

Topic of a Bachelor thesis

COMSOL Multiphysics Modeling of a Methanation Reactor

Experimental / **Theoretical**

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Motivation:

Simulations are powerful tools for minimizing costs, identifying safety gaps and optimizing processes. However, this only applies if the model created represents reality with sufficient quality. Especially in process engineering, process simulations are indispensable. Be it in the design of chemical apparatuses or in operational processes. Also with regard to the digitalization of the chemical industry, a wide variety of models are needed to cope with a wide variety of problems.

Problem definition:

In addition to simulation software that can be used universally to solve a wide variety of problems, there is also special software that is optimized for specific areas. For the modeling of process engineering apparatuses, COMSOL Multiphysics can be mentioned as a representative example. In the thesis a Comsol simulation model for an existing methanation reactor at the Max-Planck-Institute Magdeburg is to be developed. The following main tasks are derived from this:

Task list:

- Creation of a Comsol model for an existing methanation reactor
- Comparison of the results from the Comsol simulation with the results from previous simulations and experiments

Start: by arrangement

Duration: 3 months

Prior knowledge:

- Basics of chemical reaction engineering
- Knowledge of CAD and COMSOL Multiphysics an advantage

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References:

- [1] Paz-Garcia, J. M., Villen-Guzman, M., Cerrillo-Gonzalez, M. M., Rodriguez-Maroto, J. M., Vereda, C., Gomez-Lahoz, C., „TEACHING CHEMICAL ENGINEERING USING COMSOL MULTIPHYSICS “
- [2] Zimmermann, R. T.; Bremer, J.; Sundmacher, K.: Load-flexible fixed-bed reactors by multi-period design optimization. Chemical Engineering Journal 428, 130771 (2022)
- [3] Rönsch S, Schneider J, Matthischke S, Schlüter M, Götz M, Lefebvre J, et al., „Review on methanation - from fundamentals to current projects.” Fuel