

All Cummins HHP Engines Approved for Biodiesel Blends



Biodiesel defined



A renewable, biodegradable alternative to diesel fuel, made from vegetable oils, animal fats or recycled cooking oil.



Common biodiesel blends, such as B20, offer similar engine power, ignition, torque and yield as petroleum diesel.

Biodiesel can be used in most diesel engines with little or no modification. The letter "B" indicates the percentage of biodiesel in a blend. **Common blends include:**

B7

7% biodiesel
93% petroleum diesel

B20

20% biodiesel
80% petroleum diesel

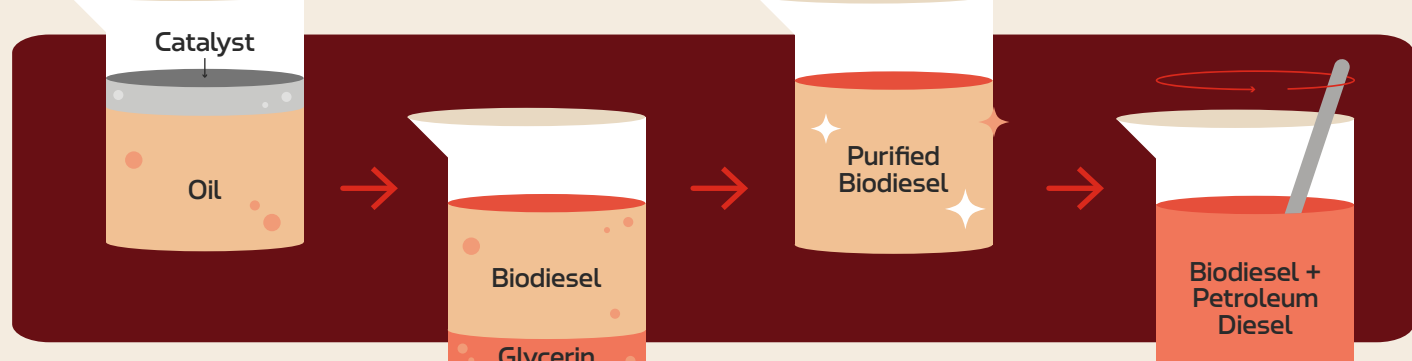
a common blend for fleets

B40

40% biodiesel

used in specialized or modified engines

Production process



- The oils or fats used as feedstocks are combined with alcohol (typically methanol or ethanol) and a catalyst (usually sodium or potassium hydroxide).
- A chemical reaction known as **transesterification** converts the feedstocks into biodiesel and glycerin.
- The glycerin is removed, and the biodiesel is purified.
- In most cases, biodiesel is blended with petroleum-based diesel fuel.

Varied feedstock

High-quality biodiesel can be refined from many feedstocks, but other properties may involve tradeoffs:



Highest energy content

- Palm oil
- Animal fats



Best stability

- Canola/rapeseed oil
- Sunflower oil



Most sustainable

- Waste cooking oil
- Non-edible oils



Lowest cost

- Waste cooking oil
- Animal fats

Potential biodiesel benefits



Environmental

- Lower particulate matter (PM) and carbon monoxide (CO) emissions
- Reduced greenhouse gas (GHG) emissions
- Fast biodegradability
- Non-toxic



Economic

- No costly retrofits of existing equipment
- Domestic production boosts energy security of the producing nation; lower import bills
- Cost of operation can increase with higher fuel filtration requirements



Performance

- Similar performance to petroleum diesel
- Higher cetane allows engines to start easier and run more efficiently
- Better lubrication extends equipment life

