

Brewery using Pall's SUPRApak™ filter modules reduces operating costs and minimizes waste

Overview

Particle and fine filtration of beer downstream of DE filters with depth filter sheet material is a well established practice in the brewing industry. Pall's latest generation of depth filter modules, the SUPRApak module, consists of depth filter sheet material wrapped around an inner permeable core, designed to provide a controlled flow path and ensure the full filtration capacity of the module is utilized.

The filter modules are installed in a closed system housing to eliminate the problems associated with traditional flat sheet filters such as drip losses, the build up of mold and sheet sticking. Being closed the filter guarantees high product safety while the compact design helps reduce system footprint. The change of multiple modules is achieved in one simple procedure to significantly reduce the OPEX. Equally the housings cost only a fraction of comparable sheet filters therefore also ensuring a reduction in CAPEX.

The Challenges

To validate this new technology, Pall partnered with a brewery wanting to replace a flat sheet filter installation consisting of a DE plate and frame filter (76 m²/818 ft² filter area) followed by a sheet filter (170 m²/1,829 ft²), with a closed system. The objective was to eliminate the drip losses and build up of mold, reduce operating costs and lower the impact of the process on the environment by using less valuable natural resources.

The Solution

A single module SUPRApak housing was installed between the existing DE and sheet filters. Initial validation over a 7 month test period covering 13 filtration and 17 sterilization runs at 85 °C (185 °F) identified an optimum flow rate of 20 hl/h (528 USgph) per module. Differential pressure did not exceed 1.5 bar (22 psi) and the microbiological retention, as monitored by the brewery, showed the modules remained in a proper serviceable condition.

After validation, SUPRApak filter modules were applied on an industrial scale by replacing the sheet filter for a period of at least six months. The total production of this brewery was approximately 600,000 hl (15,850,323 USg) per year.

Approximately 230,000 hl (6,075,957 USg) were filtered with the sheet filter equipped with 85 folded 1 m x 2 m (3.3 ft x 6.6 ft) sheets having a total filter area of 170 m² (1,829 ft²) at a flow rate of 240 hl/h (6,340 USgph).



SUPRApak L module and SUPRApak housing

The filter sheets had to be replaced after approximately 10,500 hl (277,654 USg), equating to 22 changes of filter sheet sets per year.

To achieve the same flow rate of 240 hl/h (6,340 USgph), 12 SUPRApak filter modules were required, installed in two housings fitted in parallel. A total test volume of 232,250 hl (6,135,396 USg) of beer was filtered during which time the modules were exchanged 11 times, equating to an average filtration volume of 21,114 hl (557,773 USg) per module set or of 10,557 hl (278,886 USg) per housing. The lifetime per module set was between 13 and 15 filtrations / sterilizations. The microbiological evaluation of the filtrate was carried out on samples from the DE filter outlet (i.e. the SUPRApak filter location inlet) and the outlet of each SUPRApak housing. The results showed equivalence when comparing SUPRApak with the original sheet filter installation on yeast and beer spoiling microorganisms.



With the flat filter sheets having 170 m² (1829 ft²) filtration area, 10,250 hl (270,776 USg) of beer could be filtered, equivalent to 60.3 hl/m² (148.0 USg / ft²). With the 12 SUPRAPak modules in two compact closed system housings, a total volume of 16,240 hl (429,015 USg) (related to 10 filtrations/ sterilizations, which is recommended by Pall) could be filtered, equivalent to 1,353 hl/module (35,742 USg/module).

One SUPRAPak module replaced 22.4 m² (241 ft²) of conventional filter sheets. A detailed cost comparison between the existing sheet filter and the new SUPRAPak installation was undertaken to prove the project scope for operating cost reductions. The cost of the filter material, change out and handling, for rinsing / sanitization and cleaning operations, product losses and disposal were all considered. Table 1 shows the split of the different cost categories.

Table 1 – Brewery specific cost comparison of flat filter installation versus SUPRAPak installation

	Cost Saving with SUPRAPak [% / hl (USg)]
Filter costs	55.1
Change out – Handling costs	87.5
Rinsing / Sanitization / Cleaning operations	86
Product losses	99.2
Disposal	66.7
Total OPEX	68

The comparison clearly shows considerable advantages of using SUPRAPak filter technology. The cost for the filter material itself is almost half that of the flat filter sheets and additionally, in terms of filter element maintenance, of water and cleaning agent volumes required, reductions in product losses, (drip losses and dead volume) plus the costs of filter media disposal, SUPRAPak filter module technology demonstrates significantly lower costs.

The Benefits

Applying SUPRAPak filter module technology in particle and fine filtration of beer downstream of DE filters, breweries can significantly reduce their production costs. The specific example given above demonstrated the following benefits:

- Reduced OPEX compared to flat filter installations by 68 %
- Lower environmental impact: less energy (-66 %), less water (-16 %) and less waste (-66.7%)
- Increased process safety and product quality
- Easy cleaning and less contamination
- Compact filter design for reduced system footprint
- Modular, flexible housing concept

Due to the convincing results and the advantages shown the customer maintained the SUPRAPak test equipment and removed the flat filter sheet installation

About Pall Corporation

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Pall Corporation

Pall Food and Beverage

25 Harbor Park Drive
Port Washington, NY 11050
+1 516 484 3600 telephone
+1 866 905 7255 toll free US

Portsmouth - UK
+44 (0)23 9230 2269 telephone
+44 (0)23 9230 2509 fax
industrialeu@pall.com

Visit us on the Web at www.pall.com/foodandbev

Pall Corporation has offices and plants throughout the world. For Pall representatives in your area, please go to www.pall.com/contact

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