23/04/2024

Storia e Sviluppo della Tecnologia HVO in ENI:

Realizzazione degli Stabilimenti di Marghera e Gela

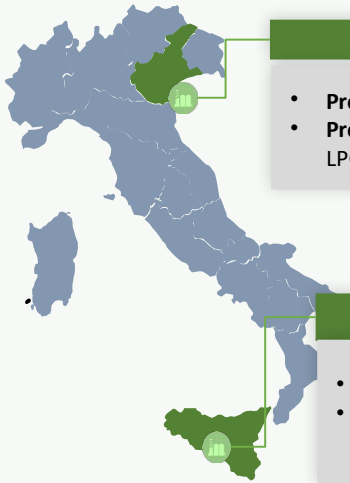
L. Alburno

enilive

Indice

ENI BIOREFINERIES SYSTEM AND CONVERSION MODEL

ENI BIOREFINERY SYSTEM



VENICE BIOREFINERY (2014)

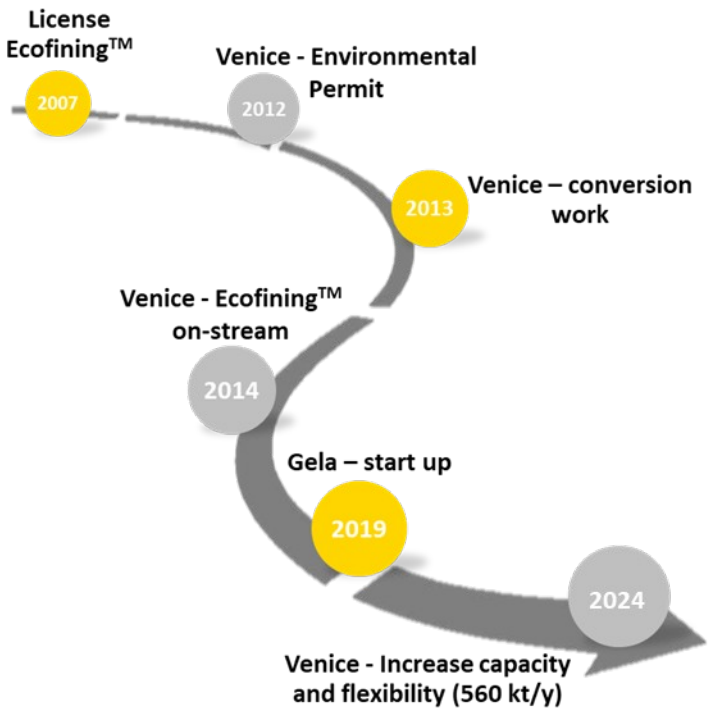
- **Processing capacity:** 360 kt/y (560 @2024)
- **Products**: HVO Diesel, HVO Naphtha e HVO LPG, HVO-Jet (@2024), Artic Diesel (@2024)

GELA BIOREFINERY (2019)

- **Processing capacity :** 750 kt/y
- **Products**: HVO Diesel, HVO Naphtha, HVO LPG, HVO-Jet (@2024), Artic Diesel (@2024)

