ENJOY MEMBRANE FILTERED BEER
INSPIRING THE WORLD WITH CLEAN SOLUTIONS

The brewing industry has passed the sustainability point of no return. Having reached its maximum potential, the industry is quickly leaving conventional solutions behind in favor of clean technologies that satisfy ever-increasing expectations in terms of sustainability.

This is leading to ambitious goals to reduce water, energy and solid waste footprints. But also other sustainable aspects, like the increasing demands on a safe and healthy working environment are setting harsh conditions to the way of working in a brewery. Beer drinkers all over the world are setting higher demands on consistency of the quality of beer, like taste and appearance. And more and more they choose for different beer styles at different moments at different places. This is setting a higher need for more flexibility in the brewery, while at the same time pressure is increased on the availability of high-quality raw materials. Besides, in an increasingly competitive brewing industry market, the need to reduce capital and operational expenditures is inevitable.

Pentair, as solution provider of the brewing industry, is having the right clean solutions to help you with these challenges. A great example is the Beer Membrane Filter (BMF). Pentair’s BMF system adheres to two key sustainability principles: do more with less and avoid using disposable single-use items and materials. The BMF system filters more beer using less water while producing no solid waste. With membrane filtration, breweries no longer rely on the one-time use of raw materials that are questionable in terms of employee health and safety, and that produce sizable solid waste handling issues and disposal charges.

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Pentair plc (www.pentair.com) delivers industry-leading products, services and solutions for its customers’ diverse needs in water and other fluids, thermal management and equipment protection. With 2014 revenues of $7.0 billion, Pentair employs approximately 30,000 people worldwide. Pentair Beverage Filtration Solutions is a global specialist in diatomaceous earth free Beer Membrane Filtration, brewery and beverage projects, and has standardized units for a variety of industries. The product portfolio contains numerous innovative and sustainable solutions, such as Beer Membrane Filtration, yeast handling, yeast storage, yeast propagation, fermenting, bright beer section, CIP sets, and total automation. This enables Pentair to deliver turn-key projects up to complete cold block processing.
BEER MEMBRANE FILTER

THE BMF +FLUX AT ÖETTINGER BREWERY IN MÖNCHENGLADBACH, GERMANY – CAPACITY 700 HL/H CONTINUOUS
The BMF system is automated in several platforms and PLC configurations and Pentair is delivering the filter system on a turnkey basis. The BMF product has unique features because of the use of membranes, the optimized filtration process, and smart engineering. This all leads to benefits in the area of sustainability, quality, operation and cost level.

A typical BMF systems has an unfiltered beer tank, the membrane filter modules itself and a filtered beer tank and a designated cleaning agents cabinet. Next all kind of connections for incoming beer, outgoing beer, process water, de-aerated water, hot water, air, CO₂ and power are needed.

Besides the membrane modules, system standard components like valves, pumps and inline measurement for pressure, temperature and flow are used. For the dosing of the chemicals a very smart solution is used. A so called jet stream pump, based on the venture principle, is applied. Compared to other solutions, maintenance is barely limited to zero. Besides, the robustness of this system is very high.

Pentair Beer Membrane Filters are well thought-thru designed systems. Because of the use of membrane modules, one can easily coop with required capacities from 70 to 900 hectoliter per hour. Secondly, by applying standardized units, costs are kept low and continuous improvement can be easily applied.

GREAT BENEFITS

Benefits
- **Sustainability**
  - Low energy consumption because of no centrifuge
  - Reduction of 50% of the solid waste stream
  - Safe and hygienic working environment
- **Beer Quality**
  - Constant beer quality
  - Better taste stability because of no iron pick-up
  - Permanent barrier to beer spoiling bacteria
- **Operation**
  - Ease of operation thru a simple process
  - Easy to fully automate
  - Less labor – No handling of DE
- **Cost Level**
  - Beer loss down to 0.1%, with no pre- and after run tank
  - Fixed sum for membranes per hectoliter – predictable and simple
  - Low Opex thru maximized run volume
MEMBRANE TECHNOLOGY
Membrane filters have great benefits above diatomaceous earth filters. For the filtration of beer, membranes in the form of so-called hollow fibers - which resemble a lot like straws in your kitchen drawer - are the ideal solution. They have a high amount of filtration area per module, back flush possibility, hygienic design and robustness towards (negative) pressures and higher temperatures.

Next the membranes are made of a polymer, because compared to other materials they have great affinity towards beer, leading to the highest flow per m² of filter area. In this specific case polyethersulfone is applied, which is known for its great compatibility for cleaning agents and it is one of the best polymers to use in relation to food and drink contact.

