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A Guide To Renewable Diesel And Biodiesel

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As environmental sustainability becomes a top priority for shippers and carriers, the use of alternative fuels is increasing in importance. Renewable diesel and biodiesel have emerged as two viable alternative fuels that could play a key role in decarbonizing transportation. But what are the differences between these two energy types? How can shippers and carriers benefit from using them? This guide provides detailed information on renewable diesel and biodiesel so you can make informed decisions about how to best integrate them into your transportation network.

What is renewable diesel?

Renewable diesel is a fuel made from fats and oils, such as soybean oil or canola oil, and is processed to be nearly the same chemically as petroleum diesel. Consequently, renewable diesel can be used as a replacement fuel, or a “drop-in” fuel, for petroleum diesel. Due to its composition, it can be co-processed with petroleum diesel, transported in petroleum pipelines, and sold at retail stations, with or without blending. As such, 100% renewable diesel, R100, is available as a complete replacement for petroleum diesel, although lower blends are also possible.

The most common production method for renewable diesel in the US is hydro-processing or hydro-treating, which parallels the process used to crack crude oil into gasoline, diesel, and other petroleum products. Since the technology used for crude oil refining is also used to make renewable diesel, there is far less incentive to switch production to renewable diesel without substantial economic support from external sources. Thus, renewable diesel production is price prohibitive to scale without adequate carbon policies.

What are the advantages of using renewable diesel?

- Less likely to affect fuel lines and filters and will perform better in cold temperatures
- Derived from a renewable source and can be produced domestically, thereby reducing lifecycle emissions and limiting reliance on foreign oil
- Serves as a replacement fuel for vehicles due to its chemical composition which is nearly the same as petroleum diesel

What are the disadvantages of using renewable diesel?

- If not managed properly, feedstocks will be grown for renewable diesel, thereby displacing crops and cropland that would otherwise be used for food.
- Deforestation or poor land management practices if not managed properly can be linked to renewable diesel production
- Not entirely free of tailpipe emissions, such as particulate matter, which can harm exposed communities.

The role of renewable diesel in reducing greenhouse gas emissions

According to the [Department of Energy](#) (DOE), the greenhouse gas emissions reduction potential of using renewable diesel instead of petroleum diesel is about 62% for heavy-duty vehicles. The [Western Washington Clean Cities Coalition](#) finds that R100 reduces particulate matter by about 34%, nitrous oxides by about 10%, and carbon monoxide by about 12% compared to petroleum diesel.

A comprehensive outlook on renewable diesel's production, consumption, and price trends

As we analyze renewable diesel, production and consumption are driven almost solely by California. However, the spread of state clean fuel standards, such as those in Oregon and Washington State, as well as more targeted Renewable Fuel Standard objectives may also bolster the market. Greater attention on clean fuels for maritime shipping may also strengthen the market for renewable diesel.

are strong enough to make renewable diesel economical. Government grants and incentives and the national Renewable Fuel Standard also support renewable diesel production.

The Energy Information Administration (EIA) forecasts that domestic renewable diesel production capacity will nearly triple by the end of 2023 from the current production capacity of 77,000 barrels per day.

Consumption

While California remains at the forefront of producing and importing renewable diesel with over 570 refueling stations, other states are beginning to follow suit. Notably, Oregon, Idaho, and Montana have established a presence in this sector, albeit on a smaller scale.

Price Trends

In California, the price of renewable diesel has historically tracked quite closely with petroleum diesel. Outside of the California market and its economic incentives, the price of renewable diesel is more prohibitive, preventing wider use.

What is Biodiesel?

Biodiesel is manufactured from animal fats, vegetable oils, or recycled restaurant grease, and is renewable and biodegradable. The primary biodiesel feedstock in the U.S. is vegetable oil, especially soybean oil.

The biodiesel production process involves combining fats and oils with an alcohol in the presence of a catalyst in a process called transesterification. This converts biomass oils into fatty acid methyl (or ethyl) esters. In comparison, petroleum diesel is comprised of saturated hydrocarbons. **Notably, the cost of producing biodiesel is approximately the same as producing petroleum diesel.**

What are the advantages of using biodiesel?

- Biodiesel is widely available; in fact, biodiesel blends of up to 5% are typical in almost all diesel sold across the US. Biodiesel blends of 2% (B2), 5% (B5), and 20% (B20) are also quite common. **Unlike renewable diesel, biodiesel blends tend to stay at lower levels, so B100 is not common.**
- Biodiesel comes from a renewable source and can be produced domestically, thereby reducing lifecycle emissions and limiting reliance on foreign oil.

