

US Department of Energy: Alternate Fuels

http://www.afdc.energy.gov/fuels/emerging_green.html

Hydrogenation-Derived Renewable Diesel

Hydrogenation-derived renewable diesel (HDRD), also known as green diesel or second-generation biodiesel, is the product of fats or vegetable oils—alone or blended with petroleum—refined by a hydrotreating process. HDRD meets the petroleum diesel ASTM specification. This allows it to be legally used in existing diesel infrastructure and vehicles. HDRD derived from domestic biological materials is considered an alternative fuel under the [Energy Policy Act of 1992](#).

Production

HDRD can be produced from soybean, palm, canola, or rapeseed oil; animal tallow; vegetable oil waste or brown trap grease; and other fats and vegetable oils. Producing HDRD involves hydrogenating triglycerides to remove metals and compounds with oxygen and nitrogen using existing refinery infrastructure. Dedicated hydrotreating facilities that do not use conventional petroleum can also produce HDRD.

Fuel producers are designing HDRD to substitute for or blend in any proportion with petroleum-based diesel without modifying vehicle engines or fueling infrastructure. To be used in diesel engines, HDRD must meet the same ASTM standards as conventional diesel.

Distribution

HDRD is compatible with existing fuel distribution systems. Blended HDRD can be distributed through modern infrastructure and transported through existing pipelines to dispense at fueling stations.

Benefits

HDRD fuels can be an alternative to conventional transportation fuels. The benefits of HDRD fuels include:

- **Increased energy security**—HDRD can be produced domestically from a variety of feedstocks while creating U.S. jobs.
- **Fewer emissions**—Carbon dioxide captured by growing feedstocks reduces overall greenhouse gas emissions by balancing carbon dioxide released from burning HDRD. Blends of HDRD can reduce carbon monoxide and hydrocarbons. In addition, HDRD's [ultra-low sulfur](#) content should enable the use of advanced emission control devices.

- **More flexibility**—HDRD that meets quality standards can fuel modern diesel vehicles. This fuel is compatible with existing diesel distribution infrastructure (not requiring new pipelines, storage tanks, or retail station pumps), can be produced using existing oil refinery capacity, and does not require extensive new production facilities.
- **Higher performance**—HDRD's high combustion quality results in similar or better vehicle performance compared to conventional diesel.

Research and Development

Manufacturers are performing most of the ongoing HDRD research and development. Some manufacturers—including [ConocoPhillips](#), [Neste Oil](#), [Petrobras](#), [Syntroleum](#), and [UOP](#)—are developing and testing HDRD refining processes in commercial settings. The U.S. Department of Energy (DOE) supports HDRD research and development, including UOP's work developing production technologies.

More Information

Learn more about hydrogenation-derived renewable diesel from the links below. The AFDC and U.S. Department of Energy do not necessarily recommend or endorse these companies (see [disclaimer](#)).

- [Biomass News from the Green Car Congress](#)
- [Alberta Renewable Diesel Demonstration: An Assessment of Winter Operability and Infrastructure Integration \(PDF\)](#)
- [California Renewable Diesel Multimedia Evaluation \(PDF\)](#)
- [Biodiesel and Other Renewable Diesel Fuels \(PDF\)](#)
- [From Biomass to Biofuels: NREL Leads the Way \(PDF\)](#)
- [Liquid Fuels from Biomass \(PDF\)](#)

The AFDC also provides a [publications](#) search and a database of [related links](#).



Air Resources Board
Mary D. Nichols
Chairman

State of California

Edmund G. Brown Jr.



State Water Resources Control Board
Felicia Marcus
Chair

July 31, 2013

Certified Unified Program Agencies (CUPAs)
Underground Storage Tank (UST) Operators
Petroleum Fuel Marketers, Refiners, and Blenders
Renewable Diesel Producers/Importers
Other Interested Stakeholders

Renewable Diesel Should Be Treated the Same as Conventional Diesel

This is a joint statement by the Air Resources Board (CARB) and the State Water Resources Control Board intended to clarify questions that have been raised regarding the status of renewable diesel. As discussed below, renewable diesel should be treated the same as conventional CARB diesel for all purposes, including storage in underground storage tanks (USTs).

