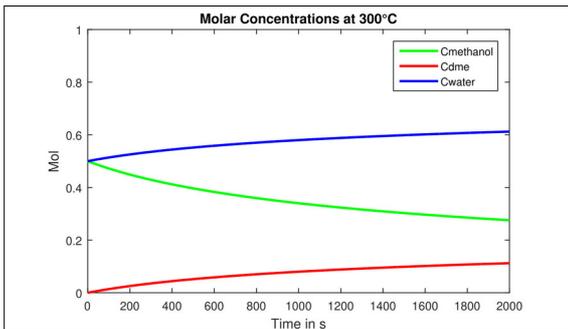




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Subject Area	Energy and Environment

## Study of Production and Application of Dimethyl Ether



Reaction kinetics of the reactant methanol and the products water and DME for a common mixture of 1:1 methanol/water.

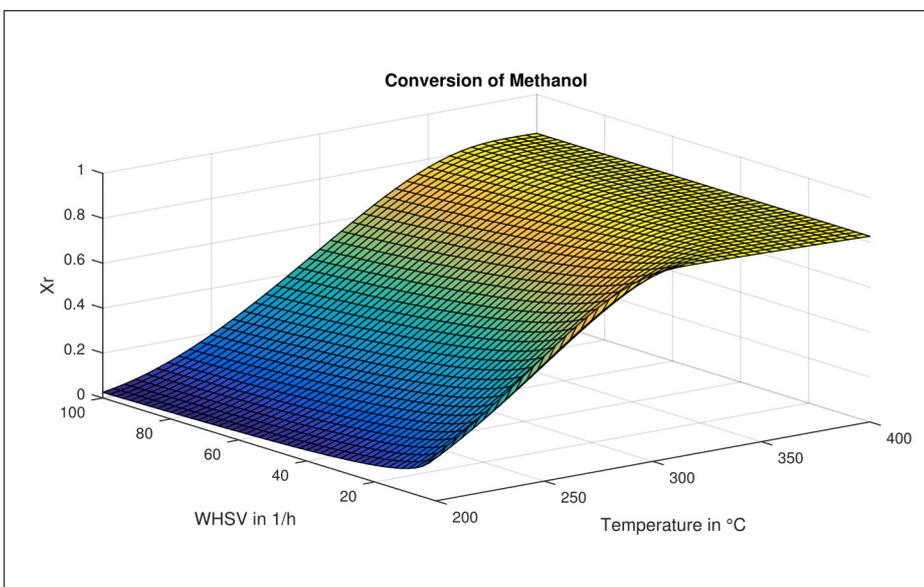


View on the built storage unit, with the compressor, the condenser (top right) and the mobile tank, which stores the DME

**Introduction:** While dimethyl ether (DME) might sound like an exotic chemical, it is, in fact, the simplest ether compound. DME is a clean, colorless gas at ambient temperatures, but it can be liquefied under moderate pressure. It is used as blend with LPG in china, as propellant worldwide or as a renewable alternative to diesel in cars, trucks or ships. Generated from syngas from fossil fuels like coal, petroleum or natural gas, there is a growing interest on renewable sources like biomass or renewable power. The inordinate use of fossil fuels which causes environmental problems or climate change and the rising demand of renewable energies has been driving academic researches into new chemical routes to sustainable and clean fuel production to solve the energy crisis due to limited resources.

**Objective:** DME plays more and more an important role in the Power-to-X technology sector, which is a significant element to link the sectors mobility, heat, power and the chemical industry. The path of production comes from renewable hydrogen and carbon dioxid to methanol, which is a fundamental chemical for a broad industry. The focus of this work is on the synthesis of DME through dehydration of methanol, the following liquefying and storage system. After research, conception and developing of system parts, the existing test-bench were extended with the liquefying and storage unit.

**Result:** The production of a highly flammable gas was stable and successful. Unfortunately, a gas analysis was too time expensive and so there is no guarantee for the presence of DME. The liquefying unit worked as intended, however a seal was not stable in contact to DME, in consequence no bigger amounts of DME could be stored. The built construction is a fundamental basis for further research at the IET for reactor-tests, gas-analysis, two-phase or liquefying processes and will be used as demonstration plant for a broad public of students, politics, investors and further stakeholders in the energy sector.



Simulated conversion of methanol as function of the Weighted Hourly Space Velocity and the temperature given in the reactor. The reaction is nearly independent from pressure.