OPTIMIZED BEER FILTRATION WITH THE LATEST GENERATION MEMBRANE FILTER

ROB HUTTENHUIS
PENTAIR
AREA SALES MANAGER

IBD SYDNEY – 17 MARCH 2016
AS ONE COMPANY, WE HAVE THE GLOBAL RESOURCES

<table>
<thead>
<tr>
<th>30,000</th>
<th>6</th>
<th>$8 Billion</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMPLOYEES</td>
<td>CONTINENTS</td>
<td>ANNUAL REVENUE</td>
</tr>
<tr>
<td>100+</td>
<td>1,000’s</td>
<td>90+</td>
</tr>
<tr>
<td>MANUFACTURING FACILITIES</td>
<td>PRODUCT LINES</td>
<td>SERVICE CENTERS</td>
</tr>
</tbody>
</table>
PENTAIR FOOD & BEVERAGE PROCESS SOLUTIONS

PENTAIR BEVERAGE SYSTEMS

- Production of the Beer Membrane Filter (BMF) + cellar solutions
- Production of membranes and membrane modules using proprietary production equipment
- Solutions for process, wastewater treatment

PENTAIR SÜDMO, Germany

- Production of valves, fittings and integrated valve systems
- Provides sustainable processing solutions to maximize production time and operational flexibility, from design through to the final commissioning of your process system.

PENTAIR HAFFMANS

- Production of quality control and process equipment for the brewing and beverage industries
- Production of CO2 recovery and biogas upgrading solutions for the brewing / beverage, bio-ethanol and biogas industry
CONTENT

- WHY MEMBRANE FILTRATION
- DEVELOPMENT ON PROCESS
- DEVELOPMENT ON DESIGN
- TAKE HOME
GENERAL BENEFITS

BEER MEMBRANE FILTRATION VS. DIATOMACEOUS EARTH

• Better and constant beer quality
• Comparable CAPEX and OPEX levels
• No storage, handling or disposal of dust containing DE – also health risk
• Easy start-stop-start procedure
• Sustainable and green – lower CO₂ footprint and eliminates solid waste stream

No iron pick-up

\[ \text{O}_2 + \text{Iron} \rightarrow \text{Free radical oxidation} \rightarrow \text{Beer Aging} \]
GENERAL BENEFITS

WHY PENTAIR BEER MEMBRANE FILTRATION (BMF)?

• Marktleader membrane filtration
• Experience:
  • First commercial beer membrane filter 2002
  • Over 100 M hl/year of beer filtered by BMF
• Flexible design
• Membrane production and dedicated cleaning program
• One supplier:
  • Process technology (PWPT)
  • Membranes (X-flow)
  • Valves (Sudmo)
  • CO2 (Haffmans)
### WHO IS ENJOYING MEMBRANE FILTERED BEER?

**Number of BMF’s sold/commissioned**

<table>
<thead>
<tr>
<th>Region</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>North America</td>
<td>2</td>
</tr>
<tr>
<td>Europe</td>
<td>26</td>
</tr>
<tr>
<td>Asia Pacific</td>
<td>31</td>
</tr>
<tr>
<td>Latin America</td>
<td>6</td>
</tr>
<tr>
<td>Africa</td>
<td>23</td>
</tr>
</tbody>
</table>

**ANNUALLY 100 MILLION MEMBRANE FILTERED HECTOLITERS ARE CONSUMED!**
MEMBRANE FILTRATION - A JOURNEY...

...OF CONTINUOUS INNOVATION

1st Generation BMF

BMF-18

BMF-18 Compact Type 1


BMF-18 Compact Type 2

BMF-18
NEW GENERATION BMF – THE BMF +FLUX

- Experiences of 80 BMF units
- Close cooperation with our customers
- Fruitful relationship with beer institutes
- Continuous innovation
WHAT’S NEW - LARGER MODULE & SMALLER SKID

Stainless steel casing
WHAT IS CONTROLLED FLUX?

**BMF-18 (current)**

Cross-flow unfiltered beer

Filtered beer

**BMF +FLUX (new)**
BACK FILTRATION

- Backfiltration prevented by +Flux

- Controlling the permeate level to avoid back filtration
- Opens the possibility to build modules with increased filtration surface
- Optimized Flux resulting in longer filter runs
BMF + FLUX – WHAT’S MORE NEW...

