

Lowering the Cost of Trap Filtration in Breweries

Overview

Most breweries use some form of filtration to clarify beer. The most common way to remove the large amounts of yeast from beer is with DE (diatomaceous earth) filtration. DE filters generally perform well, however they do have some drawbacks. One problem with DE filters is, regardless of age, DE filters bleed. The older the filter gets the more it unloads and bleeds DE into your beer. The amount of bleed is also operator and process dependent. It's an acquired skill to run a DE filter.

Particle or trap filters are used to ensure that the DE that bleeds through the DE filter does not remain in the beer. There are several filters on the market that can be used as trap filters. However, the most economical technology is the backflushable and cleanable cartridge filter. To reduce the costs of this trap filtration step, Pall Corporation has developed a unique filter that can be backflushed and reused many times. To assist with backflush efficiency and extend filter life, Pall has also designed a special inverted filter housing.

The Challenge

Many craft breweries experience significant cost and production issues associated with trap filtration. These costs are mainly due to frequent filter change outs and the associated labor. Down time and beer loss due to frequent filter changeouts can affect brewery production schedules, particularly when filters plug mid-batch.

Pall Corporation was challenged to develop an easy-to-use filter system that can withstand many filtration cycles, providing a low cost of operation. Such a filter system must

hold up to high temperatures during cleaning and sanitization as well as the low temperature of production. The filter system should also be small, utilizing a minimum number of cartridges to reduce investment and operating cost.

The Solution

Pall® Profile® Star TF filters installed in an inverted filter housing are the most economical solution to the brewer's trap filtration needs.

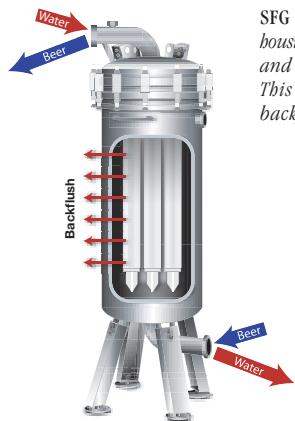
This is an all polypropylene filter designed specifically for this task. It does not suffer from unloading in the forward direction, media migration or channeling. These are all potential problems with general purpose filters often used for this task because they are thought to be 'cost effective'.

Profile Star TF cartridge filters are designed to be backflushed and reused many times. The filter is a pleated depth filter providing an optimized surface area with substantial depth. It is important to note that filters with too much surface area cannot be effectively reverse-cleaned as they will suffer from what is called preferential flow when backflushing is attempted. However, the increased amount of filter surface area of Profile Star TF filters over conventional depth filters allows for smaller, less expensive housings.

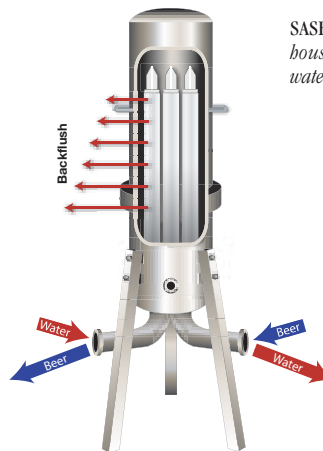
The Profile Star TF filter is made using a graded density structure that allows the filter to hold large amounts of particles during filtration. The filter is made from one piece of media and there is no potentially weaker side seam. Having no side seam allows the filter to be backflushed at extremely high flow rates (about 2 times the forward filter flow rate). This extremely high backflush rate allows for excellent cleaning.



Filter media: Representations of the cross section of three types of depth filter are shown. The image on the left is a cross section of a melt blown cartridge with graded density (tighter pores near the core). The center image is a cross section of a pleated conventional melt blown medium. This cartridge has high area and dirt holding capacity. The image on the right is a cross section of a Profile Star cartridge filter. The media depth, lack of side seal and star pleat structure make it ideal for use as a beer trap filter.



SFG housing: An inverted housing with product (beer) and water flow indicated. This housing is ideal for backflushable cartridges.



SASE housing: A standard housing with product and water flow indicated.

The SFG filter housing also plays an important role in filter life. Made from 316L stainless steel and ASME coded, the inverted SFG housing design has two very important advantages:

- The first advantage relates to beer quality. During filtration, the housing is filled with beer from bottom to top. This mode of filling results in low oxygen uptake due to the removal of trapped air within the housing. In this flow direction the housing is self-venting.
- The second advantage is improved back flushing or cleaning of the filters which reduces operation costs. After every filtration, a back flush is performed to remove the particles the filter has just trapped. During back flush mode, the flow of water is from top to bottom. With the help of gravity and the high reverse flow that Profile Star filters can handle, the entire length of the filter cartridge is cleaned. Efficient cleaning of the filters reduces the frequency of filter changeouts and lowers the overall cost of filtration per barrel.

Benefits

- The optimized star pleat design gives the filter higher surface area. This allows for smaller filter housings and less filters in service; two important cost factors for installation and long-term costs.
- The Profile Star filter is designed for repeated backflushing. Since the filter is made from once piece of filter media, without any side seam or weak point, you can back flush with confidence.

Choice of filter media:

It is important to have a media such that particles are prevented from penetrating into the media such that they cannot be backflushed out at the end of the run. Also equally important is to keep the dP increase during processing to a reasonable low level to prevent ingress of powder into the media since if it gets in too far it can't get back out again. When it comes to the backflush cycle, the filter should release the upstream surface-laden cake with relative ease. A pre-steep in dilute caustic solution is recommended to break down any protein/tannin residues from dead yeast that will tend to bind the DE together. Polypropylene filters and caustic are good companions. During this period much of the retained DE will be released through the dump valve.

- The inverted housing design aids in low oxygen pick-up and optimized cleaning via back flush.
- The lowest possible cost of operation.

About Pall Corporation

Pall Corporation is the largest and most diverse filtration, separation, and purification company in the world. Pall serves the food and beverage industries with advanced membrane filtration technology and systems engineered for reliability and cost effectiveness. Membrane processes can concentrate products without heat, purify and clarify, selectively remove constituents, and minimize effluent. Unique space-saving membrane filtration systems are easy to install, simple to use, and satisfy a wide range of filtration requirements—from removing particulates and spoilage microorganisms to providing high-quality air and gases.



Food and Beverage

25 Harbor Park Drive
Port Washington, NY 11050

+1 866 905 7255 toll free
+1 516 484 3600 phone
+1 516 625 3610 fax
foodandbeverage@pall.com
www.pall.com

Visit us on the Web at www.pall.com

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