PALM OIL FREE @2023

TECHNOLOGY DEVELOPMENT



CONVERSION MODEL

OPTIMIZING CAPEX AND SCHEDULE

REDUCE INDUSTRIAL ENVIRONMENTAL EMISSIONS

MAINTAIN LOCAL OCCUPATION

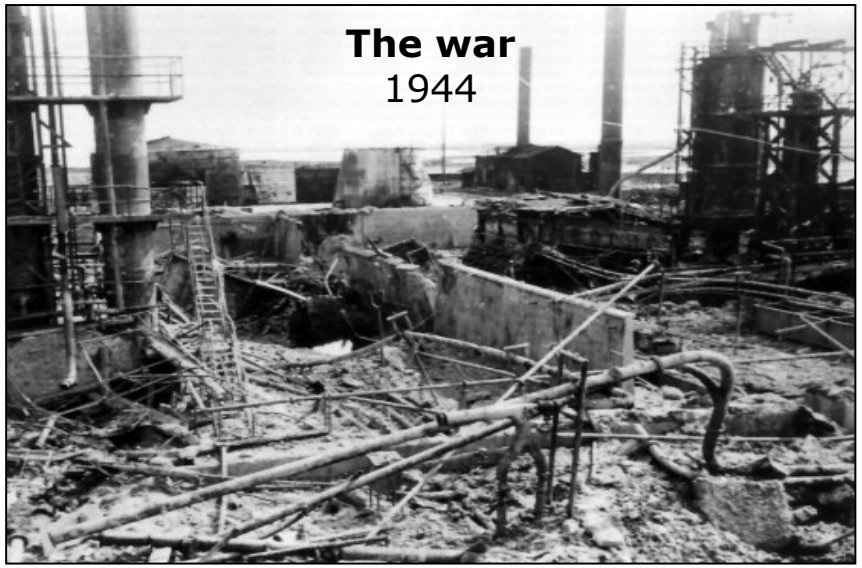
Venice Biorefinery assets

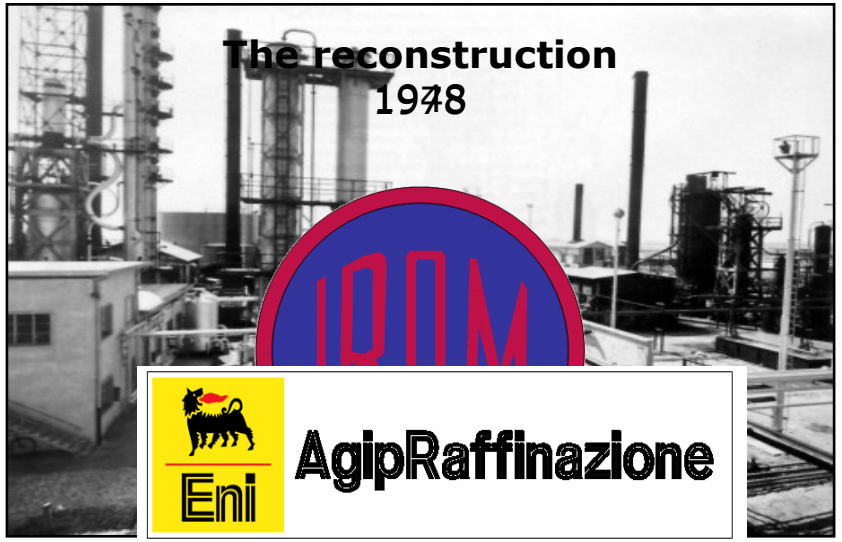
Venice Biorefinery

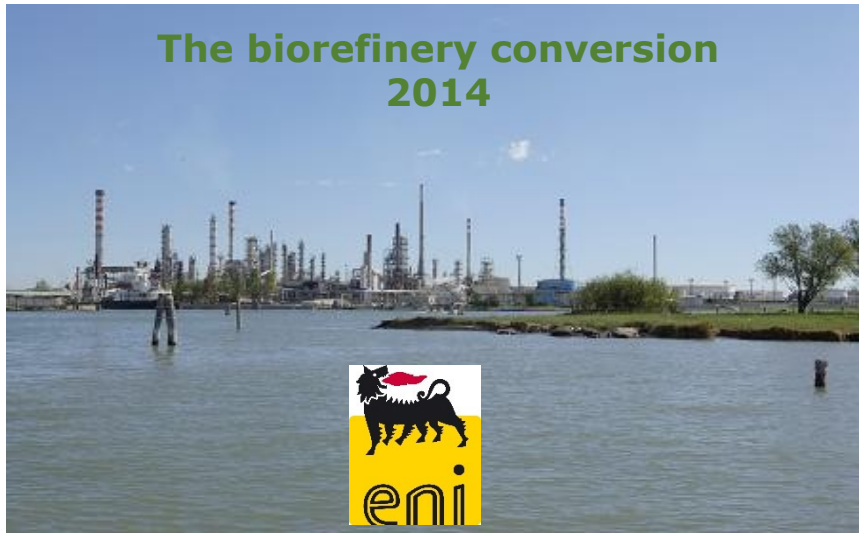
Identikit DATA

Refinery	*Start-up*	***may 2014***
	Capacity	***360*** *kt/y*
Personnel	*Employees*	***200***
	Third-party	***250***
Logistic Hub	*harbor*	***2***
	Stock	***1.25*** *Mm^3*
	Tank Tracks	***50*** *trk/day*
	Ship	***220*** *ship/y*
	Deliv. products	***4,5*** *Mt/y*

The history of Venice biorefinery







Biorefinery overall scheme

BIO

VIRGIN NAPHTHA → GASOLINE PRODUCTION → GASOLINE

GASOLINE PRODUCTION → H_2 → ECOFINING™

BIOMASS → ECOFINING™ → HVO PRODUCTS

BIO CONVERSION

FEEDSTOCK

Vegetable oils

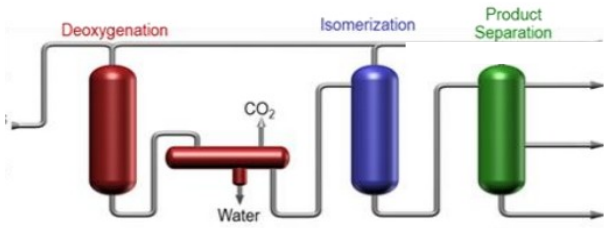
RUCO
(Regen.Used Cooked Oil)

Animal fats

Advanced feedstock

ECOFINING

Eni and UOP developed the ECOFINING™ Process:



BIOFUELS

- HVO GPL
- HVO NAPHTA
- HVO DIESEL
- BIOJET @2024

> NO BLENDING WALL <

* Hydrotreated Vegetable Oil

Gela Biorefinery assets

Gela Refinery Case

