



# Renewable, Aromatic, Drop-in (Readi) Fuels

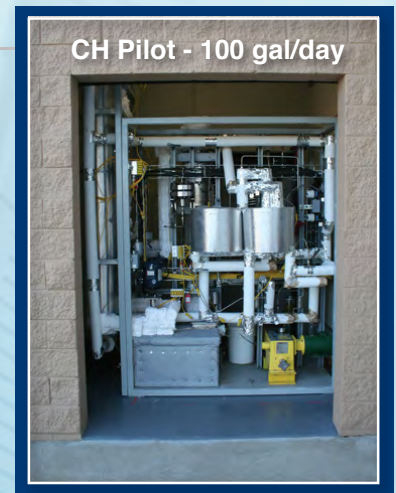
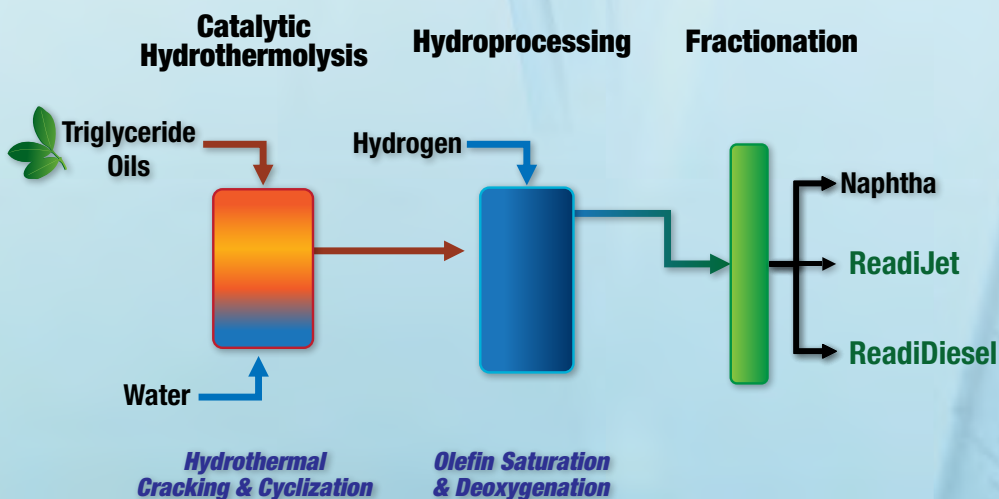
## TECHNOLOGY HIGHLIGHT

**ReadiJet** **ReadiDiesel**

### Process Summary

Applied Research Associates Inc. (ARA) developed a novel process called Catalytic Hydrothermolysis (CH). The patented CH process converts oils from plants and algae into **Renewable, Aromatic, Drop-in (Readi)** fuels known as **ReadiJet** and **ReadiDiesel**. These fuels are **ready** to use, without blending, in turbine and diesel engines designed to operate on petroleum-based fuels. The **low-cost** CH conversion process uses water to reduce hydrogen consumption, catalyst consumption, and carbon footprint relative to other alternative fuel conversion processes such as Fischer-Tropsch (FT) and Hydrotreated Renewable Jet (HRJ). The CH process converts any non-edible oil (triglyceride) directly into high-density aromatic, cycloparaffin, and isoparaffin hydrocarbons that are ideal for jet/diesel fuels.

### The Catalytic Hydrothermolysis Process (PATENTED)



### Benefits of the CH Process:

- Produces high yields of pure hydrocarbon fuels
- Produces high-density cycloparaffin and aromatic compounds
  - *Ideal chemical composition for **ReadiJet** and **ReadiDiesel** fuels*
- Produces valuable bio-based chemicals
- Converts **any** renewable oil feed stock
- Reduces hydrogen consumption compared to HRJ and FT
- Reduces CO<sub>2</sub> emissions compared to HRJ and FT
- Minimizes water, chemical, catalyst, and energy consumption



[www.ara.com/fuels](http://www.ara.com/fuels)

