COMSYN

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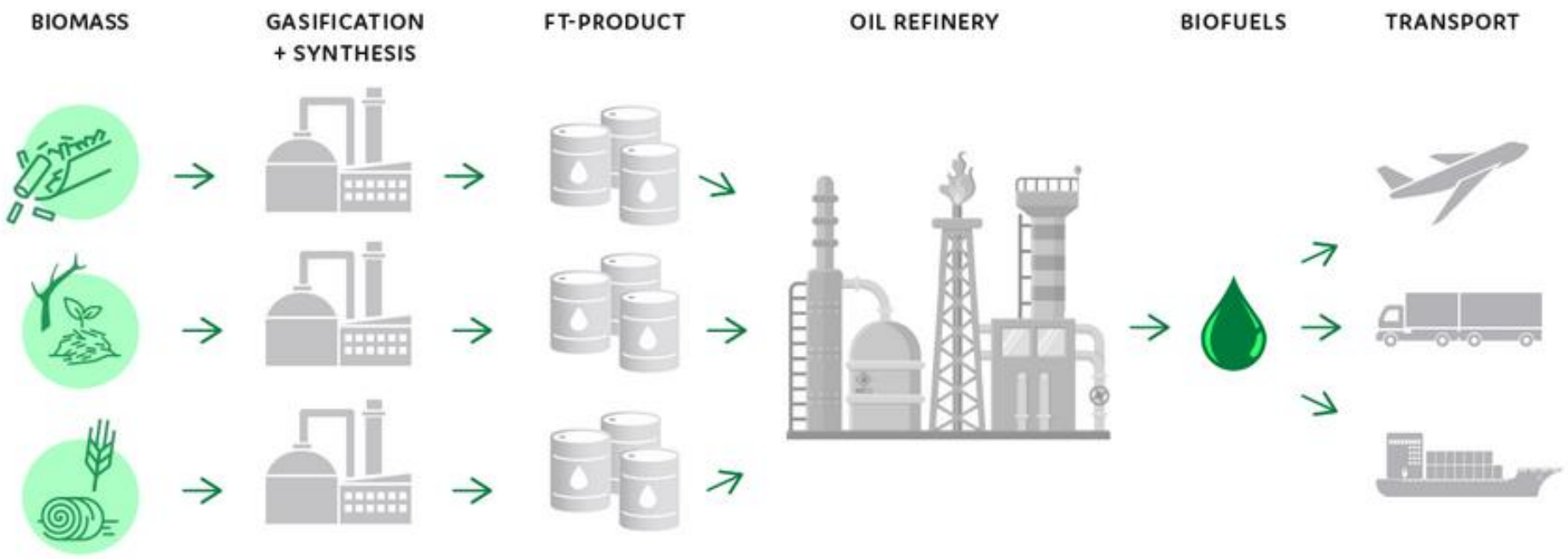
Compact Gasification and Synthesis process for Transport Fuels



PROJECT FACTS

2017 – 2021

7 partners

5.1 M€ budget

3 pilot campaigns from biomass to biofuels

~200 - 400 kg of biofuels produced for research and demonstration.

Decentralized primary conversion of biomass in 30 – 150 MW units.

Technology development for primary conversion, Fischer-Tropsch synthesis and oil refinery feeding systems.

Target reduction of the biofuel production cost: up to 35% compared to alternative routes.
=> Less than 0.80 €/l production cost for diesel.

Project title: **Advanced Biomass Catalytic Conversion to Middle Distillates in Molten Salts**

Project Acronym: **COMSYN** Project Number: **727476** Call: **H2020-LCE-06-2017** Topic: **Sustainable Fuels**

Main Category of the Project: Biofuels from lignocellulosic biomass.

TRL: 4-5

Keywords: biomass, gasification, gas cleaning, Fischer-Tropsch synthesis, biodiesel/-gasoline

Technological approach of the Project: Develop and validate a concept for competitive bio-based fuels by means of a compact gasification and synthesis process. Conversion of diverse biomass residues (30–150 MW biomass feed) to liquid intermediate products close to distributed biomass resources. Subsequent product upgrading in central refineries is investigated and designed for future roll out.

Expected Impact of the Project: Improvement of economic, environmental and social benefits of biofuels; optimization of energy and GHG balances; significant cost reduction; ensured secure and affordable energy supply using diversified, cheap feedstock; enhance Europe's competitiveness.

Highlights (technological): Fuel flexible biomass gasification plus improved syngas cleaning efficiency by developing filtration, reforming and sulfur removal technologies. Advanced Fischer-Tropsch reactor, specially designed for decentralized biofuel production.

What is needed in future: Renewable fuel technologies that are suitable for different European locations, biomass feedstocks and weather conditions. Technologies should be easy to implement into current systems to allow quick commercialization. Public funding is needed to cover the gap between TRL 6 and 8.