Eni Refining in Italy

The Refinery

The History

- **1959: ANIC Gela SpA.**
- **1992: Agip Petroli**
- **2002: Raffineria di Gela SpA**

…Reinventing petroleum refineries

- **2019: BioRefinery (Throughput = 750 kt/y)**
  CAPEX 300 M€
- **2023: Degumming upgrade startup**
- **2024: Biojet project startup**
  CAPEX 60 M€

Gela BioRefinery – Construction Project

Highlights

BioRefinery

- *Production Capacity 750 kt/y*
- *SU: July 2019*

Project Overview

- *New items: 250*
- *Large storage tanks revamping*
- *Logistics Upgrade*

Development

- *Total Construction Hours:* ***nearly 5*** **Million**
- *Dismantling works > 7000 t*
- *Erection Works > 3500 t piping*
- *Interconnecting: > 20 km*
- *Workforce Peak ~ 1300-1400 / daily*

Innovation

- *The reconfiguration aimed to revamp the desulphurization units to* ***Eni's proprietary Ecofining™ technology****. All ancillaries units are being reutilized with modifications.*
- *Second refinery conversion at a larger size than Venice, including new built section for alternative feedstock (BTU).*
- *The biorefinery is designed for treating advanced and unconventional loads up to 100% of capacity with a high operating flexibility.*

