



Supercritical Fluid Extraction Technology (SCFE)

World-class technology for natural products

There is a tremendous demand for high purity & residual solvent free extracts of natural products. Also there is an increasing safety concern & requirement of eco-friendly manufacturing processes for the extraction of natural products.

Supercritical fluid extraction technology provides an economical solution to these challenging tasks. Its superiority over the conventional technologies of extraction, especially for natural products in the food and pharmaceutical industry is well recognized.

Supercritical CO₂ textile dyeing is an emerging innovative waterless technology for dyeing of textile fabrics that will revive the textile industries.

Commercial applications

- Extraction of natural products such as spice oil & oleoresins, flavors, fragrances, colors.
- Decaffeination of Tea & Coffee.
- Production of uniform & ultra fine particles.
- SCO₂ Textile dyeing of fabrics.
- SCO₂ cleaning of high precision metal components.
- Drying of aerogels.

Advantages of SCFE

- Extract with delicacy & freshness close to natural.
- High potency of active components.
- Longer shelf life extracts.
- No residual solvent, no effluents, eco-friendly & green technology.
- High flexibility of process conditions.
- Simultaneous fractionation of extracts.
- High yields compared to solvent extracted products.
- Low extraction batch times.
- Recycling of CO₂.

Advantage of CO₂ as a solvent

- Carbon dioxide generally regarded as safe (GRAS) for food products.
- Inexpensive & easily available.
- Non-toxic, non-flammable and Inert to most materials.

Amar advantage

- Established in 1974 with 5 years of experience in SCFE technology.
- 0.5 lit. lab scale to 1000 lit. commercial plants offered.
- Pressures upto 700 bar for lab scale & 350 bar for commercial.
- Semi or fully automated PLC based plants with CO₂ recycling.
- CE-PED, U stamp, CSA, UL certification optional.
- Can customize designs as per client requirement.

Process description for lab-scale plant

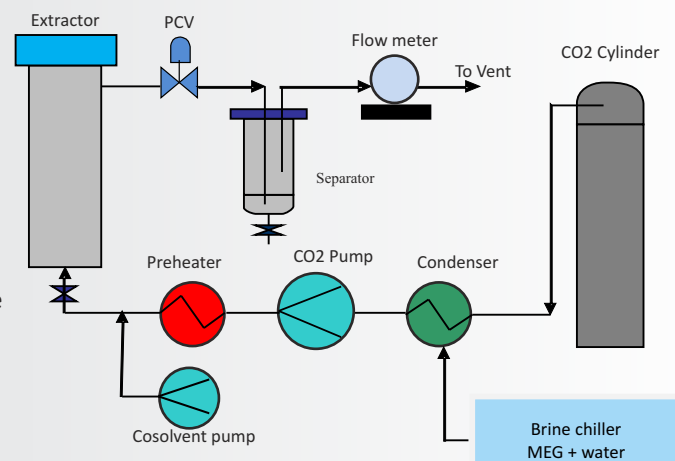
The Carbon dioxide gas from the cylinder is first liquefied & then pressurized above the critical pressure of CO₂ (73.8 bar) to the required pressure necessary for extraction. This high pressure liquid CO₂ is then heated above the critical temperature of CO₂ (31 °C) to the required temperature. The CO₂ which is now in supercritical phase (SCCO₂) enters the extractor where the raw material is fed in powder form & the extraction is achieved on the basis of solubility. The compounds dissolved in SCCO₂ finally come to the separator at atmospheric pressure & gets precipitated. The CO₂ leaving the separator is measured by passing it through a CO₂ gas flow meter.



