

Process and technology development

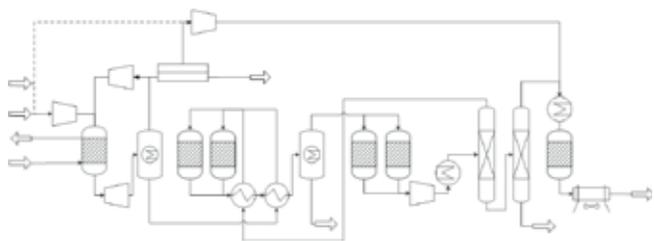
The era of fossil, carbon based fuels and chemicals has reached its peak. The utilization of renewable energy and resource for the production of basic chemicals and liquid or gaseous fuels requires a broad knowledge of process engineering and thermodynamics. We offer solutions for process and technological developments ranging from technological feasibility studies over model based benchmarking in the field of process engineering to economy investigations.

■ Topics:

- Power to gas (methanation)
- Renewable fuel production (GtL)
- H₂-production, storage and utilization in fuel cells

■ Feasibility studies

- Balancing of materials, energy and exergy
- Profitability analysis (estimation and comparison of CAPEX and OPEX)



Process flow sheet

Contact / Directions

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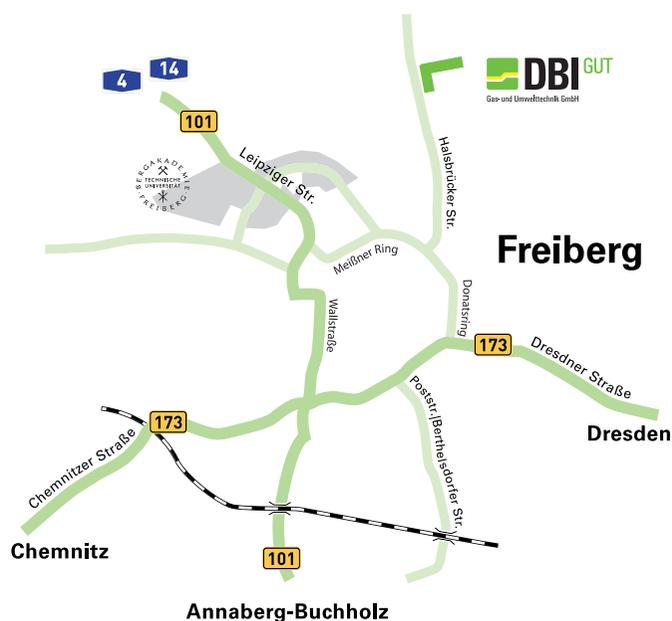
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retrieved february 2014



GAS PROCESSING

Catalyst screening
Kinetic analysis
Modelling and simulation
Process and technology development

Catalyst screening

Heterogeneous catalyzed gas reactions are dominating a lot of processes like the production of bulk and fine chemicals and even the energy supply, e.g. exhaust gas purification or gas processing for fuel cells. Our company is testing catalysts under exactly defined conditions. Therefore we have three laboratory-scale testing facilities with different catalyst volumes, temperature and pressure ranges.

Specification of the testing facilities

- Temperature up to 1000 °C
- Pressure up to 100 bar
- Catalyst volume up to 750 ml
- Up to six gases, e.g. H₂, CH₄, CO, CO₂, N₂, O₂
- Liquids (evaporator or saturator)
 - Water, methanol
 - Liquefied gases (LPG, DME)
 - High-boiling liquids (tar)

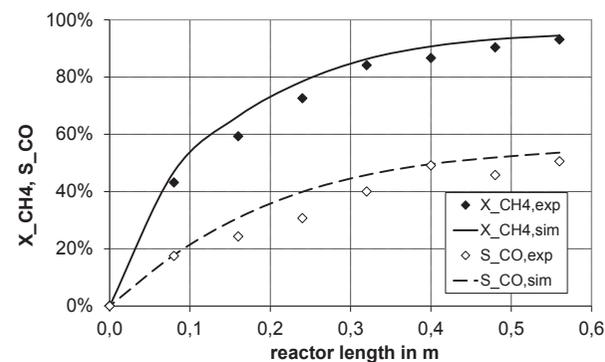


Testing facility for high pressure synthesis

Kinetic analysis

The knowledge of the kinetic parameters, which are specific for every catalyst, is very important for understanding the performance of reactors and for calculating high-quality models of the reactor. The existing equipment and the knowledge of the employees enables our company to evaluate the real kinetic data of different catalysts. These can be evaluated and validated based on reduced 2-D reactor models using experimental results from our laboratory plants.

- Experimental evaluation of intrinsic kinetic data
- Gradient-free measurement using pulverized catalysts
- Evaluation of different parameters for modelling (λ_{eff} , D_{eff})
- Validation of kinetic data with larger reactors and numerical reactor models

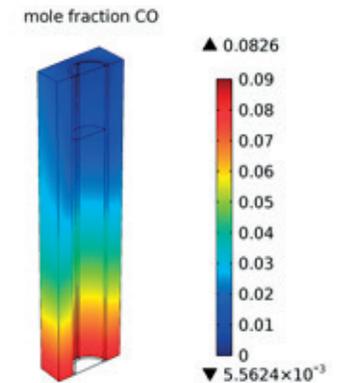


Validation of a kinetic analysis (methane steam reforming)

Modelling and simulation

Because of the complex and coupled chemical and physical phenomena within the main components of process plants, e.g. Reactors, heat exchanger or adsorber; it is hard to design them by analytical approaches. With the help of a commercial software we can calculate the distribution of temperature, pressure, velocity and concentrations even for complex geometries – fast and efficient.

- Application-oriented modelling of reactors, heat exchangers and thermal process plants
- Calculation of temperature, pressure, velocity and concentration distributions
- Sizing and basic design



CO concentration in a cooled shift reactor