BIOFIT

Bioenergy Retrofits for Europe's Industry

HORIZON 2020
BIOFIT PROJECT

BEST PRACTICE
FACTSHEET

RETROFIT OF PORTO MARGHERA REFINERY (ITALY)

KEY INFORMATION

Plant owner:	ENI S.p.A
Plant name:	ENI refinery at Porto Marghera
Location:	Porto Marghera (Venice), Italy
Industry sector:	Fossil refineries
Main product of plant:	Green Diesel (HVO)
Retrofit measure:	**retrofit of plant to change feedstock from petrol to vegetable oils**
Beginning of retrofit:	2013
Start-up after retrofit:	2014
Capital Expenditure:	130 Million EUR

Copyright of photos: ENI

TECHNICAL DATA

	INITIAL STATE	AFTER RETROFIT
Main feedstock	**Oil**	**Vegetable oil, cooking oil**
Main product	**Transportation fuels**	**Green diesel, Green Naphtha. Green LPG, Green Jet**
Capacity of main product [t/y]	**360,000**	**360,000***
Estimated annual GHG emissions [tCO_2eq]	**Not available**	**Not available**
Estimated annual specific GHG emissions [$tCO_2eq/(t_{main\ product})$]	**Not available**	**Not available**

* will be increased to 560.000 t/year in 2021

INITIAL STATE

The Venice Refinery, located in the industrial area of Porto Marghera, was built in 1926, during the first industrialization of the area. Because of the damages suffered during the Second World War, the refinery was completely rebuilt in 1947. In 1978 the refinery became property of ENI. Crude oil was refined to produce transportation fuels such as petrol, diesel, LPG, and naphta.

"ENI's Green Refinery project at Porto Marghera is the world's first example of the conversion of a conventional refinery into a bio-refinery able to transform organic raw materials into high quality biofuels."

RETROFIT

MOTIVATION AND DECISION

ENI had planned to close the refinery of Porto Marghera in order to reduce the excessive number of existing plants and the consequent overproduction of refined fuels in a market that from 2008 onwards registered a 20% drop in fossil fuel consumption. The costs for refining oil and producing fuels for ENI's distribution network were too high. In addition, ENI had five refineries in Italy and the closure of that of Venice seemed obvious. But after the development of the Ecofining™ process (patented by ENI), the management board estimated that, with a limited investment, it would be possible to convert the oil refinery to the production of biofuels.

PLANNING AND EXECUTION

The retrofit of the refinery focused on the repurposing of the catalytic hydrodesulphurisation section. The retrofit started in 2013 and the production of biofuels started in 2014, with an initial capacity of 360.000 tonnes per year. Since June 2018 a new purification plant allows to import raw (rather than pre-treated) vegetable oils and to significantly increase the share of animal fats. In 2021, with an upgrading of the plant, ENI expects to increase the processing capacity to 560,000 tonnes of oils per year, with increasing shares of waste oils, animal fats and by-products of palm oil processing.

1978 REFINERY BECOMES PROPERTY OF ENI

2008 PLAN OF CLOSING REFINERY

2013 START OF RETROFIT WORK

2014 RETROFITTED PLANT STARTS OPERATION

2021 PLANNED UPGRADE OF PLANT

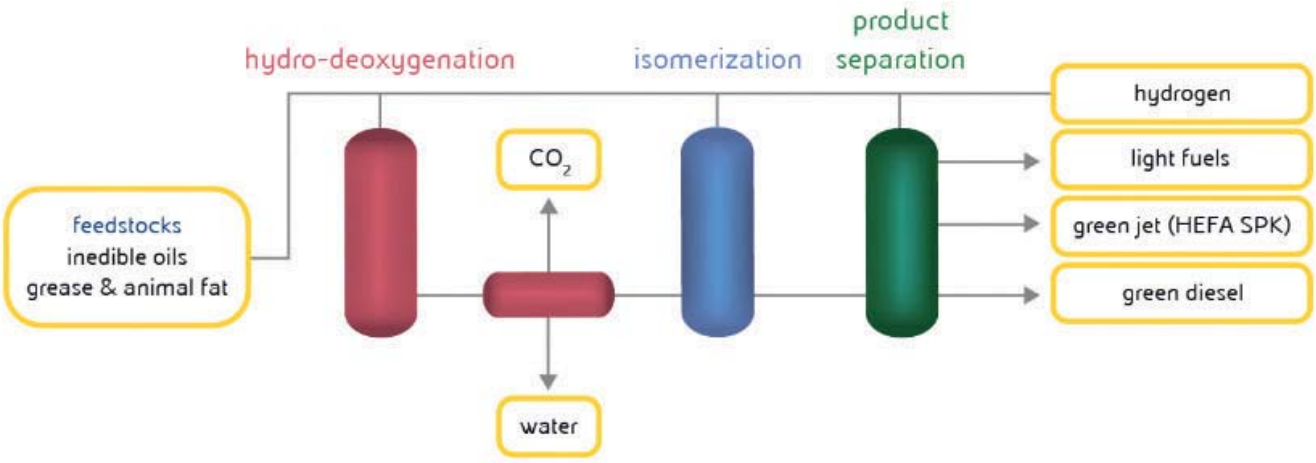
CURRENT STATE

ENI developed a new hydrotreatment process called Ecofining™ to produce biofuels, mainly Green Diesel (HVO) but also Green Jet, Green Naphtha and Green LPG. The process consists of two stages.

1. The biological feedstock is completely deoxygenated under hydrogen partial pressure, producing a mix of linear paraffins.
2. The mix of linear paraffins is then isomerized on proprietary catalyst to the final products.

Since 2014 the process is used to produce Green Diesel from palm oil. In 2016 ENI started production of the Eni Diesel+, which includes a 15% fraction of second generation feedstocks (animal fats, used cooking oils and agricultural waste).

The green diesel produced at the refinery is used by the public transportation fleet of the city of Venice and all cooking oils from the city are supplied to the refinery. Moreover ENI has recently signed a deal with the National Consortium for collection and treatment of used oils (CONEA), who will encourage the member companies to send used oils to the refinery. Green Naphtha is currently under testing by the Italian Navy and the US Navy. The use of third generation feedstock (oils from algae or waste) is under development at ENI's Gela refinery, which is currently undergoing the same retrofit as the Venice refinery (change from oil refinery to biorefinery).



STAGE 1: DEOXYGENATION UNDER HYDROGEN

- REACTIONS
  - CRACKING OF TRIGLYCERIDES STRUCTURE
  - OIL DEOXYGENATION
  - SATURATION OF DOUBLE LINKS
- PRODUCT: PARAFFINS
- BYPRODUCT: PROPANE

STAGE 2: ISOMERIZATION OF PARAFFINS

- REACTIONS
  - CRACKING OF PARAFFINS
  - ISOMERIZATION OF PARAFFINS
  - PRODUCT: GREEN DIESEL
- BYPRODUCTS: GREEN PETROL AND GREEN LPG

Scheme of the hydrotreatment process, which follows the pretreatment of the feedstocks (Copyright of Figure: ENI)

IMPACT

For ENI, the retrofit of the Porto Marghera refinery is not only of environmental and technological significance, but also of economic and social importance, since it allows giving new life to the plant and guaranteeing continued employment through innovation. Reusing an existing structure instead of building a new one offers considerable savings at the investment level.

"This is the first time that ENI has implemented the circular economy in the refining sector."

SOURCES

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MORE INFORMATION ABOUT THE ENI REFINERY

Website www.eni.com
Contact www.eni.com/en_IT/contacts/contacts.page

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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