



Don't give clogs a chance

Location:

Laives, Italy

Challenge:

Easy-to-use sterile filtration solution for clear NFC apple juice (not-from-concentrate apple juice) that prevents colloidal clogging to achieve a longer service life

Solution:

Two-stage cartridge filtration system using BECO PROTECT CS™ depth filter cartridges as a pre-filter and BECO MEMBRAN PS Pure™ as a final sterile filter

Result:

Service life increased to 1.3 million gallons (5 million liters) of clear NFC apple juice with no membrane filter cartridge clogging

"These new filter cartridges have enabled us to once again improve the quality of our sterile filtration. Above all, we have achieved our goal of significantly improving the service life of the filters - we have now achieved a total system life of approximately 1.3 million gallons (5 million liters). There are no more clogs in the membrane filter cartridges."

*Thomas Meran,
Operations Manager at
VOG Products*

Background

An increasing number of consumers prefer high quality products when buying juice. NFC juice (not-from-concentrate juice) is becoming particularly popular and its market share is continuously expanding. VOG Products has benefitted from this rise in demand. The company operates state-of-the-art tank storage with a capacity of over 2.6 million gallons (10 million liters) dedicated to the storage of NFC juice.

VOG Products is one of the largest fruit processors in Europe. The company is based in Laives in the South Tyrolean plain and processes around 360,000 tons of fruit per year, including 300,000 tons of apples of which a part is used to produce approximately 21 million gallons (80 million liters) of apple juice. Quality is the top priority: Only handpicked, high-quality fruit is used. After pressing, the juice is pasteurized and then held in the cold store under controlled conditions. Alternatively, if the customer requires the juice can be produced and shipped „just in time“, thus preserving maximum freshness and the

natural flavor of the juice.

The juice is sterile filtered a second time before shipping, to preserve the flavor of the clear NFC apple juice. This removes TAB (Thermo Acidophilic Bacteria), in particular the *alicyclobacillus acidoterrestris* species (ACB), from the fruit juice. If left in the juice, it would have a significant negative effect on the flavor.

Challenge

"Finding a reliable, safe and easy-to-use filtration solution was important to us," comments Thomas Meran, Operations Manager at VOG Products. VOG therefore decided to use Eaton filter cartridges. A significant advantage of the filter cartridges is that they work within an enclosed system - so none of the product can escape and impurities cannot enter the system. This is an important aspect in terms of product quality, safety and process cleanliness during juice production. The filter cartridges can also be changed quickly and easily and can be regenerated and sterilized multiple times. "Our collaboration with Eaton began over 15 years ago, with



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solutions for aroma filtration," says Meran. "Eaton is now a major supplier of filtration solutions."

A two-stage system was used at VOG: The clear NFC apple juice was initially passed through two housings, each containing 30 pre-filter cartridges, at a temperature of 32 to 34 °F (0 to 1 °C) and 12 °Brix. The juice was then passed through two further housings, each equipped with 30 membrane filter cartridges with an absolute retention rate of 0.2 µm, which safely removed unwanted microorganisms and spores. However, the colloids in the apple juice repeatedly caused clogging of the membrane filter cartridges. The colloids became attached to the fine pored structure of the membrane surface which resulted in a rapid increase in pressure and a lower flow of filtrate. The membranes needed to be rinsed at increasingly shorter intervals, which significantly reduced the filtration performance and the service life of the filter cartridges. „We were therefore looking for a solution that could further improve the cost-effectiveness of the sterile filtration of our clear NFC juices," says Operations Manager Meran.

Solution

Eaton upgraded the filter cartridges to improve the existing system, especially in terms of service life.

For the removal of microorganisms, VOG Products now equips each of the two cartridge housings with 30 BECO MEMBRAN PS Pure filter cartridges with a length of 30 inches. The asymmetric pore structure of the polyether sulfone membrane offers a high level of microbiological retention with an absolute retention rate of 0.2 µm. These new filter cartridges are designed to have a very long service life. The polyethersulfone membranes are protected by polypropylene support fleece, while the

core and cage are made of polypropylene and offer high mechanical stability. Due to its special design, the membrane filter cartridge withstands a differential pressure of up to 73 psi (5 bar) in the direction of flow and 29 psi (2 bar) in the counterflow direction at room temperature - which is another factor that contributes to a long service life. At the same time, more than 100 steam sterilization cycles can be performed at 221 °F (105 °C) for 30 minutes. The maximum temperature for steam sterilization is actually 250 °F (121 °C), which will also safely destroy thermophilic spores.

