

Turning industrial emissions in Värmland into renewable fuel for aviation

The project is led by Associate Professor Salman Raza Naqvi at Karlstad University, together with COWI Sweden and a local pulp mill/energy company. Support from COWIfonden will enable laboratory studies, process modeling and public sharing of the results.

Over 24 months, the team will study how carbon dioxide from pulp mills and waste-to-energy plants in Värmland can be captured and used to produce sustainable aviation fuel. These industries release large amounts of carbon dioxide that comes from biomass rather than fossil resources. Instead of allowing this carbon dioxide to enter the atmosphere, the project will examine how it can become a useful raw material.

The work will combine laboratory experiments with computer-based process models. First, the researchers will test methods for capturing carbon dioxide from gas streams that represent local industrial plants. They will compare a standard capture liquid with an alternative that is expected to require less energy. The aim is to remove at least 90 % of the carbon dioxide. Next, the captured carbon dioxide will be combined with hydrogen produced using renewable electricity. It will then be converted into gases and liquid fuel components that can be further processed into aviation fuel.

The laboratory results will be used to improve computer models of the complete production process. These models will compare different fuel routes and estimate their energy demand, production costs and climate effects at industrial scale.

The project is important because large aircraft are difficult to operate using batteries and will continue to require energy-rich liquid fuels. At the same time, Värmland has a strong pulp, paper and energy industry with large streams of renewable carbon that are not yet fully used.

The expected result is a practical basis for deciding whether a pilot plant should be developed in the Nordic region. The project will also produce openly available data, process models, research papers and public presentations. In the longer term, the findings could help industries, engineers and public authorities develop facilities that turn regional emissions into lower carbon aviation fuel, support Sweden's climate goals and create new value from existing industrial resources.