



Initiative for Resiliency in
Energy through Vehicles

Biodiesel Fueled Vehicles and Emergency Response



Biodiesel fueled snowplow in New York.

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Biodiesel fire engine in San José, California.

Biodiesel is a readily-accessible alternative fuel that is an asset to communities during emergencies, particularly when there is an increased need for heavy-duty, diesel-fueled equipment. Biodiesel can be used in existing diesel engines, and fleets that have transitioned to biodiesel have used the vehicles to perform critical services during gasoline and diesel shortages. Moreover, fleets that have installed biodiesel storage tanks and generators have used their on-site refueling capability to ensure continuous operation during disasters, and provide needed fuel to other emergency fleets. Fleets that transition to biodiesel have also experienced lower fuel costs and have lessened their environmental impact.

Vehicles that use biodiesel can help build system resilience by diversifying an emergency response fleet.

If a storm or other emergency disrupts a region’s primary fuel supply, emergency managers should be able to turn to public and private biodiesel suppliers so that their diesel fleets can be used to help during the emergency. By knowing the location of biodiesel refueling facilities, emergency managers will be able to better prepare for and respond to disasters.

While vehicles that run on biodiesel can provide needed services during fuel supply disruptions, they can be impacted by climatic conditions and electricity outages. Higher-level blends of biodiesel can gel in cold temperatures, which can present storage and operational issues in northern climates. In addition, during power outages, refueling sites without generators will not be able to pump the fuel from underground storage tanks until electricity is restored.

The following pages include examples of cities and states that have incorporated biodiesel into their emergency fleet, and provide additional information that fleet and emergency managers should consider when considering the use of biodiesel in their vehicles.

Biodiesel Fueled Vehicles in Disasters

PROS:

- ✓ A variety of biodiesel blends can be used in all existing diesel engines
- ✓ On-site storage tanks can provide fuel to emergency services fleets and others during disasters
- ✓ Readily-accessible alternative for heavy-duty fleets

CONS:

- ✗ Higher-level blends can gel in cold temperatures
- ✗ Natural solvent can release deposits that may clog fuel filters and require replacement with higher biodiesel blends
- ✗ Underground refueling sites without generators may be rendered inoperable during power outages

CASE STUDY

New York City's Biodiesel Fleet



One of New York City's biodiesel snow removal vehicles.¹

New York City's Department of Citywide Administrative Services (DCAS) oversees fleet operations for New York City (the City).

DCAS operates the largest municipal fleet in the U.S., with over 28,000 vehicles across emergency departments, including the Police Department, Fire Department, and Emergency Management, as well as non-emergency services.² The City's clean fleet requirements commits the City to a 50 percent reduction in greenhouse gas emissions from fleet operations below 2005 levels by 2025 and an 80 percent reduction by 2035.³ Biodiesel is one of the city's strategies for achieving that goal.

The City has been aggressively using biofuels and other alternative fuels for ten years to help achieve City-wide air quality, environmental, and energy security goals. Biodiesel use was mandated in 2013 when the Mayor announced that the city's 9,000 diesel-powered municipal fleet would burn a B5 biodiesel blend year round. Local Law 73 passed by the City Council in that year states that each on-road diesel fuel-powered vehicle owned or operated by a city agency shall be powered by an ultra-low sulfur diesel

fuel blend of B5 or higher.⁴ The mandate also calls for B20 to be used during the summer months starting in 2016 in non-emergency fleets. Importantly, the law mandating biodiesel use also contains a waiver provision, allowing the City to suspend biodiesel use if biodiesel is not readily available. This waiver can be used during times of emergency if biodiesel is in short supply, or if the vehicles are not able to perform their duties.

