

Fuels for Climate-neutral Airplanes

“PowerFuel” Project Prepares Commercialization of Synthetic Kerosene from Renewable Electricity and Airborne Carbon Dioxide at KIT



Compact plants to produce climate-neutral fuel might accelerate transformation of the transportation system. (Photo: KIT, PPQ)

Aviation is energy-intensive. Air traffic is increasing constantly, with negative impacts on the world’s climate. Now, Karlsruhe Institute of Technology (KIT) and Ineratec, a spinoff of KIT, are testing, together with other partners from industry and research, the production of synthetic climate-neutral fuels for aviation, heavy-duty traffic, and ship traffic.

“We urgently need CO₂-free mobility,” says Professor Roland Dittmeyer, Head of the Institute for Micro Process Engineering (IMVT) of KIT. In Germany, about one fifth of the climate-damaging emissions are caused by traffic. This problem might be solved by electric drives, if they are supplied with CO₂-free electricity. But: electric mobility is hardly suited for use in aviation or ship traffic. The solution: synthetic fuels based on the greenhouse gas CO₂ and renewable electricity. It is planned to extract CO₂ from ambient air using a direct air capture system by Climeworks. The electrolysis technology to generate hydrogen from water with the help of electricity is made by Siemens.



KIT Energy Center: Having future in mind

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Within the PowerFuel project at KIT, a pilot plant developed by Ineratec is applied to convert CO₂ into synthesis gas with the help of hydrogen. "The synthesis gas is then used to produce liquid fuel in a reactor," says the Managing Director of Ineratec Tim Böltken. By means of this power-to-liquid process, nearly climate-neutral fuel can be produced in an economically efficient way. Energy supply from renewable sources is subject to natural fluctuation. By the use of compact chemical reactors developed by Ineratec, an optimum response to these fluctuations is found and power that so far remained unused can be stored in liquid fuel. "Compared to conventional gasoline, diesel, or kerosene, our synthetic fuels have far better combustion properties," Böltken says. The quality of synthetic fuels and the use in different transportation sectors are studied and assessed by the German Aerospace Center (DLR) and Aviation Fuel Projects Consulting. In the pilot phase, the plant is to produce 200 to 300 l fuel per day.

Parallel to the operation of the plant complex, Siemens, Bauhaus Luftfahrt, and TU Hamburg will make energy systems analyses supported by simulation based on electricity market models. Analysis shall also cover the question how synthetically produced fuels can be commercialized.

The project is funded by the Federal Ministry for Economic Affairs and Energy.



More about the KIT Energy Center: <http://www.energy.kit.edu>

Being “The Research University in the Helmholtz Association,” KIT creates and imparts knowledge for the society and the environment. It is the objective to make significant contributions to the global challenges in the fields of energy, mobility and information. For this, about 9,300 employees cooperate in a broad range of disciplines in natural sciences, engineering sciences, economics, and the humanities and social sciences. KIT prepares its 25,500 students for responsible tasks in society, industry, and science by offering research-based study programs. Innovation efforts at KIT build a bridge between important scientific findings and their application for the benefit of society, economic prosperity, and the preservation of our natural basis of life.

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