How can science contribute to the competitiveness of the refinery sector?

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eni.com

Giacomo Rispoli EVP RSP
Technology as a key opportunity for refineries to overcome present crisis

- Present European oil scenario is characterized by a **structural products demand fall** and a consequent **refining overcapacity in the whole of Europe**
- **The Refining crisis is expected to remain and further worsen in next years** unless **realistic measures** to support it
- **eni much appreciates the EU raising attention to the refining crisis** and considers today meeting as a **good opportunity to share the significant value that research and development of new technologies** could provide to refining industry to face present challenges
- As I show you in next slides **eni is investing significantly in new technologies** to support refining sector improving its competitiveness
Refining is generally considered a technologically mature sector ...

Effort/Advancement curve for refinery technologies

- 1963: Ebullated bed hydrocracking
- 1962: Modern Hydrocracking
- 1949: Platforming
- 1942: Fluid catalytic cracking
- 1941: Butane isomerization
- 1940: Catalytic reformer
- 1938: Alkylation
- 1930: 1° Hydroferining
- 1929: Delayed coking
- 1927: Coal hydrogenation
- 1925: Thermal cracking

Last significant development back in the ’60s
... but the industry needs a technology breakthrough to face the new challenges

![Refinery technologies curve](image)

- **Trendbreakers**
  - Population growth (Energy demand increase);
  - Environmental concerns.

- **Improved conversion**
  - Unconventional Oils
  - Stranded Gas

- **Environmental sustainability**
  - Renewable sources
  - Efficiency
eni is developing the technological answers to industry needs

<table>
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<th>Industry need</th>
<th>eni’s answer</th>
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<td>Value maximization of unconventional resources via <strong>more efficient conversion of:</strong></td>
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<tr>
<td>• Lower quality crudes</td>
<td>EST and its development</td>
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<td>• Stranded Gas</td>
<td>GTL</td>
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<td>• <strong>Efficient hydrogen production</strong> in conversion process</td>
<td>CPO</td>
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<td><strong>Environmental sustainability</strong> via:</td>
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<td>• <strong>Increased use of sustainable renewable sources</strong></td>
<td>Eni-UOP EcoFining(^{TM}) and II generation biofuels</td>
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<td>• Waste minimization and efficiency</td>
<td>Zero Waste refinery</td>
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EST – eni slurry technology: from first plant to the current one
EST – eni slurry technology: more than 2000 people per day to complete Sannazzaro plant by IH2013
GTL – gas to liquids

Eni-IFP-Axens GtL F-T Technology

Pilot plant, Eni refinery Sannazzaro
20 bld (850 t/y) of paraffins
The **Reformer has 310 catalytic pipes, 155 for each radiant room, with 360 side burners.** Each pipe is 13 meters long and the oven is 24 meters high.
EcoFining: the green refinery scheme

Virgin Naphta → Topping → Isomerization → Reforming → GPL, Naphta, Gasoline, Gasoil

CH4 → H2 → EcoFining → High quality greendiesel

Virgin materials: Palm oil, Used cooking oil, Animal fat, Algal oil

High quality greendiesel production through EcoFining process.
II generation biofuels

Demo plant at Gela refinery

MicroAlgae Biodiesel
Zero Waste Refinery

WASTE

DRYING PROCESS ➔ GASIFICATION ➔ COMBUSTION

CLEAN STEAMS ➔ STEAMS TREATMENT ➔ STEAMS

INERTIZATION

VITRIFIED SOLID WASTE

100%

Ashes ➔ 3-10%

Plasma oven

Syngas

refining & marketing
Technology innovation is a key success factor in the future of refining, especially in Europe

- **Europe must be “re-industrialized” in a different way** to survive non-EU competition:
  - More innovation and knowhow,
  - Less capital,
  - More skilled manpower,
  - More energy efficiency and
  - Greater environmental care

- In our view, **technology innovation will be the breakthrough for the future of the EU Refining System**, enabling a **current technology curve shift**

  ![Graph showing the advancement and effort over time with key years marked (1900, 1920, 1940, 1960, 1980, 2000, 2010). The graph indicates eni is looking at changing the refining paradigm.](image-url)
A new refinery paradigm in eni: from first EST Plant to a new refinery scheme...

eni new breakthrough technologies enable a new simplified refinery scheme

Design Patent Nr. MIA10001999, registered on 27th of October 2010 as "Innovative refinery scheme".

Reducing:
- Feedstock costs
- Investment
- Energy consumption

Increasing:
- Light products yields

2000 - 2013
2013 on
New technology discoveries will change the future EU refining scheme: from a simple refinery, through complex, to a “simplex” one.
Thank you
for your
kind attention

For further information, please contact: giacomo.rispoli@eni.com