

## Focus on Fuels

### In This Issue

#### TM&C Services

[Renewable Fuel Standards Set for 2014, 2015, & 2016](#)

January 2016

Volume 6, Issue 1



**Elizabeth Hilbourn, P.E.**  
**Dir. of Regulatory Services  
& Special Studies**

Renewable diesel has been a growing subset of biomass-based diesel RINs, comprising 20% of D4 RIN generations in recent years. Because of its energy content, it receives 1.7 RINs to the gallon in comparison to biodiesel which receives 1.5. Renewable diesel is produced from the same feedstocks as biodiesel; however, the chemical reactions are different which lead to significantly renewable diesel properties that are more similar to petroleum diesel than biodiesel. Unlike ethanol, which has a 10% blendwall for various reasons, renewable diesel is considered a drop in fuel and has no blending limit either by regulation or by diesel properties. Some shutdown refineries have considered modifications to produce renewable diesel. Marketers have had an easy time introducing it into the marketplace, even for use with no blending with petroleum diesel. Distribution companies, which consider themselves green, have announced multi-year plans to purchase renewable diesel. Trucking companies are signing off on the use of renewable diesel on its engines (Mack Trucks, Volvo Trucks, Scania). The California Governor announced in early December 2015 that all state agencies will now be required to purchase renewable diesel for their fleets of diesel-powered vehicles and equipment. This month's *Focus on Fuels* explores this 'hot' renewable fuel.

### TM&C Services in Fuel Regulations

TM&C provides a full range of services in its fuels regulatory practice. Some of these services are listed below.

- Preparing, reviewing and submitting fuels reports, including CDX submissions.
- Facility audits for compliance with fuels

### Renewable Diesel

*by Elizabeth Hilbourn*

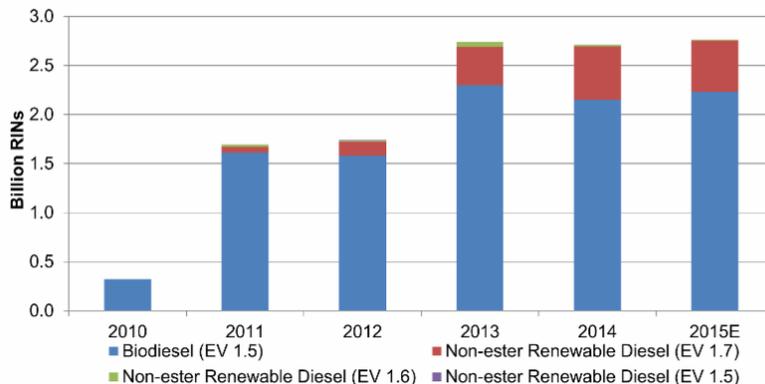
Currently, 500 million D4 RINs are generated from renewable diesel. Around the world, renewable diesel is often considered an advanced biofuel. The International Energy Agency (IEA), in their Tracking Clean Energy Progress, refers to renewable diesel as advanced

programs.

- Interaction with EPA to pose fuels-related questions.
- Industry specialist assistance for required gasoline attestations.
- Industry specialist assistance for in-line blending audits.
- Assistance in setting up a fuels compliance group/program.
- Personnel reviews of compliance-related groups.
- Compliance status reviews and recommendations.
- Negotiations/consultation during EPA enforcement actions.
- 3rd-Party Engineering reviews.
- Due diligence reviews of facilities and companies in RFS RINs Program.

biodiesel. Renewable diesel is marketed as hydrotreated vegetable oil (HVO) abroad. Renewable diesel is also called hydroprocessed esters and fatty acids (HEFA).

**Figure 1**  
**Biomass-Based Diesel (D4) RIN Generation**



In recent years, several major facilities have been built (and more are planned) to produce renewable diesel fuel. The largest renewable diesel facility in the U.S., the Diamond Green Diesel plant, was constructed in 2013 adjacent to the Valero Norco refinery. In 2014, the Venice, Italy ENI refinery was converted to a renewable diesel facility; and this year, part of the Paramount, California refinery is being converted to a renewable diesel facility. Plans are in order for 2016 to be the last year to process crude oil at the Total La Mede, France refinery, where a renewable diesel facility is currently being built. The Bakersfield, California refinery has processed tallow through its hydrotreater with petroleum to generate an advanced biofuel RIN (D5).

### Renewable Diesel versus Biodiesel

Typical biodiesel that is not distilled at the back end has an amber appearance, whereas renewable diesel is crystal clear (see Figure below). Properties of HVO are considered superior to biodiesel. HVO cetane is notable at greater than 70, whereas soybean oil biodiesel typically has a 47 cetane. Specific gravity of HVO is lower than biodiesel at about 0.78 versus biodiesel's around 0.83. HVO has higher energy content than biodiesel; the majority of U.S. HVO is given a RIN equivalence value of 1.7 versus 1.5 for biodiesel. This means that 1.7 D4 RINs can be generated for every gallon of renewable diesel generated. Measured contaminants are lower for HVO than biodiesel. Cloud point and cold flow properties of HVO are superior to petrodiesel and much better than biodiesel, particularly when isomerization is used in the renewable diesel production process, since it creates branched alkanes. HVO fuel quality is equal to the synthetic Fischer-Tropsch BTL and GTL diesel fuels.

