ETIP Bioenergy
European Technology and Innovation Platform

Biofuel Fact Sheet

Aviation Biofuels

Introduction

Traditional jet fuels are a mix of hydrocarbons, including mostly normal paraffins, iso-paraffins, cycloparaffins and aromatics. They are almost exclusively obtained from the kerosene fraction of crude oil. Two types of fuels are used in commercial aviation: Jet-A and Jet-A1.

Fuel specifications for aviation fuels are very stringent due to critical safety concerns. Also, a high specific energy content is a must, thus advanced liquid (drop-in) biofuels are the only low-CO_2 option for substituting kerosene in a short/medium term. Drop-in biofuels are liquid hydrocarbons that are functionally equivalent and as oxygen-free as petroleum-derived transportation fuel blendstocks. Drop-in aviation biofuels have the same properties as the traditional aviation fuels, so they can be blended readily after having passed a stringent certification process ensuring the full compatibility with aircraft and fuel logistics.

Drivers

The International Civil Aviation Organization (ICAO) is a UN agency managing the administration and governance of the Convention of International Civil Aviation. ICAO has made a plan to reduce CO_2-emissions and has started CORSIA, the Carbon Offsetting and Reduction Scheme for International Aviation. The goal is to reach carbon-neutral growth of the aviation sector from 2020 onwards. As of 23 August 2017, 72 states, which are representing 87.7% of international aviation activity, voluntarily participate in CORSIA.

A variety of measures shall contribute to the goal of carbon-neutral growth, one of them being the use of aviation biofuels. In the past few years, aviation biofuels have seen tremendous development. Currently, a number of airlines have signed biofuel purchase agreements, three airports provide aviation biofuels and more than 2,500 commercial flights are flown on biofuels.

Airlines that have signed alternative fuel purchase agreements

United Airlines
KLM Royal Dutch Airlines
Lufthansa
Scandinavian Airlines
British Airways
Cathay Pacific
FedEx (Air Cargo)
Southwest Airlines
JetBlue Airways
Alaska Airlines

Airports distributing alternative fuels to regular flights

LAX (Los Angeles, USA)
OSL (Oslo, Norway)
ARN (Stockholm, Sweden)

Aviation biofuel is also available at:

BMA (Stockholm, Sweden)
OSD (Östersund, Sweden)
KSD (Karlstad, Sweden)

Sustainable Aviation Fuel Production Pathways

The approval of new aviation fuels is a long-lasting process, requiring large amounts of fuel for testing. So far, five production pathways for alternative aviation fuels have been approved to meet ASTM International standards. These are:

- Alcohol to Jet Synthetic Paraffinic Kerosene (ATJ-SPK, up to 30% blend): This biofuel is created from isobutanol which is derived from feedstocks such as sugar, corn or wood. The alcohol is dehydrated to an olefinic gas, oligomerized, hydrogenated and fractionated.
- Synthesized iso-paraffins (SIP, up to 10% blend): This biofuel is based on sugars that are converted to a pure paraffin molecule using an advanced fermentation.
- Hydro-processed Esters and Fatty Acids Synthetic Paraffinic Kerosene (HEFA-SPK, up to 50% blend): This biofuel is made from vegetable oils and animal fats, which are deoxygenated and hydroprocessed.
- Fischer-Tropsch Synthetic Paraffinic Kerosene (FT-SPK, up to 50% blend): This biofuel is based on the gasification of biomass, followed by Fischer-Tropsch synthesis.
- Fischer-Tropsch Synthetic Kerosene with Aromatics (FT-SPK with aromatics): Some alkylated benzenes of non-petroleum origin are added to the FT-SPK.

The technical standards would also allow for fuels produced from natural gas and coal, but the aviation industry is clearly aiming for sustainable alternatives. However, the related technologies are still under development and current production capacities are limited.

Sixteen additional pathways are currently under review by ASTM.

Further information

Read further information about aviation biofuels at:

http://www.etipbioenergy.eu/value-chains/products-end-use/end-use/air

https://www.icao.int/environmental-protection/GFAAF/Pages/default.aspx

Production facilities for aviation biofuels

ATJ-SPK

Gevo	USA, Texas
	Corn starch
	75,000 gallons/a
	Operating since 2011

SIP

Total & Amyris	Brazil
	Sugars
	Operating since 2012

HEFA – SPK

AltAir	USA, California
	Oils and fats
	0.14 billion l/a
	Operating since 2015
Neste (4 facilities at industrial scale)	Finland
	Oils and fats
	Operating since 2013

FT – SPK

Red Rock Biofuels	USA, Oregon
	Woody biomass
	16 million gallons/a total capacity, share of jet fuel is smaller
	planned

http://www.irena.org/menu/index.aspx?mnu=Subcat&PriMenuID=36&CatID=141&SubcatID=3816