

Industrial Solutions
Process Technologies

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Industrial Solutions

Extraction of natural substances



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Extraction of spices and herbs



Typical products for the extraction of valuable ingredients using supercritical CO₂

The supercritical extraction of spices and herbs plays a major role in obtaining high quality products from natural raw materials.

The main applications of these products are in:

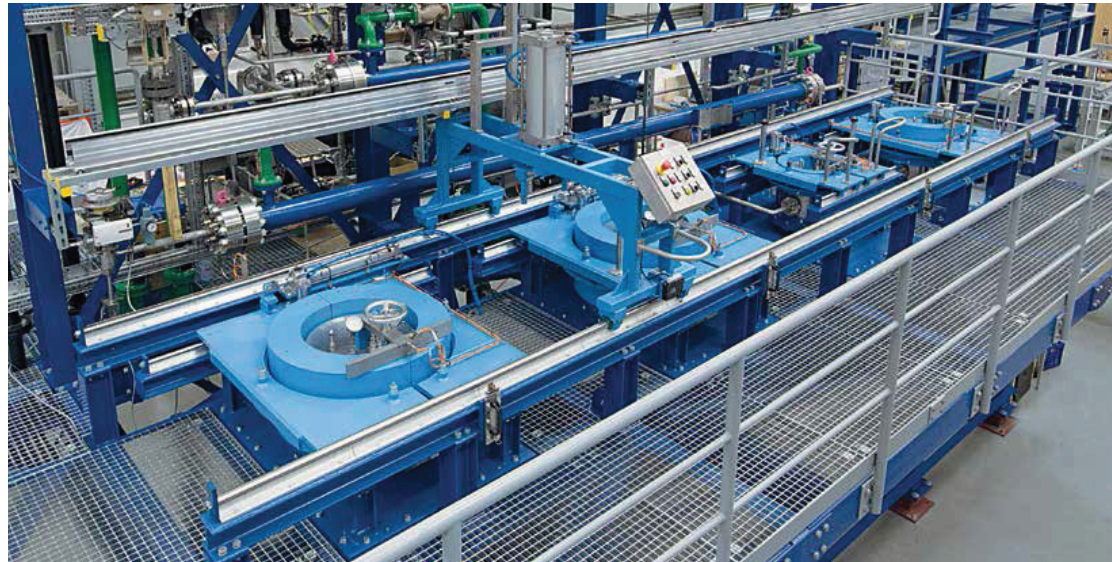
- Food industry
- Cosmetics industry
- Pharmaceutical industry

The extraction using supercritical CO₂ covers processes like:

- Decaffeination of coffee
- Extraction of hops
- Extraction of essential oils
- Extraction of flavour
- Extraction of colour pigments

Supercritical extraction using CO₂ as extraction agent

For the extraction of the above mentioned products, in most cases traditional extraction processes cannot be used. Hence, a high pressure process using supercritical CO₂ is applied for extracting the valuable products from the natural feedstock.



Advantages of supercritical CO₂

Using supercritical CO₂ for the extraction process has a lot of advantages in comparison to processes using organic extraction solvents, e.g.:

- Easy availability
- Low price
- Non-toxicity
- Non-explosivity
- Solvent free products
- Reduction of pesticides
- No thermal stress due to moderate temperature conditions (below 100°C)
- Easy separation of solvent and product



Plants for the extraction using supercritical CO₂

The extraction process

The extraction process of solid feedstock is very similar even for different kinds of products. The product is filled into a product basket which is then put into the extractor. The extractor is pressurized using CO₂ up to process conditions and the extraction begins. CO₂ is fed from the CO₂ tank via high pressure pump into the extractor where it dissolves the extract from the feed material and is then led to the expansion valve. Here, the CO₂ is depressurized down to gaseous conditions and the CO₂ and extract are routed to the separation system, where the extract is separated from the gaseous CO₂. Afterwards, the CO₂ can be recondensed up to CO₂ tank conditions and recycled to be used for the extraction again.

Pre-treatment of raw material and products

The feedstock to be treated for the supercritical extraction process is filled in corresponding suitable product baskets. Usually, the feedstock is a ground powder with a mean particle size of approx. 0.1mm. Furthermore, the feedstock is dried in advance to the extraction to prevent clogging which can be caused by high water content of the material.

Uhde's scope of supply and services

Uhde High Pressure Technologies is able to assist its customers in all steps of establishing a supercritical extraction facility.

This covers:

- Process engineering for initial process evaluation
- Process engineering for process intensification
- Extraction experiments for validation of process data
- Equipment engineering
- Specification of utilities
- Specification of equipment
- Process engineering for lab-scale up to production-scale
- Supply of complete turnkey plants pre-mounted on skids or delivered in parts to be assembled at site
- Assistance with installation and commissioning
- Training of plant operators
- After sales services
- Spare parts

Picture top left: Product handling inside the extraction autoclave using a product basket

Picture bottom left: 500 bar extraction plant consisting of 3 extractors, 2 separators and a CO₂ recycling system

Chart: Simplified flowsheet for the extraction process using supercritical CO₂