Currently New York City pays approximately 3-7 cents more per gallon for biodiesel.⁵ However, the City takes advantage of the federal blending credit, which reimburses the city the equivalent of \$1 per gallon of biodiesel purchased. Thanks to the federal blending credit, New York City is saving approximately \$1.4 million per year in fuel costs.⁶

Consider a Waiver Provision

If your community is considering mandating biodiesel use, consider including a waiver provision that would allow the community to use additional fuel sources during times of emergency. See New York City's *Local Law 73 of 2013* for sample language.⁷

NYC saves even more using biodiesel because they combined the switch to biodiesel with a switch to No. 2 diesel from No. 1. Historically New York City used No. 1 diesel year round, even though No. 1 is most appropriate for extremely cold weather and costs over 60 cents more per gallon than No. 2 diesel. When the City switched from No. 1 diesel

to B5 blends using No. 2 ultra-low sulfur diesel, the City saved approximately 55 cents per gallon – even before the federal blending credit.⁸

New York City stores its biodiesel in City-owned underground storage tanks and also uses biodiesel in mobile fleet generators.⁹ The underground storage tanks are certified to the B100 standard, even though they primarily store B5 and B20. EPA allows B20 to be stored in underground storage tanks without special certification; however, storage tanks for biodiesel blends above B20 must go through a separate certification process. For more information on certification standards, see EPA's Underground Storage Tanks Regulations.¹⁰

The City currently operates over 400 independent fueling sites. Half of these stations are general fuel-

ing locations and are accessible to any City-owned vehicles, and another 200 are small fuel tanks at firehouses. The City also operates 100 mobile fleet generators that run on biodiesel.¹¹

NYC's biodiesel fleet and fuel supply has been used during tornados, hurricanes, and other small and large scale emergencies – including the 2012 petroleum shortage. During the shortage, the City was sourcing 50-60 percent more biodiesel to make up for disruptions in the fuel market by fueling more diesel vehicles.¹² The City used biodiesel to fuel the municipal fleet, and also provided biodiesel to private fleets, such as school buses, forestry contractors, food trucks, and personal vehicles. Having in-house B5 and B20 storage tanks allowed the City to provide fuel during a time when petroleum was in short supply.

NYC Biodiesel Fleet Metrics

FUELS

9,000

vehicles on biodiesel

OPERATES

400

independent fueling sites

RUNS

100

mobile fleet generators on biodiesel

SAVES

\$1.4 million

per year in fuel

CASE STUDY

Florida Power & Light Company's Biodiesel Fleet And Storage Facilities



FPL's biodiesel storage tank, supplying fuel to the FPL fleet and customers.¹⁵

Florida Power & Light (FPL) has a fleet of 1,850 vehicles that run entirely on B20, and are used regularly during and after emergency situations.

As an energy-providing fleet, FPL is required by EPCRA to reduce the company's reliance on conventional fuels. To comply with EPCRA¹³ and achieve company-wide sustainability goals, FPL started using biodiesel in 1999 and gradually increased biodiesel use over the following decade. The company also decided to use biodiesel to protect against fuel supply disruptions during emergencies. Florida doesn't have any crude oil pipelines; petroleum arrives in Florida by ship, and when hurricane conditions are forecast, shipping and local seaport operations are suspended until it is safe for the impacted ports to reopen. With enough ports closed, the state is essentially cut-off

from imported diesel and gasoline, and an active hurricane season may entail regular supply shortages.

Following the 2004 hurricane season there was a prolonged fuel shortage, and FPL decided an alternative fuel source was needed on-site to protect against future supply disruptions. FPL initially leased a two million-gallon biodiesel tank, and later refurbished a 4.8 million-gallon tank to maintain fuel supply during emergencies. These tanks are backed-up by generators, which are also powered by biodiesel. Due to limited local supply of B20 and FPL's high quality standards, FPL purchases B100 and ultra-low sulfur diesel and blends its own B20, which is used in vehicles across the fleet.

The fleet has driven over 100 million miles on biodiesel without issue, and has also been used to deliver fuel and assistance to communities across the country. Following Superstorm Sandy, FPL dispatched utility crews to the northeast to assist with recovery efforts and provide biodiesel to areas that were experiencing fuel shortages. FPL also sells biodiesel under EarthEra Clean Biodiesel to local fleets during normal operations as well as emergency events, and in some instances is the area's main source of fuel. During Hurricane Wilma in 2005, FPL was pumping 190,000 gallons of fuel per night at staging sites across the state.

