

# PROCESS CONTROL FOR BEER FILTERABILITY: CFMF

## Pall/Westphalia & Alfa Laval/Sartorius

**Pall's PallSep VMF** vibrating membrane filter for improved crossflow membrane filtration to recover beer from surplus yeast....add back up to 1.5%.

**Pall – Westfalia PROFI** system.....combines centrifuge upstream of modular CFMF system.

**Cross-Flow Filtration** an alternative to DE filters such as sheet filters, disc filters, and trap filters. **Sartorius's Sartflow Filtration System & Alfa Laval's Sartocan PESU Narrow Channel and Flat Membrane Modules** - combination of cross-flow technology and membrane filter cartridges to replace DE, then use downstream sterilizing-grade filter cartridges.....regenerate using patented oxidative reagent to remove beta-glucans and intermittent backflushing to remove particulates.....500hL/hr possible.....regenerate after @ 400 hours or greater.

**"ProFi" system**.....if add PVPP before, then while centrifuge removes, presence of yeast may interfere with haze PP adsorption, making it difficult to recover either.....recommend stabilize with PVPP post-CFMF, adding additional equipment.

Sartorius: polyethersulfone membrane. Cassettes for CFMF ...come in systems of 100 hL/hr or 500 hL/hr. Claim two year life....cannot provide absolute sterility, does reduce bacteria by  $10^5/cm^2$ .

Alfa Laval: Sartocan PESU Microfiltration Membrane Modules.....designed for routine beer filtration application as a replacement for DE....deliver 0 yeast/100 ml along i.e. does provide micro stability, along with all other advantages of CFMF.... for a 3 million hL/year brewery cost per hL in Euros is 0.406 vs. 0.424 for DE ..... system has "in-line testability" to assure no system breaks/leaks prior to bringing on-line ....uses modular design for "Sartocan Membrane Cassettes" ..... 72 plate & frame type cassettes per line, 10 hl/day/cassette maximum of 20 lines, 400 hL/hr. Claim reduced generation of beta-glucan gel during CFMF versus DE ( $V_{max}$  of 6840 vs. 1830 for DE). Also clearer beer compared to DE (0.41 vs. .53 EBC at 0°C). Part of micro control is the system's "Pressure Drop Test" (in addition to micro plating).....if < 5mbar is OK, > 5 mbar then yeast could be passing through.... if > 50 mbar then there is a break!

PROFI CFMF ....previously called "SWS". Pott's Brewery in Germany claims operating costs w/o centrifuge @ same as DE, however much longer filter runs and labor, water & energy reduced by 50% if pre-centrifuge added!

NORIT CFMF .....feel separators are not required for brewers using VCF design with good natural yeast separation.

NORIT: CFMF vs. DE .....claim costs of 0.53/bbl vs. 0.60/bbl, respectively. Claim 500 cleanings before replacement of membranes – typically 1-2 years over  $1.5 \times 10^6$  hL. Runs of 8-20 hours.

NORIT CFMF .....Cologne brewery reports 40 hour run times & batch volumes > 600 hL at 2/3 cost of DE systems.

NORIT CFMF .....see increased NIEBEM foams by 10-15 units vs. DE filtered beer.

NORIT CFMF .....recommend use of CSS to chillproof – totally powder free system with no DE then.

Norit **"BMF (Beer Membrane Filtration)"** CFMF system for primary beer filtration.....19-24 modules/skid, with capacity of @ 225 hl/hr....sometimes used in combination with **Handtmann's CSS** colloidal stabilizing treatment.

History of Filtrix CFMF: first used in 1985 to recover beer from yeast....1991 first ceramic Filtrix for beer recovery .....2003 saw their first polymer CFMF using new module design and "Dual Flow Principle" of an inner bundle with up flow, outer bundle down flow for recovery of beer from yeast.....yeast cells < 5/100ml and bacteria reduction of factor of  $10^5$ .

**TFS vs. Classic Candle Filter:**  
In TFS units, the entire vessel serves as the unfiltered beer side, with no perforated plates separating the unit into filtered and unfiltered sides (and the filtrate and unfiltrate, respectively). The filter candles are threaded into a patented register vessel, which together with the candles, forms the filtrate side of the system. In TFS units, the candles therefore have very low internal volume compared to traditional Filtrix systems, allowing for much LONGER candle lengths (up to 94.5 inches). Result is a smaller unit system volume/footprint, with increased operational stability. Are 2-3 outlets per filter unit. Operate at 1-6.8 hL/m<sup>2</sup> x hr<sup>-1</sup>, costing 0.15-0.28 Euros/hL of filtrate to operate.

TFS is evaluating other materials to replace DE including cellulose, starch, synthetics, etc...), now at the regulatory approval stage.

Materials used for CFMF technologies:  
a) polymers (e.g. polysulfone), or  
b) ceramic, or  
c) microsieves  
Comparing ceramics vs. polymers, former more expensive but also more robust and insensitive to chlorine. Two geometries – tubular (0.5 < 8 mm) vs. flat (< 0.5 mm).

TFS (Twin Flow System) DE vs. Candle DE .....claim 10% better delta P, extended runs, third less water usage, third less pre-coat, decreased DE usage by 25%. Current candle systems can upgrade to TFS at small cost. Steineker's newest generation of DE filtration (2005 MBAA).

Filtrix CFMF Technology: tubular ceramic filters cost effective for beer recovery systems, but still not cost-effective for beer filtration application in finishing operations. Based on CFMF with ceramic membranes as opposed to the polymer based membranes of Norit.

## Beer Filterability

Norit

Filtrix/Steineker

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