E-fuel – background and highlights

17.1.2024 Final Seminar

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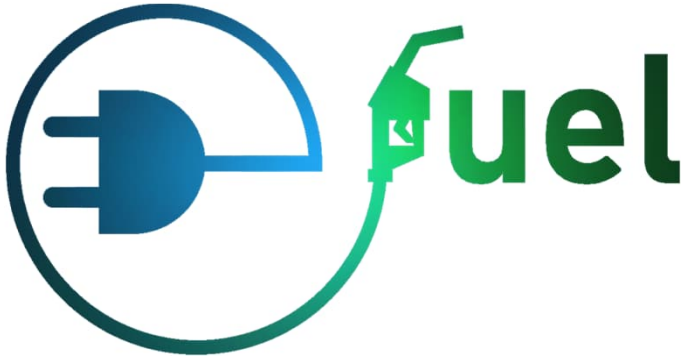
Basics and some numbers



- Business Finland's co-innovation project (part of Neste Veturi)
- 14 partner companies, VTT as research organisation
- Duration 3 years (1.1.2021-31.12.2023)
- VTT's budget 3.7 M€ (about 30 000 work hours), total budget ~ 7 M€
- In addition, VTT's projects with companies ~700 k€
  - Neste's project for demonstration at Bioruukki
  - Convion & Elcogen projects for SOE development and
  - Andritz CO_2 capture development

The main objectives

1) To demonstrate production of drop-in paraffinic e-fuels in bench scale with high efficiency by combining and integrating high temperature electrolysis and Fischer-Tropsch synthesis

2) A readiness to scale up the concept after 2-year project to a production scale of 10 kton/a

E-fuel demonstration and e-diesel field tests

Renewable electricity
130 kW

Steam
35 kg/h

VTT

VTT steam generator

Flue gas
30 kg/h

Excess H_2 out

Convion SOEC with Elcogen stacks

Lean flue gas out

Andritz-CRUF CO_2 capture

0.5 kg/h

H_2

H_2 compression (30 bar)

3 kg/h

CO_2

CO_2 compression/liquefaction (60 bar)

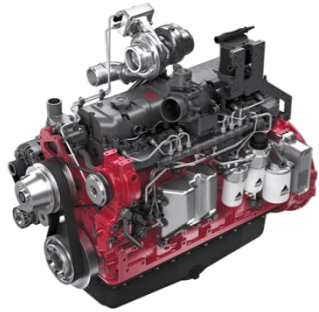
VTT MOBSU
(mobile synthesis unit)

FT products upgrading
(by Neste)

0.3 kg/h (liquid(wax fraction)

60 liters
(diesel)

E-fuel field testing
(by AGCO Power)



Highlights 1/2

- WP1 Novel high temperature electrolysis:
  - A 10 kW size Solid Oxide Electrolyser (SOEC) system with Elcogen E3000 stack was designed, built and tested at VTT.
- WP2 CO_2 capture:
  - High potential and feasible ways to produce pure CO_2 to synthesis.
- WP3 Synthesis:
  - Improved MOBSU-scale CPOX/rWGS + FT-process and catalyst that allowed successful demo tests at WP4.
- WP4 Process integration and demonstration
  - E-fuel concept successfully demonstrated in Bioruukki by the integration of 6 units resulting in the production of 300 kg of FT crude product.

Highlights 2/2

- WP5 E-fuel usability:
  - The end-use performance of high-quality, high-cetane number, aromatics-free and sulphur-free e-diesel proved to be excellent in a small-scale field demonstration with a tractor powered by AGCO Power diesel engine and in comprehensive emission studies.
- WP6 Energy systems and climate impact analysis:
  - The EU regulations for RNFBO GHG criteria were clarified during the project and GHG balances according to the criteria could be studied.
- WP7 Business case evaluation:
  - Optimization tool of RFNBO-eKerosene FT-plant for dimensioning and operation strategy; tool showed clearly (1) the importance of optimization for production costs, (2) emission reduction targets for SAF can be reached
- WP8 Management, collaboration and dissemination
  - Excellent collaboration with companies, high visibility in media by 5 press releases and 3 main events.

Thank you and enjoy the E-fuel seminar!

VTT

beyond

the obvious

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