

FRAUNHOFER CENTER FOR CHEMICAL-
BIOTECHNOLOGICAL PROCESSES CBP

PRODUCT PROCESSING

REACTION AND EXTRACTION PLANT



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 reaction unit consists of a 100-liter reactor made of steel enamel with a condenser and alternating recipient tanks. Liquid phase reactions at temperatures between -20°C and $+200^{\circ}\text{C}$ can be carried out in the plant. Using the condenser, solvents can be separated by distillation and reaction products are concentrated. Alternatively, operation under reflux is also possible. Reaction and distillation are carried out under normal pressure or vacuum at pressures from up to approx. 20 mbar (abs). Separation processes of liquid media are investigated in the extraction unit by means of liquid/liquid extraction at atmospheric pressure and temperatures up to 50°C . In order to achieve the optimum exchange of substances, the two phases in the extraction column are conducted in counterflow. By varying the operating parameters such as the stirrer speed or volume flow optimum conditions for the separation process can be adjusted.

Technical Data

- Reaction Unit
 - Distillation/reflux boiling possible
 - Material steel enamel/borosilicate glass/PTFE
 - Volume 100 liters
 - Pressure 50–1013 mbar
 - Temperature -50 – 200°C
 - Dosing pumps max. 80–120 L/h
 - ATEX compliant (zone 2, T3)



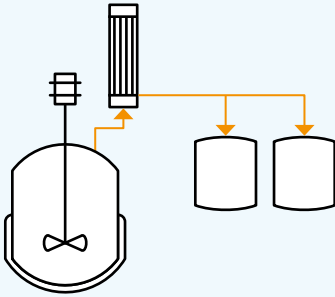
- Extraction Unit
 - Stirred countercurrent extraction column with two heatable 100-liter recipient tanks and two 100-liter product tanks
 - Material borosilicate glass and PTFE
 - Throughput up to 84 L/h
 - ATEX compliant (zone 2, T3)
- Accessory
 - Mobile filter unit for pressure and vacuum filtration

PROCESS

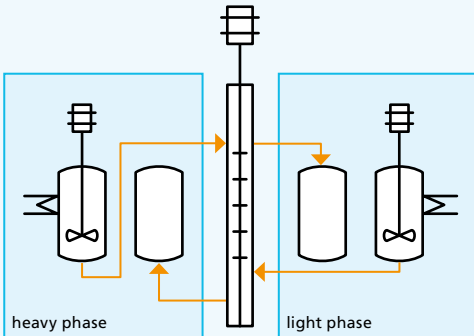
Extraction of phytosterols from tall oil soap

The reaction and extraction plant is used, for instance, to obtain phytosterols from tall oil soap. Tall oil soap is a by-product of the cellulose industry and contains at least 2 percent sterols, chiefly β -sitosterol which, after separation and purification, is used in the cosmetics industry or as food supplements. In a multistage process consisting of continuous liquid/liquid extraction, crystallization, filtration as well as solvent recovery and drying phytosterols with a purity of more than 98 percent are obtained.

Reaction section with distillation head and 2 recipient tanks



Extraction column with stirrable and heatable product tanks



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