



CLIMATE CHANGE, ADVANCED BIOFUELS AND CLEAN DIESEL

When Rudolph Diesel patented his engine over a century ago, it was designed to operate on vegetable oils. Today, most diesel engines are still capable of operating on high quality fuels derived from vegetable oils. Whether it is biodiesel or renewable diesel fuel, the use of high quality advanced biofuels results in significant reductions in greenhouse gas emissions. The use of biodiesel alone has cut greenhouse gas emissions by the same amount as removing 25.3 million cars from the road.

What is biodiesel and renewable diesel fuel?

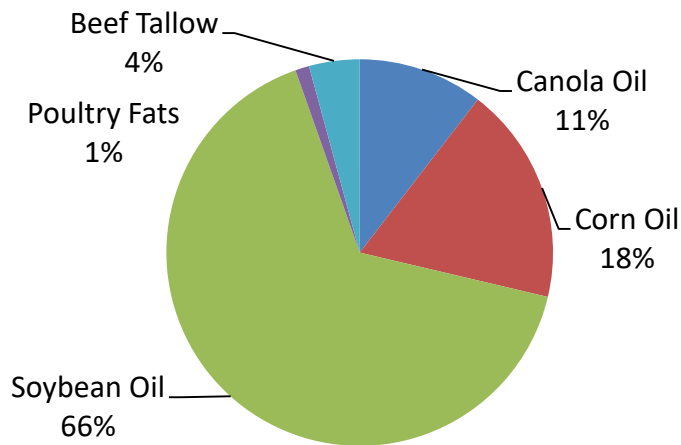
Many of us are aware of ethanol that is blended into gasoline. Ethanol is derived exclusively from corn while biodiesel is a fuel derived from a variety of waste residues. In the U.S., soy and animal fats represent the largest feedstocks for the production of biodiesel.

Renewable diesel fuel is also derived from the same feedstocks as biodiesel. A different chemical process is used to generate an advanced biofuel that meets the same technical specification as petroleum diesel fuel, as defined by the American Society of Testing and Materials (ASTM).

As long as we cultivate crops and livestock for other uses, we will be able to turn unusable waste into fuel.

Biodiesel Feedstocks (2018)

SOURCE: Monthly Biodiesel Report; U.S. EIA



What are the greenhouse gas reduction benefits of renewable diesel and biodiesel fuel?

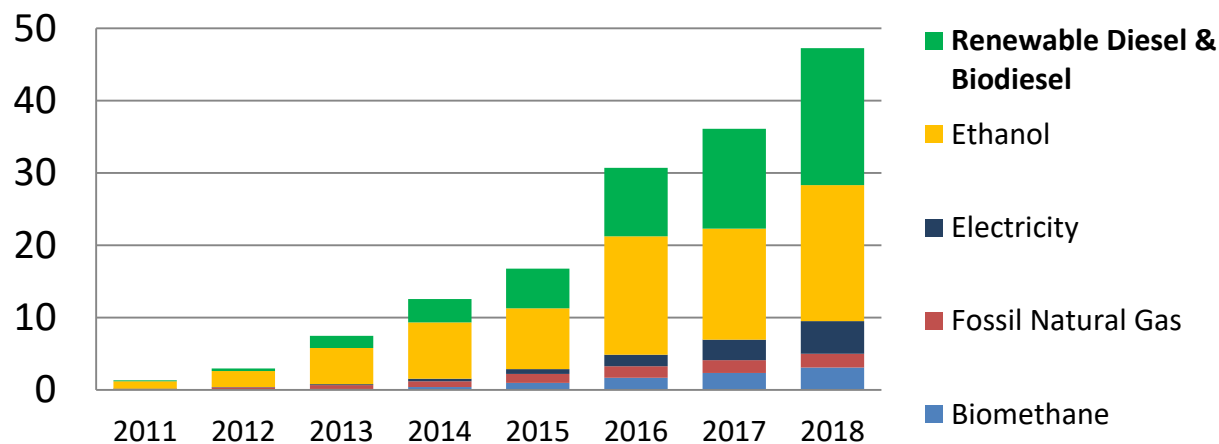
According to the U.S. EPA, biodiesel and renewable diesel fuel are classified as an “Advanced Biofuel” capable of reducing greenhouse gas emission by at least 50 percent. In the case of biodiesel, recent research indicates that greenhouse gas emissions are reduced between 66 and 76 percent relative to petroleum based diesel fuel. Renewable diesel fuel has the potential to further reduce emissions by upwards of 80 percent.

