Renewable Aviation Fuel Market - Global Industry Size, Share, Trends, Opportunity, and Forecast Segmented By Technology (Fischer-Tropsch (FT), Hydroprocessed Esters and Fatty Acids (HEFA), Synthesized Iso-Paraffinic (SIP), and Alcohol-to-Jet (AtJ)), By End-User (Commercial, Defense, and General Aviation), By Region, By Competition 2019-2029

Market Report (3 days) | 2024-01-07 | 185 pages | TechSci Research

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Report description:

The Global Renewable Aviation Fuel Market was valued at USD 7.23 Billion in 2023 and is growing at a CAGR of 48.01% during the forecast period. In order to enhance the development of Renewable Aviation Fuel, Renewable Aviation Fuel companies can consider expansion, collaboration, partnership, acquisition, and joint ventures. Furthermore, constantly evolving aviation engine technology can make the existing technology obsolete very soon. This can further intensify the industry rivalry among the prominent market players.

Since the count of Renewable Aviation Fuel providers (suppliers) is less in comparison to the count of buyers, the bargaining power of suppliers is relatively higher as compared to the bargaining power of buyers. Due to promising profit margins, the threat of new entrants in the Renewable Aviation Fuel market is considered to be moderate.

As per the U.S. Department of Energy (DOE), air travel accounts for nearly 175 million metric tons of CO2 emissions or about 2.6% of domestic Greenhouse gas (GHG) emissions each year in the United States. According to Environmental Protection Agency (EPA), large business jets and commercial airplanes contribute around 10% of US transportation emissions and account for almost 3% of the country's total greenhouse gas (GHG) production. Thus, such high contributions of harmful emissions hinder market growth to some extent.

The use of aircraft is highly growing across logistics applications. Airlines transport over 52 million metric tons of goods each year. According to International Air Transport Association (IATA), approximately 90% of cargo in international trade is shipped via sea route, and only around 0.5% is transported by air. But this transport by air cargo translates to around 35% of world trade by value

or nearly USD6 trillion in value. With an increasing demand for international products, the need for a safe and efficient air service is anticipated to rise enormously in the near future.

Key Market Drivers

Renewable Aviation Fuel is used for powering aircraft and various types of Renewable Aviation Fuels are the by-products of crude oil. The Renewable Aviation Fuel market is majorly driven by the rising trend of air travel and the expanding aviation sector in various developing nations. The development of the latest aviation biofuels and the increasing requirement for low-cost carriers are also anticipated to create notable opportunities for all the market players during the study period. Factors such as stringent environmental regulations along with fluctuating crude oil prices can hinder the Renewable Aviation Fuel market growth to a certain extent.

Increasing Investment

Increasing investment in the aviation sector, rising disposable income, and the growing tourism industry are some of the latest factors that are supporting the Renewable Aviation Fuel market substantially.

In an effort to develop sustainable Renewable Aviation Fuel, United Airlines and 5 corporate partners announced to invest USD 100 million in February 2023. GE Aerospace, Air Canada, Boeing, JPMorgan Chase, and Honeywell are the 5 corporate partners which would help in the development of sustainable Renewable Aviation Fuel.

As per the data from the U.S. Bureau of Economics, personal income increased by USD1.97 trillion (10.5%) and Disposable Personal Income (DPI) grew by USD2.13 trillion in April 2020. With rising income levels and expanding tourism sector, the number of air travelers is increasing rapidly across various nations of the world.

In 2023, Dubai received around 14.36 million international overnight visitors. This number is a 97% year-on-year (Y-o-Y) increase as compared to 7.28 million tourist arrivals in 2021. According to the World Tourism Organization, a specialized agency of the United Nations (UN), tourist arrivals in Maldives in January 2021 stood at 92,103. This count rose to 99,397 by 3rd February 2021. The growing count of tourists is creating promising scope for the aviation industry.

Key Market Challenges

Volatility in Crude Oil Prices:

One of the primary challenges faced by the Renewable Aviation Fuel market is the inherent volatility in crude oil prices. The aviation industry is heavily dependent on crude oil for jet fuel production, and fluctuations in oil prices can significantly impact operational costs for airlines. Political instability, geopolitical tensions, and economic uncertainties contribute to this volatility, making it a perpetual concern for the Renewable Aviation Fuel market.

Environmental Regulations and Sustainability:

The aviation sector is under increasing pressure to reduce its environmental footprint. Stringent emission regulations and the global push towards sustainability pose a challenge to traditional Renewable Aviation Fuels, which are primarily derived from fossil fuels. The industry is actively exploring alternative fuels, such as biofuels and synthetic fuels, but their scalability and cost-effectiveness remain significant hurdles.

