Ecofining™: turning organic waste and 2nd generation agrifeedstock into biofuel

R&D BP EE: Bio-Fuel and Next Generation Downstream (BIFGD)

Marco Masiero - San Donato Milanese, 2023 February 27th

Biorefineries and expansion strategy

ENI BIO-REFINERY SYSTEM

VENICE BIO.REFINERY (2014)

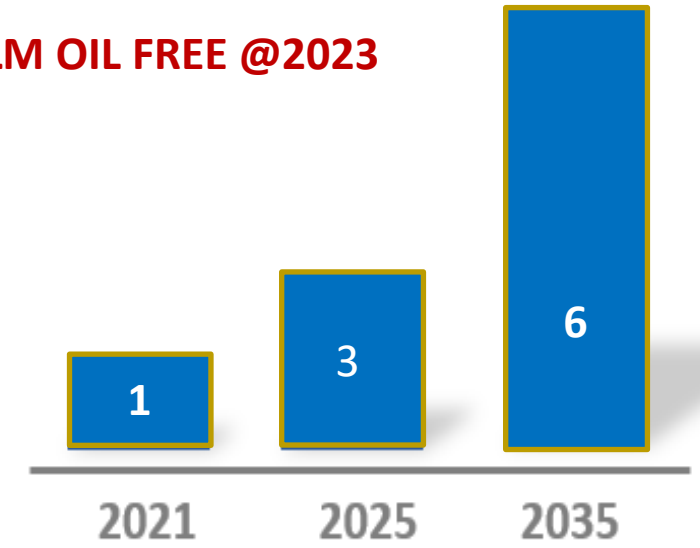
- **Capacity:** 0.4 Mt/y
- **Products:** Renewable Diesel, Ren. Naphtha and LPG

GELA BIO.REFINERY (2019)

- **Capacity:** 0.7 Mt/y
- **Products:** Renewable Diesel, Naphtha, LPG

EXPANSION STRATEGY – ORGANIC GROWTH (Mln t/y)

PALM OIL FREE @2023



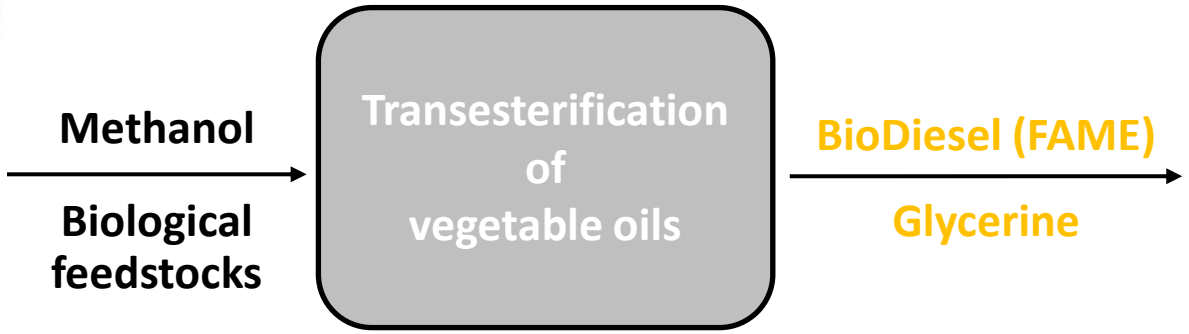
KEY HIGHLIGHTS

- *The Venice refinery was the first conventional refinery in the world to be converted into a biorefinery **(2014)***
- *The Gela biorefinery was started up in August **2019***
- *In **2020**, the installed capacity of Eni's biorefineries reached 1 Mln t/y*
- *Eni's strategy is to increase biorefining capacity up to 6 Mln t / y in 2035 with a worldwide presence*
- *Biorefineries will play a key role in aiming for Eni to **achieve net zero emissions by 2050***

(1) Sustainable Aviation Fuel – Also known as Renewable Jet Fuel

Biodiesel process: Conventional vs. New generation

Conventional



Features

- Process temperature: 50 – 100 °C
- Process pressure: atmospheric
- Blending wall: max 7%