## Properties of *ReadiJet* Fuel Produced by Catalytic Hydrothermolysis (CH)

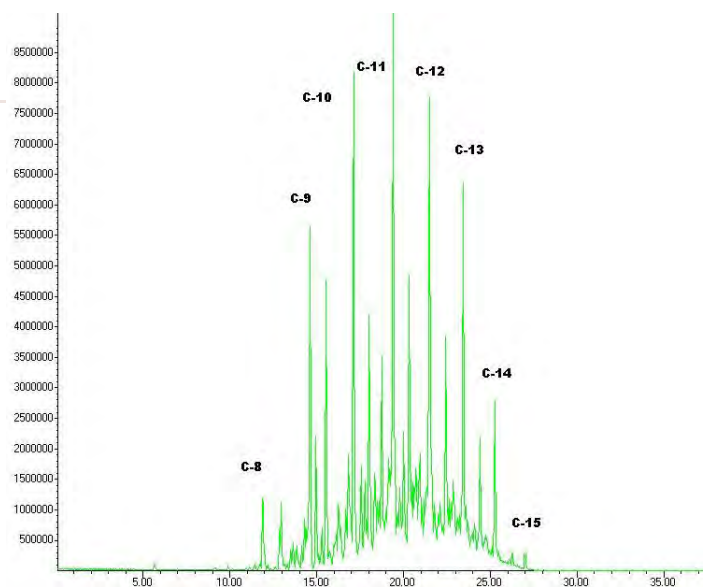
Specification Test	MIL-DTL-83133H Spec Requirement	ReadiJet™ from Camelina	ReadiJet™ from Carinata	Petroleum JP-8 Reference
Total Acid Number, mg KOH/g	≤0.015	0.011	0.012	0.003
Aromatics, vol %	≤25	24.2	16.8	18.8
Olefins, vol %	≤5	1.3	1.8	0.8
Heat of Combustion (m), MJ/kg	≥42.8	42.9	43.2	43.3
Hydrogen Content, % mass	≥13.4	13.3*	13.8	13.8
Smoke Point, mm	≥19	22	26	22
<b>Thermal Stability @ 260°C:</b>				
Tube Deposit Rating	≤3	1	1	1
Change in Pressure, mm Hg	≤25	0	0	2
Flash point, °C	≥38	48	46	51
Freeze Point, °C	≤-47	-54	-57	-51
Viscosity @ -20°C, cSt	≤8.0	3.9	3.5	4.9
Viscosity @ -40°C, cSt	≤12.0	7.4	6.5	9.9
Density, kg/L @ 15°C	0.775 - 0.840	0.818	0.802	0.804
Lubricity (BOCLE), wear scar mm	≤0.85	0.59	0.57	0.53



Analysis performed by AFRL/RZPF

## Catalytic Hydrothermolysis (CH) Produces Superior Quality Renewable “Drop-in” Fuels

- Meets ASTM and MIL specs for petroleum fuels
  - Compatible with petroleum and synthetic fuels
  - Ready to use with or without blending
  - High-density, contains aromatics
- Exhibits excellent combustion quality
  - No sulfur, high hydrogen, clean-burning
- Exhibits excellent low-temperature properties
  - Viscosity, freeze point, pour point, cloud point
- Exhibits excellent storage and thermal stability



CG of ReadiJet from Carinata Oil

### Contact Information:

Applied Research Associates, Inc.  
430 West 5th Street, Suite 700  
Panama City, FL 32401  
Phone: 850-914-3188

**Mr. Edward N. Coppola**  
ecoppola@ara.com

**Mr. Chuck Red**  
cred@ara.com



ARA is an international research and engineering company recognized for providing technically excellent solutions to complex and challenging problems in the physical sciences. Founded in Albuquerque, NM in 1979, ARA has offices throughout the United States and Canada. ARA provides a broad range of technical expertise in defense technologies, civil technologies, computer software and simulation, systems analysis, environmental technologies, and testing and measurement. ARA also provides sophisticated technical products for environmental site characterization, pavement analysis, and robotics. For more information about ARA's diverse and innovative capabilities visit our web site at [www.ara.com](http://www.ara.com).