Infrastructure Limitations:

The infrastructure required for the production, transportation, and distribution of Renewable Aviation Fuel is complex and capital-intensive. Insufficient infrastructure can lead to supply chain bottlenecks and increased costs. As the demand for air travel continues to grow, ensuring a robust and efficient infrastructure becomes paramount to meet the escalating needs of the Renewable Aviation Fuel market.

Technological Advancements:

While technological advancements have the potential to revolutionize the aviation industry, they also present challenges for the fuel market. The development of electric and hybrid aircraft, although promising for environmental sustainability, poses a threat to traditional Renewable Aviation Fuels. The industry must adapt to these advancements by investing in research and development to stay relevant and competitive.

Global Economic Fluctuations:

The aviation industry is highly sensitive to global economic conditions. Economic downturns can lead to reduced air travel demand, affecting the profitability of airlines and, consequently, the demand for Renewable Aviation Fuel. The cyclical nature of the global economy introduces an element of unpredictability, requiring the Renewable Aviation Fuel market to navigate through

periods of both growth and contraction.

Political and Geopolitical Factors:

Political instability and geopolitical tensions can disrupt the global supply chain of Renewable Aviation Fuel. Trade conflicts, sanctions, and regional conflicts have the potential to impact the availability and pricing of key raw materials, affecting the stability of the Renewable Aviation Fuel market. Developing resilient strategies to navigate geopolitical uncertainties is essential for sustained market stability.

Investment and Funding Challenges:

The Renewable Aviation Fuel industry requires substantial investments in research, infrastructure, and technology to address emerging challenges. Securing funding for such initiatives can be a barrier, especially during economic downturns. Governments, industry stakeholders, and financial institutions need to collaborate to ensure the availability of necessary resources for the sustainable development of the Renewable Aviation Fuel market.

Regulatory Compliance:

Adhering to stringent safety and environmental regulations is a critical aspect of the Renewable Aviation Fuel industry. Non-compliance can lead to severe penalties and damage the reputation of both fuel producers and airlines. Staying abreast of evolving regulations and investing in compliance measures are essential for ensuring the long-term viability of the Renewable Aviation Fuel market.

Key Market Trends

Transition to Sustainable Renewable Aviation Fuels (SAFs):

One of the most prominent trends in the Renewable Aviation Fuel market is the increasing emphasis on sustainability. As environmental concerns rise, there is a growing shift towards Sustainable Renewable Aviation Fuels (SAFs). These fuels, derived from renewable resources such as biofuels and synthetic fuels, aim to reduce the carbon footprint of aviation. Governments, airlines, and fuel producers are investing in research and development to enhance the production and adoption of SAFs, marking a crucial step towards a more environmentally friendly aviation industry.

Advanced Biofuels and Synthetic Fuels:

Within the realm of sustainable Renewable Aviation Fuels, advanced biofuels and synthetic fuels are gaining traction. Advanced biofuels, produced from non-food feedstocks and waste materials, offer a more sustainable alternative to traditional jet fuels. Similarly, synthetic fuels, created through processes like Power-to-Liquid (PtL) or gas-to-liquid (GtL), provide a pathway to decarbonize the aviation sector. These innovative fuels have the potential to address both environmental concerns and the need for energy security in the Renewable Aviation Fuel market.

Hydrogen as an Renewable Aviation Fuel:

The aviation industry is exploring hydrogen as a potential clean energy source for aircraft. Hydrogen has the advantage of producing zero emissions when used as a fuel, and research is underway to develop hydrogen-powered aircraft. However, challenges such as storage, infrastructure, and the energy-intensive process of hydrogen production need to be addressed for widespread adoption. The trend towards hydrogen reflects the industry's commitment to exploring diverse and sustainable energy solutions.

Digitalization and Smart Technologies:

The Renewable Aviation Fuel market is embracing digitalization and smart technologies to optimize operations and enhance efficiency. Advanced analytics, IoT (Internet of Things), and AI (Artificial Intelligence) are being employed to monitor fuel consumption, streamline supply chains, and predict maintenance requirements. These technologies not only improve the overall efficiency of the Renewable Aviation Fuel market but also contribute to cost reduction and environmental sustainability.

Collaboration and Partnerships:

Collaboration and partnerships across the aviation ecosystem are becoming increasingly vital. Fuel producers, airlines, governments, and research institutions are joining forces to accelerate innovation and address the challenges facing the industry. Collaborative efforts aim to enhance the production of sustainable Renewable Aviation Fuels, invest in infrastructure, and navigate regulatory landscapes. Such partnerships foster a holistic approach to addressing complex issues and driving positive change in the Renewable Aviation Fuel market.

