Technology #1
Fermentation of used cooking oils (UCOs)

Description
Waste cooking oil is a rich carbon source for bacteria, which is utilized in their metabolism to synthesize the fully biodegradable, non-toxic and biocompatible P3HB (a Polyhydroxyalkanoate - PHA). It has applications in cosmetics, biomedicine, packaging, agriculture and in 3D printing.

Bacteria are able to produce up to 0.70 kg of PHA out of 1 kg of UCO.

One of the advantages of implementing a technology for UCOs valorization is that it is not required to start the selective collection of the oil from scratch.

Innovation keys for the environment
- Production of a high-added-value product (much higher than biofuels) in a growing market sector.\(^1\)
- Reduction of the use of fossil-based polymers and virgin plastics
- Contributing to increasing the use of used cooking oil, which is harmful to the environment when disposed of inappropriately.

Biowaste feedstocks
Used cooking oil and other oily industrial waste streams (i.e., sludge palm oil)

Bioproducts

<table>
<thead>
<tr>
<th>Bioproduct(s)</th>
<th>Market sector</th>
<th>Market price</th>
</tr>
</thead>
<tbody>
<tr>
<td>PH3B</td>
<td>Cosmetics</td>
<td>35 000 Eur/t</td>
</tr>
<tr>
<td></td>
<td>Biomedicine</td>
<td>50 000 Eur/t - 100 000 Eur/t</td>
</tr>
<tr>
<td></td>
<td>Bioplastic</td>
<td>4 780 Eur/t</td>
</tr>
</tbody>
</table>

Process flowchart
- Used cooking oil
- Fermentation
- Polymer isolation
- Biopolymer
- Post-processing
- Cosmetics
- Wound dressing
- Packaging
- Fertilizer
- Biomass residue (to biogas plant)

Legend:
- Biowaste feedstock
- Process input
- Process step
- Bioproduct

The HOOP project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement N°101000836.
### Existing production plants

<table>
<thead>
<tr>
<th>Production plant location</th>
<th>Feedstock</th>
<th>Bioproduct</th>
<th>TRL</th>
<th>Production capacity (ton/year bioproducts)</th>
<th>CAPEX</th>
<th>OPEX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial plant in Ostrava, Czech Rep.</td>
<td>UCOs</td>
<td>PH3B</td>
<td>9</td>
<td>(45000 L/y producing 35 t PHA/y; expected to increase to 227500 L/y producing 175 t PHA/y.)</td>
<td>CAPEX &gt; 1M€ (7,3 mil Euro for prod. capacity 175 t PHA/y)</td>
<td>11,2 Euro/kg for production capacity 175 t PHA/y</td>
</tr>
</tbody>
</table>

### Acknowledgements

WaysTup!  
waystup.eu  
Biossupack  
biosuppack.eu

### Further information

(1) Nowadays, about 90 % of used cooking oils (UCOs) collected is destined to biodiesel production.


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