

Customer Success Story:
Liquid sugar process filtration

Market segment:
Food and beverage

Filter elements are a sweet success in improving both the safety and performance of liquid sugar processing operations

Location:

Baltimore, USA

Challenge:

Reduce cost and downtime of filter bag maintenance and improve operator safety in both batch and continuous processing operations

Solution:

Upgrade to premium Eaton® HAYFLOW™ filter elements in Eaton MAXILINE VMBF™ multi-bag filter housings with QIC-LOCK™ opening mechanism

Result:

Reduced filter bag changes from once per shift to once every three days while simplifying maintenance procedures and improving operator safety

“Switching to premium HAYFLOW filter elements let a 12-bag MAXILINE filter housing deliver the performance of a 20-bag housing and improved operator safety at the same time. That’s a win-win.”

*Wim Callaert,
senior product manager at
Eaton’s Filtration Division*

Background

One of the largest producers in the sugar industry traces its roots all the way back to 1799. Today the company descended from that enterprise produces 6.5 million tons of sugar annually from plants in the Americas and Europe.

Of course, the granulated sugar used to sweeten a morning coffee is only one of many sugar-based products included in that 6.5 million tons. Liquid sugar is the sweetener of choice for many foods and beverages and it’s produced on an industrial scale in a Baltimore, MD plant that has been in continuous operation for about 100 years.

“Liquid sugar is produced by dissolving dry sugar in water at temperatures up to 160 °F with occasional excursions as high as 200 °F to produce a thicker syrup,” explained Wim Callaert, senior product manager at Eaton’s Filtration Division.

“Undissolved solids, called “Fish Eyes” and other contaminants have to be filtered out of the liquid at midstream and again just prior to packaging for delivery to meet strict quality and purity standards.”

The plant initially installed Eaton strainers in the midstream and finishing areas of the process and as the demand grew upgraded to large Eaton MAXILINE™ 12-bag filter housings. The standard needle felt filter bags they initially chose required a filter change once per shift. This was difficult, time-consuming and potentially dangerous due to the hot, viscous liquid being filtered and the confined locations of the filter housings.

Eaton was invited to evaluate the situation and develop a solution to reduce the maintenance cycles and make maintenance easier and safer for operators and maintenance personnel.

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Challenge

Before changing the filter bags, the bag filter housing is first isolated and then drained. Then the clogged filter bags and the displacement balloons, which reduce the internal volume of the filter bag in order to minimize product losses when draining the housing, are removed. The housing is rinsed and the effluent is drained before new filter bags and displacement balloons are inserted. Then the housing is closed, filled and put back in service.

The liquid sugar production line uses three large 12-bag MAXILINE housings and this process was repeated for every shift generating significant downtime. In addition, some of the MAXILINE housings are located in areas of the plant that are not easily accessible. As a result, the standard filter bags were not always placed correctly causing potential damage to the filter bag and leading to other possible filtration problems.

"The filtration system actually was undersized for the volume of product being filtered," Callaert noted. "The standard solution would be to extend filtration capacity by adding more bag filter housings, but that would require a significant capital investment and consume additional floorspace without reducing maintenance time."

Instead, the Eaton team focused on improving the performance of the filter bags and began testing a variety of different options.

Solution

The solution was to equip the existing 12-bag MAXILINE housings with high-performance HAYFLOW filter elements. Eaton recommended 25-micron polyester HAYFLOW filter elements using SENTINEL™ seal rings for both the midstream and final filtration applications to handle the high temperatures involved.

"HAYFLOW filter elements combine the best features of filter bags and filter cartridges in a single, compact, high-performance element," Callaert said. "They use fully-welded, nominal rated polypropylene or polyester needle felt media with approximately 2.5 times longer service life that provides a 65-percent increase in filter surface compared to standard filter bags. In addition, the compact HAYFLOW filter elements minimize the amount of product lost during maintenance and eliminate the need for heavy displacement balloons while the SENTINEL seal rings simplify installation and reduce bypass losses."

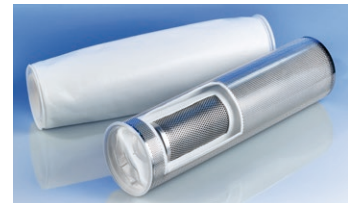
Result

The filtration process was able to change from a time-based maintenance schedule to a differential pressure (Δp) based schedule that allowed the filter elements to load up to optimal saturation levels and use their full capacity. The HAYFLOW filter elements increased filter surface area by 65 percent, in effect turning each 12-bag housing into the equivalent of a 20-bag housing.

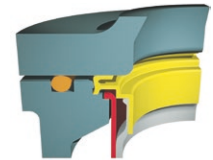
"The HAYFLOW filter element is made of high capacity media vs. the standard media previously used," Callaert added. "This change increased the filtration capacity up to five-fold times. This, along with the significantly increased capacity of the HAYFLOW solution reduced filter maintenance requirements from once per shift to once every three days on average with a commensurate reduction in downtime and increased process productivity."

In just one step, the compact HAYFLOW filter element is much easier to install and remove compared to the previously used two-piece combination of filter bag and displacement balloon. Its 75 percent smaller internal volume reduces product loss and its weight when removed. The SENTINEL seal ring provides a seal that virtually eliminates bypass losses and ensures proper alignment to help prevent damage to the element during installation.

"However," Callaert said, "the most important benefit is the improvement in operator safety resulting from both the longer maintenance cycles and the much easier maintenance procedures made possible by the upgrade to premium HAYFLOW filter elements. Less operator exposure to a hot, viscous product substantially reduces the possibility of accident or injury."



Eaton **HAYFLOW filter elements** combine the benefits of a filter bag and a filter cartridge to increase filter area by up to 65 percent compared to standard filter bags and deliver extended service life, longer filter change intervals and reduced operating costs.



Eaton **SENTINEL seal ring** lip rings provide a flexible, chemical resistant seal that's adaptable to any filter housing. The pressure activated sealing lip ensures bypass-free filtration over all ranges of pressure, temperature and micron rating and the design simplifies installation and removal.



Eaton **MAXILINE VMBF multi-bag filter housings** are designed for high-volume applications requiring frequent filter bag changes including batch processes and high-dirt load applications. Their QIC-LOCK opening mechanism facilitates fast and easy filter bag changes to improve productivity and reduce operating costs.

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