Enzymatic oil extraction from olive pomace

For more than 2000 years olive oil has been known for its nutritional properties. With an increasing awareness of the need for healthy food, the consumption of olive oil has been steadily rising over the years.

Viscozyme® L and Celluclast® 1.5 L increase the oil yield of the olive pomace. They improve the breakdown of the cell wall, destabilise the oil-water emulsion and facilitate easier separation.

Enzymatic treatment also improves the quality of the oil since the risk of rancidity is reduced due to increased extraction of polyphenols and vitamin E. An additional effect is that the wastewater will be easily biodegradable. Enzymes are processing aids and are water soluble; therefore they are not present in the final product.

Benefits
The key benefit of using Viscozyme L and Celluclast 1.5 L in olive oil production from pomace is:

- **Increased yield during oil recovery:** Depending on conditions and raw material, as much as an additional 10 kg/ton of olive pomace can be obtained using Viscozyme L.

Additional benefits are:
- **Improved oil quality from pomace:** Higher quality oil with minimal acidity and reduced level of free oleic acid is created because no organic solvents are used. Therefore there is a significantly reduced risk of Polycyclic Aromatic hydrocarbons (PAHs) formation.

- **Reduced rancidity:** Increased preservation of the oil against rancidity due to the higher content of polyphenols and vitamin E (tocopherol) which are created by the gentle enzymatic treatment process.
• **No organic solvent extraction**: Extraction by means of organic solvents is not necessary, no caustic soda is needed during refining.

• **Improved use of equipment**: Smoother operation of the decanter and centrifuge due to the emulsion breaking action of Viscozyme L and Celluclast 1.5 L. The separation stage is considerably quicker as a result of the fast and clear differentiation of the oil and water phases.

• **Lower oil content in process water**: Due to easier separation prior to centrifugation, the process water contains less oil and total solids are reduced. Due to the enzymatic degradation of carbohydrates into fermentable sugars, the biodegradability of the wastewater is improved.

**Increased yield during oil recovery from pomace:**
Industrial trial results in practical example oil extraction from olive pomace:

<table>
<thead>
<tr>
<th>Oil content of the pomace at the entrance of the malaxer in %</th>
<th>Oil content of the pomace at the exit of the decanter in %</th>
<th>Increased amount of extraction oil due to the enzymes in %</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.00</td>
<td>2.90</td>
<td>0 (control without enzymes)</td>
</tr>
<tr>
<td>2.60</td>
<td>1.60</td>
<td>38</td>
</tr>
<tr>
<td>2.60</td>
<td>2.00</td>
<td>23</td>
</tr>
<tr>
<td>2.30</td>
<td>1.40</td>
<td>39</td>
</tr>
<tr>
<td>2.60</td>
<td>2.20</td>
<td>15</td>
</tr>
</tbody>
</table>

**Conditions:**
Dosage: 100ml Viscozyme L / ton of cake
Pomace mash flow: 3 tons per hour
Holding time: minimum one hour
Temperature: 40-45°C

**Safety, handling and storage**
Safety, handling and storage guidelines are provided with the product.

**Products**
Viscozyme L is a natural enzyme preparation produced by the fungus *Aspergillus aculeatus*. Viscozyme L contains, beside the different pectolytic activities, various side activities, such as hemicellulases and cellulases. These enzyme activities are naturally present in small amounts in the cell of olives and are responsible for the softening of the fruit during maturation.

Celluclast 1.5 L is a natural enzyme preparation produced by the fungus *Trichoderma reesei*. Celluclast 1.5 L is a cellulase supporting the enzymatic cell wall break down and together with Viscozyme L leads to a synergistic effect. There is more information about the above-mention products available at the Customer Centre.
Performance
Inside the olive cell the oil is found in large droplets in vacuoles and in small droplets in the cytoplasm.

When Viscozyme L is added to the pomace, the enzymes break down the cell walls, thus liberating additional amounts of oil which would not be accessible to a mechanical treatment or solvents alone. The second effect of the enzyme is the destabilization of the oil-water emulsion.

Usage
A diluted enzyme solution (if possible 10% in cold clean tap water) is added by a dosing system (a simple pump is recommended) directly into the mixing tank prior to the separation step (centrifuge).

Viscozyme L and Celluclast 1.5L are working optimally at the natural pH of the olive pomace.

All parameters are highly dependent on the olive quality, variety, ripeness and the process equipments used.

Flow chart of Olive Oil Pomace Processing
Safety, handling and storage
Safety, handling and storage guidelines are provided with the product.