BACK TO BASICS

What You Need to Know About Biodiesel Fueled Vehicles

Pure biodiesel is a renewable fuel that can be manufactured from vegetable oils, animal fats, or recycled restaurant grease for use in compression-ignition engines, which run on petroleum diesel. Biodiesel can be blended and used in any concentrations. The most common are B100 (pure biodiesel), B20 (20 percent biodiesel, 80 percent petroleum diesel), B5 (5 percent biodiesel, 95 percent petroleum diesel), and B2 (2 percent biodiesel, 98 percent petroleum diesel). Biodiesel concentrations up to 5 percent may still be listed as just diesel fuel, with no additional labeling required at the pump. These blends conform to the ASTM specifications for diesel fuel (ASTM D975) and provide for safe operation in all diesel engines.

B20 is the most common biodiesel blend in the U.S., and fleets that use biodiesel blends of 20 percent or higher qualify for biodiesel fuel use credits. B20 must meet prescribed quality standards,¹⁴ and vehicles that use B20 or a lower-level blend generally do not require engine modifications.¹⁵ B20 performs well in most temperatures but, similar to No. 2 diesel, may

have issues in the extreme cold. Engines operating on B20 have similar fuel consumption, horsepower, and torque to petroleum-fueled diesel vehicles.

B100 and other high-level biodiesel blends are less common than B5 and B20, and consultation with the equipment manufacturer can be helpful prior to use. High-level blends typically have slightly lower energy content per gallon, gel in cold temperatures and present unique storage issues. B100 and other higher-level blends also have a solvent effect, and can clean a vehicle's fuel system and release deposits from petroleum fuels that may initially clog filters and require filter replacement in the first few tanks.

Biodiesel blends have been extensively tested up to B20 and are approved by nearly every vehicle and engine manufacturer for most of their equipment. However, the use of higher blends or B20 in equipment for which it was not approved does not void any warranties. Engine warranties are written to cover the parts and workmanship of the equipment being supplied. Warranties do not cover fuels. Any issues that can be directly attributed to the fuel used (whether or not the fuel includes biodiesel) may not be covered by the manufacturer.

