BRAZILIAN BIOCOMBUSTÍVEIS LTDA

PRODUCT TECHNICAL DATA SHEET
BBL 100

Technology BBL 100 – Next-generation renewable drop-in fuel for diesel engine and SAF
Patent n. BR 11 2022 011447-8 A2 - INPI

BRAZILIAN BIOCOMBUSTÍVEIS
Tecnologia Renovável Avançada

BBL - Advanced Renewable Diesel

Technical Product Package

The technology is protected by patents granted by INPI (Brazil) and filed under the PCT system, ensuring global intellectual property rights.

Part I – Product Technical Data Sheet

Product Identification

Product Name: BBL – Advanced Renewable Diesel
Variants: BBL DX (Diesel Blend) | BBL SAF (Sustainable Aviation Fuel)
Technology Ownership: Patent protected (INPI Brazil + PCT international)
Producer: Brazilian Biocombustíveis Ltda. (BBL)
Type: Next-generation renewable drop-in fuel for diesel engine.

Technical Description

BBL 100 is an advanced renewable fuel developed through a proprietary process that blends refined or used vegetable oils with ethanol/methanol and a patented additive (BBL additive). This results in a homogeneous, stable and high-performance drop-in Renewable Diesel compatible with both diesel and aviation applications.

Key Technical Specifications

Property	BBL DX 100	Test Method
Appearance	Clear, amber liquid	Visual
Density @15°C (kg/m³)	840–890	ASTM D4052
Viscosity @40°C (mm²/s)	3.0–4.5	ASTM D445
Flash Point (°C)	<30	ASTM D93
Cetane Number	>40	ASTM D613
Sulphur (mg/kg)	<3.0	ASTM D5453
Oxidation Stability (h@110°C)	>10	EN 14112
Higher calorific value (kcal/kg) 2	8.210	ASTM D3286
Lower calorific value (kcal/kg) 2	7.570	ASTM D3286
Freezing Point (°C)	–27	ASTM D2386
CO_2 Lifecycle Reduction	Up to –70%	ISO 14064

*Values are indicative and may vary depending on feedstock and production batch.

Biocombustíveis Brasileiros Ltda
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Applications

• BBL DX – drop-in renewable diesel replacement for ground transport, machinery, and power generation, blend with diesel,
• BBL SAF – sustainable aviation fuel for blending with Jet A1/QAV, validated by ENAC Italy to participate at the program ¨Roadmap for Sustainable Aviation Fuel in Italy¨.

Main Advantages

• Drop-in fuel – compatible with existing diesel engines and infrastructure.
• Tested and validated for blending up to 50% with fossil diesel (vs. 15% for conventional biodiesel) in motor vehicles, within the ANP RESOLUTION, ¨Experimental Fuels¨.
• High superior oxidative stability and storage life (more than 5 years)
• Lower NOx, SOx, CO, and particulate emissions.
• Validated for tests, within ENAC's Roadmap for Sustainable Aviation Fuels (Italy).

Safety & Handling

Non-toxic and biodegradable. Handle as per standard diesel/aviation fuel practices. Avoid ignition sources, store in sealed tanks, and use personal protective equipment when necessary.

Part II – Technical Product Dossier

1. Executive Summary

BBL – Advanced Renewable Diesel represents a breakthrough in renewable fuel technology. Unlike conventional biodiesel, it does not rely on transesterification but uses a proprietary process that blends vegetable oils with ethanol (and or methanol) and BBL additive to create a stable, fully miscible, drop-in fuel. The result is a next-generation Renewable Diesel that can be blend seamlessly with fossil diesel and Jet A1 without engine modifications.

2. Product Overview & Chemical Route

The BBL process involves three key steps: (1) pre-treatment of refined or used vegetable oil feedstock, (2) controlled mixing with hydrous ethanol/methanol, and (3) addition of the BBL proprietary additive. This additive enables molecular stabilization between oil and alcohol, forming a homogeneous renewable fuel with enhanced oxidative stability and cold flow properties, with no by-product.

3. Performance Data

Comparative testing has confirmed that BBL 100 can be blended up to 50% with fossil diesel with no loss in performance, in motor vehicles. Emission reductions of up to 70% CO_2 and significant reductions in NOx, SOx, CO, and particulate matter were recorded.

Comparative Performance Table

Parameter	Conventional Biodiesel (FAME)	BBL DX	BBL SAF
Max Blending Ratio	~15%	Up to 50%	Up to 5% (Jet A1)
Stability	Moderate	High	High
Cold Flow (CFPP)	-5°C	-20°C	<-40°C
Compatibility	Limited	Full drop-in	Full drop-in
CO_2 Lifecycle Reduction	~50%	~70%	Need to be tested

4. Applications & Market Segments

BBL fuels serve dual markets: the diesel segment (transport, logistics, marine and power generation) and the aviation segment (SAF). Both can use existing infrastructure, enabling rapid adoption with minimal capital investment.

5. Sustainability & Environmental Impact

BBL contributes directly to the decarbonization of the transport and aviation sectors. Lifecycle analyses show up to 70% reduction in CO_2 emissions compared to fossil fuels. The use of waste and recycled feedstocks (UCO – Used Cooking Oil) aligns with circular economy principles and supports ESG goals.

6. Production & Scalability

BBL's modular industrial units allow flexible production between 50 and 80 million liters/year per unit, scalable up to 1 billion liters/year globally by 2030. The first industrial unit is planned for Brazil, leveraging proximity to ethanol/methanol and vegetable oil supply chains.

7. Safety & Handling

BBL fuels are non-toxic, biodegradable, and have low aromatic content. Standard handling practices for liquid fuels apply. Avoid direct contact and ensure adequate ventilation during storage and use.

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