Electrification of Aircraft:

The electrification of aircraft is gaining attention as a disruptive trend in the aviation industry. Electric and hybrid-electric propulsion systems are being explored to reduce emissions and operational costs. While fully electric commercial aircraft are still in the early stages of development, the trend signifies a shift towards cleaner and more energy-efficient technologies. The Renewable Aviation Fuel market is closely monitoring these developments, recognizing the potential impact on traditional fuel demand.

Global Energy Transition and Policy Support:

The global push towards clean energy and sustainable practices is influencing policies related to Renewable Aviation Fuels. Governments worldwide are introducing regulations and incentives to support the development and adoption of sustainable Renewable Aviation Fuels. Policy frameworks that encourage research and development, provide financial incentives, and set emission reduction targets play a pivotal role in shaping the trajectory of the Renewable Aviation Fuel market.

Segmental Insights

Technology Insights

Hydroprocessed Esters and Fatty Acids (HEFA), is the dominating segment, Hydroprocessed Esters and Fatty Acids (HEFA), commonly known as Hydrogenated Vegetable Oil (HVO) or Hydroprocessed Renewable Jet (HRJ), is a type of hydrocarbon aviation fuel made from animal or vegetable oils (triglycerides) by hydroprocessing.

In 2011, hydro-processed esters and fatty acids (HEFA) technology received certification from the American Society for Testing and Materials (ASTM) for bio-jet fuel production. HEFA uses oleo-chemical feedstock, such as oil and fats, for renewable fuel production.

A significant share of available commercial volumes of bio-jet fuels comes from HEFA biojet, with several commercial-scale facilities worldwide producing the same. However, renewable diesel (HEFA-diesel) is also made during the process, with a larger market scope and a higher sales price. Thus, producers are focusing on HEFA-diesel instead of HEFA-jet.

Moreover, hydrocarbon aviation fuel made from animal or vegetable oils comes under bioenergy. According to International Renewable Energy Agency, in 2023, the total global bioenergy capacity accounted for 148 GW, expected to grow due to its environment-friendly nature.

Regional Insights

The North America region is experiencing significant economic growth, North America is one of the largest markets for the aviation industry and renewable aviation fuel. Between 1978 and 2023, US airlines improved fuel efficiency by over 130%, which resulted in nearly 5 billion metric tons of carbon dioxide savings. According to the Airlines for America (A4A), the country's airlines operate approximately 28,000 flights daily in the pre-pandemic stage. Most airline companies in North America posted heavy financial losses in 2020 and 2021. However, airline traffic is expected to recover during the forecast period. Further, as crude oil prices are increasing rapidly, the demand for renewable aviation fuel is expected to grow during the forecast period.

The Bio-Energy Technologies Office (BETO) of the United States and the Department of Energy (DOE), supported by Energy Efficiency and Renewable Energy (EERE), are making efforts to expand the adoption of sustainable, domestically produced alternative fuels for transportation and aviation to stimulate the growth of the renewable fuel industry. In North America, the primary policy incentive for renewable aviation fuel production is the US Renewable Fuel Standard (RFS), which credits refiners and fuel importers who blend renewable fuel into transportation fuel to meet Renewable Volume Obligation standards.

Key Market Players

?TotalEnergies SE
?Neste Oyj
?Swedish Biofuels AB
?Red Rock Biofuels LLC
?Gevo Inc.
?Honeywell International Inc.
?Fulcrum BioEnergy Inc.
?SG Preston Company
?LanzaTech Inc.

?Shell Plc

Report Scope:

In this report, the Global Renewable Aviation Fuel Market has been segmented into the following categories, in addition to the industry trends which have also been detailed below:

? Renewable Aviation Fuel Market, By Fuel Technology:

o Fischer-Tropsch (FT)

o Hydroprocessed Esters and Fatty Acids (HEFA)

o Synthesized Iso-Paraffinic (SIP)

o Alcohol-to-Jet (AtJ)

? Renewable Aviation Fuel Market, By End User:

o Commercial

o Defense

o General Aviation

? Renewable Aviation Fuel Market, By Region:

o North America

? United States

? Canada

? Mexico

o Asia-Pacific

? China

? India

? Japan

? South Korea

? Indonesia

o Europe

? Germany

? United Kingdom

? France

? Russia

? Spain

o South America

? Brazil

? Argentina

o Middle East & Africa

? Saudi Arabia

? South Africa

? Egypt

? UAE

? Israel

Competitive Landscape

Company Profiles: Detailed analysis of the major companies present in the Global Renewable Aviation Fuel Market.

Available Customizations:

Global Renewable Aviation Fuel Market report with the given market data, Tech Sci Research offers customizations according to a company's specific needs. The following customization options are available for the report:

Company Information

?Detailed analysis and profiling of additional market players (up to five).

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