Green Fuel and Chemicals (COMET)

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Introduction

The production of synthesis gas and the downstream production of fuels and chemicals represents a promising technological combination that can make a significant contribution to the defossilization of the energy, transport, and chemical sectors. In particular, the development of renewable aviation fuel (SAF) is a crucial element in significantly reducing the carbon footprint of the transportation sector.

The COMET project ***Green Fuel and Chemicals*** uses two technological pathways for the production of liquid fuels and chemicals:

- **Fischer-Tropsch (FT) synthesis**
- **Alcohol synthesis**

Depending on the catalyst and process parameters employed, both processes can directly convert synthesis gas or e-synthesis gases, as well as H_2 and CO_2, at the catalyst. For FT-synthesis, an iron catalyst is specifically required.

Key facts

Project duration: 2023/04 – 2027/03
Project volume: 3.2 Mio. €
Funding: FFG Austria – COMET Programme – Nr. 892426

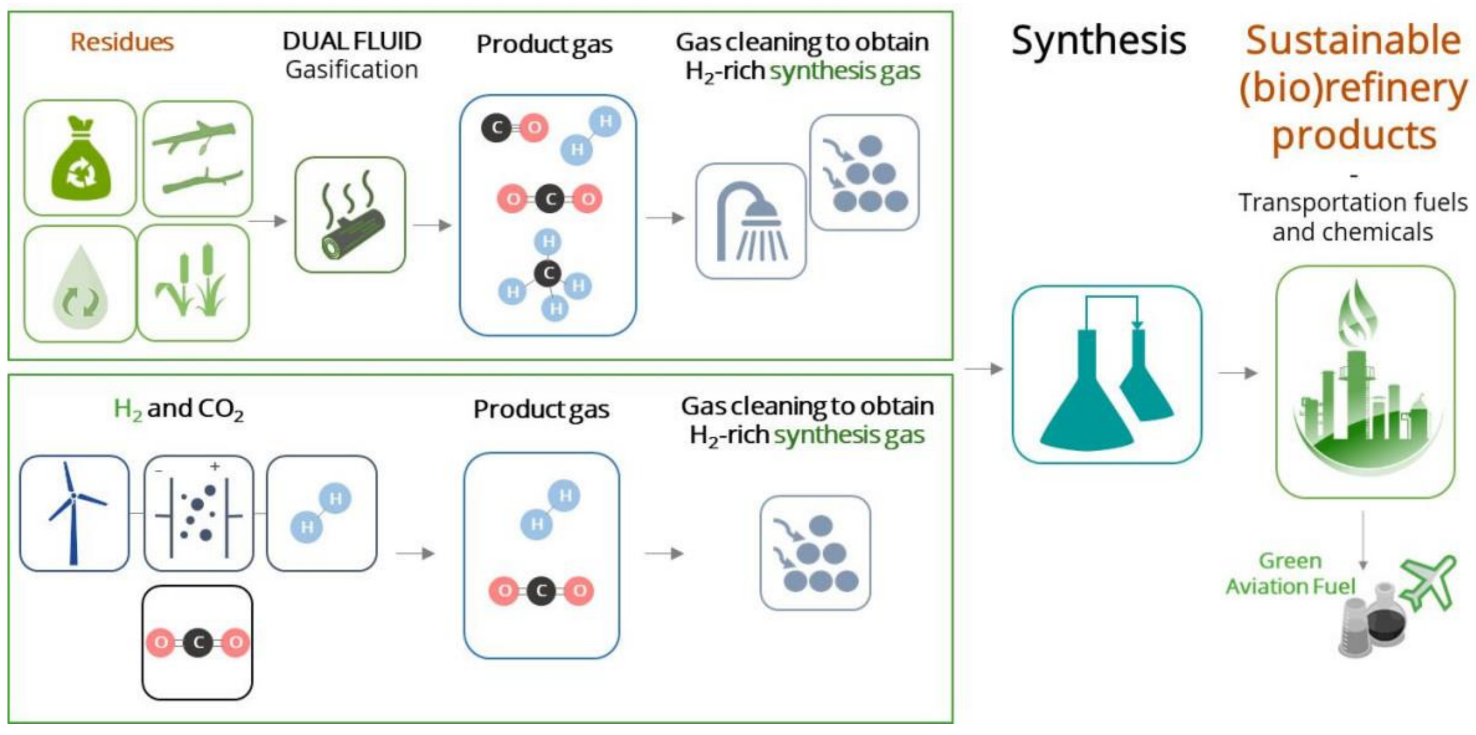
Objectives

The objectives of the project are to determine the most economical pathway (FT-synthesis vs. alcohol route), to identify available raw materials, to investigate the feasibility of SBCR technology for large-scale deployment, to demonstrate an Alcohol-to-Jet (AtJ) pathway, and assess the compliance of the process chains with ASTM international standards.

Methodology

A combined approach of experimental and theoretical investigations is employed to achieve the project's objectives.