Pre-treatment and Ecofining Processes

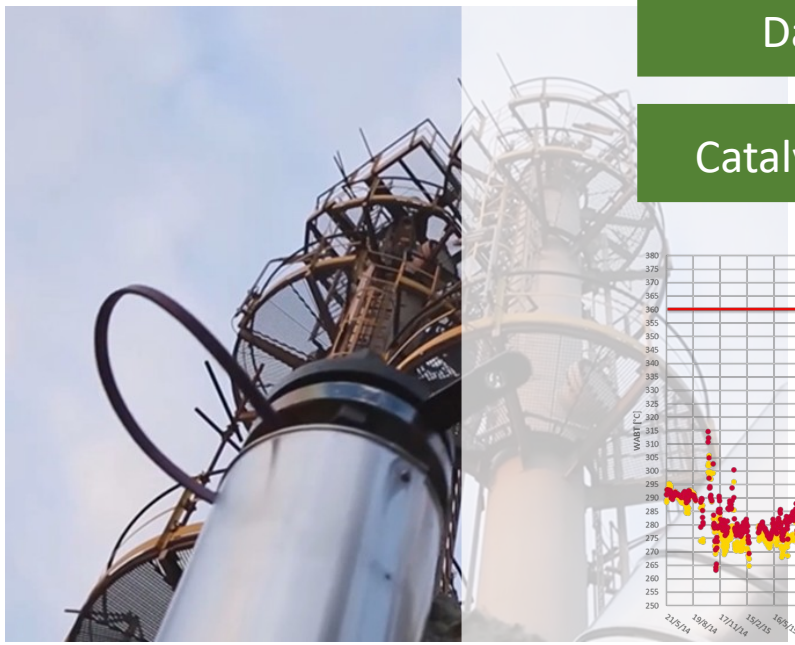
Main target for pollutant removal in pretreating

Pollutant	Target	Removal process
Phosphorous	2 ppm[1]	Degumming
Total metals	10 ppm[1]	Bleaching
Nitrogen	1000 ppb[2]	Ecofining – 1st stage

1) In the Ecofining feed mixture in the 1st stage of reaction

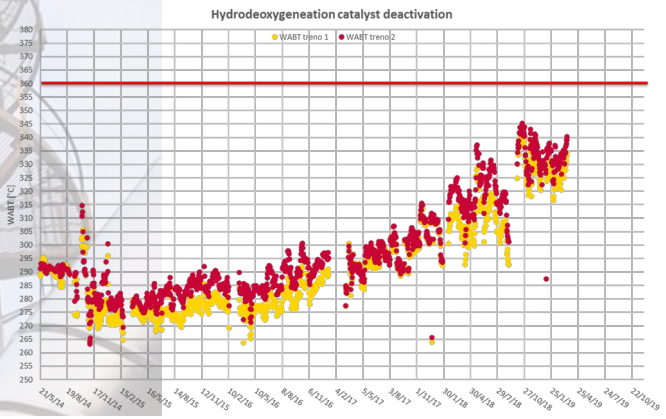
2) In the Ecofining feed to the 2nd stage of reaction

