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## Abstract

# BIOFLEX! - Clean and flexible use of new difficult biomass fuels in small to medium-scale combustion

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Due to the efforts to promote the use of biomass for heat and power generation, there is an increasing demand regarding woody biomass fuels, which leads to a price increase and a shortage of these fuels. Thus, there is a generally rising interest in the use of alternative fuels such as agricultural biomass fuels (e.g. straw, grasses) and biogenic waste from agriculture and industry. These fuels are generally ash-rich and show in comparison to woody fuels increased N, S, Cl and K contents. Therefore, ash-related problems as well as increased NOx, HCl and SOx emissions occur during combustion. For this reason, a more complex plant technology compared to wood fuels is required, resulting in increased investment costs and a lower economic attractiveness. In small-scale combustion, individually tailored solutions and expensive secondary measures for emission reduction are economically not viable and for medium-scale plants limited knowledge regarding the problems associated to the utilisation of “difficult” biomass fuels so far held back the development of flexi-fuel combustion systems, leaving the market sector almost unexploited. Therefore, the development of cost efficient and general primary concepts for increased fuel flexibility is urged in order to boost the innovation, enlarge market potential and deliver clean and efficient technology solutions.

Against this background the overall objective of BIOFLEX! (01/2016-03/2019) was to increase fuel flexibility and innovation potential for the use of more difficult solid biomass fuels in the small to medium-scale (<10 MWth) heat and power production sector. The specific aims were (i) to further develop and implement fuel design and combustion system design related measures making the clean and efficient utilisation of bio-residues, by-products and other resource efficient energy crops, such as straw, grass and husks, possible, (ii) to develop guidelines for the design of appropriate low emission combustion technologies and for appropriate fuel design of the identified fuels and (iii) to perform testing of these measures in appropriately adapted testing plants in cooperation with furnace and boiler manufacturers.

Thereby, the following major R&D pathways have been followed:

- To improve the understanding of ash transformation issues in combustion, by fundamental ash transformation research and by connecting ash transformation with the combustion.
- To investigate the application of additives and fuel blending in order to make new problematic feedstock better applicable in small to medium-scale biomass combustion systems.
- To further develop combustion technologies for the small and medium capacity range by means of primary measures such as new grate furnace and pulverised fuel burner technologies for ash rich difficult biomass fuels, CFD optimised combustion chamber and advanced air staging concepts and improved control systems tailored to the demands of fuel flexibility
- To present technologically and economically viable guidelines for the design of appropriate fuel-flexible low emission combustion technologies and for appropriate fuel design strategies.

Today, when utilising bio-residues, by-products and other resource efficient energy crops in state-of-the-art small and medium-scale biomass combustion plants, usually severe problems with slagging and deposit formation lead to unacceptably low plant availabilities, increased maintenance efforts as well as increased gaseous and PM emissions. Within BIOFLEX!, solutions and technologies have been developed which make an application of these fuels in small and medium-scale plants possible. To spread this knowledge to a broad public, the project results have been made available via the project webpage (https://bioflex-eranet.eu).

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More information about the event, photos and presentation slides are available for download: https://nachhaltigwirtschaften.at/en/iea/events/2020/20200124-highlights-bioenergy-research.php