1 Ltr. extraction vessels in series & parallel for 690 bar (10,000 psi) pressure with CO₂ pump for extraction of natural products



Supercritical drying of Aerogels



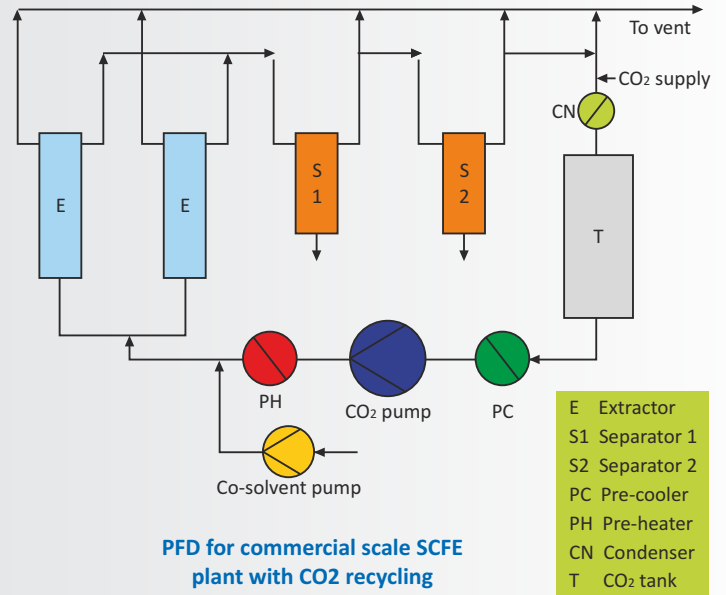
SCFE flow diagram for lab scale model



Green Chemistry Specialist

Process description for commercial scale plant

The raw material in powder form is fed to the extractor. The liquid carbon dioxide from the CO₂ tank is pre-cooled by passing it through the pre-cooler. This pre-cooled liquid carbon dioxide is then pressurized by means of a positive displacement plunger pump to a pressure above the critical pressure of CO₂ (i.e. 73.8 bar). High pressure liquid CO₂ is then heated above the critical temperature of CO₂ (i.e 31 °C) by passing it through the preheater. CO₂ which is now in the supercritical state enters the extractor in which the raw material is loaded. The SCCO₂ dissolves substances on the basis of solubility, depending on the operating conditions. The SCCO₂ with soluble extracts enters the separators where the pressure & temperature are reduced sequentially so that solubility decreases & extract precipitates in the separators. Finally the clean CO₂ without any traces is recycled back to the CO₂ tank via condenser.



Specifications

Lab scale SCFE plant (0.5 & 1 lit.):

- Design Pressure: Upto 700 bar.
- Design Temperature: 150 °C

Commercial Scale SCFE plant (10 - 1000 lit.):

- Design Pressure: Upto 350 bar.
- Design Temperature: 80 °C

M.O.C: SS316



SCFE plant for the dyeing of textile fabrics

SCFE standard models

SCFE plants with Utilities	Working volume (lit.)	Feed cap. (kg/day)
Lab-scale	0.1	0.24
Lab-scale	0.25	0.6
Lab-scale	0.5	1.0
Lab-scale	1.0	2.0
Pilot-scale with PLC system	5.0	12
Pilot-scale with PLC system	10	24
Pilot-scale with PLC system	20	48
Commercial-scale with PLC system	100	240
Commercial-scale with PLC system	200	480
Commercial-scale with PLC system	400	960
Commercial-scale with PLC system	1000	2400



SCFE plant for extraction of herbs & production of fine particles.

Our motto, customer's delight & not mere satisfaction



AMAR EQUIPMENTS PVT. LTD.

Serving Industry since 1974.

6, Parmar Industrial Estate, Bail Bazaar, Kale Marg, Kurla (W), Mumbai - 400 070. India.

Tel: +91-22- 6225 5000 • Website: www.amarequip.com

E-mail: sales@amarequip.com / export@amarequip.com



- High Pressure Autoclaves • Multiple Reactor Systems • Gas Induction Reactors
- Ex-Proof & Automated Pilot Plants • Glass Autoclaves • Super Critical Fluid Extraction
- HPHT Corrosion Testing • Magnetic Drive Couplings & Agitators

- Metal Micro Reactors • Glass Flow Reactors • Photochemical Reactors
- Packed Bed Tubular Reactors • Continuous Stirred Tank Reactors