DENSE PHASE FLUIDS
Supercritical fluids are substances above their critical temperature. In this phase, the characteristics and properties of the fluid are intermediate between those of a liquid and those of a gas. The generic expression “dense phase” groups the various phases of a substance ranging from liquid to subcritical to supercritical.

In these phases, CO₂ for example is ideally suited to replace organic solvents in several industrial processes, offering an alternative which is absolutely environmentally friendly and not much more expensive when all factors are considered.

There are many possible fields of industrial application for dense-phase fluids, ranging from the food to the pharmaceutical field, from the chemical to the agroindustrial, and many more. In each field, the opportunities to use these fluids are virtually unlimited. The gradual involvement of researchers, universities and industrial organizations is leading to the discovery of many other possible applications.

The widespread interest in these substances is based on at least two facts: first of all, they allow to reduce the use of organic solvents, which are notoriously toxic for human beings and have a high environmental impact; secondly, the quality of the extracts is far higher because there are no solvent residues and low temperatures are used, avoiding degradation of the product.

With respect to other processes, it is not necessary, for example, to use water, which is becoming an increasingly precious resource with consequently mounting costs due to its gradual shortage. CO₂, instead, is almost inexhaustible and its cost is very low.

The only limitation of these processes is the operating pressure, which is usually between 60 and 400 bar.

Accordingly, it is necessary to produce plants which can operate at very high pressures yet are safe enough for operators and conveniently priced for competing with conventional processes, which are performed at atmospheric pressure.

Here are some examples of the main industrial applications of dense-phase fluids:

- FOOD: separation of flavors, fats and contaminants;
- PHARMACEUTICAL: extraction of active components, preparation of natural products, vitamins;
- COSMETIC: extraction of fragrances and oils;
- CHEMICAL: purification of extracts, impregnation, micronization;
- AGRICULTURE: extraction of pesticides and soil contaminants;
- LAUNDRY: dry cleaning of garments;
- MECHANICAL: degreasing of parts, precision cleaning of high-value components.