- No modifications are necessary for a vehicle to run on biodiesel, although owners and operators should be mindful when considering higher blend levels as there may be vehicle-specific limitations.
- The higher lubricity of biodiesel compared to petroleum diesel helps prevent premature fuel system wear and tear.
- Biodiesel has a higher oxygen content compared to petroleum diesel, lowering emissions but also reducing peak engine power.
- Biodiesel is much less toxic than petroleum diesel, making spills easier to clean.
- Unlike petroleum diesel, biodiesel does not contain sulfur or benzene, a known carcinogen.

What are the disadvantages of using biodiesel?

- Since biodiesel is made using vegetable-based feedstocks and stored at fueling stations, it can grow mold if it gets too warm or congeal if it gets too cold.
- The higher lubricity of biodiesel compared to petroleum diesel raises concerns about deposits on tank walls and pipes, which can clog fuel filters.
 - Note: Additives such as cold-flow improvers, fuel stabilizers, antimicrobial additives, detergent additives, and corrosion inhibitors, can help mitigate the less desirable attributes of biodiesel.
- Small-scale, low-quality biodiesel production tends to not be as uniform and reliable as the quality of petroleum diesel
- If not managed properly, feedstocks will be grown for biodiesel thereby displacing crops and cropland that would otherwise be used for food.
- Deforestation or poor land management practices if not properly managed can be linked to biodiesel.
- Not entirely free of tailpipe emissions, such as particulate matter, which can harm exposed communities.

The role of biodiesel in reducing greenhouse gas emissions

The emissions reduction from using biodiesel varies due to a variety of factors, such as the source material and blend level. According to the DOE, the utilization of biodiesel (B20) can lead to a substantial decrease in greenhouse gas emissions from heavy-duty vehicles. In fact, emissions from biodiesel can be reduced by approximately 60% when compared to petroleum diesel.

Further supporting this statistic are the findings of a 2011 [fact sheet](#) by the DOE, which estimates that biodiesel B20 emits 11% less carbon monoxide and 10% less particulate

matter than standard diesel. It is important to note, however, that biodiesel does emit about 2% more nitrous oxides than petroleum diesel. This increase is directly attributed to the addition of oxygen during the production process.

A comprehensive outlook on biodiesel's production, consumption, and market trends

As we analyze biodiesel, production and consumption are modest, but relatively flat. The International Energy Agency forecasts relatively stable consumption through 2026. Much of this growth will depend on the continued impact of the RFS and LCFS, as well as whether states bolster their biofuels support or more aggressively lean into electric vehicles. As with renewable diesel, greater attention to clean fuels for maritime shipping may also strengthen the market for biodiesel.

Production

Biodiesel production has notably received longstanding support from tax incentives, grants, tax exemptions, the Renewable Fuel Standard, and California's Low Carbon Fuel Standard. Despite the substantial support and incentives, production is primarily concentrated in the Midwest region of the U.S.

Consumption

In the U.S., biodiesel holds the esteemed position of being the second-most produced and utilized biofuel, surpassed only by ethanol. While there is a degree of uncertainty on which vehicles can efficiently operate on higher blends of biodiesel, we believe addressing this concern will be pivotal to propelling the acceptance of biodiesel.

Price Trends

Our research indicates that the average retail price of biodiesel (B20) in dollars per GGE has consistently emulated the price trajectory of petroleum diesel. This correlation plays a significant role in decision-making processes for shippers contemplating a transition to biodiesel.

Moving forward with renewable diesel and biodiesel

As shippers and carriers strive to achieve sustainability goals, renewable diesel and biodiesel stand out as two clean energy sources worth exploring. Both options offer a low-carbon alternative to traditional fuels without sacrificing performance. When it comes to making a decision, there is no one-size-fits-all solution; the best choice for you will depend on many factors including cost, availability, supply chain needs, and more.

Therefore, it's important that you have access to reliable resources and detailed information to make an educated decision.

Breakthrough can help you navigate the complexities of the alternative fuels landscape. Consider [CleanMile](#), our transportation emissions management solution that provides shippers with pertinent data and strategic insights to reduce emissions and costs simultaneously.