Because of its unique production process, Pentair is able to make the best fitted pore size distribution, leading to a constant beer quality over the life time of the membrane.

For an epic membrane filter not only the best membranes are needed, but also the perfect filtration process and cleaning procedure of the membranes. The Pentair filtration process is able to withstand large amounts of yeast; yeast even has a positive effect on the run volumes. Therefore any pre-clarification of beer with a centrifuge is not necessary. This is saving the brewery investment, energy and expensive maintenance.

The cleaning procedure is well-thought thru. By using a back flush with caustic, typically 5-10 times, before the membranes are actually regenerated, the lowest possible consumptions for water and chemicals are reached. The use of chemicals is optimally reduced by reusing them more than once.

So far the membranes itself, which is already showing you why polymer membranes have the best fit-for-use & fit-for-purpose properties because of the following added values:

- High flow per m²
- Compatible towards cleaning agents
- Constant beer quality
- Withstand high yeast count
- No centrifuge
A BMF FOR EVERY BREWERY

For breweries up to an annual capacity of 1.5 million hectoliter the so called Compact series are designed. The maximum nominal flow of this system is 250 hl/h. For larger breweries, a beer filter line up to 900 hl/h, batch or continuous, is available.

As mentioned, for breweries up to an annual output of 1.5 million hectoliter a compact, automated, plug & play and containerized filter is designed. Options like a steam set, dosing unit for silica gel or PVPP and an integrated carboblender are possible. The whole unit, including these options, is manufactured and tested at Pentair. Next, it is split up in mounted skids, and put in transport containers. Commissioning is done at the brewery in a short period of 3 weeks including connections, first beer, optimization and training.

For breweries who need larger filters, from 300 hl/h up to 900 hl/h, operation can be batch wise or continuous. In case of a continuous line, two sets of membranes are installed, in which the sets are alternating meaning there is always one set producing beer.

Once the BMF is running the best beer quality can be enjoyed. The filter takes out what needs to be taken out, and leaves in the beer what must stay in. Due to the unique features of the membrane, overall quality is more constant. The taste after several months is significantly better due to lower amount of aging components.

All this at a higher sustainable level and low cost level. One can truly say that the BMF is the best choice for the brewer of today...and tomorrow!

Of course the beer membrane filter must run for decades, at the same performance as at start-up. Therefor Pentair has its global service organization.

<table>
<thead>
<tr>
<th>Product Code</th>
<th>Operation</th>
<th>Basic Pipe Line Diameter [DN]</th>
<th>Nominal Capacity [hl/h]</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMF-18 Compact 1</td>
<td>Batch</td>
<td>50</td>
<td>100 - 150</td>
</tr>
<tr>
<td>BMF-18 Compact 2</td>
<td>Batch</td>
<td>65</td>
<td>150 - 250</td>
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<tr>
<td>BMF +FLUX-x-80</td>
<td>Batch</td>
<td>80</td>
<td>200 - 400</td>
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<tr>
<td>BMF +FLUX-x-100</td>
<td>Batch</td>
<td>100</td>
<td>280 - 600</td>
</tr>
<tr>
<td>BMF +FLUX-x-125</td>
<td>Batch</td>
<td>125</td>
<td>420 - 900</td>
</tr>
<tr>
<td>BMF +FLUX-2*x-80</td>
<td>Continuous</td>
<td>80</td>
<td>200 - 400</td>
</tr>
<tr>
<td>BMF +FLUX-2*x-100</td>
<td>Continuous</td>
<td>100</td>
<td>280 - 600</td>
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<td>BMF +FLUX-2*x-125</td>
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</tr>
</tbody>
</table>
TALK TO THE EXPERTS
Today, service is much more than just repair and maintenance. Service contracts are an integral part of the brewery’s preventive maintenance program. During project management, the Pentair service team is introduced to the customer and assists with commissioning.

On-site the service team gathers valuable information about the local conditions of the operation. Through performance data monitoring, long-term information is acquired, which ensures that troubleshooting and service activities can be very efficient and to the point in the event of an emergency.

At our control center a data connection line instantly puts Pentair experts online with your system. This service maximizes your plant’s uptime. By taking advantage of the full service contract, the brewery is assured that the potential for continuous improvement is explored on a regular basis and thus can place its focus on the core business.

Pentair’s life cycle/service management is divided into two phases: design and operation. Proposal/planning, contract management, and engineering up to commissioning are typical design services. Start-up, monitoring, consulting (24/7 helpdesk), maintenance/replacement of components, evaluation, and optimization are part of the operation services. The overall goal is to ensure that a brewery is constructed and operates in the best possible and most cost-efficient way.