Biodiesel vs. traditional vs. renewable diesel

	Biodiesel	Traditional Diesel	Renewable Diesel (HVO)
Sustainability	Renewable	Non-renewable	Renewable
Emissions	Potential increase in NOx compared to diesel	High pollutants and GHGs	Similar to biodiesel or better
Maturity	Best-known and accepted biofuel	In use since 1893	Newer alternative; limited availability
Compatibility	Increasing blends often have maintenance and fuel-handling impacts	Works in any diesel engine	Chemically identical to petroleum diesel; compatible with existing engines and infrastructure
Lubricity	High: reduces engine wear	Standard	Low: often solved by blending with 2% biodiesel
Storage	Requires separate tanks and extra precautions	Standard fuel storage	Standard fuel storage; can mix with traditional diesel
Shelf Life	6 months	Most reliable within 6 to 12 months	Comparable to traditional diesel
Cold-Flow Performance	Tends to gel or solidify at warmer temperatures than petroleum diesel; requires additives in cold weather	Standard	Varies by refining process; additives are less effective
Cost	Varies: average B20 cost is similar to or slightly lower than traditional	Baseline	Most expensive

Biodiesel powers several applications today



Mining equipment



Marine vessels



Locomotives



Heavy-duty trucks



Agricultural & construction

Compatible Cummins Engines

On-Highway

ISX ISV5.0
ISM ISB*
ISL ISX CM570**

Off-Highway

QSK QSL
Q5X Q5C
Q5M Q5B Series*

Diesel

Cummins HELM™ X10, X15 and B-Series advanced diesel engines

Marine

Cummins MerCruiser™ Diesel Marine Engines*

Many Cummins engines can also be used with blends up to B40 in Indonesia. All future Cummins products will be compatible with B20.

*Built after January 2007
** Built after January 2002

Challenges and considerations



Biodiesel costs more to produce
higher feedstock costs; more complex processing; governmental support is critical



Feedstock availability and quality
Multiple feedstocks available but limited; fuel quality defined for specific blend percent



Fuel-handling challenges
requires additives in cold weather



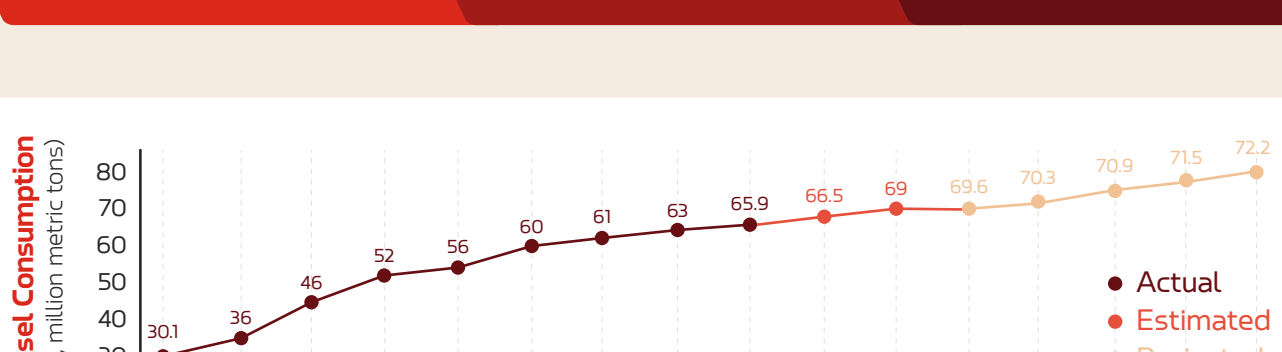
Energy density impact
approximately 8% lower for B100

Biodiesel global impacts

71M Metric tons globally produced and consumed in 2024.

1/3 Of all biofuels produced and consumed worldwide are biodiesel.

2B Gallon per year biodiesel production capacity in the U.S.



Regulations, standards and incentives



- ASTM D6751** specifies U.S. requirements for pure biodiesel (B100) that will be blended with petroleum diesel.
- ASTM D7467** establishes U.S. quality requirements for biodiesel blends used in diesel engines (B6–B20).
- BN 14214** is the European standard for biodiesel.

- The U.S. Renewable Fuel Standard (RFS) and EU Renewable Energy Directive (RED II) set **minimum blending requirements** for biofuels, including biodiesel, in transportation fuels.
- U.S. biodiesel producers are eligible for a tax credit of **\$1 per gallon**.

Global biodiesel mandates

