CONDITIONING MONITORING AND FURNACE OPERATION AND DESIGN

(562) - INCREASING FUEL FLEXIBILITY OF BIOMASS BOILERS AND PLANTS WITH NEW SENSOR MODULES

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The heterogeneity of biogenic fuels and especially biogenic residues with regard to water and ash content, particle size and particle size distribution is challenging for biomass combustion and limits fuel flexibility. Online fuel characterization as a part of the control process could help to optimize combustion processes, increase fuel flexibility and reduce emissions. In this presentation results form the project DigitalFire will be presented. In the »DigitalFire« project, the Fraunhofer Institute UMSICHT is exploring the possibilities of digitizing biomass furnaces. Cost-effective standard components should make existing plants more flexible and economical. To achieve this goal, various sensors, »soft« sensors and data acquisition systems will first be installed in the project. In total the developement of four new sensor modules and their first test runs will be presented. The sensor modules include optical, acoustical and other process signals and are aligned alongside the hole process chain. The data generated, e.g. on the calorific value, fuel composition and quality, grate temperature and plant condition are collected, processed and visualized. Subsequently, machine learning methods or artificial neural networks are used to evaluate the data and make it usable, e.g. for automated adjustment of the optimum firing parameters or warnings of critical plant conditions. A user-friendly front-end - also for mobile devices (e.g. an app) - ensure that this information is always directly available to the operator. The project has a duration of three years and is funded by the Federal Ministry of Food and Agriculture.

One sensor module is based on the principle of hot air convective drying. The idea is to pass hot air through a bulk of fuel like wood chips, measure the changing air properties, draw conclusions from them and estimate relevant fuel properties before entering the furnace. To achieve this goal, a testrig was set up in the laboratory and a series of tests were performed with different fuels. The results show that a differentiation of certain properties can be achieved. Furthermore, based on the data, the concept for a software for an automated, data-based fuel detection system was designed.

Palavras-chave : Biomass combustion, Digitization, Online fuel recognition, Fuel flexibility

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