SULZER

Intelligent separation and concentration solutions
for quality food and nutraceuticals processing

Efficiency for higher yield

Separation processes are used in the food and beverage industry to fractionate and purify products, in order to achieve the desired properties required for your food product. This is especially valid for food ingredients which play a predominant role in the final product's quality.

Be it concentration of juices and extracts, or food ingredients production, and irrespective of the application, minimized heat impact, low residence times and hygienic equipment design play an important role to maintain the color, taste and nutritional value of the final product. A further request from the industry is a design with low energy demand to reduce both production costs and environmental impact.

To fully meet these requirements we offer you following from our unique range of technologies:

- **Freeze concentration**, for superior liquid food with best aroma conservation
- **Single and multistage falling film, thin film and short path vacuum evaporation**, for economic concentration and gentle treatment of heat-sensitive liquid products with a wide range of viscosities
- **Efficient rectification** with state-of-the art column internals
- **Liquid-liquid extraction** for special purification tasks
- **Membrane separation** with lowest energy consumption

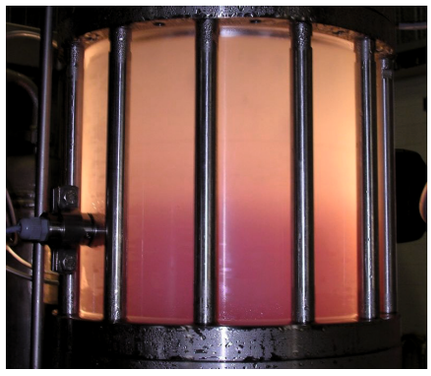
Our intelligent separation solutions follow the rules of lowest temperatures and shortest residence times for the products. In many cases a combination of our different separation technologies is the most suitable solution for the production of food products and food ingredients at optimum quality. Hygienic design and fabrication of the equipment according GMP rules and easy cleaning possibilities are a must for food production standards and are strictly followed in the realization of our plants.

We have your specific needs in our focus. All plants are designed and manufactured in our own workshops and tailored to your specific requirements. The viability and performance of our proposed process concept is validated in our test centers in Switzerland.

Packed internals of a liquid-liquid extraction colum

Industrial freeze concentration unit

Falling film evaporator tubes



Wash column in a freeze concentration unit

Applications of our technologies

Concentration processes

Applying evaporation, freeze concentration and/or membranes
Production of:

- Coffee, tea, malt, hop, yeast extracts
- Fruit and vegetable juice concentrates
- Sugar derivates and sirups
- Starch derivates
- Sweeteners
- Essential amino acids
- Gelatin
- Phospholipids
- Organic acids
- Vitamins
- Phytostanol esters
- Lactic acid

Purification processes

Applying steam stripping, rectification, liquid-liquid extraction, crystallization and/or membranes

- Deodorization of edible oil
- Production of aroma compounds
- Production of food grade phosphoric and acetic acid
- Refining of cacao products
- Winterization of edible oil
- Winterization of essential oils
- Removal of agrichemical residues

Fractionation processes

Applying rectification, evaporation, pervaporation/ membranes, liquid-liquid extraction and/or crystallization

- Solvent recovery after precipitation processes in sugar, pectin and lecithin production
- Solvent recovery after extraction processes
- Solvent separation from edible oil
- Flavor production from aqueous mixtures
- Beer/wine de-alcoholization
- Solvent recovery in esterification processes
- Aroma recovery from evaporation condensates
- Aroma compounds removal, concentration and fractionation
- Aroma synthesis
- Omega 3 fatty acids production from fish oil
- Fractionation of butter fat
- Citrus oil separation

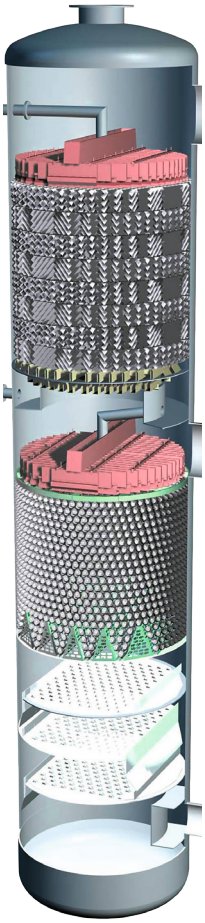
Our separation technologies for food and beverage, nutraceuticals