For purposes of this statement, conventional CARB diesel is petroleum-based diesel that meets specified aromatics, sulfur content, and lubricity standards, as well as ASTM International standard specification, ASTM D975-12a. Similarly, renewable diesel also meets ASTM D975-12a, but it is made from non-petroleum sources. Specifically, renewable diesel meets the definition of “hydrocarbon oil” and the physical and chemical properties specified in ASTM D975-12a. For comparison, Attachment 1 shows the ASTM D975-12a specifications and typical properties for conventional CARB diesel and samples of renewable diesels recently tested by various researchers. As shown, both the tested conventional CARB diesel and renewable diesel samples fall well within the ASTM D975-12a specifications.

Despite renewable diesel being comparable to conventional CARB diesel, there have been questions regarding the ability of marketers and others to store renewable diesel in USTs. Further, questions have been raised about the compatibility of renewable diesel with leak detection systems used in USTs currently storing conventional CARB diesel. We consider renewable diesel to be a “drop in” fuel that can be blended with conventional CARB diesel in any amount and used with existing infrastructure and diesel engines. Accordingly, renewable diesel that meets the requirements for conventional CARB diesel and ASTM D975-12a should be treated no differently than conventional CARB diesel that is legal for sale in California.

The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs, see our website: <http://www.arb.ca.gov>.

California Environmental Protection Agency

Various Stakeholders

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Our staffs would be happy to discuss any questions you may have with regard to renewable diesel or this letter. Please contact Mr. Floyd Vergara, Chief, Alternative Fuels Branch, at (916) 327-5986 or fvergara@arb.ca.gov for air-related questions, and Ms. Shahla Farahnak, Assistant Deputy Director, Groundwater Quality Branch, at (916) 341-5737 or sfarahnak@waterboards.ca.gov for water-related questions.

Sincerely,

Sincerely,


Richard W. Corey
Executive Officer
California Air Resources Board


Tom Howard
Executive Director
State Water Resources Control Board

Attachment

cc: Ms. Shahla Farahnak,
Assistant Deputy Director,
Groundwater Branch, State Water Resources Control Board

