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Development environment for the SAF industry

Process technology, digital tools, pilot plants and services along the entire flexible process chain from biogenic residues to sustainable aviation fuel

Aviation was one of the fastest growing sources of greenhouse gas emissions prior to Covid-19. The global increase in CO_2 emissions is demonstrably responsible for global warming. Only by reducing fossil CO_2 emissions and preserving biodiversity can extreme weather events and climate flight be minimized, or survival in threatened regions be made possible. For this reason, the EU is aiming to extensively reduce fossil fuels and achieve climate neutrality by 2050. In its Sustainable Development Goals, the UN also aims to reduce CO_2 emissions as well as to massively increase sustainable energy sources by 2030. The energy sector, energy-intensive industry, and mobility in particular must pursue climate-friendly and intelligent paths.

In 2021, the International Air Transport Association (IATA) resolved to achieve net zero emissions from the worldwide aviation industry by 2050. In order to achieve this target, multiple approaches need to be tested, experience gained, and the most effective approaches rapidly implemented.

Objective

The Research Unit of Fuel and Energy System Engineering, headed by Dr. Stefan Müller and Prof. Robert Mach (formerly headed by Prof. Hermann Hofbauer), has the goal of developing production plants for industry that convert biogenic residues into synthetic, sustainable fuels and energy sources. Any biogenic residual materials are planned to be used for the environmentally friendly production of sustainable aviation fuels, if possible in the vicinity of airports. (Materials will vary based on regional availability.) It will then be possible to obtain the desired fuels - particularly sustainable aviation fuels - from the residues, according to the economic objectives and requirements set.

Solution

The central core of the plants is gas generation by means of a dual fluidized bed (DFB). It was invented and optimized in over 30 years of continuous research work

Pilot plant of 100 kW (thermal) and laboratories at TU Wien

at the TU Wien. In this fluidized bed process, combustion and gas generation, which in conventional plants take place simultaneously in one reactor chamber, are divided into two spatially separate reactors. The bed material which circulates between the two reactors ensures optimum reaction sequences and also supplies heat to the gasification process. The feedstocks can thus be efficiently thermally converted into a high-quality product or synthesis gas, and subsequently processed into the desired energy sources, such as Sustainable Aviation Fuels.

The major advantages of DFB technology are its flexibility in its use and processing of a wide variety of biogenic residues, and its good controllability for achieving optimum yields of product gas. The use of CO_2 itself as a raw material is also conceivable and is currently being researched in detail. The product gas is then purified accordingly and processed into sustainable aviation fuels using the industrially proven Fischer-Tropsch process, as well as conventional refinery processes.

What we offer

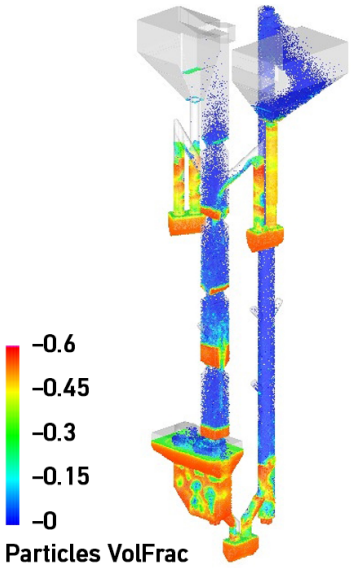
Through DFB technology, all products of a petroleum-based refinery can also be produced from biomass or from residual materials. The hydrocarbons bound in the

residual materials are converted into the molecules or chains of hydrocarbons needed for fuel. This enables the production of high-quality and sustainable fuels: from environmentally friendly hydrogen, methane, hythane and synthetic natural gas to liquid biofuels, such as climate-neutral gasoline or diesel and sustainable aviation fuel, or even the production of various basic chemicals containing carbon.

Biogenic materials such as forest residues, bark, or residues from agriculture and food production can be used as feedstocks. Their use can replace the extraction and combustion of fossil fuels.

Industry will find an experienced cooperation partner in the research group “Industrial Plant Engineering and Application of Digital Methods” at the TU Wien. With a testing laboratory for fuels as well as laboratory and pilot plants for the analysis of the entire process chain, questions concerning the planning, construction and operation of plants for the flexible production of sustainable fuels and chemicals can be dealt with quickly and answered in a well-founded manner. The synthesis steps from the product gas generated to the desired end products can also be studied in laboratory facilities at the TU Wien.

Operators, planners and plant engineers are supported with detailed process know-how and state-of-the-art digital methods in the rapid evaluation and implementation of their plans - as well as the optimization of their plants - in a highly targeted and efficient manner.



Digital tools for the simulation of all processes

Target groups

- airport operators, airlines
- turbine manufacturers
- energy suppliers
- plant manufacturers
- transport and logistics companies
- initiators and operators of industrial plants and demonstration projects

Your Advantages

- DFB technology converts a variety of biogenic residues into aviation fuel and hydrogen in an energy-efficient manner
- flexible production of CO_2-neutral liquid fuel via Fischer-Tropsch process in the vicinity of airports
- production of sustainable aviation fuel with competitive system efficiencies between 50 to 80%
- 100 kWth pilot plant and laboratories at TU Wien provide testing capabilities across the entire process chain from feedstock to final products
- access to digital modeling and simulation tools - to determine realistic performance metrics and for process design, control and optimization
- comprehensive development environment for optimizing industrial-scale implementation plans
- state-accredited test laboratory for combustion plants for reliable characterization of fuels used at the TU Wien
- competent consulting and assistance in the preparation, design, validation, implementation and operation as well as optimization of demonstration and industrial plants
- multiple patent protection available
- seven commercial industrial plants with DFB technology already exist in Austria, Germany, Sweden, Thailand and Japan - with a combustion heat capacity of 3.8 to 33 MW
- cooperation partner TU Wien has more than 30 years of experience in thermo-chemical conversion of biogenic fuels into various energy carriers and forms

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