Friedrich-Alexander-Universität
Technische Fakultät

Department Chemie- und
Bioingenieurwesen (CBI)
Lehrstuhl für Energieverfahrenstechnik
Prof. Dr.-Ing. Jürgen Karl

Bachelor/Master's thesis

Investigation of the flow field in a trickle bed reactor through particle-resolved CFD-Simulation

Content:

Biological methanation (**BM**) is a promising pathway for energy storage (Power-to-Gas). Trickle-bed reactors are frequently used in **BM** due to their potential for high purity product. The critical challenge of this process is to quantify and to improve the packing surface utilization since the developing flow field is highly influenced by fringe effects and by unequally distributed input flow profile. To gain insight into this topic an existing trickle bed reactor filled with porous packing material is utilized. Different shapes of the packing material are experimentally tested at constant water flows through the trickle bed.

For this research, the primary purpose is to investigate the influence of different particle shapes on the flow field in the trickle bed, to find out their further influence on the degree of utilization of fluid in trickle bed reactor. The packed bed is first generated using the 3D computer graphics software "Blender". Then, the porosity of the bed is calculated, and the calculated result will be validated through the empiric equations. After that, the physical geometry is imported into the computational fluid dynamics(CFD) software "Fluent", and the pressure drop and velocity distribution will be analyzed through the particle-resolved CFD simulation.

Tasks:

- Literature research: particle-resolved simulation for packed bed, flow field of trickle bed.
- Geometry generating in Blender, grid meshing in ICEM.
- 3D-CFD simulation through particle-resolved method in ANSYS Fluent
- Post-processing of the CFD simulation.
- Written documentation of the thesis.

Your profile:

- Motivation and interest for computational fluid dynamic simulation.
- Basic knowledge of CFD-Simulation (favorable, but not mandatory)
- Basic knowledge of Python programming language (favorable, but not mandatory)
- Working independently
- Teamwork with the supervisor

Start: as soon as possible

Contact:

Xu Fang, M.Sc.
Phone: +49 9115302-99036 Email: xu.fang@fau.de