Poor integration within petroleum refinery (need of dedicated infrastructure for production, storage and distribution)

New generation

Features

- Process temperature: 270 – 350 °C
- Process pressure: 40 barg
- Blending wall: **it can be use in purity**

Ecofining^{TM}: feedstocks

First Generation

Crude and refined vegetable oil

Conventional feedstocks in competition with food

Rapeseed

Sunflower

Soybean

Palm

Second Generation or Advanced

Mainly feedstocks that does not compete with food

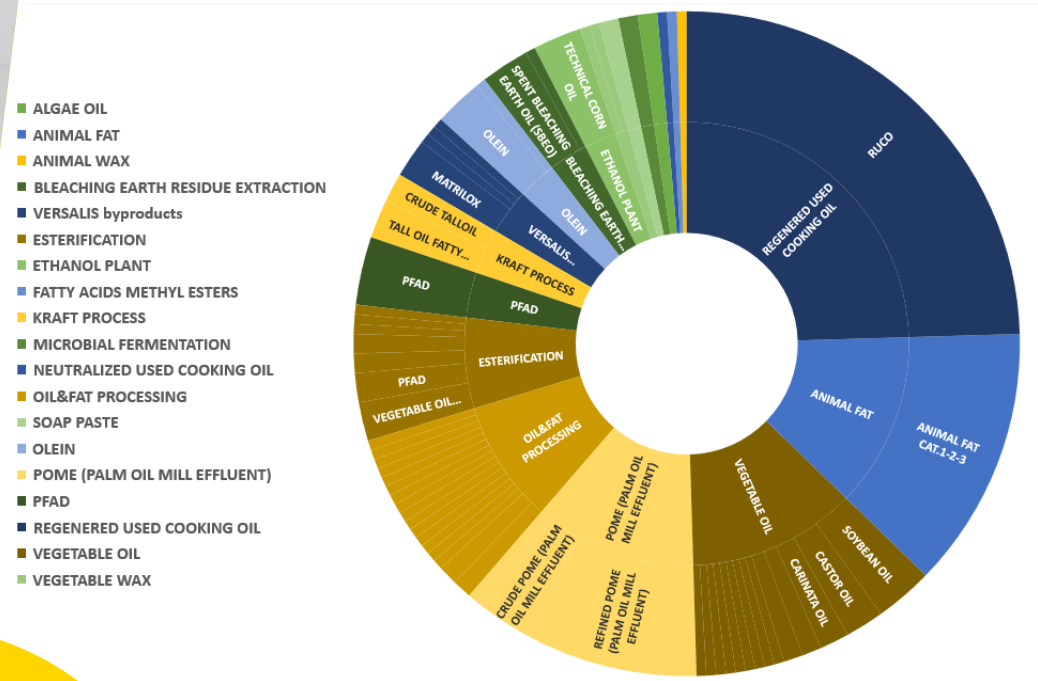
Waste cooking oil

Animal fats

Waste & Residues

No-food cultivation

ENI BIOFEEDSTOCK DATABASE



400+ biofeedstocks
Present so far:
Byproducts, vegetable oils, animal fats, R&D innnovative products

