FIRST RESPONDER SAFETY: BIOFUELS AND BIOFUEL VEHICLES

BIOFUELS

Biofuels, including ethanol and biodiesel, are derived from renewable resources and are generally blended with gasoline and diesel and used as a replacement for gasoline and diesel in vehicles.

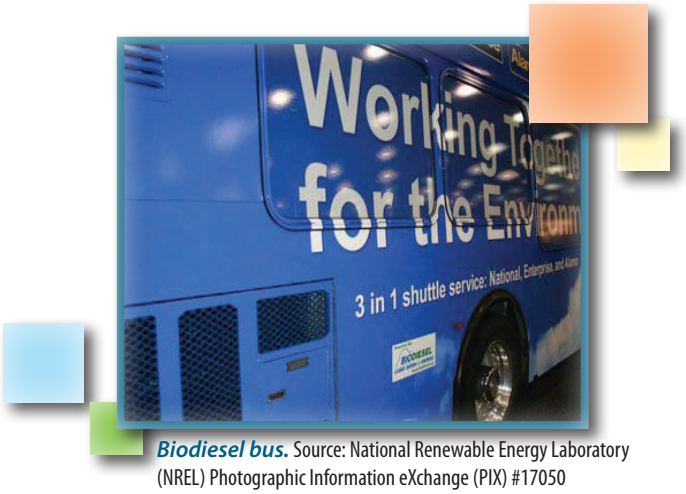
Biodiesel. Biodiesel is a non-toxic, renewable, odorless, and biodegradable liquid fuel. It can be produced domestically from a wide range of vegetable oils and animal fats, including waste vegetable oil from restaurants. Pure biodiesel (B100) is often blended with diesel to create biodiesel blends. Blends of 20% biodiesel/80% diesel blend (B20) and above are considered alternative fuels under the Energy Policy Act (EPAct) of 1992.

Ethanol. Ethanol is a colorless, odorless, renewable, and biodegradable fuel that is most often added to gasoline to boost octane and/or meet air quality requirements. Ethanol, also known as ethyl alcohol, can be produced from starch, sugar, or corn feedstocks or from cellulosic materials. Ethanol used as an 85% blend mixed with gasoline (E85) is considered an alternative fuel under EPAct 1992.

BIOFUEL VEHICLES

Biofuels are used as cleaner replacements for conventional fuels. Biodiesel and biodiesel blends can offset the use of diesel, while ethanol blends can offset the use of gasoline in many vehicles. Vehicles that run on biodiesel and ethanol operate in the same way as conventional vehicles; the internal combustion engine (ICE) converts the fuel into mechanical energy.

Biodiesel Used in Diesel Vehicles. With proper fuel tank maintenance and fuel blending, B20 and lower-level biodiesel blends generally require no diesel engine modifications. At these low levels, users may actually see improvements in engine durability due to biodiesel's lubricating properties and higher cetane number. B100 or other high-level biodiesel blends can be used in some diesel engines built after 1994 with biodiesel-compatible material for parts such as hoses and gaskets; users are advised to consult manufacturer warranty statements.



Biodiesel bus. Source: National Renewable Energy Laboratory (NREL) Photographic Information eXchange (PIX) #17050

Ethanol Used in Gasoline Vehicles. The U.S. Environmental Protection Agency classifies low-level ethanol/gasoline blends up to 10% ethanol (E10) as "substantially similar" to gasoline, meaning they can be used legally in any gasoline-powered vehicle without engine modifications. Automobile manufacturers have also approved the use of low-level blends in their vehicles without compromising warranties because they work well in gasoline engines and create no noticeable difference in vehicle performance. The majority of gasoline used in the U.S. contains a low-level blend of ethanol to oxygenate the fuel and reduce air pollution.[1]

Flexible fuel vehicles (FFVs) are capable of running on any blend of ethanol and gasoline up to 85% ethanol (E85). These vehicles contain one fueling system, which is made up of ethanol compatible components and is set to accommodate the higher oxygen content of E85. Other than fueling capability and ethanol compatible components, FFVs are identical to their conventional gasoline counterparts. More than 30 vehicle original equipment manufacturer models are now available with an FFV option.

