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Bio-based Sustainable Aviation Fuels

PEP Report 278B

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Abstract

Environmental carbon emissions and the resulting climate change issues have attracted the attention of governments and corporations around the world. A large majority of countries have announced net zero decarbonization goals to be achieved before 2070. There is a concerted effort to reduce carbon emissions in a timely manner within industrial and transportation sectors. The use of bio-derived fuels often results in significantly lower lifecycle carbon emissions when compared with the use of fossil fuels, due to the biogenic nature of carbon in the biofeedstock. Consequently, biofuels are receiving increasing attention due to their potential contribution to the decarbonization goals.

Air transport is one of the sizable components of carbon emissions to the environment. Commercial aviation is responsible for about 2–3% of global greenhouse gas (GHG) emissions. Realizing the importance of aviation in carbon emissions, International Air Transport Association (IATA) has committed to the goal of carbon-neutral growth in international commercial aviation beginning in 2021. US airlines have set a goal to reduce carbon dioxide (CO_2) emissions by 50% in 2050 compared with the 2005 levels. Other popular decarbonization strategies such as electric batteries, while popular for road transport, are considered to be infeasible for aviation due to weight limitations, especially for commercial long haul flights. Consequently, bio-based sustainable aviation fuels are the only viable option, at least in near future. This report presents the technoeconomic analysis of three current industrial processes to produce aviation fuels from bio-derived feedstock. These processes are

- BioJet production from isobutanol by Gevo
- Alcohol-to-Jet (ATJ) process from ethanol by LanzaJet
- Isoconversion™ process by Lummus/Chevron

The production economics assessment in this report is based on a US Gulf Coast location. However, an iPEP Navigator module (an Excel-based computer costing model developed by IHS Markit) will be attached with this report to allow a quick calculation of the process economics for three other major regions also: Germany, Japan, and mainland China. For every process, the module also allows production economics to be reported in English or metric units in each region.

The technological and economic assessment of the processes is PEP's independent interpretation of the companies' commercial processes based on information presented in open literature, such as patents or technical articles, and may not reflect in whole or in part the actual plant configuration. We do believe that they are sufficiently representative of the processes and process economics within the range of accuracy necessary for economic evaluations of the conceptual process design.

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