- Theoretical assessments include a market study on potential feedstocks, analysis of process chain compliance with ASTM international standards, evaluation of the scalability of SBCR technology to a potential demonstration scale, a techno-economic assessment, and a LCA of the AtJ and FT-synthesis process route.
- Laboratory and pilot-scale experiments are conducted to generate data for these theoretical assessments and to refine the technologies used. In lab scale, advancements are made in fine gas cleaning (based on TSA – temperature swing adsorption), and the use of CO_2 is tested in both the FT process and the AtJ route. Additionally, the conversion of alcohols to SAF and olefins is evaluated in the lab at TUW. Full pilot-scale experiments using residues as feedstock are also conducted.



First results

Several feedstocks (wood chips, forestry residues, bark pellets, cashew husks) were tested in the 1 MW demo gasifier to facilitate e.g. further improvements in the gas cleaning section. The FT catalyst was screened at the lab scale, with the best-performing conditions subsequently tested in the FT pilot unit to produce the first FT product derived from residues. The market study on potential feedstocks has been completed, and the initial steps for constructing the alcohol synthesis plant have been initiated.

Feedstocks

Wood chips

Forestry residues

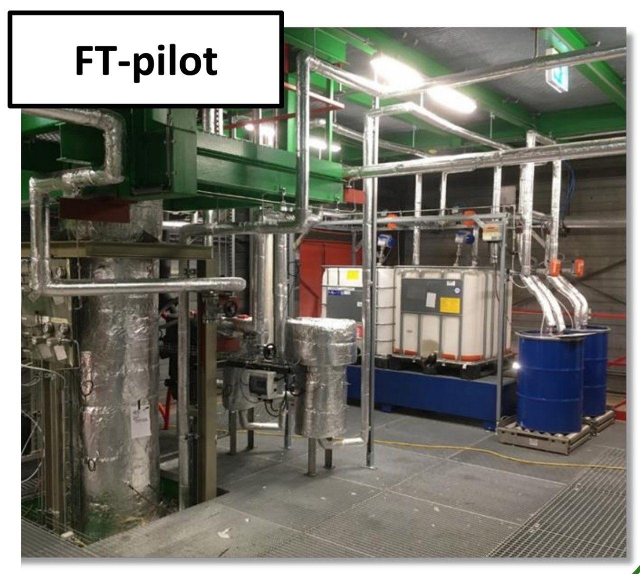
Cashew husks

R&D Infrastructure

FT-lab

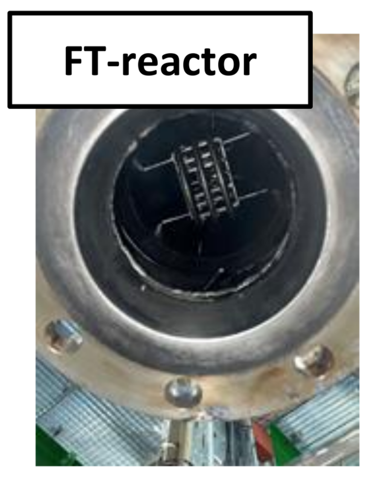
TSA

FT-pilot



Experiments

FT-reactor



FT-catalyst

Ready f. operation

FT-products

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