U.S. STATISTICS

Alternative Fuel	Number of vehicles in use (2008)[a]	Total annual fuel use in vehicles (2008)[a]	Total fueling stations (May 2010)[b]
Biodiesel	N/A	324,329,000 GGEs[c, d]	663[e]
E85	450,327[f]	62,464,000 GGEs	2,051

[a]U.S. Energy Information Administration, Alternatives to Traditional Transportation Fuels 2008.
[b]U.S. Department of Energy (DOE), Alternative Fuels & Advanced Vehicles Data Center (AFDC).
[c]GGE: Gasoline gallon equivalent.
[d]Represents total gallons of biodiesel blended with diesel or used as B100 in vehicles.
[e]Includes only stations selling blends of B20 and above.
[f]Includes only those E85 vehicles believed to be using E85. Primarily fleet-operated vehicles; excludes other vehicles with E85-fueling capability. As of 2009, the National Renewable Energy Laboratory estimates that the total number FFVs in use is about 8.35 million (DOE, AFDC).

[1]Renewable Fuels Association, Annual Industry Outlook 2010

VEHICLE SAFETY

Biofuel vehicles meet the same safety standards as conventional vehicles. First responders must understand the different components that make these vehicles unique in an emergency situation.

Biodiesel. Biodiesel contains no hazardous materials and is generally regarded as safe. Like most fuels, biodiesel will burn; thus, certain fire safety precautions must be taken.

Ethanol. Ethanol is highly flammable, and it is easily ignited by heat, sparks, or flames. In addition, ethanol vapors may form explosive mixtures with air, and these vapors may travel to the source of ignition and flash back. In addition, fires involving ethanol/gasoline mixtures containing more than 10% ethanol, such as E85, should be treated differently than traditional gasoline fires because these fuels mix readily with water and degrade the effectiveness of non alcohol-resistant firefighting foam.

Because both biodiesel and ethanol are often blended with diesel and gasoline, respectively, safety precautions normally taken with these conventional fuels should be considered as well.

FIRST RESPONDER INFORMATION

Important considerations when responding to an accident involving a biofuel vehicle:

- Approach the vehicle with caution and only with the appropriate training.
- Eliminate all ignition sources.
- Look, smell, listen, feel, and use sensors to detect leaking fuel or a fire.
  - o If the vehicle is on fire or a leak is detected, do not approach the vehicle.
  - o If no fire or leak is detected, isolate the fuel system.

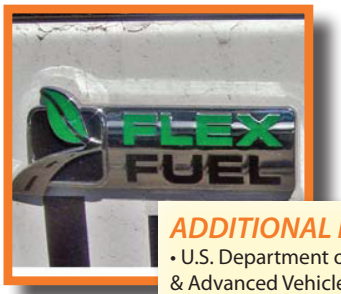
In the case of a vehicle fire:

- Isolate the fire, if possible.
- Extinguish the fire. Fires in vehicles fueled with blends of more than 10% ethanol should be extinguished with alcohol-resistant firefighting foam, instead of water.
- Be aware that, if the flame is extinguished without stopping fuel flow, the fire may reignite.

- In the case of a fuel spill or leak, use the appropriate non-combustible materials to absorb the fuel.

If extrication is necessary:

- Be sure there are no leaks or vapors that could ignite.
- Know cribbing points and cut zones before cutting into a vehicle.
- Avoid cutting critical components.



ADDITIONAL RESOURCES

- U.S. Department of Energy, Alternative Fuels & Advanced Vehicles Data Center: http://www.afdc.energy.gov/afdc/
- Renewable Fuels Association: http://www.ethanolrfa.org/
- Ethanol Emergency Response Coalition: http://www.ethanolresponse.com/
- Growth Energy: http://www.growthenergy.org/
- National Biodiesel Board: http://www.biodiesel.org/
- National Fire Protection Association: http://www.nfpa.org/

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