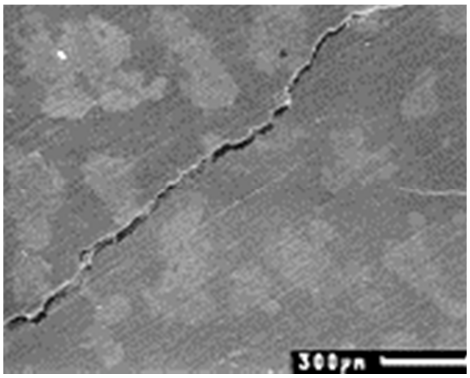
PIM parts and Ceramics debinding process & Supercritical CO_2 equipment

Carbon dioxide debinding process of injection molded “green” parts presents major advantages over the classical thermal cracking. SEPAREX proposes its competence and equipment for process demonstration and equipment design from lab to pilot and commercial scale.

Process advantages

Powder Injection Moulding and complex ceramic parts (like modern cutting tools) require high quality debinding. Traditional processes like pyrolysis or solvent debinding are long, environmentally unfriendly, inefficient on parts with complex geometry and often lead to dimension changes and cracks initialization.

Exemple of PIM turbine
(from PIM international, vol5, 2011)



Typical crackings observed
in wax-based–binder molding

Instead, supercritical CO_2 debinding permits a much faster, reliable and reproducible binder extraction without dimension modification and defaults creation, when correctly operated with adequate fluid temperature, pressure and flow rate during pressurization, binder extraction and depressurization steps.
Moreover, supercritical fluid CO_2 is to be preferred to a liquid solvent like heptane as binder solvent, with a rate about 5 times higher and apparition of no defects instead of major defects observed with heptane.

Technology benefits

- Higher-quality debinding without deformation and default, even on complex parts
- Shorter processing time (between 5 to 30 times shorter)
- More flexible production
- Lower energy consumption
- Ecological process without any organic solvent disposal

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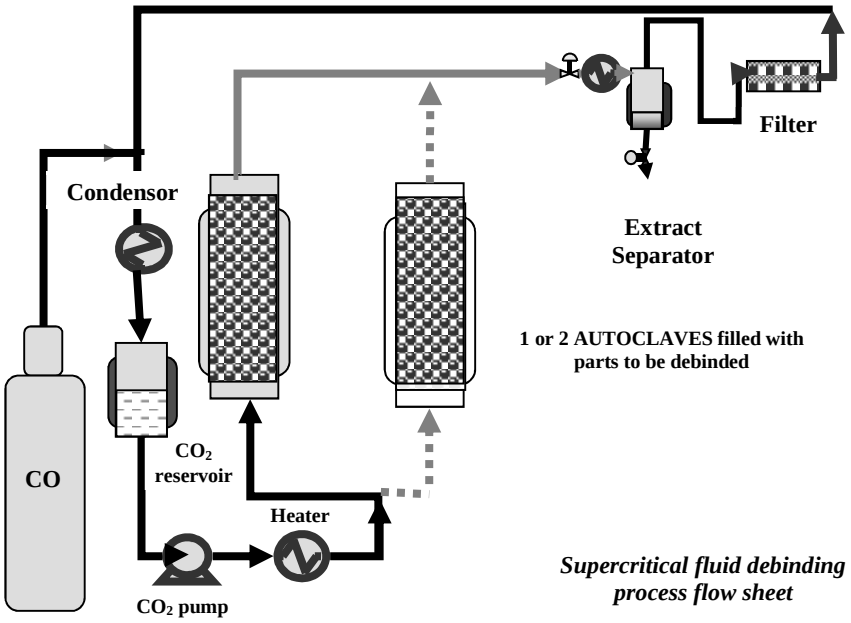
SEPAREX
Supercritical Fluid Technology



Supercritical fluid debinding process flow sheet

Equipment

Designed according regulatory standards (EU or US), SEPAREX machines incorporate a robust computer control system permitting long runs without permanent manpower survey.

Standard Configuration	SFDeb
Max operating pressure (Bar)	380 bar
Max operating temperature	80°C

- Processing plant with one or several debinding reactors to ensure a high-capacity production.
- Optimized support for the parts to be debinded to obtain high debinding homogeneity and reducing the processing time twice compared to standard supercritical debinding
- High reliability and optimal maintenance to permit a high throughput.
- Full process automation and data logging with minimal manpower survey overnight.

SEPAREX Services

- Process development, optimisation and demonstration on client's products
- Lab and production equipment design and construction
- Maintenance support

References *:*

- *Ecole Nationale Supérieure Céramiques industrielles Limoges - France (R&D Lab-scale)*
- *Carbide tools manufacturers (pilot and commercial scale systems)*

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