Exponentially more greenhouse gas emissions have been eliminated thanks to the use of biodiesel and renewable diesel fuel in California than either ethanol or all-electric cars and trucks. Since 2011, California adopted a program to require the reduction of the carbon content of transportation fuels like gasoline and diesel. Through the Low Carbon Fuel Standard, fuel producers and distributors have a variety of strategies to meet transportation carbon reduction requirements like installing electric charging infrastructure, natural gas fueling stations or distributing more biodiesel and renewable diesel fuel.

Since 2011, 18.9 million tons of greenhouse gas emissions has been eliminated from the use of renewable diesel and biodiesel fuel in California. This compares to just 4.9 million tons of greenhouse gas emission reductions from the use of all-electric cars and buses, according to the California Air Resources Board.

Cumulative CO2 Reductions (million tons)

SOURCE: California Energy Commission, Low Carbon Fuel Standard Dashboard



Is the use of renewable diesel fuel and biodiesel fuel expanding?

Production and consumption of these advanced biofuels are expanding. Between 2017 and 2018, the U.S. Energy Information Agency reports that biodiesel production expanded by 7 percent.

A key federal policy for renewable fuels is the Renewable Fuel Standard (RFS). The RFS program was originally created under the U.S. Energy Policy Act of 2005, which established the nation's first renewable fuel volume mandate. The original RFS program required that 7.5 billion gallons of renewable fuel be blended into gasoline by 2012. Under the Energy Independence and Security Act of 2007, the RFS program was expanded to include diesel, in addition to gasoline. Taken together, RFS provides a significant incentive for the production of biodiesel and advanced biofuels. In 2014, biodiesel producers supplied over 1.2 billion gallons. The U.S. Environmental Protection Agency expanded the amount of bio-based diesel fuel to 2.4 billion gallons through 2020. According to the U.S. Energy Information Agency, 35.6 million gallons of renewable diesel fuel was sold in 2018 while 63 billion gallons of petroleum diesel fuel was sold.

California is the largest market for renewable diesel fuel. The California Air Resources Board reports that the use of renewable diesel fuel has grown from 1.8 million gallons in 2011 to almost 384 million gallons in 2018. While consumption of renewable diesel fuel and biodiesel fuel are increasing quickly in California, they still represent a small portion of fuel consumed. In 2018, over 13 billion gallons of petroleum diesel fuel was consumed in California.

Is biodiesel and renewable diesel fuel compatible with modern diesel engines?

Diesel engines are capable of operating on blends of high quality biodiesel. Most heavy-duty engines that power commercial vehicles and off-road equipment are warranted to operate on blends of biodiesel up to 20 percent, or B20. Most new and newer diesel passenger vehicles and light trucks are also warranted to operate on B20 while a few later model diesel passenger vehicles are warranted to operate on blends of up to B5.

Because renewable diesel fuel meets the same ASTM standard as petroleum diesel fuel, most diesel engines are certified to operate on 100 percent renewable diesel fuel. Valtra tractors, a division of agricultural equipment manufacturer AGCO, uses renewable diesel fuel as the factory fill fuel meaning all new tractors delivered to customers come with a full tank of renewable diesel fuel.

What is the cost of using renewable diesel and biodiesel fuel?

According to the U.S. Department of Energy that tracks retail fuel prices including alternative fuel prices, B20 is sold at a discount to petroleum diesel as of April 2018. Historically, B20 prices track closely with petroleum diesel fuel, sometimes selling above and sometimes below petroleum diesel.

