- Examination of particle size distribution of the agglomerates.
- Test with an optical microscope and electron surface structures selected agglomerates. An analysis of SEM/EDS resulting agglomerates.
- Appliance an innovative method for testing the susceptibility of milling the resulting agglomerates in order to determine their durability using Hardgrove test.

The results of these studies will reduce a risk of agglomeration of the bed during the combustion of biomass fuels thus increasing the availability of the boiler. The scientific aspect of this work has a significant impact on the understanding of combustion of coal and biomass boilers with vibrating grate, the impact of alkaline elements to the size and durability of the resulting agglomerates. This paper presents the operating characteristics of the vibration grate depending on the type of used fuel. Also it shows how changing the composition of the resulting slag, depending on changes in the conditions of combustion. For the first time susceptibility Hardgrove test was used milling slaggs to determine the durability of the resulting agglomerates. The practical result of this thesis is also to create a test sequence for testing biomass burning on the vibrating grate. The essence of this work is also building the vibrating grate pilot boiler. This project is done in collaboration research center which is the Institute of Power Engineering and Turbomachinery at Silesian University of Technology and the representative of the industry company AMEC Foster Wheeler Energy Poland.