OLIVE OIL PROCESSING COURSE

Solid - Liquid Phase Separation
Extraction efficiency

<table>
<thead>
<tr>
<th>Efficiency Level</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very good efficiency</td>
<td>&gt;90.0%</td>
</tr>
<tr>
<td>Benchmark efficiency</td>
<td>&gt;85.0%</td>
</tr>
<tr>
<td>Unacceptable</td>
<td>&lt;70.0%</td>
</tr>
</tbody>
</table>

Extraction efficiency formula:

\[ E.E. = 1 - \frac{(Oil \ pomace \times (100 - Oil \ fruit))}{(Oil \ fruit \times (100 - Oil \ pomace))} \]

Or

< 8.0% oil/dry matter in the pomace

With 50% moisture fruit = 3.0% oil/fresh in pomace

With 60% moisture fruit = 2.0% oil/fresh in pomace
Fruit and moisture levels

Fruit moisture vs. extraction efficiency - Plant A

Fruit and soil moisture

Fruit moisture vs. extraction efficiency - Plant B
Decanter

Decanter
Decanter

- Capacity.
- Efficiency.
Capacity of the Decanter

- Viscosity (Temperature).
- Length.
- Diameter.
- Differential between screw and bowl.
- Particle size (Crushing).
Efficiency of the Decanter

- Density difference between phases (Talc – Water - Crushing).
- Speed of rotation.
- Size of phases (Decanter plates).
- Separation time (Pumping speed).

Capacity vs. Equipment

Processing efficiencies: Lines 1 & 2
Pumping speed

- How do I know if I am pumping too fast?
  - Oil losses above limit.
  - Oil comes out dirty (Not always).

- How do I know if I am pumping too slow?
  - No problems apart from increased costs.
  - Do not go under 40% NC of the Decanter.
Pumping speed

Pumping speed
Decanter plates

Decanter plates
Decanter plates

Marino Uceda – Australia 2005
Decanter plates

• How do I know when to change the plate?
  
  • Once you have tried everything else and the oil still comes out very dirty and with very low Decanter capacity. Put an smaller plate.
  
  • Or if there is too much oil in the decanter. Stop the feeding pump into decanter, flush it with water and the amount of oil that is obtained should not exceed 1.5 % of the TC of the decanter. E.g.: 5 tn/hr should not produce more than 50-75 litres. Put a larger plate.

Processing

Fruit Processing Chart

<table>
<thead>
<tr>
<th>Grid</th>
<th>Paste</th>
<th>Condiments</th>
<th>Oil</th>
<th>Pomace</th>
<th>Final</th>
</tr>
</thead>
<tbody>
<tr>
<td>1*2</td>
<td>T°</td>
<td>Speed</td>
<td>T°</td>
<td>Flow</td>
<td>Acidity</td>
</tr>
</tbody>
</table>
## Extraction efficiencies per plant and operator

<table>
<thead>
<tr>
<th>Operator</th>
<th>&lt; 1 year</th>
<th>1-2 years</th>
<th>&gt;2 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant A</td>
<td>-</td>
<td>84.67%</td>
<td>90.10%</td>
</tr>
<tr>
<td>Plant B</td>
<td>75.93%</td>
<td>83.20%</td>
<td>-</td>
</tr>
<tr>
<td>Plant C</td>
<td>-</td>
<td>89.31%</td>
<td>92.15%</td>
</tr>
</tbody>
</table>

## OLIVE OIL PROCESSING COURSE

**Liquid - Liquid Phase Separation**
Centrifugation

\[ h_1 \cdot d_1 = h_2 \cdot d_2 \]

\[ \frac{h_1}{h_2 - h_1} = \frac{d_1 - d_2}{\text{Cte}} \]
Centrifugation
Centrifugation
Centrifugation

Oil in water:
- Ideal: < 0.1%
- Unacceptable: > 0.3%

Water in oil:
- Ideal: < 0.2%
- Unacceptable: > 0.6%

Oil temperature:
- Ideal: 1-2°C higher than malaxing T°
- Unacceptable: Lower than malaxing T°.
- > 5°C higher than malaxing T°
Centrifugation

- Accurate selection of regulation ring.
- Check oil aspect at all times (Clean milky aspect).
- Check foam aspect at all times (White as soon as it is formed).
- Do not over feed the separator.
- Do not add more than 40% of water/oil.
- Temperature of water between 35-38°C. Never colder than the oil.
- Constant flow of oil and water.
- Regulate discharge times (1-2 hours).
- Maintain clean all parts.
Settling

- Maintain oil in settling for 24-48 h.
- Drain settlings every two hours.
- Remove foam every six hours.
- Avoid contact with open air or light.
- If we drain more than 1% settlings for total oil produced we have to check the separator.
- Maintain temperature above 18ºC.
- Check acidity and peroxides before sending to final tank.