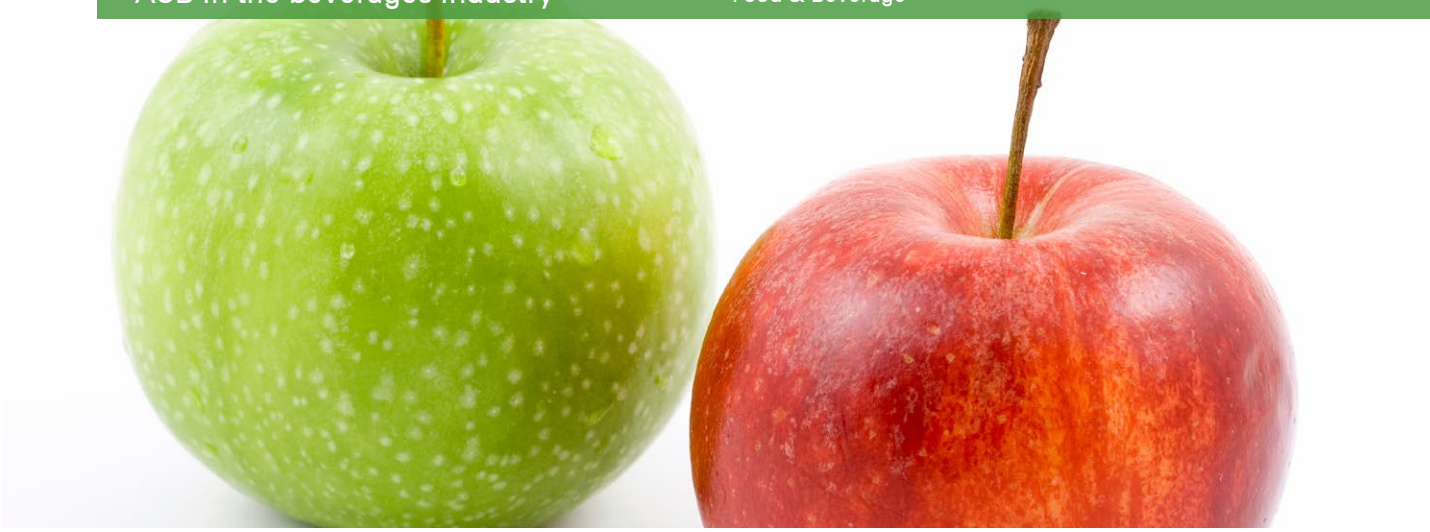
Customer Success Story:
ACB in the beverages industry

Market Served
Food & Beverage



An immaculately clean solution

Multi-sheet filter not only removes ACB, it also minimizes drip loss

Location:
Poland

Challenge:
Removing ACB from juice concentrate more efficiently while also improving process cleanliness and employee safety by minimizing product discharge from the plate and frame filter

Solution:
BECO COMPACT PLATE A600™ plate and frame filtration system with optimized tubular frames and high-performance hydraulic system with automatic re-tightening

Result:
New filtration solution minimizes drip loss, increases process cleanliness, employee safety, productivity and improves the quality of the juice concentrate

Thanks to its high pressure tightening and automatic re-tightening, the filtration system not only reduces drip loss to a minimum, it also increases the efficiency and cost-effectiveness of the entire process.

Background

According to Statista, Europeans consumed roughly 900 million liters of apple juice in 2018. Consumers are placing increased emphasis on the quality and taste of natural products, which presents the manufacturers of fruit juices and fruit juice concentrates with challenges: Customers expect increasingly high quality. In particular, removal of ACB from concentrate is now essential for any juice concentrate manufacturer to maintain a competitive position in the marketplace.

The *Alicyclobacillus acidoterrestris* species (ACB) represents a major challenge for many producers of fruit juices and fruit juice concentrates. Because the spore-producing bacteria are thermophilic and acidophilic (TAB: thermo acidophilic bacteria), which means that while pasteurization may kill the actual bacteria, the temperature is not sufficient to destroy their spores. Applying higher temperatures during pasteurization is not an adequate remedy since, firstly, it has a negative effect on fruit juice quality, in particular on color and taste, and, secondly, it can actually stimulate germination of the spores. ACB in fruit juice concentrate has a significant negative impact in terms of flavor: It generates off-flavors such as guaiacol, 2.6 dichlorophenol and 2.6 dibromphenol, producing a taste that consumers describe as disinfectant-like, antiseptic, phenolic or smoky. Even a minimal initial bacteria content of one spore per milliliter is sufficient to result in a propagation of ACB.

