

FRAUNHOFER CENTER FOR CHEMICAL-  
BIOTECHNOLOGICAL PROCESSES CBP

# PRODUCT PROCESSING

## HIGH-PRESSURE EXTRACTION PLANT FOR SOLVENT-FREE EXTRACTION





## PORTFOLIO

Valuable ingredients can be enriched or isolated from biomass by extraction with supercritical carbon dioxide  $\text{scCO}_2$  or propane using our high-pressure extraction plant. The special process is characterized by the fact that carbon dioxide has excellent solvating properties under supercritical conditions and after the extraction procedure is separated from the extract obtained by decompression without leaving any residue. The selectivity of the extraction and fractionation can be further enhanced by using ethanol as a co-solvent as well as several pressure reduction stages. For the extraction of nonpolar recyclable materials liquid propane as an alternative extraction agent can be used. The plant can be operated continuously or batch-wise.

### Technical Data

- Temperature max. 80°C
- Extraction agent
  - Propane (up to 100 bar) max. 10 kg/h
  - $\text{scCO}_2/\text{EtOH}$  (up to 500 bar) max. 10 kg/h
- Extraction material
  - Solids (in 2-liter batch extractor, particle size min. 100  $\mu\text{m}$ )
  - Suspensions in counterflow column, output 2 kg/h, particle size min. 1–10  $\mu\text{m}$ , solids content 0.5–20%



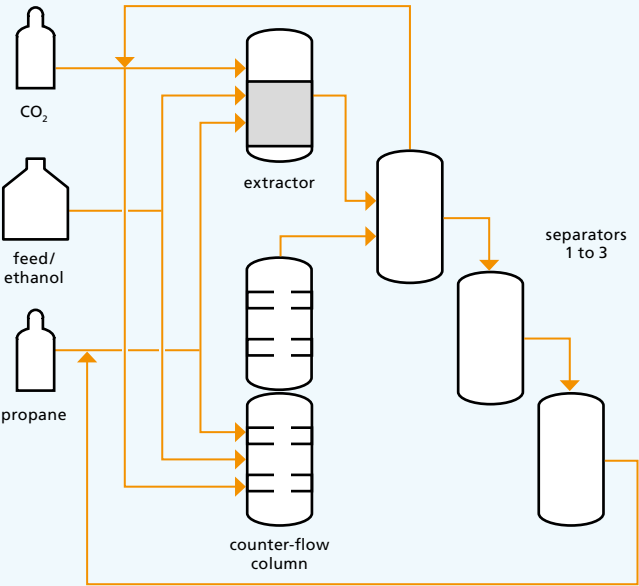
- Separation of valuable compounds
  - one to two stages with scCO<sub>2</sub>
  - three stages with propane
  - Recovery of extraction agent
- Material stainless steel, suitable for sea water
- ATEX compliant (zone 1, T3)

## PROCESS

### Extraction of $\beta$ -carotene from microalgae

Extraction processes of valuable compounds from algae biomass have been studied intensively. Microalgae can produce a large number of substances that are interesting for the food sector. Depending on the species used and the cultivation conditions, the microalgae produce large quantities of fatty acids (as triacylglycerides), proteins, polar membrane lipids (with omega-3 fatty acids) as well as various carotenoids and phytosterols. Recently, the extraction of  $\beta$ -carotene from the microalgae *Dunaliella salina* has already been demonstrated successfully.

# FLOW CHART OF THE HIGH-PRESSURE 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.

# CONTACT

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