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Compact Gasification and Synthesis

Project tasks and responsibilities

DFB PILOT @ VTT

5 m³/h SLIP-STREAM TO SYNTHESIS

MOBILE SYNTHESIS UNIT

DFB GASIFIER → **FILTER** → **REFORMER** → **ULTRACLEANING STEPS** → **FISCHER-TROPSCH SYNTHESIS** → **Product Upgrading**

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DFB Gasifier
- Finalized: 2015
- Biomass feed: ca. 50 kg/h
- Gasifier temperature: 750 – 820 °C
- Oxidizer temperature: ca. 900 °C
- Bed material: Dolomite/sand mixture

5 m³/h SLIP-STREAM TO SYNTHESIS

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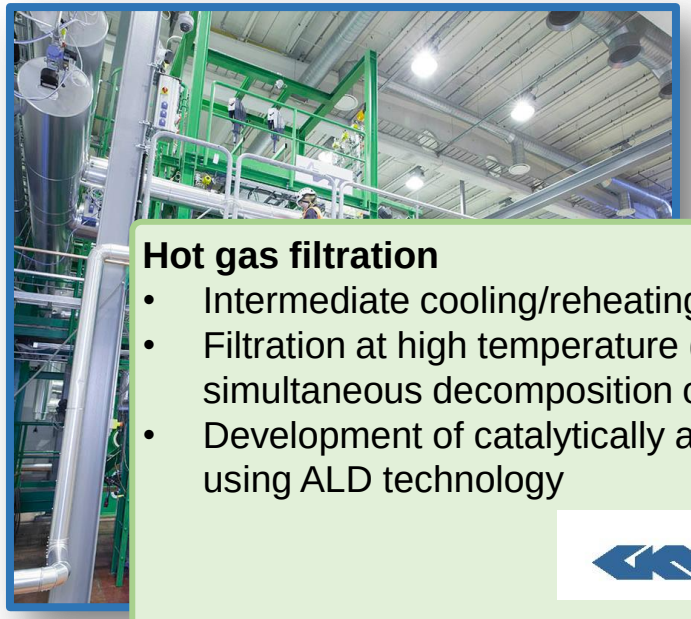

Hot gas filtration

- Intermediate cooling/reheating steps eliminated
- Filtration at high temperature (ca. 800 °C) with simultaneous decomposition of tars
- Development of catalytically activated filters using ALD technology

GKN SINTER METALS

/h
EAM TO
ESIS

MOBILE SYNTHESIS UNIT

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Catalytic reforming

- Development of an oxygen-permeable membrane reactor to enable better control of reaction temperature in the reformer (hot spots)
- Catalyst development: ALD coating to increase the activity as well as sulphur and coke tolerance of the catalyst

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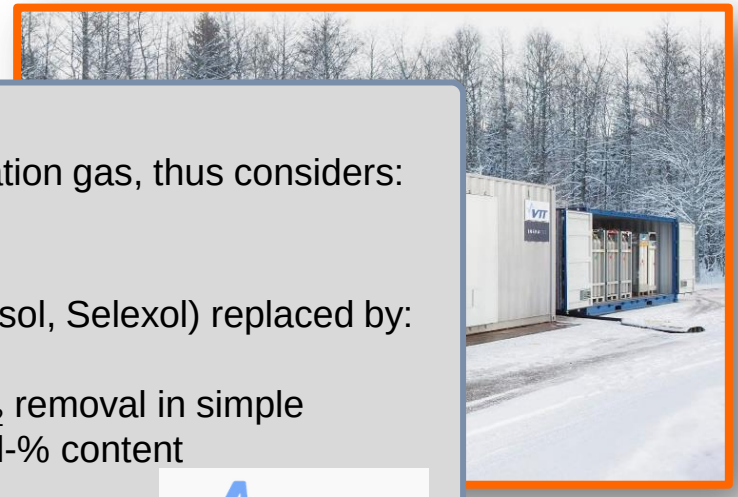

Ultracleaning concept:

- Specifically for biomass-based gasification gas, thus considers:
  - Low to medium sulphur content
  - Residual hydrocarbons (tars)
- Wet scrubbing acid gas process (Rectisol, Selexol) replaced by:
  - Simpler dry bed desulphurization
  - No removal of CO_2 or partial CO_2 removal in simple pressure water scrubbing to 5 vol-% content

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MOBILE SYNTHESIS UNIT

Fischer-Tropsch microreactor*:

- Compact and modular design
- High efficiencies
- Load flexible

INERATEC

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5 m³/h SLIP-STREAM TO SYNTHESIS

MOBILE SYNTHESIS UNIT

Product upgrading

- Co-processesing of FT-waxes or
- Stand-alone treatment (incl. a new hydroisomerisation unit)

UniCRE

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MOBILE SYNTHESIS UNIT

Techno-economic assessment of the process, identify its potentials:

- optimal integration of gasification island and synthesis plant
- evaluation on the optimal size of the primary gasification-FT plants
- optimal strategy for product upgrading

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