For more than 20 years now, the juice concentrate producer has been using a variety of Eaton beverage treatment products: These include enzymes, bentonite, gelatins, silica sol for fining, activated carbon for adjusting color, aroma and taste, and diatomaceous earth for filtration. To successfully remove ACB, the company has also been using Eaton depth filter sheets for several years: After concentration, the apple juice concentrate is filtered through the depth filter sheets, where

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due to its high viscosity of 65 to 70 brix it reaches a temperature of 176 to 194 °F. Only after this final filtration is it cooled down to be loaded into tanker trucks. Sheet filtration has proven to be a very effective process for the reduction of ACB. In laboratory tests, Eaton verified that at an initial bacterial content of more than 100,000 colony-forming units per milliliter (cbu/ml), no spores were detected in a filtrate that had been filtered with depth filter sheets from Eaton's product line.

Challenge

While the process for microbial removal filtration for apple concentrate met the provider's high-quality standards, the company was not as happy with the filtration system itself – which was not made by Eaton, but by another supplier. Like many other companies that use plate and frame filtration systems, the juice concentrate producer had problems with leaks: So much concentrate forced its way between the individual filter elements that the equipment had to be covered with a tarpaulin during the filtration process to protect the surrounding area from splashes of hot concentrate. The leakage from the filtration system therefore represented a hazard to employees. In addition, more effort had to be put into keeping the spaces around the equipment clean to ensure the plant's high cleanliness standards.

Solution

With its plate and frame filter upgrade BECO COMPACT PLATE A600, Eaton was able to provide the solution: The high-performance, electrically- or pneumatically-operated hydraulic system in this plate and frame filtration system compresses the filter elements with a pressure of up to 3,481 psi – much greater than the previous filtration system was able to achieve. The solid design of the chassis as well as the robust filter frames ensure that the hydraulic pressure is effectively directed onto the filter sheets and that none of the components in the system warp even after it has been in operation for extended periods and at high temperatures. An automatic re-tightening system also monitors the actual tightening pressure during operation, because fluctuations in temperature or pressure of the concentrate can alter the force applied to the filter sheets. The system can detect these changes immediately and automatically adjusts the hydraulic pressure if it falls below a threshold value. This allows the system to be operated even at high pressure without causing increased product leakage – positive operating pressure is up to 87 psi, differential pressure is at a maximum of 58 psi.

Result

The provider was surprised that such low product leakage occurred from the BECO COMPACT PLATE A600 during operation. In addition, the filtration system's flexibility also proved a major plus. The filter surface area, for example, can be adjusted to between 7.1 and 745.9 square feet, or, depending on requirements, provide multi-stage filtration. Moreover, the system as a whole is easy to operate and its ergonomic design, smooth surfaces and exposed profile plates (tubular grid) make it easy to be cleaned. All filter plates are made of stainless steel (AISI 316L) and therefore comply with the food industry's highest standards. The juice concentrate producer uses up to 128 depth filter sheets from Eaton's standard line of products in its BECO COMPACT PLATE A600 filters. The types used for pre-filtration have a nominal retention rate of 3 or 4 µm, the types used for microbial removal filtration between 0.5 µm and 0.4 µm. The result: following filtration, no ACB are detected in the concentrate.

The system also offers the company real economic benefits as well. It is possible to operate at higher pressure, which means that a single configuration can achieve a higher product volume or longer filtration batches. Lower costs also benefit customers since the increased product quality achieved with the Eaton filter sheets mean sterile filtration is no longer needed when reconstituting the concentrate. This was reason enough for the company to procure a second BECO COMPACT PLATE A600 only a short time later.

Eaton BECO COMPACT PLATE A600 plate and frame filtration system

A high-quality multi-sheet filter with wide-ranging optional features. The flexible filter surface area can be adapted to an individual application, and drip loss can be reduced to a minimum through the optimized tubular grid exposed on both sides and the hydraulic compressing mechanism with automatic re-tightening.

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

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

Friedensstraße 41
68804 Altlußheim, Germany
Tel: +49 6205 2094-0

An den Nahewiesen 24
55450 Langenlonsheim, Germany
Tel: +49 6704 204-0

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

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

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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