



**Dr. Anjan Ray**

Regional Commercial Director, Renewable Energy and Chemicals, UOP India Pvt Ltd, A Honeywell Company

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Energetica India catches up with Dr. Anjan Ray, Regional Commercial Director, Renewable Energy and Chemicals, UOP India Pvt Ltd, A Honeywell Company to get more insights into Honeywell's Green Jet Fuel

**ENERGETICA INDIA: Please introduce us to Honeywell's Green Jet Fuel.**

DR. ANJAN RAY: UOP, a Honeywell company, has developed and commercialized the UOP Renewable Jet Fuel™ process, which converts non-edible, second-generation crops, natural oils and wastes to Honeywell Green Jet Fuel™. This renewable fuel has been proven to meet key aviation fuel specifications for both commercial and military flight and to reduce greenhouse gas emissions by as much as 85% compared with petroleum aviation fuel.

The UOP Renewable Jet Fuel process was developed under a grant from the U.S. Defense Advanced Research Projects Agency (DARPA). The process is feedstock-flexible, meaning it can convert a wide range of sustainable feedstocks such as algae, certain greases, used cooking oil and camelina, into high-quality, on-spec Honeywell Green Jet Fuel. When used up to a 50% blend with petroleum jet fuel, Honeywell Green Jet Fuel meets aircraft specifications with-

out requiring any aircraft modifications. In demonstration flights, the engine with Green Jet Fuel performed just as well, and in some cases better than, the engines with petroleum-based fuel. In 2011, Honeywell Green Jet Fuel was approved by ASTM International for use in commercial aircraft.

Today, Honeywell Green Jet Fuel is being commercially produced in refineries in the U.S. and Europe. Alt Air Fuels, based in California, will start up a new unit this year. The facility will supply fuel to United Airlines for flights from Los Angeles to San Francisco.

**ENERGETICA INDIA: What kind of savings (costs and emissions) can be seen by using green jet biofuel?**

DR. ANJAN RAY: Honeywell Green Jet Fuel is both sustainable and practical. It has shown high energy density in flight, which allows aircraft to fly farther on less fuel, and it is clean burning because it contains low levels of aromatics and sulphur. Hon-

eywell Green Jet Fuel offers an impressive reduction of up to 85% in greenhouse gas emissions relative to petroleum-based fuels. Apart from cost saving and reduction in greenhouse gas emissions, Honeywell Green Jet Fuel offers several other advantages:

- Honeywell Green Jet Fuel meets or exceeds key aviation fuel specifications when blended with petroleum fuel
- Honeywell Green Jet Fuel can replace as much as 50% of petroleum fuel in aircraft without changes to fleet technology or the fuel storage and delivery infrastructure. Thus, it can be considered a drop-in replacement for fossil jet fuel, commonly termed Aviation Turbine Fuel (ATF) in India
- Honeywell also manufactures Auxiliary Power Units (APUs) for a range of aircraft. Honeywell Green Jet Fuel is certified for use in these APUs just as it is certified for use in jet engines by most major engine manufacturers

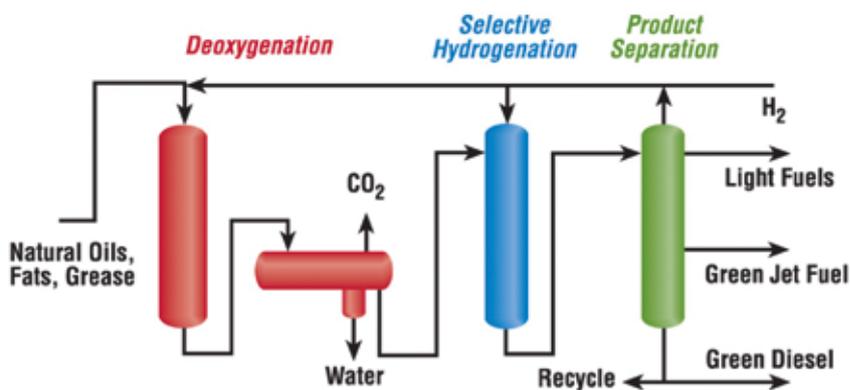
- Honeywell Green Jet Fuel is made from second-generation feedstocks that don't interfere with food, land or water resources.

**ENERGETICA INDIA: How is this jet fuel manufactured? When can we see green jet fuel being commercially viable compared to current jet fuels?**

DR. ANJAN RAY: The UOP Renewable Jet Fuel process is based on traditional refining hydroprocessing technology. It works by adding hydrogen to remove the oxygen from the feedstock and then further refining this product to meet the required specifications. The process produces a bio-synthetic paraffinic kerosene (bio-SPK) or Green Jet Fuel that is then blended with standard jet fuel for use in flight. The resulting fuel meets all of the jet fuel specifications set by qualifying agencies.

The majority of the cost to produce any fuel is contained within the feedstock, so as more second-generation feedstocks are developed across the world, the economics of sustainable biofuels will start to improve.

As the first company in the world to produce and demonstrate renewable jet fuel, UOP has been a pioneer in making aviation biofuel a reality. UOP has partnered with multiple military and commercial aviation leaders, including the U.S. Navy



Honeywell Green Jet Fuel process.

and Air Force, major global airlines such as KLM and Japan Airlines, and aircraft OEM partners such as Boeing and Airbus, to demonstrate the viability of Honeywell Green Jet Fuel. Since the first demonstration flight at the end of 2008, testing has proven that Honeywell Green Jet Fuel meets or exceeds key specifications for flight.

The fuel was approved for commercial, passenger-bearing flights by ASTM International on July 1, 2011. Soon thereafter, Honeywell's corporate jet, a Gulfstream 450, took the world's first transatlantic biofuel flight, travelling from New Jersey to Paris.

**ENERGETICA INDIA: How has the Indian market reacted to the product?**

DR. ANJAN RAY: We have seen interest from multiple airlines. In particular, airlines flying from Indian airports to EU countries are likely to benefit from use of aviation biofuels if and when the EU Emissions Trading Scheme (ETS) is fully implemented. The ETS requires aircraft flying into EU airports to demonstrably reduce their greenhouse gas emissions. Some reductions can be achieved by

the use of more modern, energy-efficient aircraft and by smarter flight path management, also areas in which Honeywell has made significant contributions through our Aerospace business. However, the ICAO targets for CO<sub>2</sub> emissions cannot be met by such initiatives alone; biofuels are an essential component of the overall solution. In effect, a premium for biofuels relative to fossil fuels can then be justified to the extent of avoiding a carbon tax.

**ENERGETICA INDIA: What kind of market potential does the company expect in India?**

DR. ANJAN RAY: Because Honeywell Green Jet Fuel is commercially approved and is being produced on a commercial scale, it can be used in regular passenger flights in India. There are no licensed UOP Renewable Jet process units in India at this time, though we are in conversations with potential licensees in the region. A key barrier is the limited availability of non-food feedstocks in India, because of which economies of scale are not yet available. For example, our licensed plant for green diesel production in Louisiana, USA, consumes as much feedstock daily as the monthly supply of Jatropha oil in India.

That said, we see promising signs of scaling up biofuel feedstock availability by the Ministry of New and Renewable Energy and the Department of Biotechnology, Government of India. While this may take time, it is important to explore mechanisms for collecting and using waste cooking oil for biofuels on a large scale, as has been done fairly successfully in the U.S., EU and China. One should also consider using non-food residues from edible oil refining, which are currently used in sectors such as soaps and candles ◀◀

