Membrane filtration: An effective way to food quality

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In the food and beverage industries, the precise separation of particles is increasingly important in the production of beer, apple juice and numerous dairy products. Membrane filtration is a good example of a simple and efficient technology used to enhance food quality with excellent future prospects.

What is membrane filtration?

Membrane filtration is a technique that uses a physical barrier, a porous membrane or filter, to separate particles in a fluid. Particles are separated on the basis of their size and shape with the use of pressure and specially designed membranes with different pore sizes. Although there are different membrane filtration methods (reverse osmosis, nanofiltration, ultrafiltration and microfiltration, in order of increasing pore size), all aim to separate or concentrate substances in a liquid.

Main food applications

In the food and beverage industries, membrane filtration is state-of-the-art technology for clarification, concentration, fractionation (separation of components), desalting and purification of a variety of beverages. It is also applied to improving the food safety of products while avoiding heat treatment. Some examples of final products using this technique are fruit and vegetable juices, like apple or carrot; cheeses, like ricotta, ice cream, butter or some fermented milks; skimmed or low-lactose dairy products; microfiltered milk; non-alcoholic beers, wines and ciders, etc.

Cheese

Ultrafiltration of milk represents the first real innovation in the history of cheese making, offering substantial advantages to both manufacturers and consumers. During the cheese making process some of the nutrients found in milk are lost in the whey (e.g. carbohydrates, soluble vitamins and minerals). These losses have a considerable impact on the economics of the processing operation. Ultrafiltration is an effective means of recovering the by-products, which can be used for further food formulations. At the same time the result is cheese products of higher nutritional value at a better price. Another application in cheese is the use of microfiltration to remove undesirable micro-organisms from the milk used in the production of raw milk cheeses.

Microfiltered milk

Classical techniques used to improve milk’s shelf-life and safety are based on heat treatments, like pasteurisation and sterilisation. Those techniques modify some sensory properties of milk, for example its taste. Microfiltration constitutes an alternative to heat treatment to reduce the presence of bacteria and improve the microbiological safety of dairy products whilst preserving the taste. Fresh microfiltered milk
has a longer shelf-life than traditionally pasteurised fresh milk. There is also a new development in membrane technology manufacture, which leads to a similar hygienic safety as “thermisation” of skimmed milk at 50°C. This will allow the commercialisation of new milk, which can be stored at room temperature for six months and with a taste similar to fresh pasteurised milk.

Many benefits

The use of membrane filtration offers a wide range of advantages for the consumer as well as for the producer.

On the one hand, filtration technology offers an efficient way to gain superior quality and safety without destroying the fundamental sensory qualities of the product. It removes unwanted ingredients like microorganisms, dregs or sediments that have a negative impact on product quality, making the final product more attractive in texture and increasing its shelf life. On the other hand, it may reduce some production steps and increase yield, has a high degree of selectivity, improves control over the production process and has low energy costs.

The development of filtration techniques and their distribution is not yet complete. There is continuing development of new applications based on the technique. New methods, in particular development of better and longer lasting membranes, offer new perspectives.

References