BIOFIT
Bioenergy Retrofits for Europe's Industry

HORIZON 2020
BIOFIT PROJECT

BEST PRACTICE
FACTSHEET

RETROFIT OF VOLOS BIODIESEL PLANT (GREECE)

KEY INFORMATION

Plant owner:	Elin Verd
Plant name:	Elin Verd biodiesel plant
Location:	Volos, Greece
Industry sector:	1st generation biofuels
Main product of plant:	biodiesel
Retrofit measure:	**remodeling, expansion and process optimization of whole plant**
Beginning of retrofit:	2013
Start-up after retrofit:	2014
Capital Expenditure:	3.86 Million EUR

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TECHNICAL DATA

	INITIAL STATE	AFTER RETROFIT
Capacity of main product (biodiesel) [t/y]	**80,000**	**33,000**
Main feedstock	**Vegetable oil**	**Animal fats and cooking oil**
Calculated annual GHG emissions [tCO_2eq][1]	**45,180**	**15,090**
Estimated annual specific GHG emissions [$tCO_2eq/t_{main\ product}$]	**1.506 $tCO_2eq/t_{biodiesel}$**	**0.503 $tCO_2eq/t_{biodiesel}$**

[1] Calculated as the product of the annual specific GHG emissions and the annual biodiesel production (assumed equal to a reference value of 30.000 tonnes/year)

INITIAL STATE

In 2003 ELIN purchased 9.500 m^2 of land in the Volos Industrial Zone to build up a new biodiesel production plant. The design of the plant was assigned to the German company Petrotec Biodiesel GmbH. Initially the planned production capacity was 8,000 tonnes per year, but it was later decided to increase the capacity to 80,000 tonnes per year. The plant was completed in 2007 and started operation in 2008.

"The biodiesel distillation process guarantees a high quality biodiesel, even from inferior quality raw materials."

RETROFIT

MOTIVATION AND DECISION

The aim of the retrofit project was to increase both the raw material flexibility and the quality of the final biodiesel product via the remodeling, expansion and process optimization of the existing biodiesel plant. The goal of Elin was to change the feedstocks from vegetable oils to mainly cooking oils and animal fats.

PLANNING AND EXECUTION

The Austrian company BDI was contracted for the retrofit commission, worth € 3.86 million, at the beginning of 2013. During the retrofit two process steps were added, the acid esterification unit and the biodiesel distillation unit. The main challenge of the retrofit was the integration of the BDI system in a biodiesel technology from a different manufacturer, without adverse effects on the ongoing biodiesel production. The project was handed over to Elin Biofuels on time and on budget. The retrofitted plant started operation in December 2013, applying the new production process. Used cooking oil and animal fats can now be used as feedstock for high-quality biodiesel. The production capacity of the facility when waste oils and fats are used is 33,000 tonnes per year.

2007 BEGIN OF PRODUCTION AT THE VOLOS PLANT

2012 DECISION ON PLANT RETROFIT

2013 START OF RETROFIT WORK

2013 RETROFITTED PLANT STARTS OPERATION

CURRENT STATE

The production process is divided into several steps. First of all the used cooking oil undergoes a purification process to meet the process specifications standards. The purified oil (highly acidic) is then sent to the esterification unit, which turns the free fatty acids into methylesters, resulting in a mixture of fatty acid methylesters and low acidity oil. Afterwards, a transesterification reaction in presence of excess methanol and a basic catalyst (potassium methoxide) produces fatty acid methyl esters (biodiesel).

The product contains numerous compounds (such as methanol, soaps, catalyst, water) that are removed in the final steps of the process. In the refining unit three washing steps are carried out, so that the levels of water, methanol and remaining catalyst fulfill the EN14214 specifications. In the distillation unit heavy components (such as polymerized fatty acid methyl esters) or traces of sulfur are removed, to achieve the final product, which is stored in 6 tanks, (125 m^3 each). The whole process is controlled by a fully automated optical monitoring system.

Additional units to treat the by-products and the process water are the glycerine purification unit, the methanol rectification unit and the water recuperation unit.

