VIRENT BioForm® Gasoline

Overview

The BioForming® process for producing BioForm® Gasoline converts plant-derived feedstocks into renewable gasoline range hydrocarbons. The product is a clean burning mixture of aromatics, paraffins, and isoparaffins that lead to attractive properties, including high octane, sulfur below detectable limits, and advantaged energy density. Virent BioForm Gasoline is registered with the Environmental Protection Agency (EPA) for use up to a 45% blend, which meets all ASTM D4814 specifications.

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 Gasoline is fully fungible, containing the same hydrocarbon types as petroleum derived gasoline. Other benefits include high octane, energy density, and compatibility with current infrastructure and engines.

Key Properties

Octane Number

BioForm Gasoline can be produced with octane up to 110. High octane prevents knocking that leads to unwanted noise, loss of power, and engine damage.

Reid Vapor Pressure (RVP)

RVP is controlled by distillation, similar to a petroleum refinery. BioForm Gasoline can be tailored to meet seasonal and geographical specs. Conforming to RVP spec ensures good cold start performance.

Sulfur

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

Boiling Point Distribution

The fuel has a broad boiling point range from C_4-C_{12}, comparable to conventional gasoline. The range can be tailored by distillation to meet end use requirements.

Aromatics and Olefins

Compositional similarity of BioFormate blendstock to conventional reformate allows for high blend levels

Water Solubility

No appreciable water solubility ensures compatibility with current infrastructure and engines, unlike ethanol.

Heating Value

Heating value similar to conventional reformate results in >30% energy density advantage compared to ethanol.

Finished Gasoline Properties

Spec Test	ASTM D4814 US Automotive	VIRENT (1)
Octane #, AKI	87-93	**91**
RVP, psi	7.8-15	**9.1**
Sulfur, ppm wt	80	**2.1**
Distillation, °C		
T10	50-70 max	**53**
T50	77 min to 110-121 max	**101**
T90	185-195 max	**154**
End Point	<225	179

(1) 45% Virent BioForm Gasoline blend for EPA testing

Blendstock Properties

Test	VIRENT (1)	Conventional Reformate (2)	Ethanol(3)
Octane #, AKI	**90 – 110**	60 – 105	110
RVP, psi	**1 – 15**	1 – 5	17
Sulfur, ppm wt	**BDL(4)**	1 – 10	--
Aromatics, Vol%	**70 – 99**	60 – 95	--
Olefins, Vol%	**0.5 – 2**	0.5 – 2	--
H2O Solubility Vol%(5)	**Negligible**	Negligible	100%
Heating Value, BTU/gal(5)	**115,000**	115,000	78,000

(1) Typical properties of 100% BioFormate, ranges can be tailored based on distillation
(2) Typical conventional reformate range, "SAE 902098 Gasoline Blend Stock Analysis"
(3) Typical E100 blendstock properties, Alternative Fuels Data Center http://www.afdc.energy.gov/
(4) Below detectable limits
(5) Estimated based on composition, not directly measured