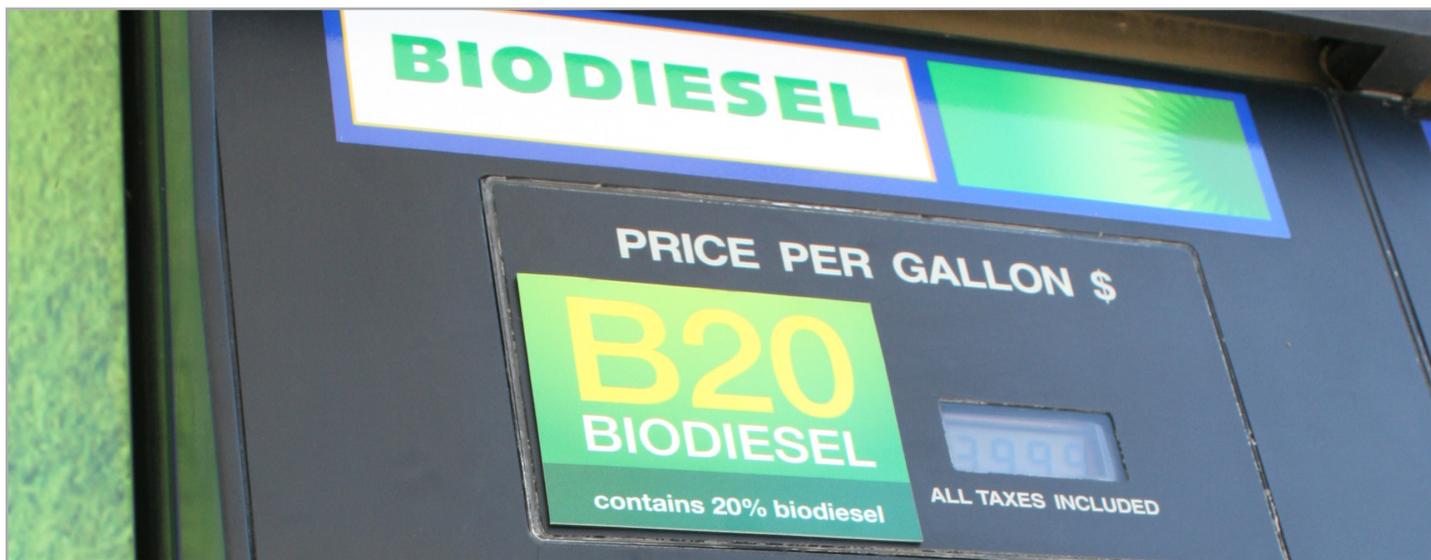
Ethanol, Biodiesel, and Vegetable Oil

Ethanol and biodiesel are both biofuels that are made from biomass materials and used for transportation – but they have distinctly different properties. Ethanol is an alcohol fuel made from sugars found in grains, such as corn. Nearly all gasoline sold in the U.S. is about 10 percent ethanol by volume. Any gasoline-powered vehicle in the U.S. can use “E10,” with some older vehicles able to use up to “E15,” but only flex-fuel vehicles can use gas-

oline with ethanol content greater than 10 percent.

Biodiesel is a fuel made from vegetable oils, fats or greases, and can be used in diesel engines without modifications. Fuel-grade biodiesel should be checked against industry specifications and is a legal motor fuel for sale and distribution. Raw vegetable oil does not meet biodiesel fuel specifications, is not a legal motor fuel, and should not be used.

Refueling



Biodiesel is available at many public stations across the country. Standard diesel dispensers and storage equipment can readily be used for biodiesel.

Biodiesel can be stored and pumped from existing petroleum diesel storage tanks. Locations of public stations that offer B20 or higher blends can be found on the Alternative Fueling Station Locator website.¹⁶ Additional private refueling sites and sites offering blends below B20 may also be available in your area.

Fleets that are considering a switch to biodiesel should be familiar with storage and handling, purchasing, and safety requirements. Typically the standard storage and handling procedures used for petroleum diesel can be used for biodiesel. The fuel should be stored in a clean, dry, dark environment in a tank made from aluminum, steel, fluorinated polyethylene, fluorinated polypropylene, or Teflon.¹⁷ Biodiesel can be used in existing petroleum diesel underground and above-ground fuel storage tanks with minor preparation, and must adhere to EPA guidance. EPA requires both underground and above-ground storage tank manufacturers to provide a statement of compatibility with their products with specific fuel blends, and underground storage tank compatibility statements are available from the

Petroleum Equipment Institute and the Steel Tank Institute.¹⁸ Prior to storing B20, existing tanks and lines should be thoroughly cleaned and dried, as B20 will absorb any contamination left over from petroleum storage.¹⁹

Biodiesel contains no hazardous materials and is considered safe. Several studies have found that biodiesel degrades more rapidly than conventional diesel, and because of this environmentally sensitive areas have replaced petroleum diesel with biodiesel. Biodiesel is also considered safer than petroleum diesel because it is less combustible. The flashpoint for biodiesel is higher than 212 degrees Fahrenheit, while the flashpoint of diesel is 126 to 204 degrees Fahrenheit. However, some biodiesel blends may also contain kerosene, which is highly flammable with a flash point of 100 to 162 degrees Fahrenheit.²⁰ Because of the range of flash points and combustibility of the fuel blends, biodiesel users should follow safety and handling precautions outlined in the National Renewable Energy Laboratory's Biodiesel Handling and Usage Guide.²¹

Costs

Operating a vehicle on biodiesel is considered one of the lowest-cost alternative fuel vehicle options because most biodiesel blends can be used in existing diesel vehicles. While the fuel cost may be slightly more than conventional diesel (approximately 3-7 cents per gallon, depending on the blend and regional availability of tax credits), fleets that blend and use biodiesel in their vehicles qualify for the Biodiesel Mixture Excise Tax Credit. This tax credit in the amount of \$1.00 per gallon must first be taken as a credit against the blender's fuel tax liability; any excess over this tax liability may be claimed as a direct

payment from the IRS.²² For more information about biodiesel incentives, visit the Alternative Fuels Data Center's Biofuels Laws and Incentives website.²³

To calculate the total cost of operation for vehicles running on B20 or B100 when compared to diesel fuel, fleet managers can use the U.S. Department of Energy's Alternative Fuel Life-Cycle Environmental and Economic Transportation (AFLEET) Tool. AFLEET examines both the environmental and economic costs and benefits of alternative fuel and advanced vehicles.

