

FRAUNHOFER CENTER FOR CHEMICAL-
BIOTECHNOLOGICAL PROCESSES CBP

CHEMICAL PROCESSES

HYDROTHERMAL UNIT



The Fraunhofer Center for Chemical-Biotechnological Processes CBP in Leuna, central Germany, closes the gap between the lab and industrial implementation. By making infrastructure and plants (pilot scale and miniplants) available, the center makes it possible for cooperation partners from research and industry to develop and scale up biotechnological and chemical processes for the utilization of renewable raw materials right up to industrial scale.

This field of work focuses on the process-technological development of chemical processes to produce biobased basic and fine chemicals for further processing in the chemical, pharmaceutical or food industries. In addition to new process concepts, the optimization of the resource and energy efficiency of existing processes also plays an important role here. Established processes can be adapted and optimized from the ecological and economic viewpoint. In doing this, we both consider biobased raw materials and also examine conventional processes for manufacturing petrochemical products.



PORTFOLIO

The hydrothermal unit consists of a flow reactor including up- and downstream processing to carry out homogeneously and heterogeneously catalyzed reactions under pressures up to 300 bar and temperatures up to 500°C. Thus, conversions can be carried out in the gas and liquid phase as well as under supercritical conditions. Flammable solvents as well as educt and product mixtures can be processed with the reaction system.

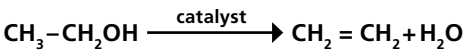
Technical Data

- Flow tube reactor 2.15 liters
- ATEX-compliant unit (zone 2b, T3/T4)
- Dwell times approx. 5–30 minutes
- Pressure max. 300 bar
- Temperature max. 500°C
- Dosing pump max. 20 kg/h
- Multistage connected phase separators with adjustable pressure and temperature ranges
- Gas phase analytics by means of online GC
- Continuous product filling in IBC containers or pressurized gas cylinders



PROCESS

Dehydration of ethanol to produce ethene

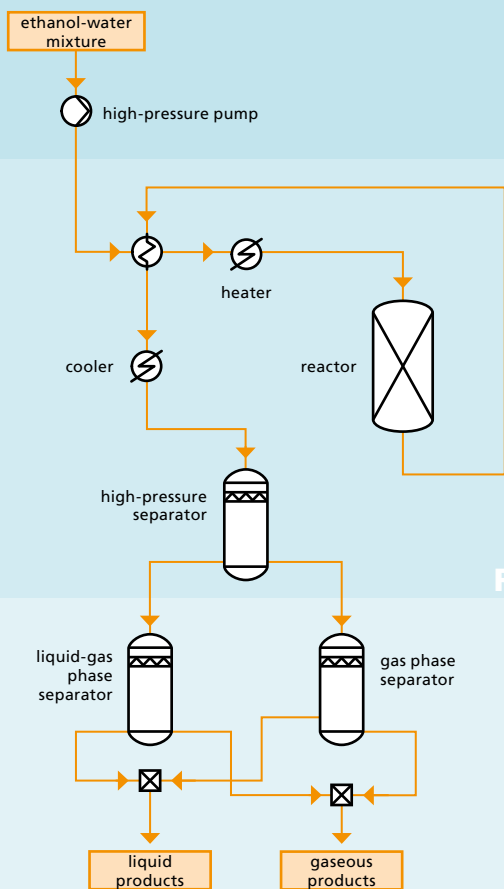


First the plant is rinsed with N_2 and then pressurized to a maximum of 300 bar. In the second step, ethanol is transferred from the 300-liter tank to the high pressure dosing pump and a mass flow between 5 and 20 kg/h is selected.

After that, the educt is preheated with the hot reaction product to recover heat, brought to a reaction temperature between 400°C and 420°C in the heater and fed into the reactor, which is filled with catalyst material. The approx. 2 meter long flow tube reactor is heated by a 5-zone split tube oven.

After dehydration the mixed-phase stream is cooled to ambient conditions and separated in the high-pressure separator. In order to achieve the highest possible purity of the ethene phase, several separators are connected in series in the downstream section of the unit. The ethene can be filled into gas cylinders. Monitoring is provided by means of online GC.

FLOW CHART OF THE HYDROTHERMAL UNIT



DOSAGE

REACTION

SEPARATION

CONTACT

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