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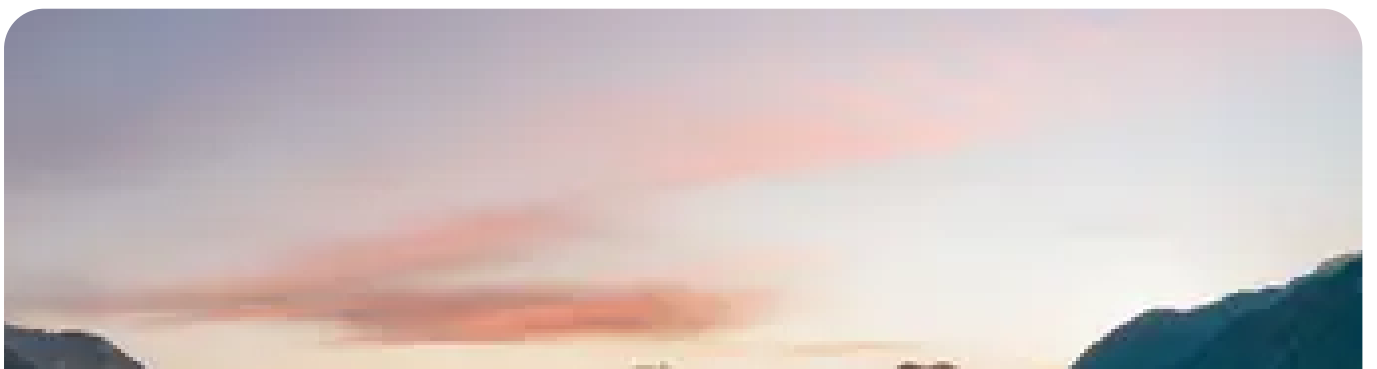


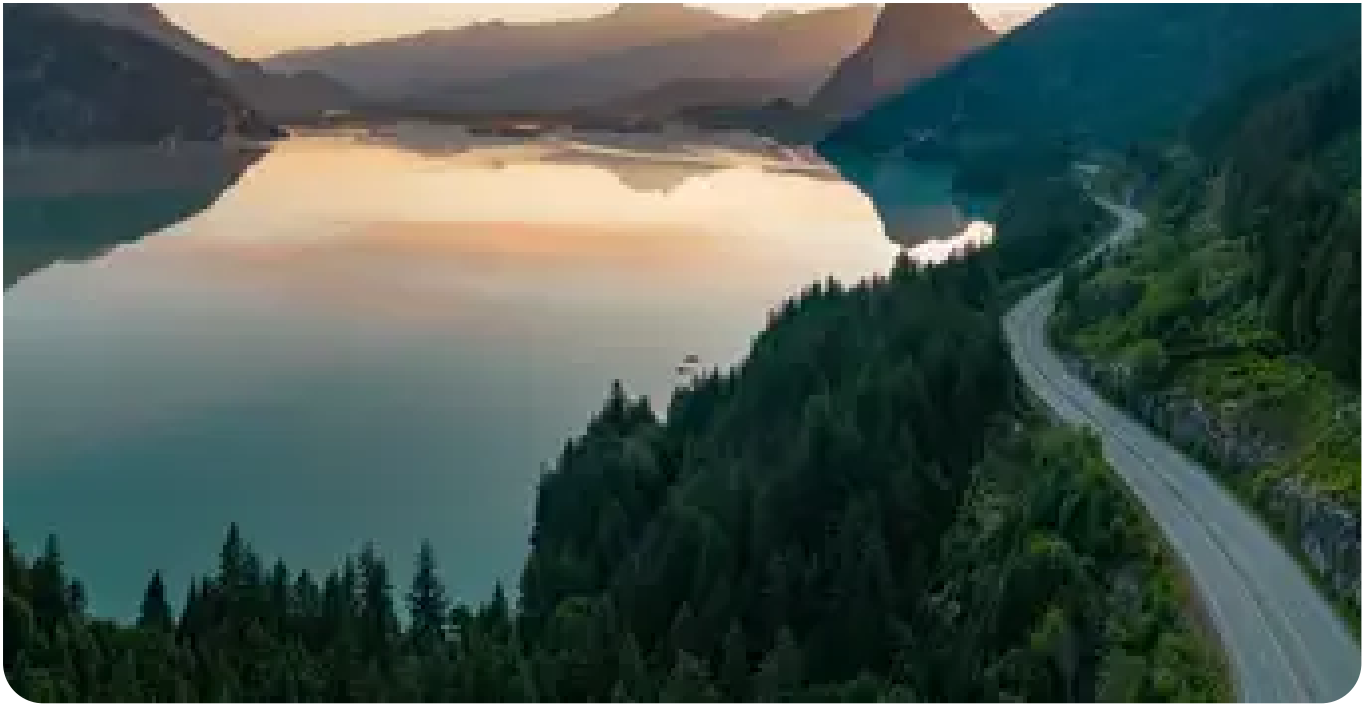
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