OTTO VON GUERICKE UNIVERSITÄT MAGDEBURG
VST FAKULTÄT FÜR VERFAHRENS- UND SYSTEMTECHNIK

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**Topic of a Bachelor thesis**

*Buffering Strategies for P2Syngas Applications*

Theoretical

Magdeburg, 04.09.2019

**Motivation:**

The production of syngas can be accomplished via different routes. One interesting pathway that is based on renewable hydrogen and CO2 is via reverse water-gas shift (RWGS) [1]. It requires a feed stream composed of carbon dioxide and hydrogen. While CO2 can be provided continuously as a byproduct of other synthesis processes, H2 is assumed to be generated by renewable energy sources (e.g. solar or wind). Their intermittency must be dealt with by suitable buffering strategies [2]. Figure 1 represents a simplified flowsheet for the system being considered.

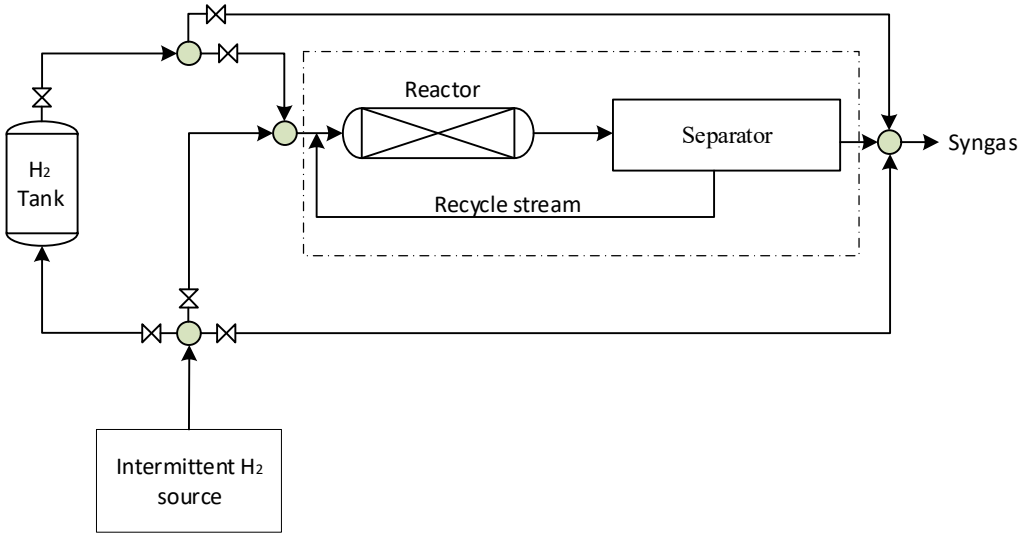


*Figure 1:* Simplified plant topology.

**Problem definition:**

Goal of this thesis is the formulation of an appropriate mathematical description for the dynamic system. For this, dynamic mass balances for each unit must be derived based on literature information. Based on the model, the size of the buffering tank and the energy requirements for H2 pressurization can be determined for different scenarios.

**Task list:**

- Modeling and simulation of the fundamental process steps involved
- Generation of the plant topology, simulation of the process
- Sizing and cost estimation of the buffering tank for different syngas requirements
- Calculation of energy requirements for H2 pressurization

**Start**: winter (January)/spring 2020

**Duration**: 4 months

**Prior knowledge:**

- Matlab
- Knowledge in Process Systems Engineering (i.e. conservation laws, ideal reactor design)
- Basic knowledge in process control

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**References:**

[1] Wenzel, M., Rihko-Struckmann, L. and Sundmacher, K., 2017. Thermodynamic analysis and optimization of RWGS processes for solar syngas production from CO2. AIChE Journal, 63(1), pp.15-22.
[2] Peng, X., Root, T.W. and Maravelias, C.T., 2019. Optimization-based process synthesis under seasonal and daily variability: Application to concentrating solar power. AIChE Journal, 65(7).