60 new samples
Analyzed every year

31 countries

70 relevant parameters
examined for each sample

Price range 50-180 % vs CPO
for main typologies

Strategic for new biofeedstocks evaluation and procurement

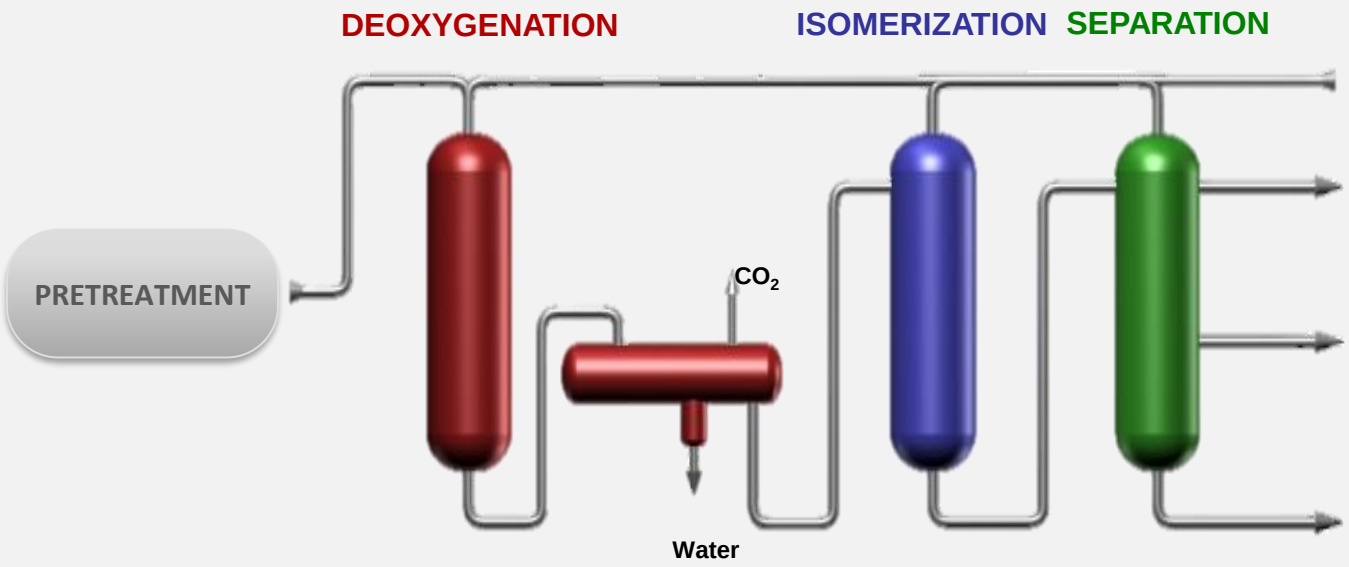
- Continuous scouting of new biofeedstocks
- Integrated activity with Trading, Supply, Circular Economy and Industrial Operations functions
- Information sharing with dedicated share point

Ecofining™ Technology

RAW MATERIALS

- 1ST GENERATION
- 2ND GENERATION
- 3RD GENERATION

ECOFINING™ PROCESS



1ST STAGE

- Contaminant removal
- Oxygen removal
- Hydrogenation

2ND STAGE

- Isomerization
- CRACKING
- Improving cold properties

BIOFUEL

- H_2
- BIO LPG E NAPHTHA
- BIOJET HEFA (SAF)
- RENEWABLE DIESEL (HVO)

HVO Quality

Properties	Fossil Diesel	FAME	HVO (Hydrogenated Vegetable Oil)
Oxygen, %	0	11	0
Specific weight	0.840	0.880	0.780
Sulphur, ppm	< 10	< 1	< 1
Heating value, MJ/kg	**43**	**38**	**44**
Cloud Point, °C	From 0 to -5	From -5 to +15	Up to -20
Polyaromatics, %wt	**< 8**	**0**	**0**
Cetane number	**51 – 55**	**50 – 55**	**75 – 90**
Oxidation Stability	Standard	Poor	Excellent

HVO: Hydrogenated Vegetable Oil

Eni Diesel+ e HVOlution

- Grazie alle innovazioni tecnologiche apportate alle Bioraffinerie di Venezia e Gela, l'**Eni Diesel + è l'univo carburante italiano taglio Diesel composto per il 15% da Hydrogenated Vegetable Oil (HVO)** prodotto attraverso oli vegetali. Dal **18 Gennaio 2016** l'**Eni Diesel +** è disponibile in oltre **3.500 Eni Stations.**

- **Ma la vera rivoluzione è che dal febbraio 2023, è disponibile HVOlution, l'HVO in purezza. HVOlution è già stato sperimentato con ottimi risultati** su mezzi pesanti, in ambito aeroportuale e su strada, autobus e treni, mentre nelle **Eni Live Station** è destinato principalmente all'utilizzo sui mezzi a trazione pesante