## Figure 2 Biodiesel vs. Renewable Diesel (HVO)



The same feedstocks are used to produce both HVO and biodiesel. In the production of HVO, hydrogen is used to remove oxygen from the triglyceride vegetable oil molecules and to split the triglyceride into three separate chains, thus creating hydrocarbons which are similar to existing diesel fuel components.

Renewable diesel has more connection to the refining process than any other renewable fuel. The hydrotreating process is a process utilized by petroleum refineries today to remove contaminants such as sulfur, nitrogen, condensed ring aromatics, or metals. In this process, feedstock reacts with hydrogen under elevated temperature and pressure to change the chemical composition of the feedstock. In the case of renewable diesel, hydrogen is introduced to the feedstock in the presence of a catalyst to remove other atoms such as sulfur, oxygen and nitrogen to convert the triglyceride molecules into paraffinic hydrocarbons. Since this process is currently used by many petroleum refineries, renewable diesel blends can be produced with existing refineries by co-processing the feedstock with petrodiesel; however, if renewable diesel is co-processed with petroleum products, it can only generate an advanced biofuel RIN (D5) and not a biomass-based diesel RIN (D4), which is typically generated for renewable diesel. This is a slight downgrade in RIN quality since a D4 RIN can be used to satisfy a D5 obligation, but a D5 RIN cannot be used to satisfy a D4 obligation.

The equipment and process are similar to the hydrotreaters used to reduce diesel sulfur levels in petroleum refineries. This allows for blending renewable diesel into petroleum diesel in any desired ratio without any concerns regarding quality. Biodiesel is made by the transesterification process, whereby the added alcohol (commonly methanol) is deprotonated with a base to make it a stronger nucleophile. HEFA fuels

are hydrocarbons, rather than alcohols or esters, and can be used in diesel engines without the need for blending with petroleum diesel fuel. Below is a list of current producers registered with the EPA to produce a D4 1.7 EV renewable diesel.

**Table 1**  
**EPA Registered 1.7 EV Renewable Diesel D4 Producers**

Facility Name	Location
AltAir Paramount, LLC	CA
Diamond Green Diesel LLC	LA
Renewable Environmental Solutions, LLC	MO
Green Energy Products Renewable Diesel	KS
Houston Refining LP	TX
Neste	Rotterdam
Neste	Singapore
Neste	Finland
RB Processing, L.L.C.	TX
REG Geismar, LLC (prior Dynamic Fuels, LLC)	LA

Starting in 2013, with the Green Diamond renewable plant and the Valero Norco refinery, renewable diesel plants have begun to be co-located with refineries. Next was the ENI Venice, Italy refinery. The latest is the Alon Paramount refinery which utilized some idle equipment to put its renewable diesel plant on line this year. The latest announcement has been the announced conversion of Total's refinery in La Mede, France, to produce renewable diesel.

### **Market Experience**

Premium EN 590 diesel fuel containing at least 10% of HVO was sold in Finland publicly from 100 service stations year-round since 2008, even in severe winter conditions, with good experience. The highest blending ratios utilized were about 30%, and it did not contain any biodiesel. In July 2015, UPS announced that it will buy as much as 46 million gallons of renewable diesel over the next three years, helping the company reach a goal of displacing 12% of the petroleum-based fuels in its ground fleet by 2017. In June 2015, United Airlines announced a \$30 million investment in a large producer of aviation biofuels, and in July 2015, Red Rock Biofuels announced that it would produce about three million gallons of renewable jet fuel each year for FedEx, with delivery to begin in 2017 and run through 2024. Renewable diesel can drop in directly and replace diesel completely without any kind of blend-wall. Much of Neste's renewable diesel goes to California and is marketed through Propel Fuels as 'Diesel HPR', a 100% renewable diesel product. In August 2015, Propel Fuels launched Diesel HPR (High Performance Renewable) and reported a 15X jump in per-outlet sales of renewable fuel for diesel engines compared to the B20 (20% biodiesel) it replaced. Diesel HPR is recognized as 'CARB diesel' by the California Air Resources Board even though it contains no petroleum. This U.S. marketing of renewable diesel will be greatly curtailed if the biodiesel tax credit (as introduced this month) is passed.

## **Biodiesel (Renewable Diesel) Tax Credit**

There was a big push from organizations, notably the National Biodiesel Board, to make the biodiesel tax credit for 2015-2016 into a producer rather than a blender's credit. Just this month, the tax was passed through the House and Senate as a blender credit. The biodiesel tax credit allows blenders of biodiesel (and renewable diesel) to claim a credit of \$1 per gallon against their U.S. federal tax liability. If the tax was limited to just a producer credit, it would have affected renewable diesel in the U.S. since only 20% of worldwide renewable diesel capacity is located in the U.S. and an estimated 35% is imported. The result would have meant fulfilling the renewable fuel standards for 2016 and would have been even more difficult since over 20% of D4 RINs come from imports.

**Turner, Mason & Company** |  
CONSULTING ENGINEERS

2100 Ross Ave, Suite 2920

Dallas, TX 75201

Phone: 214-754-0898

Fax: 214-754-5915

[www.turnermason.com](http://www.turnermason.com)