Success Story
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BE2020
BIOENERGY 2020+ GmbH
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Emission reduction at biomass combustion plants by modular CO-lambda-optimization

Due to its inhomogeneous fuel properties, the combustion of biomass is a major challenge for combustion technologies. An incomplete burnout due to fluctuating fuel properties results in particularly high emissions (for example, dust) and must therefore be avoided. For this reason, a modular CO-lambda-optimization has been developed, which allows an almost complete combustion at high efficiencies also at fluctuating fuel characteristics. A special feature of this technology is its modularity, which allows the optimization to be retrofitted to existing systems.

Modular CO-lambda optimization

The combustion of biomass plays a major role in Austria's heat supply. The energetic use of wood is largely CO2 neutral, which is why modern industrial biomass firing systems are particularly relevant for reducing greenhouse gas emissions. An essential requirement is a high burn-out quality, i.e. a complete combustion of the wood in particular of the emitted flue gas. An incomplete combustion results in a strong increase of particulate emissions (dust) as well as gaseous emissions (carbon monoxide).

Due to its inhomogeneous composition and combustion properties, biomass poses a major challenge to combustion technologies. Special measures must be taken to ensure an environmentally friendly and efficient operation of biomass combustion plants. This can be the optimization of the combustion chamber geometry or the use of precipitator for dust emissions. However, these measures can only be taken before the construction and commissioning of the biomass combustion plants. The implementation of the measures on existing biomass combustion plants involves high effort and costs.

In the course of this project, a method for optimizing the burn-out quality has been developed, which can be applied to biomass combustion plants without any significant structural changes: **a modular CO-lambda-optimization**. This can be retrofitted to almost all existing biomass combustion systems, optimizing the combustion process – minimizing emissions and reducing fuel consumption.

Emission reduction through real-time optimization

The burn-out control in modern biomass firing systems is usually based on the control of the oxygen content of the emitted flue gas, which is measured by a lambda probe. In general, an optimal value of the oxygen content exists, at which the plant is operated with maximal efficiency and minimal emissions. However, this optimal oxygen content varies depending on the operating conditions (e.g., the thermal load) as

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well as the fuel properties (fuel type, water content).

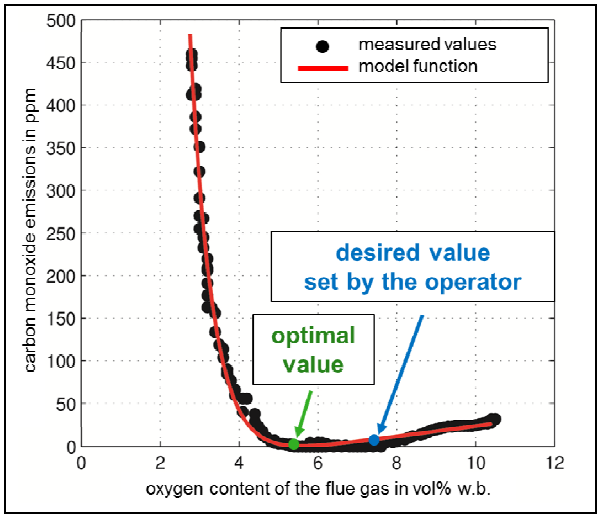

Fig. 1: Carbon monoxide emissions in dependence of the oxygen content (copyright: BE2020))

The modular CO-lambda-optimization developed determines the optimal value of the oxygen content in real-time and adjusts the oxygen content required from the plant's control. The optimization leads to a plant operation with minimal emissions and maximal efficiency at all operating conditions or fuel properties. The modular CO-lambda-optimization has already been applied to three industrial biomass combustion plants and has always led to a clear improvement in plant operation.

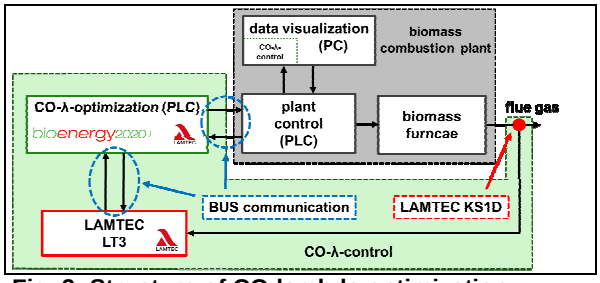

Fig. 2: Structure of CO-lambda optimization (copyright: BE2020)

Impact and effects

The modular CO-lambda-optimization enables an environmentally friendly and efficient operation of biomass combustion plants.It ensures an operation at maximal efficiency and meeting all legal limits for dust and CO-emissions.

The method is not only limited to new biomass combustion plants, but also applicable to existing plants.

Contact and information
K1-Centre BE2020

BIOENERGY 2020+ GmbH
Inffeldgasse 21b, 8010 Graz
T +43 (316) 873-9201
E christopher.zemann@bioenergy2020.eu, www.bioenergy2020.eu

Project coordinator
Christopher Zemann

Project partners

Organisation	Country
LAMTEC Meß- und Regeltechnik für Feuerungen GmbH & Co. KG	Deutschland
TIWAG-Tiroler Wasserkraft AG	Österreich
s.nahwaerme.at Energiecontracting GmbH	Österreich
Aigner Energie Contracting GmbH	Österreich