

Masterarbeit

"Vergleichbarkeit, Validierung und Potenziale von DWSIM und ASPEN Plus zur Simulation von PBtL Prozessketten"

"Comparison, Validation and potentials of DWSIM and ASPEN Plus in Simulation of PBtL process chains"

Background:

In the scale-up of lab and pilot-plant data to commercially viable scales of any processes, thorough mass and energy balances are non-negotiable. They are the foundation of apparatus dimensions and techno-economical assessments. To aid process engineers with this, different flowsheeting software exist, each with different benefits and drawbacks. While deepening the cooperation between BEST GmbH, located in Vienna, and Karlsruhe Institute of Technology, the software predominantly employed, i.e. the freeware DWSIM and the commercial product ASPEN Plus, respectively, shall be compared within this Master thesis for their suitability of modeling renewable biomass-to-liquid (BtL) process chains.

Tasks / planned work:

At first, based on past operating data from the demo-scale BtL process chain at BEST in conjunction with partially existing models, a 1 MW scale model shall be created and validated in both software's. A comparison of experimental and modelled data should be used to point out discrepancies on operation of the demo-scale plant and support future design. A scale-up of the process to a 100 MW scale shall be implemented and the process optimized based on technical key performance indicators. Finally, the potential of each software for novel processes shall be reviewed.

The topic of this Master thesis is process modelling, validation and scale-up in different software environments. Following tasks are to be fulfilled within the scope of this work:

- Literature study on process simulation, employed unit operations at BEST research site and existing operating data as well as models
- Construction of a process simulation in ASPEN Plus and DWSIM for the entire process chains from biomass to Fischer-Tropsch products on the 1 MW scale for a defined reference case
- Validation of mass and energy balances with real operating data and identification of operating discrepancies
- Review and comparison of the differences, advantages and disadvantages of both software
- Scale-up of the process chain in DWSIM to a 100 MW scale
- Identification and implementation of optimization potential through key performance indicators
- Investigation of potential uses of DWSIM for novel unit operations
- Discussion and written summary of the results

During this thesis, "principles of scientific work" of EBI ceb are to be followed. Results shall be presented accordingly and documented thoroughly. The thesis must be presented in a „fuel seminar" at EBI ceb.

Starting date: August 2025
Deadline:
Supervisor: Philipp Graefe, M.Sc. (BEST GmbH)
Examiner: Prof. Dr. Reinhard Rauch (KIT)