- Smaller Unfiltered Beer Tank
- Simpler Process
- Optimized Filtration Process
- Cartridges Pentair made

UBT → MEMBRANE FILTER SKIDS → FBT

SF

‘Optimized Beer Filtration with the Latest Generation Membrane Filter’
BMF +FLUX – MEMBRANE FILTER SKIDS
BMF +FLUX – MEMBRANES

‘Optimized Beer Filtration with the Latest Generation Membrane Filter’
BMF + FLUX – PUMPS

‘Optimized Beer Filtration with the Latest Generation Membrane Filter’
BMF +FLUX – CIP

'Optimized Beer Filtration with the Latest Generation Membrane Filter'
BMF + FLUX – LAY OUT 500 HL/H LINE

PREFAB ON A FRAME

MCC Panel (800kg)

Piping Bridge Skid


Skid 01: 969 Skid 02: 969 Skid 03: 969 Skid 04: 969

8300

18000

Filtered Beer Tank 150 hl. Nett

Security Filter Manifold Fbt

Blender Carboniser

Unfiltered Beer Tank 55 hl. Nett

PENTAIR

‘Optimized Beer Filtration with the Latest Generation Membrane Filter’
BMF +FLUX - REFERENCES

Oettinger Brewery – Germany
BMF Continuous +FLUX Filter Line
Capacity of 700 hl/h

Not shown
La Zaragozana Brewery - Spain
BMF +FLUX Filter Line
Capacity of 500 hl/h

Kirin Brewery – Japan
BMF +FLUX Filter Line
Capacity of 400 hl/h
SIX LINES!
BMF + FLUX – COMPACT & HIGHLY STANDARDIZED

- Standardized building units (LEGO principle)
- Plug & Play
- Containerized for optimal handling & transport
- Process units on skids, easy to connect to each other
- Options possible like dosing units
# BMF – PRODUCT PORTFOLIO

<table>
<thead>
<tr>
<th>Product Type</th>
<th>Nominal Flow [HL/h]</th>
<th>Operation</th>
<th>Skids</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMF-18 Compact 1</td>
<td>75 – 150</td>
<td>Batch</td>
<td>1</td>
</tr>
<tr>
<td>BMF-18 Compact 2</td>
<td>150 – 250</td>
<td>Batch</td>
<td>2</td>
</tr>
<tr>
<td>BMF +FLUX 3-80</td>
<td>225 – 400</td>
<td>Batch/Continuous</td>
<td>3 → 2x3</td>
</tr>
<tr>
<td>BMF +FLUX 4-100</td>
<td>300 – 600</td>
<td>Batch/Continuous</td>
<td>5 → 2x5</td>
</tr>
<tr>
<td>BMF +FLUX 5-100</td>
<td>375 – 600</td>
<td>Batch/Continuous</td>
<td>6 → 2x6</td>
</tr>
<tr>
<td>BMF +FLUX 6-125</td>
<td>450 – 900</td>
<td>Batch/Continuous</td>
<td>6 → 2x6</td>
</tr>
</tbody>
</table>
OPTIMIZE EFFICIENCY WITH PENTAIR SERVICES

• Reduction of owning and operating costs
• Increase plant efficiency
• Maximize equipment lifetime
• Plant monitoring
• Limit downtime to a bare minimum
TAKE HOME MESSAGE

Looking at the challenges of the brewer:

• Superior beer quality for a more and more demanding consumer
• Society demanding sustainable production process – Energy, water, waste & safety
• Competing beer market requiring low TCO
• Robust & Reliable installation and process
• Ready for the future: other raw materials & extending product mix

→ The BMF +FLUX is the answer
→ PENTAIR is the partner, not only as supplier but during the whole life time of equipment
  ▪ Service Level Agreements
  ▪ Fixed filtration costs (€/hl) - for membranes
TAKE HOME MESSAGE

• Benefits and comparable Capex and Opex made the BMF a very interesting product for the beer industry

• In Asia Pacific region with 31 references in China, Japan, Vietnam, Indonesia, Papua New Guinea, India, Myanmar, Cambodia, Singapore and French Polynesia

• Already annuaaly more than 100 million hectoliter is produced with membrane filtration

• Strong benefits in sustainability, beer quality and operations
THANK YOU FOR YOUR ATTENTION!

QUESTIONS/REMARKS: ROB.HUTTIENHUIS@PENTAIR.COM