ECOFINING PROCESS FIRST REACTION – HYDRODEOXYGENATION

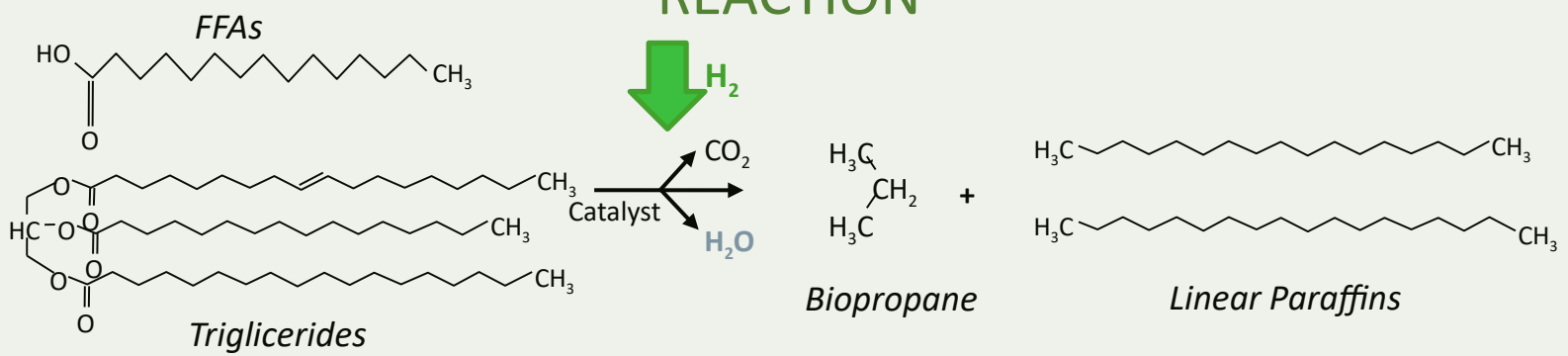


Daily monitoring of main process parameters

Catalyst deactivation monitoring – UOP data reviews



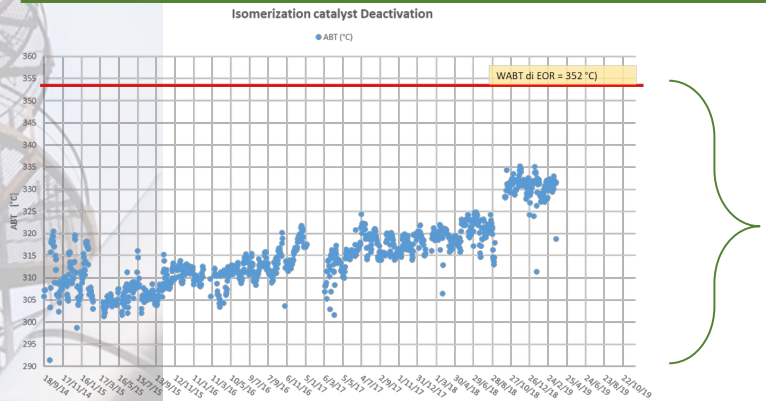
REACTION



ECOFINING PROCESS FIRST REACTION – ISOMERIZATION

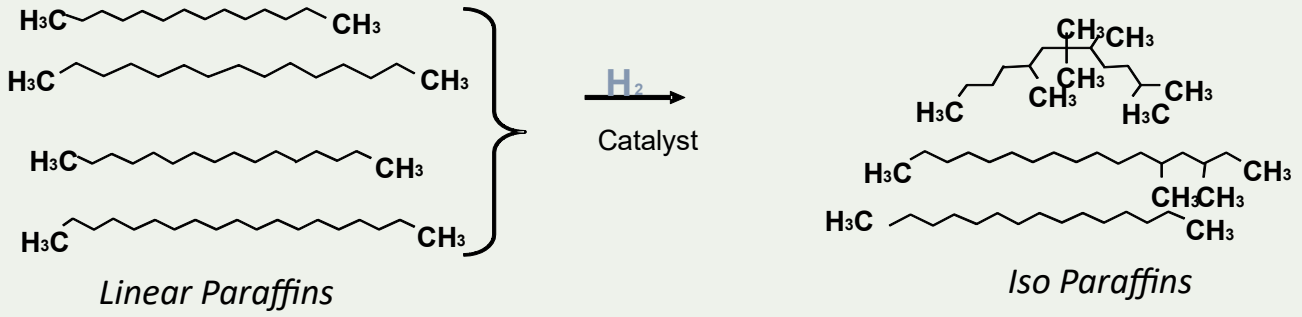
Daily monitoring of main process parameters

Catalyst deactivation monitoring – UOP data reviews



- *Excellent catalyst stability*
- *No evident deactivation increase at 200 ppb in the feed*

