

# Feed-Flexible Processing of Oil-Rich Crops to Transportation Fuel

UOP LLC



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A Honeywell Company

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UOP 4926-01

## Where is Biofuels Technology Headed?

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### Fuel Additives / Blends



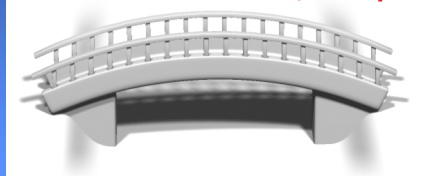
### Fuels



### UOP's Bio-Fuels Technology Goals

Identify and utilize processing, composition, and infrastructure synergies to lower capital investment, minimize value chain disruptions, and reduce investment risk.

### Inedible Oils: Camelina, Jatropha



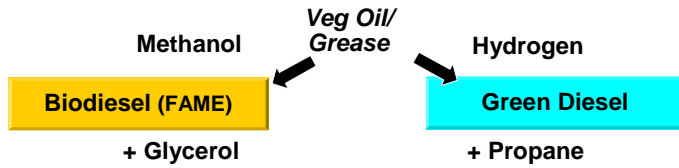
#### Generation 1

- Vegetable oils to diesel, gasoline and jet fuel

#### Generation 2

- Lignocellulosic biomass to fuels
- Algal oils to fuels

## Green Diesel vs. Biodiesel (FAME)



	<i>Petroleum ULSD</i>	<i>Biodiesel (FAME)</i>	<i>Green Diesel</i>
Oxygen Content, %	0	11	0
Specific Gravity	0.84	0.88	0.78
Sulfur content, ppm	<10	<1	<1
Heating Value MJ/kg	43	38	44
Cloud Point, °C	-5	-5 to +15	-30 to -10
Cetane	40	50-65	70-90
Lubricity	Baseline	Good	Baseline
Stability	Baseline	Poor	Baseline

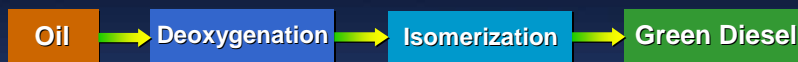
**UOP/ENI Ecofining™ Process to Produce Green Diesel**

UOP 4856I-12

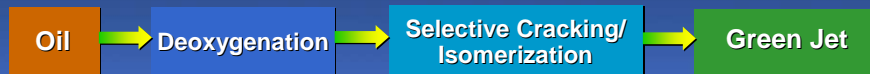
## Production of Jet Fuel

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### Ecofining™



**New Bio-Oil to JP-8 Process Based on Existing UOP Technology**



**Selective cracking: Process and catalyst development to maximize economic production of higher yields of jet-range paraffins**

UOP 4789H 30

## Properties of UOP's Bio-Based JP-8



Sample	Freeze Point, °C	Flash Point, °C	Density, g/cc
JP8 Spec	-47	38	0.775
UOP JP-8 range paraffins	-52.6	53	0.759†

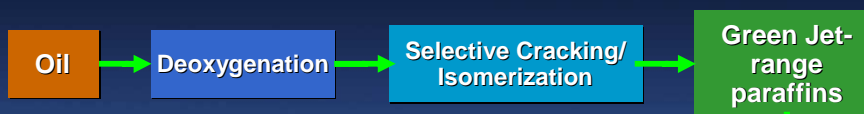
† Aromatic additives required to make JP-8 specification; also true for synthetic jet fuel

	JP8 Spec	Soybean oil derived JP-8	Coconut oil derived JP-8	Petroleum JP-8
% aromatic (*added)	max 25 vol %	15%*	22%*	18.8
Freeze Point, C	-47	-50	-62	-50
Flash Point C	38	54	56	51
Specific Gravity @ 15 C	.775-.84	0.779	0.780	0.804
Heat of combustion (Btu/lb)	18400 min	18600	18655	18600
IBP C (D86)		165	169	159
10% (D86)	157-205	176	177	182
20% (D86)		180	179	189
50% (D86)	168-229	199	188	208
90% (D86)	183-262	268	226	244
FBP C (D86)	300	279	262	265

2 samples from different biofeedstocks met JP-8 specifications

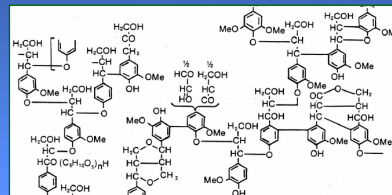
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## Meeting JP-8 specifications: Aromatics to meet density specs



### Sources of Aromatics

- Refinery sources
  - Aromatics complexes
  - Platforming
- Renewable sources
  - Deoxygenated pyrolysis oil



UOP 478BH 30

## Renewable Aromatics



	JP-8 Spec	Starting Paraffin	Deoxygenated Pyrolysis Oil (Corn Stover derived)	Deoxygenated Pyrolysis Oil (Mixed wood derived)
Freeze Point (°C)	-47	-53	-56	-54
Flash Point (°C)	39	53	49	54
Density (g/mL)	0.775	0.759	0.790	0.782

➤ 100% Bio-derived JP-8 product is possible

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## Integrated Algal Processing for jet fuel production

