The Meura Mash Filter

A fine beer may be judged with only one sip... but it's better to be thoroughly sure.
-Czech Proverb

It's not German

But, it works

More popular outside the US

- Used in production of 35% of the World’s Beers
- Everything from Coors Light to Heineken, Bass, Guinness, and Chimay
- Many installations in Africa
Invented in 1901

- By Phillippe Meura

- 100 year old Meura mash filter in service at Brasserie de Brunehaut, originally installed at Chimay
- The Meura 2001 Membrane Assisted mash filter was introduced in 1987

Meura’s Competitors

- Nortek – traditional MF
- Landaluze – Sparg flexible, air drying
- Ziemann – Mash Filter with membranes

Traditional Mash Filter

How does it work?

Darcy’s Law – describes liquid flow through a porous media

\[
Q = \frac{dV}{dt} = \frac{\Delta P}{\mu R_e}
\]

- \(Q\): filtration rate (\(\text{m}^3/\text{min}\))
- \(\Delta P\): filtration pressure (\(\text{N/m}^2\))
- \(A\): filtration surface (\(\text{m}^2\))
- \(\mu\): dynamic viscosity (\(\text{Ns/m}^2\))
- \(R_e\): resistance of the filter (\(\text{m}^3/\text{N}\))

\[
\Delta P = \mu \frac{R_e}{A} + \frac{\Delta P}{R_m}
\]

- \(R_m\): resistance of the filter cloth
- \(R_c\): resistance of the cake and adhering material
Meura’s Specs

- High Productivity
- (at least 14 brews per day)
- High Extract Yield
- (min. equal to laboratory yield)
- Very Bright Wort
- < 5 EBC Haze before boiling (Imhoff < 5 ml/l post boil)
- Low Oxidation
- (Completely enclosed environment)
- Very Dry Spent Grains
- Maximum Moisture Content <70%

Typical Performance

Mash Volume Flexibility

<table>
<thead>
<tr>
<th>Type</th>
<th>Weight Proportion</th>
<th>Malt equivalent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000 kg husked malt</td>
<td>30%</td>
<td>1000 kg malt equivalent</td>
</tr>
<tr>
<td>1000 kg husked barley</td>
<td>30%</td>
<td>1000 kg malt equivalent</td>
</tr>
<tr>
<td>1000 kg dehusked barley</td>
<td>30%</td>
<td>350 kg malt equivalent</td>
</tr>
<tr>
<td>1000 kg sorghum</td>
<td>30%</td>
<td>900 kg malt equivalent</td>
</tr>
<tr>
<td>1000 kg rice</td>
<td>25%</td>
<td>350 kg malt equivalent</td>
</tr>
<tr>
<td>1000 kg maize</td>
<td>30%</td>
<td>500 kg malt equivalent</td>
</tr>
<tr>
<td>1000 kg starch</td>
<td>20%</td>
<td>150 kg malt equivalent</td>
</tr>
</tbody>
</table>

From 80% to 125% rated capacity
Grind it up

Mashing

- Finely Ground Grist Allows for Quicker Conversion Times
- Thicker Mash Allows for Higher Gravity
  First Worts =/> 24P

Plate Layout

Mash Filter is Empty

- Filter empty in closed position
- Calls for mash
Mash Filter Filling

- Filled from below at a flowrate to fill the 29 chambers in 6 minutes
- First Worts begin to drain to kettle immediately (!)

Mash Filtration

- Filter is full and back pressure builds
- Mash Tun pump begins to throttle to maintain a constant pressure
- Mash is transferred over a period of 25 minutes

Pre-Compression

- Mash Transfer is complete
- Air Bladder inflates and compresses the mash bed ~5 mins
- All First Worts are collected in 30 minutes (!)
1st Sparging Cycle
- Sparge Water is added by the Mash Pump at a constant pressure while air is released from the bladder – 5 mins

2nd Sparging Cycle
- Filter is full
- Sparge water is added
- Controlled by flowrate or pressure

1st Compression
- Air pressure is added at 0.5 bar to the elastic membranes for 5mins

2nd Compression
- Longer than the first compression at up to 1 bar and from 5 to 15 minutes
- Spent Grains at 30% solids
- Current Lauter Tun Avg – 18%
Spent Grain Discharge

- Filter Drain < 30 gals
- Automated machine moves the frames
- Cake drops free from the frames
- Empties in less than 10 minutes

CIP

- Brewer rinses plates
- Soak Cleaning once a week with 2% Caustic
- Mild Caustic followed by mild acid for neutralization.

Pre - Warming

- If the filter sets idle too long, the filter must be pre-heated

Table 3: Quality and Composition of Wort

<table>
<thead>
<tr>
<th></th>
<th>Meura 2001</th>
<th>Lauter Tun</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polyphenols</td>
<td>ppm</td>
<td>165</td>
</tr>
<tr>
<td>Amino Acids</td>
<td>ppm</td>
<td>1995</td>
</tr>
<tr>
<td>8-Glucose</td>
<td>ppm</td>
<td>181</td>
</tr>
<tr>
<td>Total Nitrogen</td>
<td>ppm</td>
<td>760</td>
</tr>
<tr>
<td>Enzymes</td>
<td>ppm</td>
<td>410</td>
</tr>
<tr>
<td>Fatty Acids</td>
<td>ppm</td>
<td>18.3</td>
</tr>
</tbody>
</table>

Table 4: Beer Composition and Taste

<table>
<thead>
<tr>
<th></th>
<th>Meura 2001</th>
<th>Lauter Tun</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polyphenols</td>
<td>ppm</td>
<td>200</td>
</tr>
<tr>
<td>Total Nitrogen</td>
<td>ppm</td>
<td>760</td>
</tr>
<tr>
<td>Esters</td>
<td>ppm</td>
<td>31.5</td>
</tr>
<tr>
<td>Degree of Fermentation</td>
<td>%</td>
<td>85.4</td>
</tr>
<tr>
<td>Foam</td>
<td>secs</td>
<td>125</td>
</tr>
<tr>
<td>Staling Factor</td>
<td>3 days at 40°C</td>
<td>5.35</td>
</tr>
</tbody>
</table>