

Bachelor-/Master Thesis

Investigation of Atmospheric Oxyfuel Gasification of Biogenic Fuels in a Laboratory-Scale Fluidized Bed Gasifier

Contents:

In industrial processes, (high-temperature) process heat is still predominantly generated using fossil fuels, particularly natural gas. Within the scope of the *BioProcessHeat* research project, a CO₂-reducing process is being investigated, in which natural gas is substituted by climate-friendly, biogenic synthesis gas produced via thermochemical biomass gasification.

To this end, a laboratory-scale process chain is being developed, in which biomass is converted and the resulting synthesis gas is catalytically conditioned. Compared to the approach of replacing fossil natural gas with renewable gas substitutes (SNG) of natural gas quality, the combination of hot gas cleaning, partial methanation, and direct combustion of the synthesis gas in specially designed burner systems offers a simplified process route. This may contribute to improving the economic competitiveness of such systems.

This Bachelor's or Master's thesis initially focuses on the gasification of biomass. Up to now, an allothermal steam gasification process has been used in the small-scale gasifier at the Chair of Energy Process Engineering (EVT). The next step involves investigating the operation with an air-steam mixture as the gasification medium (atmospheric oxyfuel gasification). Particular attention will be paid to the influence of steam dosage on the gas composition, in order to derive conclusions regarding the optimal fuel moisture and suitable operating conditions, such as gasification temperature.

Two different biomass fuels will be tested under atmospheric oxyfuel conditions—each at varying gasification temperatures and steam content. Following the successful completion of the experimental campaign, the resulting data will be evaluated and presented graphically.

Tasks:

- Literature review on atmospheric oxyfuel gasification
- Revision of the system documentation for the small-scale gasifier in preparation for oxyfuel operation
- Planning and execution of gasification experiments using the small-scale gasifier
- Experimental series with two different fuels, varying gasification temperature and steam ratio
- Written documentation of the thesis and clear presentation of the results

Requirements:

- Structured and independent working style
- Interest in practical, hands-on laboratory work
- Working language: German or English

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