



Greening the Skies: Jatropha Validated as a Preferred Feedstock to Meet Growing Demand for Aviation Biofuels

Increasing economic and environmental pressures are forcing the aviation industry to operate more efficiently while reducing its impact on the earth. In today's challenging market, two statistics exemplify the industry's current pain: more than 50 percent of total operational costs are dedicated to fuel, and the aviation industry currently generates 12 percent of total carbon emissions from the entire transportation sector. With global air traffic expected to double or even triple by the year 2020, increasing fuel efficiency while reducing emissions has become one of the industry's most pressing goals.



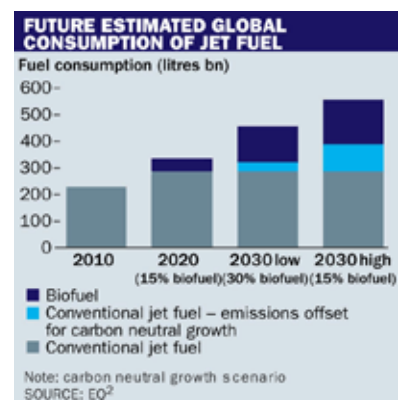
Photo courtesy of Air New Zealand

Reliance on traditional jet fuel is becoming costly on a number of levels. A report from RDC Aviation and Point Carbon has concluded that the aviation industry will face an initial carbon liability of \$1.53 billion in 2012 when aviation enters the European Union's Emission Trading Scheme in 2012. Among top airlines, British Airways, United and Delta will all have exposures in excess of 3 million metric tons of CO₂, and face offset payments of more than \$50 million each.

Major Industry Shift Toward Renewable Jet Fuel

The International Air Transport Association (IATA) has introduced a framework that includes a commitment to make industry growth carbon-neutral by 2021 and reduce overall emissions by 50% by 2050, relative to 2005 levels.

A key component of the industry's ability to meet these targets is the identification and production of large-scale volumes of renewable jet fuel that not only reduces carbon emissions, but operates more effectively than traditional kerosene-based fuels. Total global aviation jet fuel demand is 60 billion gallons per year. With a 50 percent blend of biofuels and jet fuel expected to be ASTM certified and FAA certified in 2010, a potential market of 30 billion gallons of bio jet-fuel per year will be created. Put into context, biofuels sales for 2009, globally, were approximately 22 billion gallons.



By 2015, Boeing hopes to have 500 million to 600 million gallons of second-generation biofuel available, which would comprise 1 percent of the company's needs. With such volumes required, the director general of the IATA has identified aviation biofuels as a \$100 billion market opportunity.

But one major obstacle stands in the way -- lack of supply. JetBlue Airways was forced to cancel a biofuels test flight in early 2010 due to lack of available feedstock. There is "a long list of airlines who would like to do a biofuels flight" with Airbus, says Rainer Ohler, the air framer's senior vice-president of public affairs. "The problem is the availability of biofuel."



Jatropha: Tested and Validated

Within the past year, Jatropha has emerged as a preferred feedstock to fill current supply shortages based on its performance and the ability to cost-effectively and sustainably produce large volumes over the next several years.

Jatropha oil has successfully powered test flights by Air New Zealand, Japan Airlines and Continental Airlines. The Air New Zealand flight used a 48% blend of Jatropha oil and traditional jet fuel. The two-hour flight from Auckland included a range of fuel-specific tests, including a full-throttle takeoff and climb at varying thrust levels. Leveling off at 10,000 feet, the crew varied fuel bleed loads on the engine. Between 20,000 and 25,000 feet, a suction test was conducted to check fuel lubricity. Pumps in the tank were switched off and fuel was drawn through the system using pumps on the engine. Climbing to 35,000 feet, the crew conducted two acceleration tests.

“There was absolutely no change in performance,” said David Morgan, Air New Zealand’s general manager of airline operations and chief pilot. “That’s what was notable about the flight - nothing happened; there were no surprises.”

“From a technical standpoint, it (Jatropha) performed flawlessly,”

- Darrin Morgan, Director of Sustainable Biofuels Strategy for Boeing.

Scientific findings released by Air New Zealand following the flight showed the test resulted in a 60 to 65 percent reduction in greenhouse gas emissions from the Jatropha-jet fuel blend compared to traditional jet fuel flights. The biofuel was responsible for a 1.2 percent savings in fuel over the 12-hour flight, equal to 1.43 tons of fuel. Scientists also estimate that the decrease in fuel consumption saved around 4.5 tons of CO₂ emissions.

Aviation testing has validated that Jatropha not only works as a source for aviation biofuels, but its performance exceeds traditional jet fuel for two key reasons:

- A low cloudpoint allows the fuel to function effectively at the cold temperatures required by aviation use.
- The oil burns hotter and produces more energy than traditional kerosene, improving overall fuel efficiency.

Market Momentum

Industry momentum is quickly building in support of the development of bio jet-fuel and Jatropha. Among recent developments:

- In March 2010, British Airways announced that it will construct a waste biomass gasification plant at one of four sites under consideration in East London. The plant will produce renewable aviation biofuels. The plant will commence operations in 2014, and will utilize 500,000 tons of waste biomass.
- Rentech signed an off-take agreement with 13 airlines for renewable, drop-in jet fuel made from waste biomass.
- AltAir signed with 14 airlines for renewable, drop-in jet fuel made from camelina oil
- In October 2009, Boeing, Mexico’s Airports and Auxiliary Services agency and Honeywell’s UOP announced a partnership to develop sustainable aviation biofuels sources in Mexico, with a key focus on Jatropha.



- The newly-formed Sustainable Aviation Fuels User Group announced a research project, funded by SAFUG founding member Boeing, to complete the first lifecycle analysis of CO2 emissions and socio-economic impact of Jatropha.
- GOL, the largest low-cost Latin American airline, announced its partnership with SAFUG to research and develop Jatropha as a source for sustainable jet fuel.

Jatropha: Profitable, Sustainable and Ready for Large-Scale Production

As the aviation industry searches for a short-term supply of sustainable crude oil, Jatropha can be profitably and sustainably produced today. Jatropha is considered one of the most sustainable feedstocks for biofuels. It can be grown on land considered marginalized and undesirable for food production. Because its seedcake can be used as fertilizer, it avoids the use of harmful petroleum-based fertilizers. And, third-party life cycle analysis has found Jatropha to provide a 70 percent reduction in greenhouse gas emissions compared to traditional petroleum.

It can be effectively grown in subtropical regions around the globe, providing readily accessible fuel to key aviation markets. Through its elite cultivars, SG Biofuels today can produce Jatropha crude oil at \$1.39 per gallon (\$58 per barrel), a cost that opens the door for profitable large-scale production, creating an efficient alternative fuel for the aviation industry that increases operational efficiencies through lower fuel costs while significantly reducing carbon emissions.