What to Consider When Switching to B20

1. Purchase biodiesel from a reputable source.

Check the list of BQ-9000 suppliers.²⁴

2. Buy fuel that is already blended.

This will help ensure that the fuel has been properly handled and is treated for climatic needs.

3. Check your engine recommendations.

Before using B20 or higher levels of biodiesel, check your operations manual to ensure that higher-level blends won't adversely affect the vehicle.

4. Stick to your regular maintenance schedule.

Biodiesel is a cleaning agent and may loosen petroleum deposits that have accumulated in the fuel system. If your vehicle feels sluggish when accelerating, check your filter immediately.

To learn more about the costs and processes of including B20 in your fueling station, contact your local Clean Cities Coordinator.²⁵

Other Benefits

Biodiesel use improves air quality and helps a jurisdiction meet their environmental goals. The use of biodiesel results in substantial reduction of unburned hydrocarbons, carbon monoxide, and particulate matter compared to emissions from diesel fuel. The exhaust emissions of sulfur oxides and sulfites (both components of acid rain) from biodiesel are significantly lower than traditional diesel.²⁶

Using biodiesel also reduces greenhouse gas emissions. B100 reduces carbon dioxide emissions by more than 75 percent compared with petroleum diesel, and using B20 reduces carbon dioxide emissions by 15 percent.²⁷ To estimate the energy and emissions impacts of biodiesel, fleet managers can use the U.S. Department of Energy's Greenhouse Gases, Regulated Emissions, and Energy Use in Transportation (GREET) model. GREET is a full life-cycle model that allows fleet managers and others to evaluate

various vehicle and fuel combinations and evaluate their environmental impacts.²⁸ California's Air Resources Board has also confirmed biodiesel to be the best option for reducing GHGs and provides the lowest carbon intensity fuel under the Low Carbon Fuel Standard.

In addition, biodiesel is made from a diverse mix of domestic feedstocks, and is reducing U.S. dependence on foreign petroleum and growing the U.S. economy. There are currently about 200 biodiesel plants across the country, with registered capacity to produce some 3 billion gallons of fuel. The biodiesel industry is supporting more than 62,000 jobs, and is poised to grow significantly with continued production increases. Using biodiesel can help fleets meet their "Buy America" commitments and energy security goals.



This truck belongs to a fleet based at a Walmart distribution center that was converted to run on biodiesel.

Conclusion

Biodiesel has been an asset to fleets across the U.S. during emergency situations. Both the New York City and Florida Power and Light fleets have converted to biodiesel to build system resiliency, and have installed biodiesel storage tanks with generators to ensure a consistent fuel supply. These fleets are

converting for resiliency reasons, but biodiesel can also save fleets money over the lifetime of the vehicle, and can lessen a fleet's environmental impact. For more information on biodiesel, see the resources listed below, or visit the U.S. Department of Energy's Alternative Fuels Data Center.²⁹

Ready to Get Under the Hood?

Resources to Help Fleets Get Started and Connected with Existing Biodiesel Users

The Initiative for Resiliency in Energy through Vehicles (iREV)

NASEO's iREV initiative supports state and local emergency management decision makers by providing tools and information on alternative fuel vehicles and their use in emergency management and response. iREV is led by the National Association of State Energy Officials and supported by the U.S. Department of Energy Clean Cities Program. Visit www.naseo.org/irev for more information.

U.S. Department of Energy Clean Cities Program

The Clean Cities program advances the nation's economic, environmental, and energy security by supporting local actions to cut petroleum use in transportation. Nearly 100 local coalitions serve as the foundation of the Clean Cities program by working to cut petroleum use in communities across the country. Visit cleancities.energy.gov for more information and to find contact information for your local coordinator.

National Biodiesel Board

NBB is comprised of state, national, and international feedstock processor organizations, biodiesel suppliers, fuel marketers and distributors, and technology providers. The group works to create sustainable biodiesel industry growth through education, communication, governmental affairs and technical quality assurance programs. Visit www.nbb.org for more information.

Endnotes

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