Mr. Floyd Vergara, Chief
Alternative Fuels Branch, Air Resources Board

Attachment 1
Table of Sample Renewable Diesel Properties

Property	Test Method	D975-12a ¹	Sample Fuel Properties							
			ARB Study ²		CRC Study ³					
			Conv. CARB Diesel	Renewable Diesel	RD1	RD2	RD3	RD4	RD5	RD6
Flash Point, °C	D93	38 min	148	146	68.25	59.5	72	76	46	89.25
Water and Sediment, % vol	D2709	0.05 max	---	---	--	--	--	--	--	--
	D1796	0.5 max	< 0.02	< 0.02	0.0022	0.0034	0.0031	0.0007	0.0016	0.0034
Distillation Temperature, °C90 %, % vol recovered	D86	282 - 338	322	286	294	291	301	315	297	292
Kinematic Viscosity, mm ² /S at 40°C	D445	1.3 - 24.0	2.7	2.5	2.605	2.525	2.096	3.613	1.878	2.841
Ash, % mass, max	D482	0.10 max	< 0.001	< 0.001	--	--	--	--	--	--
Sulfur, ppm (µg/g)	D5453	15 max	4.7	0.3	1	1	0.8	0.6	0.7	19.2
% mass	D2622	0.05 max	---	---	--	--	--	--	--	--
% mass	D129	2.00 max	---	---	--	--	--	--	--	--
Copper strip corrosion rating (3 h at a minimum control temperature of 50 °C)	D130	No. 3 max	1b	1a	--	--	--	--	--	--
Cetane number	D613	30 min	55.8	72.3	74.5	72.1	54.8	74.7	47.6	74.7
<i>One of the following properties must be met:</i>										
(1) Cetane index	D976-80	40 min	56.8	76.9	--	--	--	--	--	--
(2) Aromaticity, % vol	D1319	35 max	---	---	--	--	--	--	--	--
Operability Requirements										
Cloud point, °C, max	D2500	Report	-6.6	-27.1	-3.6	-14.4	-20.3	-12.7	<-54	-4.2
or										
LTFT/CFPP, °C, max	D4539 / D6371	Report	---	---	-8	-16	-27	-15	--	-9
Ramsbottom carbon residue on 10% distillation residue, % mass	D524	0.35 max	0.03	0.02	--	--	--	--	--	--
Lubricity, HFRR @ 60°C, micron, max	D6079 / D7688	520 max	---	---	576	591	370	538	603	--
Conductivity, pS/m or Conductivity Units (C.U.), min	D2624 / D4308	25 min	55	135	--	--	--	--	--	--
Total Aromatic Content	D5186-96	N/A	18.7	0.4	0.3	0.5	20.35	0.6	2.6	0.7
PAH	D5186-96	N/A	1.5	0.1	0.08	0.1	3.5	<0.1	<0.31	<0.1
Nitrogen Content, ppmw	D4629-96	N/A	1.3	1.3	0.01	0.01	7.1	0.1	0.2	0.5
Derived Cetane #	IQT*	N/A	---	74.7	77.75	73.3	52.15	89.15	44.1	79.05
Gravity, API	D287-82	N/A	39.3	51.3	50.5	50.3	39.4	48.5	38.2	49.7
IBP	D86	N/A	337	326	325	311.8	357.4	332.9	316.3	394.1
10%, °F	D86	N/A	408	426	437.7	415.4	391.5	518.9	367.8	478.5
50%, °F	D86	N/A	519	521	533.4	527.6	477.2	572.3	434.2	535.9
EP, °F	D86	N/A	659	568	585.2	573.4	602.8	646.7	619.1	578.6
Pour Point, °C	D-97	N/A	-12	-47	-6	-21	-36	-18	-69	-9

¹ASTM International D975-12a, Standard Specification for Diesel Fuel Oils

²[Biodiesel Characterization and NOx Mitigation Study](#) - Durbin et al., 2011

³[CRC Report No. AVFL-19-2](#), 2013

California Drivers Get High Performance Renewable Diesel

Posted by [News Editor](#) in [Latest News](#), [RSS](#), [Transport](#) on August 19, 2015 10:19 pm / [no comments](#)

LOS ANGELES, California, August 19, 2015 (ENS) – High performance renewable diesel fuel was introduced to Southern California drivers this week by Propel Fuels, based in Sacramento.

Called Diesel HPR (High Performance Renewable), the fuel is a low-carbon, renewable fuel that meets petroleum diesel specifications and can be used in any diesel engine.



Diesel HPR

Refined from recycled fats and oils, Diesel HPR does not contain biodiesel or petroleum diesel. It is diesel refined from renewable biomass through Neste's advanced hydrotreating technology called NEXBTL.

Neste, based in Espoo, Finland, is the leading producer of renewable diesel in the world, with an annual production volume of more than two million tons. The company is the world's largest producer of renewable fuels from waste and residues.

Diesel HPR meets the toughest specifications required by automotive and engine manufacturers. The fuel is designated as ASTM D-975, the standard for all ultra-low sulfur diesel fuel in the United States.

It is recognized as "CARB diesel" by the California Air Resources Board, although it contains no petroleum.

According to the U.S. Department of Energy's Alternative Fuels Data Center, renewable diesel's high combustion quality results in similar or better vehicle performance than conventional diesel.