Crystallization

- Freeze concentration for best aroma, flavor and color conservation
- Melt crystallization for fat fractionation
- Suspension crystallization for controlled precipitation from concentrates

Evaporation

- Falling film evaporators for heat-sensitive liquid products
- Wiped film evaporators for heat-sensitive viscous or complex products
- Short path evaporators for very high boiling and highly heat-sensitive products



Rectification column

Liquid-Liquid Extraction

- Agitated columns for flexible operation
- Packed columns for high throughput

Membrane Separation

- Pervaporation for organic dehydration and organic separation
- Membrane filtration to concentrate solutes
- Nanofiltration to remove solvents from essential oils

Rectification/Distillation

- Batch distillation for flexible fractionation of essential oils and aroma compounds
- Continuous distillation/rectification for aroma and solvent recovery
- Steam distillation for classic distillation of herbs

Our services for you

We offer you our full range of services, from concept development and testing, equipment and skid mounted plant fabrication, up to installation of your industrial plant.

In our state-of-the-art test centers we jointly develop innovative solutions validated for all your products for the complete range of our technologies mentioned. Additionally, selected pilot plants are available for installation and testing in your own labs.

Our many years of experience in design, fabrication and supply of industrial plants for demanding separations are an excellent basis to service you, with solutions with a guaranteed performance.

Freeze concentration pilot unit

We do what we say

Operational excellence

We continuously strive to be faster and better.

Customer partnership

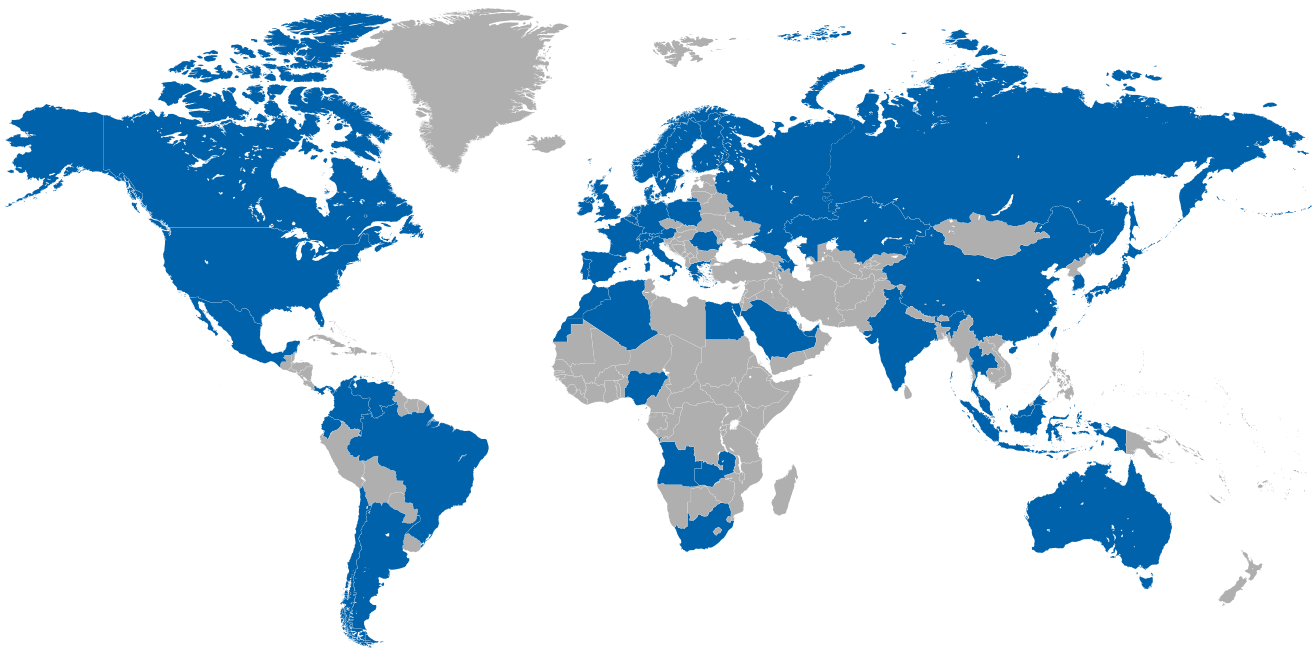
Together, we win.

Committed people

We build on the strengths and diversity of our people.

A global specialist at your doorstep

Sulzer serves clients worldwide through a network of over 150 production and service sites and has a strong footprint in emerging markets.



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