



Overview

The BioForming[®] process for producing BioForm[®] Diesel converts plant-derived feedstocks into renewable diesel range hydrocarbons. The product is a mixture of clean burning paraffins, isoparaffins and naphthenes that lead to desirable physical properties, including good cetane, sulfur below detectable limits, and strong cold flow performance. Virent BioForm Diesel meets all ASTM D975 requirements for Ultra-Low Sulfur US Number 2 Diesel without blending.

Advantages

Feedstock Flexibility

A wide variety of cellulosic and conventional plant sugars can be converted in the BioForming process to produce consistent final products.

Drop-In Fuels

BioForm Diesel is fully fungible, containing the same hydrocarbon types as petroleum derived diesel. Other benefits include reliable cold flow performance year-round, and compatibility with current infrastructure.

Key Properties

Cetane Number

High cetane equates to minimal ignition delay, improved combustion, and a cleaner burning fuel.

Sulfur

The BioForming Process removes sulfur and other ash contaminants below detectable levels, which reduces emissions and fuel systems wear.

Boiling Point Distribution

Flash point and end points are controlled by distillation, similar to conventional petroleum refinery processing. The fuel has a broad boiling point range from C₉-C₂₄, comparable to conventional diesel.

Viscosity and Cloud Point (Cold Flow)


The fuel meets exceeds all requirements to provide good fuel atomization in combustion, and far exceeds the lower cloud point performance of conventional diesel, thereby avoiding gelling and gumming issues that often associated with biodiesel.

Acid Number

An acid number below detectable limits ensures reactive oxygenated species have been removed to prevent corrosion. This contrasts with biodiesel, which has a high acid number and leads to blending limits.

Density and Heating Value

Density and heating value similar to conventional diesel results in >7% fuel economy compared to biodiesel.

Spec Test	ASTM D975 US #2 Diesel	 VIRENT	Biodiesel Typical ⁽²⁾	Conventional ULSD ⁽³⁾
Cetane Number	>40	50	>47	48
Sulfur, ppm	<15	<2 (BDL ⁽¹⁾)	<2 (BDL ⁽¹⁾)	7.5
Ash, mass	<0.010%	<0.001% (BDL ⁽¹⁾)	<0.001% (BDL*)	Not tested
Distillation, 90%V, °C	282-338	290-320	<360	320
Flash point, °C	≥52	55-60	>130	66
Viscosity @ 40°C, mm ² /s	1.9 – 4.1	2.2	4.1	2.5
Cloud Point, °C		-40	< 2	-16
Acid #, mgKOH/g		<0.02 (BDL ⁽¹⁾)	0.30	Not tested
Density @ 15°C, kg/m ³		840	890	842
LHV, MJ/kg		42.8	37.5	42.6

(1) Below detectable limits

(2) biodiesel.org ADM Biodiesel Typical Properties, SOY B100
<http://www.biodiesel.org/docs/ffs-basics/adm-fact-sheet-biodiesel-technical-information.pdf?sfvrsn=4>

(3) Commercial ultra-low sulfur diesel analyzed for comparison purposes

