

# MedClean Propre Limpio



No. 111

Pollution prevention case studies

## Integral treatment of the solid and liquid waste produced during the olive oil extraction process

<b>Company</b>	Trainalba SL and the technological center for R+D+i Fundació Cartif.
<b>Industrial sector</b>	Agroindustrial wastes.
<b>Environmental considerations</b>	<p>30 years ago, the Spanish olive oil extraction industry, "Olive Mills", has moved from traditional (press systems) to continuous systems using horizontal centrifuges (3-phase decanters) to extract the olive oil. From the '90, this industry has suffered again important changes going from the 3-phase extraction systems to the 2-phase ones which, nowadays is the most used system in Spain (90%).</p> <p>The three extraction systems used in the olive oil industry produce a solid by-product, named pomace which is classified as follows:</p> <ul style="list-style-type: none"> <li>- Press pomace, with a moisture content between 25 and 35% and an oil content between 4-7%.</li> <li>- 3-phase pomace with around 45% moisture content and 2-3% oil content.</li> <li>- 2-phase pomace (ALPERUJO) with around 70% moisture content and 2-3% oil content.</li> </ul> <p>Nowadays, the ALPERUJO, is going through a second centrifugation (in 2-phase decanters) in the mills, obtaining between 40 and 60% of the oil left. Afterwards, it is brought to the secondary extraction factories where, after being dried until 8% moisture by providing high calorific values, the oil left is extracted with solvents (mostly hexane) and the water is lost as vapor into the atmosphere.</p> <p>The ALPERUJO has high organic material content but also toxic compounds such as polyphenols, polyalcohols and volatile fatty acids. It also contains dissolved sugars which make difficult the oil extraction process at the secondary extraction industries due to the paste caramelization, which favors the formation of hexane bags into the dryers avoiding its evaporation and producing high risks of explosions at the industries.</p>
<b>Company background</b>	<p>Trainalba SL together with the technological center R+D+i Fundació Cartif, after studying the by-products generated due to the change in the extraction process from 3 to 2-phase systems, have designed an integral treatment of the liquid and solid wastes generated during the olive oil extraction process and have built a treatment plant in Baena (Córdoba.)</p> <p>The treatment developed by Trainalba and Fundació Cartif consists of 3 stages:</p> <ol style="list-style-type: none"> <li>1. Mechanical drying of the solid waste (the ALPERUJO) in a 3-phase decanter, in case the mill does not include this step.</li> <li>2. Quick solids separation of the liquid waste by means of physico-chemical processes.</li> <li>3. Vacuum evaporation and condensation of the remaining liquid waste, obtaining: 1) irrigation water or water to be poured into natural water courses following the legislation, and 2) concentrate useful to elaborate liquid fertilizers.</li> </ol>
<b>Summary of actions</b>	<p>Trainalba SL and Fundació Cartif recommend to the mills the first stage of the treatment process:</p> <ul style="list-style-type: none"> <li>- Make the second centrifugation in a 3-phase decanter to obtain, instead ALPERUJO with 70% moisture content, 3-phase pomace with 45% moisture content, reducing the transport and drying expenses, and favoring the extraction by the secondary extraction factories.</li> </ul>

## Diagrams

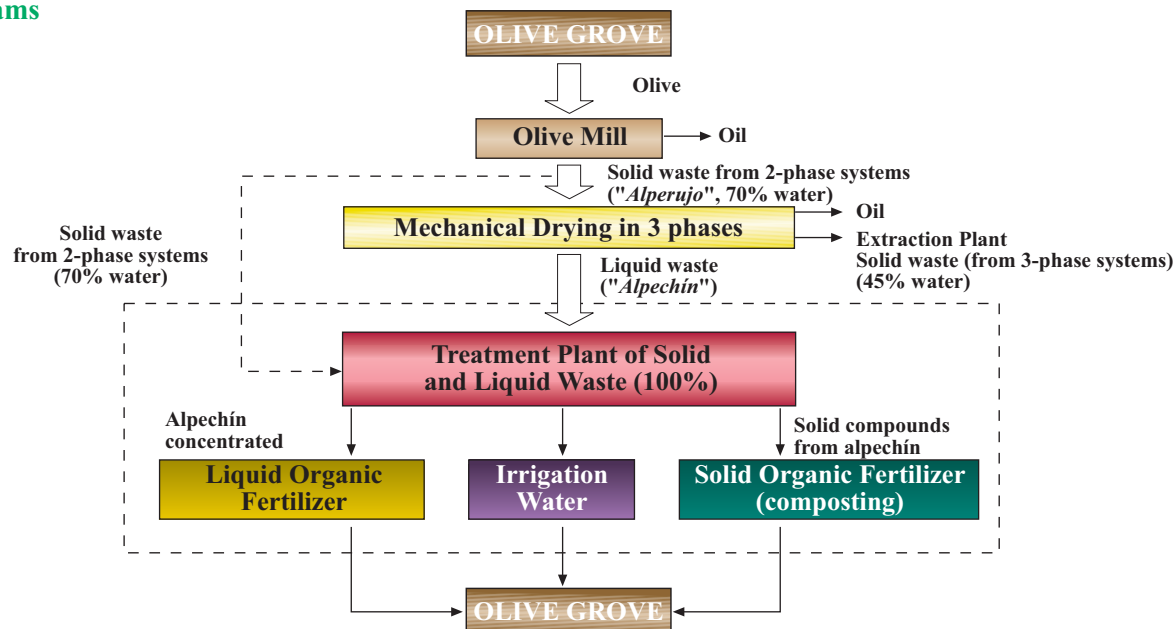


Diagram 1: second centrifugation at the mill, in a 3-phase decanter and later treatment of the remaining water for its re-use as irrigation water

## Balances

<b>Proposal benefit</b> (€/100t milled olives)	Transport savings	277.76 €
	During the pomace drying process and selling the dried pomace obtained	689.61 €
<b>Investment costs</b>	3-phase decanter (Alfa Laval). Capacity 100t/day	150,000 €
	Storage basins construction for the storage of the liquid waste (Alpechin) produced (12€/m <sup>3</sup> )	476.16 €
	Treatment cost of the liquid waste (3€/m <sup>3</sup> )	119.04 €
<b>Payback period</b>	By milling 15.567,5 t olives	156 working days for a mill with 100t/day capacity

## Conclusions

In this example there are involved two important industries of the olive oil extraction sector, the mills, and the secondary extraction factories. In addition, it is important to enhance the environmental benefit of recovering the water, instead losing it as vapor. 50% of the water involved in the process is recovered (47% of the olives constitution water and 50% of the olives washing water added). This means, for every 100t milled olives it is possible to recover 35m<sup>3</sup> water as irrigation water.

Funding this example to minimize the waste produced, is the most difficult part, since both, mills and secondary extraction factories, obtain benefits from the results. Although, the secondary extraction factories are the ones that obtain more profit, because the drying expenses are considerably reduced (38%) and its income by selling the dried pomace increases considerably, 60%. Furthermore the transport expenses to the secondary extraction factories are reduced in 40%.

Therefore, in order that the mills take advantage from the necessary modifications to include in its installations, the pomace price charged to the secondary extraction factories should be increased, at least, in 5.50€/t pomace, which is the saving registered for the secondary extraction factory during the drying process.

**NOTE: This case study seeks only to illustrate a pollution prevention example and should not be taken as a general recommendation.**



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