REACTION

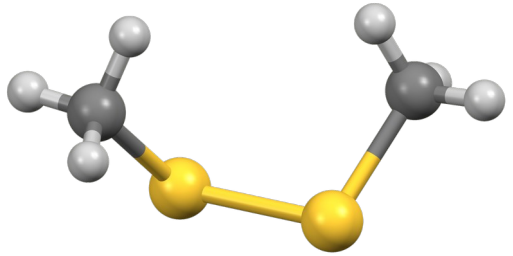


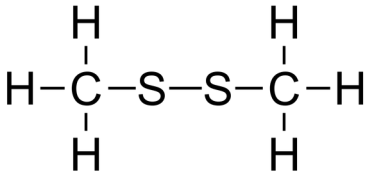
Linear Paraffins

Iso Paraffins

Main operational differences with a traditional refinery

DMDS injection





Sulfur injection required to maintain the activity of the catalyst in normal operation;

Sulfur not present in the biorefinery feedstocks

Solid handling for pre-treatment

Both fresh and spent bleaching earths need handling operation with solids

Necessary to have handling contracts or in-house handling operators to assure continuous operations

Focus on products and future developments

Biorefineries evolution continues

2007
Ecofining™ patent

2014
HVO Production in Venice

2019
Gela Refinery Startup

2023 - Venice
Increase in Pretreatment Capacity

Degumming capacity increase:
- Feedstock flexibility
- Palm oil phaseout

2025 - Venice
New Steam Reformer - 2024

Biorefinery capacity:
360 kton/y → 560 kton/y

Ecofining Upgrading - 2025

New products:
- Biojet
- Artic HVO-Diesel

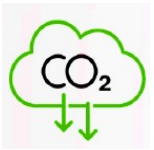
4Q2024 - Gela
Biojet production

150 kton/y

New Biorefineries

ECOFINING™

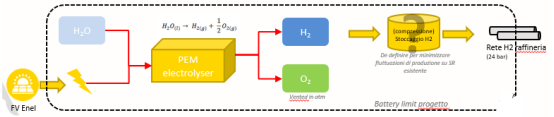
2050



Net Zero
Eni Carbon Neutrality

Gela: new project

- ***Green H2 production***



- ***Degumming improvement***

Venezia Biorefinery – Capacity Increase

CAPACITY EXPANSION	CAPEX
+ 200 KT/Y	c.a. 70 Mln USD

- **ACTUAL CAPACITY: 360** KT/Y
- **TARGET CAPACITY: 560** KT/Y
- **MAIN PRODUCT:** HVO
- **START-UP:** 2024

- **UPGRADE:**
  - NEW STEAM REFORMER (H2 SUPPLY)
  - **FEEDSTOCK AND PRODUCTS DIVERSIFICATION (Biojet/artic)**

FEEDSTOCK FLEXIBILITY	CAPEX
UCO, TALLOW, POME, LOW ILUC V.O., OTHERS	60 Mln USD PRE-TREATMENT IMPROVEMENT AND METALLURGY
LOGISTICS AND OTHER	c.a. 30 Mln USD

Gela Biorefinery – Biojet

BIOJET

+ 750 KT/Y

- **ACTUAL HVO DIESEL:** ca. 590 KT/Y
- **FUTURE HVO DIESEL PRODUCTION:** max 637 KT/Y – min 26 KT/Y
- **FUTURE BIOJET PRODUCTION:** min 98 KT/Y – max 488 KT/Y

CAPEX

c.a. 72 Mln USD

Conclusions

Eni has delevoped Ecofining™, a proprietary technology, jointly with UOP, for the Hydroconversion of Vegetable oils and Wastes

Eni has converted its Oil refineries, Venice and Gela, into Biorefineries, converting existing Diesel Hydrodesulphurization into Ecofining Units

There are ongoing projects in Venice and Gela Biorefineries to increase capacity and valuable products (i.e bio-Jet) adapting them to the regulatory evolution and incorporating the lessons learned from operations.

Eni is developing a wide experience on feedstock charachterization and on the pretreatment of alternative feedstock

Eni is willing to share its know-how for the development of new projects in partnership in Africa

THANK YOU

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