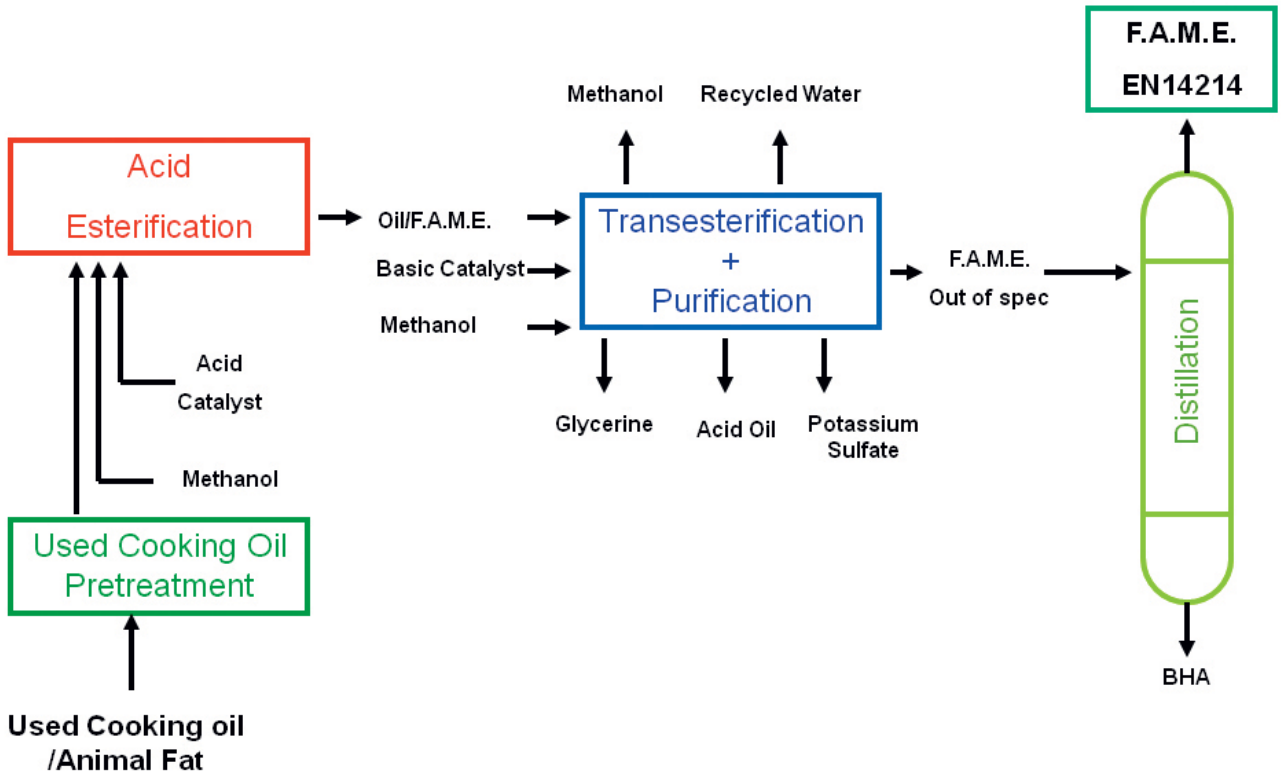

Figure: courtesy of ELIN Verd

IMPACT

As the tailpipe CO_2 emissions of biofuels are not counted in LCAs, biofuels produced from biomass cause between 50% and 90% less GHG emissions than fossil fuels. GHG emissions of biofuels stem from inputs during their cultivation, harvesting, transport and conversion. The use of waste materials such as used cooking oil and animal fats further reduces the GHG emissions of the resulting biofuels, to reach or surpass 90%. The environmental benefit is twofold, first the GHG gas emissions avoided, and second the recycling of waste materials which else would have been disposed to the environment.

"The objective of upgrading and modernizing the existing biodiesel plant for better quality, efficiency and raw material flexibility has been reached."

SOURCES

https://elinverd.gr/

https://elinverd.gr/en/about/#history

http://www.biodieselmagazine.com/articles/9537/bdi-completes-retrofit-of-10-mmgy-biodiesel-plant-in-greece

https://elinverd.gr/en/activities-biofuels-production-biodiesel/

MORE INFORMATION ABOUT THE ELIN PLANT

Website https://elinverd.gr/ Contact info@elinverd.gr

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THE BIOFIT PROJECT

BIOFIT
Bioenergy Retrofits for Europe's Industry

This best practice factsheet was prepared within the BioFIT project.
The project aims to facilitate the introduction of bioenergy retrofitting in Europe's industry.
Target industries are

- First-generation biofuels
- Pulp and paper
- Fossil refineries
- Fossil firing power
- Combined Heat and Power (CHP)

Success factors of the best practice case studies are used as basis to develop **10 concrete bioenergy retrofitting proposals** (2 per industry sector) and to facilitate the two-way dialogue with industry in dedicated working groups. The overall target is to integrate bioenergy and biofuels in existing industrial installations and encourage others to follow the existing examples.

Project website https://www.biofit-h2020.eu Contact reumerman@btgworld.com

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