California Air Resources Board studies show that renewable diesel can reach up to 70 percent greenhouse gas reduction compared to petroleum diesel.

"It's good to see this high quality, low-carbon diesel coming to corner gas stations across Southern California," said Mary Nichols, who chairs the California Air Resources Board.

"This renewable diesel will now be conveniently located for all consumers, and joins a growing suite of new, cleaner transportation fuels in California thanks to our Low Carbon Fuel Standard and forward thinking companies like Propel," she said.

Fleets and individual drivers choosing Diesel HPR enjoy better performance, reductions in greenhouse gases, and improved local air quality due to less harmful air emissions such as nitrogen oxides (NOx) and particulates (PM 2.5) as compared with petroleum-based diesel.

Diesel HPR made its North American debut in March 2015 at 18 Propel stations across Northern California, where the company has seen strong, positive consumer response.

In first three months of HPR diesel sales, Propel saw a 300 percent increase in gallons sold compared to its former biodiesel product, B20, which is 20 percent biodiesel and 80 percent petroleum diesel.

In August, Propel added 13 new retail locations in the southern part of the state.

"Drivers across Southern California can now experience the power, performance and value of Diesel HPR, while making a positive impact on the air quality of the region," said Propel CEO Rob Elam. "Any diesel vehicle can fill with Diesel HPR since it meets the ASTM D-975 quality standard for petroleum diesel."

Drivers say they appreciate the new product. "I'm thrilled to have Diesel HPR available to me here in California. I could tell a difference in the way my car ran within 10 minutes," said Erik M. of Folsom, California, who declined to give his last name.

"After running Diesel HPR fuel, the truck definitely feels like it has more torque. There seems to be better fuel economy too. I also notice significantly less smoke," said James C. of Point Richmond, California, who also chose to keep his last name private.

Propel has just launched Diesel HPR commercial and bulk availability for business and government fleets statewide.

Delivered in bulk to businesses and agencies, Propel's Diesel HPR is bundled with the company's patented CleanDrive® emissions accounting software, allowing fleets to easily quantify and report greenhouse gas reductions and air quality benefits.

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Neste's NEXBTL Renewable Diesel: The Digest's 2015 8-Slide Guide

Submitted by [admin](#) on August 18, 2015 – 10:02 am

by Jim Lane (Biofuels Digest) Neste's renewable traffic fuels and other renewable products are "part of the solution for the struggle against the climate change," the company says. Using NEXBTL renewable diesel made from 100% renewable raw materials can result in 40 – 90% lower greenhouse gas emissions over its lifecycle when compared with fossil diesel. The company highlights the benefits for fleets, distribution and refiners, below:

For fleets

The low emission profile of NEXBTL renewable diesel is a major benefit for fleet use. As NEXBTL renewable diesel's chemical composition is comparable to fossil fuel, it also behaves just like petroleum diesel. This enables fleets to switch to cleaner fuel overnight without making any additional investments or modifications to their fleet. Switching to premium-quality NEXBTL renewable diesel can help lower a fleet operator's service and maintenance costs. Also, the lower emission levels mean that fleets can contribute to improving local air quality. Therefore, NEXBTL is an excellent alternative for powering city buses, for example.

For distributors

NEXBTL renewable diesel is not only fully compatible with existing engines, but also the existing fuel distribution infrastructure. The product can be blended and distributed within the existing diesel infrastructure; all the way from the refinery to service stations and end-users. With no blending limits, NEXBTL renewable diesel is a cost-efficient solution and enables flexible fulfilment of biofuel mandates.

For refiners

The benefits of NEXBTL renewable diesel for the refiner are clear. Excellent blending properties mean that even heavier, lower cetane diesel cuts can be flexibly upgraded to on-spec fuel grades that meet biomandate needs in one easy step. As NEXBTL renewable diesel is fully compatible with the existing fuel infrastructure, no investments are required. The fuel's performance is also excellent in cold weather.