Membrane filter cartridges also offer advantages in terms of quality: the integrity of the cartridges can also be checked. A corresponding integrity measurement is performed using a pressure holding test. In this test, the pressure drop of the entire filtration system per unit time in millibars is measured for a given testing pressure. If the maximum permissible pressure drop is exceeded, the filter cartridges may be damaged. This makes it easy to confirm the correct operation of the filter cartridges and to ensure the high quality of the juice. This is an important aspect of seamless quality management, as it provides documented evidence that the apple juice has left the company in perfect condition. These integrity tests can only be performed using water-wetted hydrophilic membrane filter cartridges.

In order to prevent the filter cartridge membranes from becoming clogged, they are protected by the up-stream depth filter cartridges that remove particles and colloids. Two housings are used, each equipped with 30 BECO PROTECT CS115 CellStream depth filter cartridges, which use BECOPAD® depth filter sheets as filtering media. This is made of high-purity cellulose and gently filters the juice whilst preserving its color or flavor. The special wrapping

of the filter material also maximizes the filter area. At a nominal retention rate of less than 0.2 µm, these depth filter cartridges ensure high retention rates of ultra-fine particles and colloids and effectively protect the membrane filter cartridges from clogging. The pre-filter stage is also designed to ensure a long service life: The robust construction of the depth filter cartridges provides high mechanical and thermal stability. The maximum pressure difference during filtration may be up to 22 psi at 68 °F (1.5 bar at 20 °C), the maximum pressure during cleaning 29 psi at 176 °F (2 bar at 80 °C) and the maximum temperature during steam sterilization 250 °F (121 °C).

Result

"These new filter cartridges have enabled us to once again improve the quality of our sterile filtration," says Thomas Meran, who is impressed by the solution. "Above all, we have achieved our goal of significantly improving the service life of the filters - we have now achieved a total system life of approximately 1.3 million gallons (5 million liters). There are no more clogs in the membrane filter cartridges. We only replace the filter cartridges after the maximum permitted 100 steam cycles and only for safety reasons." All in all, VOG Products has been able to significantly improve the efficiency of its sterile filtration by using the new Eaton filter cartridges. They have provided the ideal conditions for VOG to maintain its status as one of the leading fruit processors and ensure that clear NFC fruit juice from the South Tyrol will continue to grow in popularity in the future.



BECO PROTECT CS CellStream™ pre-filter cartridges offer the highest level of protection for downstream membrane filter cartridges due to the separation mechanisms of the filter material, which is made of special cellulose.



BECO MEMBRAN PS Pure™ membrane filter cartridges safely retain spore-forming bacteria, which can harm fruit juice, using an asymmetric pore structure with an LRV (log reduction value) of more than 7 per cm².

North America
44 Apple Street
Tinton Falls, NJ 07724
Toll Free: 800 656-3344
(North America only)
Tel: +1 732 212-4700

China
No. 3, Lane 280,
Linhong Road
Changning District, 200335
Shanghai, P.R. China
Tel: +86 21 5200-0099

Europe/Africa/Middle East
Auf der Heide 2
53947 Nettersheim, Germany
Tel: +49 2486 809-0

Singapore
100G Pasir Panjang Road #07-08
Singapore 118523
Tel: +65 6825-1668

Friedensstraße 41
68804 Altlußheim, Germany
Tel: +49 6205 2094-0
An den Nahewiesen 24
55450 Langenlonsheim, Germany
Tel: +49 6704 204-0

Brazil
Av. Ermano Marchetti, 1435 -
Água Branca, São Paulo - SP,
05038-001, Brazil
Tel: +55 11 3616-8461

**For more information, please
email us at filtration@eaton.com
or visit www.eaton.com/filtration**

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