The Olive Oil Sector and climate change mitigation

The olive oil sector presents interesting options to improve its energy balance, to improve its production processes and to reduce its greenhouse gases emissions.

There can be identified three major opportunities to mitigate their emissions. Reducing emissions from the fossil fuel use, emphasizing on energy recovery from the process by-products generated, the electricity and heat production from cogeneration, and finally, optimizing the energy efficiency systems.

The biomass by-product generated in the olive oil manufacturing processes can be used as an alternative fuel. From the environmental and energetic point, it is highly recommended the use of biomass fuels instead of the fossil fuels.

In some cases special boilers are required, and although their cost is higher than the conventional fossil fuels, usually the investment payback period is smaller

Production processes and emission sources

OIL MILLS

- Electricity consumption in the pressing and handling phase, which generates indirect emissions.
- Heat treatment process in the olive oil extraction. Fuel is often the pomace and wet pomace, which is a highly recommended practice..

EXTRACTION INDUSTRIES

- Energy consumption in drying wet pomace. It is often used pomace and wet pomace as fuels.

REFINING INDUSTRIES

- Little impact on greenhouse gases emissions.

BOTTLINGS

- Little impact on greenhouse gases emissions.

Proposal of mitigation alternatives of gas emissions with greenhouse effect in the olive oil sector

ALTERNATIVE FUELS USE

- Uses of pomace: The pomace is the rest from the olive oil extraction and it has a high amount of moisture and a paste texture.

  - Using the pomace as fuel we can reach several environmental benefits:
    - Contaminating waste disposal.
    - Greenhouse gases emissions, which are considered neutral.
    - External fuel supplies independence.

  - Methane use:
    - There are some commercialized techniques that induce the methanization.
    - Methane is a biogas: their greenhouse gas emissions are considered neutral.
    - Needs a high production volume to be economically viable.

- Using leaves and pruning remains: Use of biomass, so their emissions are considered neutral.

COGENERATION

- Needs a high production volume to be economically viable.

FOSSIL FUELS REPLACEMENT

- Where biomass can not be used, it's recommended to use fossil fuels with a lower greenhouse gas emission potential. For example: use natural gas instead of butane, propane or oil.

ENERGY SISTEM EFFICIENCY OPTIMIZATION

- Oil mills temperatures adjust and control.
- Optimizing energy in the wet pomace drying.
- Periodic maintenance and regular equipment and facility cleaning.
- Emissions control.
- Using energy-efficient equipment.
- Workers awareness.








Case study:
Trainalba SL and Cartif Foundation (Spain)

(Source: MedClean-111)

Trainalba, S.L., an olive oil extraction industry, together with the technological centre R+D+I Fundación Cardif "Olive Mills", has moved from traditional(press systems) to continuous systems using horizontal centrifuges (3-phase decanters) to extract the olive oil.
After studying the by-products generated due to the change in the extraction process from, 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.)The treatment developed by Trainalba and Fundación Cartif consists of 3 stages:

1. Mechanical drying of the solid waste (the ALPERUJO) in a 3-phase decanter, in case the mill does not include this step.
2. Quick solids separation of the liquid waste by means of physico-chemical processes.
3. Vacuum evaporation and condensation of the remaining liquid waste, obtaining:
   a. irrigation water or water to be poured into natural water courses following the legislation, and
   b. concentrate useful to elaborate liquid fertilizers

GENERAL MEASURES TO REDUCE EMISSIONS

Trainalba SL and Fundación Cartif recommend to the mills the first stage of the treatment process:

- Make the second centrifugation in a 3-phase decanter to obtain, instead ALPERUJO with70% moisture content, 3-phase pomace with 45% moisture content, reducing the transport and drying expenses, and favouring the extraction by the secondary extraction factories.
- Separation of solid waste (pomace) from wastewater (OMW).
- Vacuum Evaporation of liquid waste (OMW), obtained from irrigation water and concentrate for the generation of fertilizers. Every 100 tons of pressed olives can obtain 35 m^3 of water.
- 50% of the water involved in the process is recovered, this means that for every 100t milled olives it is possible to recover 35m^3 water as irrigation water.

INVESTMENT COST AND AMORTIZATION

Proposal benefit (€/100 t milled olives)	**Transport savings**	**277.76€**
	During the pomace drying process and selling the dried pomace obtained	**689.61€**
Investment costs	**3-phases decanter (Alfa Laval) Capacity 100 t/day**	**150,000€**
	Storage basins construction for the liquid waste (Alpechín) storage produced (12€/m^3)	**476.16€**
Payback period	**Liquid waste treatment cost (3€/m^3)**	**119.04€**
	By milling 15,567.5 t olives	**156 working days for a 100t/day capacity mill**