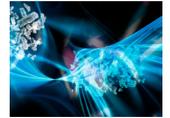
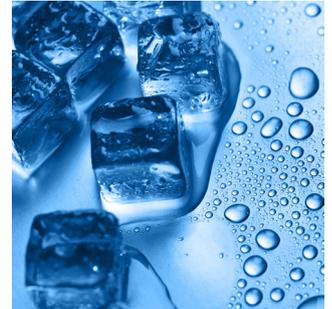




## Freeze Concentration of Alcoholic Products



### Fermented Alcoholic Products



### Application

In the alcoholic beverage industry the variety of beverages is enormous. It is increasingly more difficult to expand in this competitive market. Therefore the drive to examine new technologies for the development of new products and/or reduce the present production costs.

In fermented beverage processes water is often the focus of this problem. Higher alcohol concentrations are not possible due the mortality of the enzymes used in alcohol production. For this reason a variety of water removal techniques have been developed. The aim of concentration is to increase the alcohol content and produce an added-value product.

The main criteria in the evaluation of a new process are product quality and cost. Factors that have a positive affect on the gross added value are:

- Concentration factor.
- Microbiological and chemical stability.
- Organoleptic properties, taste, smell, etc.

The main factors influencing the economics of a concentration process are capital cost, operational cost, maintenance cost, product losses and possible charges for disposed water.

The GEA Messo PT freeze concentration technology does give maximum quality retention with a relatively high concentration factor against reasonable cost.

Freeze concentration is a proven technology for red/white wine, cider and beer. The economical achievable product concentration for alcoholic products is up to 25 %ABV (Alcohol by Volume).

### Features

High product quality as a result of:

**Low processing temperature** - the concentration takes place at the freezing point of the product (e.g.  $-5^{\circ}\text{C}$ ). All microbiological and chemical reactions have virtually stopped. There is no thermal damage to sensitive flavour components.

**Efficient separation of the water** - the separated ice crystals are 100% pure water without any included product. The separation of ice crystals in the unique wash column separator is 100% efficient so that all the flavour components remain in the concentrated product.

**No contact with air** - the process operates as a slightly overpressurized liquid filled system. Consequently, all contact with air/oxygen is eliminated and the potential for oxidation is minimized. No vapour space also means no chance for loss of volatile aroma components.

**No need for intermediate cleaning** - the process operates 24 hours per day and can go for weeks without intermediate cleaning. Throughput is flexible between 0 and 100% of design capacity.



The wash column (ice separator) of a commercial Freeze Concentration plant for orange juice illustrating the sharp separation between washed ice (top) and ice with concentrate (bottom).

## Continuous operation

Thanks to the continuous operation, there is no need for intermediate cleaning. The process operates 24 hours per day for weeks without intermediate cleaning. Throughput is flexible between 0 and 100% of design capacity.

## Freeze Concentration answers the demand for:

- High quality, healthier chilled juices.
- Enhanced market position in increasingly competitive markets.
- New product development.

## Process Description

Water removal is the key to concentration of all liquid food products. Various methods are available to remove this water. They can be divided into three main categories:

1. Evaporation converts water (and other components) into a vapour.
2. Membrane technology provides a barrier that allows water (and all smaller molecules) to pass.
3. Crystallization converts the water into solid ice crystals. Solid-liquid separators are required to remove the ice.

Evaporation is the most common and the most applied technique for concentration. The limited selectivity and high temperatures generally result in relatively poor retention of the original product quality.

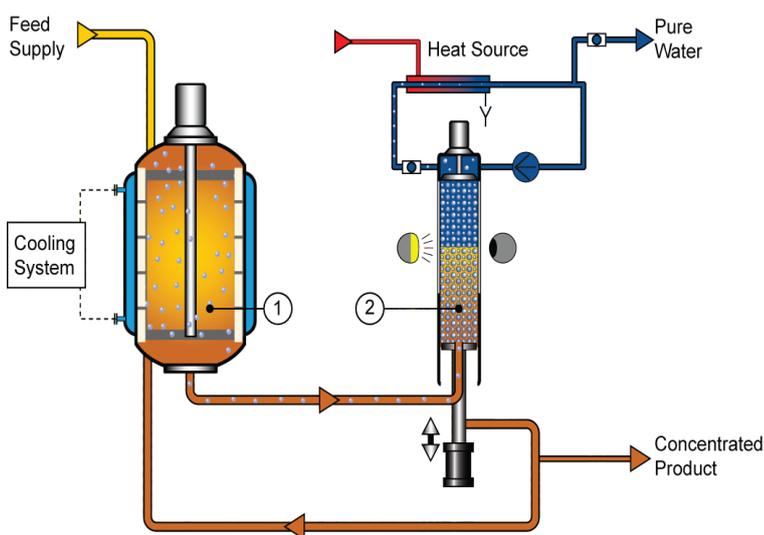
Membranes can provide low operational costs but provide a relatively poor concentration factor and limited selectivity.

Crystallization provides the highest selectivity toward water removal and due to the low operating temperatures the activity of sensitive nutritional and flavour components is maintained.

## Freeze Concentration as a Crystallization Process

Crystallization of water from liquid products has commonly been referred to as Freeze Concentration. The process has been applied for centuries. In its earliest form it was as simple as leaving a barrel filled with product outside in the winter and draining the remaining liquid as concentrated product. The ice is formed as pure water crystals and everything else remains in the liquid. GEA Messo PT has enhanced the freeze concentration process with its unique solid-liquid separation into a more sophisticated process that fits quite well into the modern food processing plant.

Commercial systems are designed from standard component sizes depending on your throughput requirements. Multistage systems are developed along with larger components to allow for any capacity up to > 30,000 kg/h.



Freeze concentration is the removal of pure water in the form of ice crystals at sub-zero temperatures. IceCon™ is the latest innovation of freeze concentration design. The diagram shows the complete process in its simplest form. This single stage process consists of one crystallizer (1) and one wash column (2). The crystallizer is a vessel with a cooling jacket. The inner wall of the vessel is scraped. The outer wall is cooled by a circulating refrigerant. Ice production and crystal growth take place inside the crystallizer. By creating residence time ice crystals grow, creating an optimal crystal size distribution for efficient separation. In the wash column, the concentrated liquid is separated efficiently from the ice crystals. A compressed ice crystal bed is washed with melted ice to remove all traces of concentrated liquid. Freeze concentration ensures that all original product characteristics remain in the concentrate.

## Next Steps

On-site demonstration of this technology is possible in various configurations using GEA Messo PT's pilot plants. For more information regarding this technology and your specific configuration requirements please contact us at: [info.niropt.nl@gea.com](mailto:info.niropt.nl@gea.com) or phone +31 73 6390 390.

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