National Average Price (April 1 and April 30, 2019)

Biodiesel (B20)	\$2.88/gal
Petroleum Diesel	\$3.09/gal

Source: U.S. Department of Energy, Alternative Fuels Data Center

Unlike other alternative fuels, biodiesel and renewable diesel fuel do not require additional refueling or recharging infrastructure. Because biodiesel is blended into petroleum diesel fuel, while renewable diesel fuel meets the same engineering standard as petroleum diesel fuel, there are few additional infrastructure costs. In many instances, all that is required is pump labelling that informs customers as to the availability of the fuel.

Other alternatives including natural gas and all-electric not only require additional and costly refueling and recharging infrastructure, these fuels and technologies require the purchase of an entirely new vehicle. The use of renewable diesel fuel and biodiesel fuel may be used in existing diesel vehicles, old and new.

Who is using biodiesel and renewable diesel fuel?

Municipalities and utilities that own and operate fleets of heavy-duty vehicles and equipment and private commercial carriers are using these fuels to achieve sustainability goals in a cost effective way.

The City of New York was an early adopter of biodiesel in its fleet of over 11,000 heavy-duty vehicles and equipment including refuse haulers, specialized equipment for the Parks Department like beach cleaners, light towers and generators. The City of New York also recently announced the use of renewable diesel fuel in the heavy-duty fleet. According to the City's sustainability plan, far greater greenhouse gas emission reductions is expected from the use of renewable fuels in the heavy-duty fleet than the planned switch to all-electric light duty cars.

Public utilities including DC Water that maintains drinking and waste water in the nation's capital to Florida Power and Light have been early adopters of biodiesel as well. The use of higher blends of biodiesel in the fleet of Florida Power and Light's 3,900 heavy-duty vehicle fleet contributed to the estimated 6,700 tons of greenhouse gas emission reductions in just one year, 2017.

Out on the West Coast, a growing list of cities and counties are exclusively using renewable diesel fuel. The City of San Francisco, an early adopter of renewable diesel fuel, is using the fuel in its fleet of over 600 "Muni" transit buses to eliminate 10,000 tons of greenhouse gas emissions in a single year. With benefits like these, more cities in California both large and small, are making the switch to renewable diesel fuel.

Package delivery giant UPS established an ambitious sustainability target for itself. The company is committed to reduce greenhouse gas emissions globally by 12 percent by 2025. To get there, UPS is committed to reduce the carbon content of its fuel mix by 40 percent and that includes the use of renewable diesel fuel. In 2015, the company announced its pledge to displace 44 million gallons of petroleum diesel with renewable diesel fuel.

Meet the Leaders in Renewable Diesel and Biodiesel Fuels

Neste: <https://www.neste.us/>

Renewable Energy Group: <https://www.regi.com/>

National Biodiesel Board: <https://www.biodiesel.org/>

Resources

Sources of Biodiesel and Production: <https://biodiesel.org/what-is-biodiesel/biodiesel-basics>

U.S. Supply of Biodiesel: <https://www.eia.gov/biofuels/biodiesel/production/>

Biodiesel Benefits in California: <https://ww3.arb.ca.gov/fuels/lcfs/dashboard/dashboard.htm>

Renewable diesel fuel production: https://www.eia.gov/dnav/pet/pet_stoc_ref_dc_nus_mbb1_a.htm

Climate Change, Advanced Biofuels and Clean Diesel

New York City Clean Fleet Plan:

<https://www1.nyc.gov/assets/sustainability/downloads/pdf/publications/NYC%20Clean%20Fleet.pdf>

UPS and Renewable Diesel Fuel:

<https://pressroom.ups.com/pressroom/ContentDetailsViewer.page?ConceptType=PressReleases&id=1438111777421-236>

Biodiesel Ambassadors: <https://www.nbb.org/join-us/partnership-programs/biodiesel-ambassadors>



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