Honeywell UOP | Renewable Fuels



Sustainable fuels for cleaner skies

UOP Renewable Jet Fuel Process™

Honeywell's UOP, a leader in refining technologies for more than a century, is leading the path to new sources of energy and cleaner skies.

Worldwide economic expansion is rapidly driving energy consumption. Global demands for aviation fuel and regulations to reduce the industry's environmental footprint are on the rise. Historically, aviation leaders have turned to mechanical and technological enhancements to find ways to reduce fuel burn and greenhouse gas emissions. Now renewable jet fuels offer the industry an alternative carbon-reduction strategy with no aircraft or engine modifications required. Honeywell Green Jet Fuel has a tremendous capability to provide a sustainable solution to meet energy challenges today and tomorrow.

Meets All Flight Specifications

Originally developed under a U.S. Defense Advanced Research Projects Agency (DARPA) contract, the UOP Renewable Jet Fuel Process™ produces high-quality, renewable jet fuel that performs just like petroleum fuels. Made from non-food, second-generation feedstocks such as camelina, jatropha and algae, Honeywell Green Jet Fuel meets or exceeds critical specifications for flight. When used up to a 50 percent blend, it can be a drop-in replacement, requiring no changes to fleet technology or the fuel storage and delivery infrastructure.

Lower Emissions, Higher Efficiency

Honeywell Green Jet Fuel is a sustainable option that is also practical. It has shown high energy density in flight, meaning aircraft can fly the same distance with a given amount of fuel, and it is clean burning because it contains low levels of aromatics and sulfur. It offers a remarkable 65 to 85 percent reduction in greenhouse gas emissions relative to petroleum-based fuels. And as second-generation feedstocks are developed and become more commercially viable, sustainable biofuels will be priced competitively with petroleum jet fuel.



Second-Generation Feedstocks

Second-generation feedstocks are non-food, natural materials that do not interfere with the availability of valuable food, land or water resources. Examples include camelina, algae and jatropha.

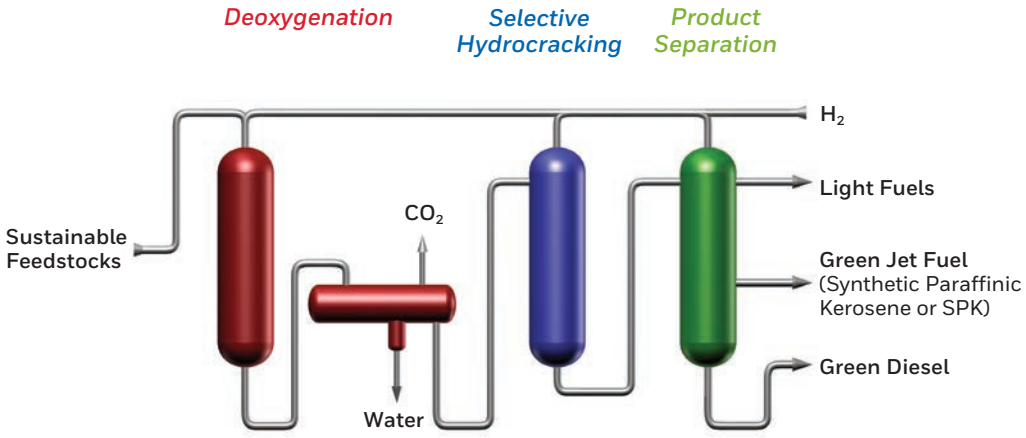
The UOP process successfully converts any of these inedible feedstocks and many others to produce on-spec, renewable jet fuel. This flexibility gives fuel producers the option to choose the biofeedstock that best suits their location and operating goals.

Green Jet Fuel Properties

Properties	*Jet A-1 specification*	*Honeywell Green Jet Fuel* *Bio-synthetic paraffinic kerosene (bio-SPK) made from camelina*	*50/50 Blend of camelina bio-SPK & Jet A-1*
Flash point, °C	Min 38	45	46
Freeze point, °C	Max -47	-57	-57
Net heat of combustion, MJ/kg	Min 42.8	43.9	43.6
Thermal stability (JFTOT) • Filter pressure differential, mm Hg • Tube deposit rating (visual)	 Max 25 Max 3	 0.0 1	 0.0 1
Aromatics, % volume	Max 22	<0.3	8.5
Sulfur, % mass	Max 0.3	<0.001	0.05

UOP Renewable Jet Fuel Process Technology

The Renewable Jet Fuel process, licensed by UOP, 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.



Flight-Proven

As the first company in the world to produce and demonstrate renewable jet fuel, UOP has pioneered the way to make aviation biofuels a reality. UOP has partnered with multiple military and commercial aviation leaders including the U.S. Navy 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 and even exceeds key specifications for flight, and the fuel was approved for commercial, passenger-bearing flights by ASTM International on July 1, 2011.

To view a list ofcommercial and military flights using Honeywell Green Jet Fuel™, please visit www.uop.com/renewableflights.





Commercially Available

UOP produced nearly 1 million gallons of Honeywell Green Jet Fuel to support military and commercial application testing and to help certify the fuel for flight through ASTM International. The first full-scale commercial plant was installed in 2015 and additional plants are being installed to produce Honeywell Green Jet Fuel.

Experience You Trust

UOP is a recognized leader in process technology for the refining and petrochemicals industries, and it has continued to evolve to meet the needs of our changing world. UOP has developed technology to support every major change in the refining industry since 1914. In fact, 31 out of today's 36 foremost refining technologies were developed by UOP. Today a staggering 60 percent of the world's gasoline and 85 percent of biodegradable detergents are made using UOP technology.

As fuel regulations become stricter worldwide and the need for alternatives to traditional petroleum resources grows, UOP will remain the leader in developing methodology and technology to address the world's energy challenges.

For more information

For more information, please contact your UOP representative or visit us online at www.uop.com

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