

Propane Basics

Propane powers about 190,000 vehicles in the United States and more than 14 million worldwide.¹ Propane vehicles are a good choice for many fleet applications, including school buses, shuttle buses, taxis and light-duty trucks. The advantages of propane as an alternative fuel include its domestic availability, performance, safety, and clean-burning qualities.

What is propane?

Also known as liquefied petroleum gas (LPG), propane is an odorless, non-toxic hydrocarbon (C₃H₈) gas at normal pressures and temperatures. When pressurized, it is a liquid with an energy density 270 times greater than its gaseous form.² A gallon of liquid propane has about 25% less energy than a gallon of gasoline.

How is propane produced and distributed?

Propane is a byproduct of natural gas processing and crude oil refining with almost equal amounts of production derived from these sources. About 97% of the propane consumed in the United States is produced in North America.³ Propane is shipped from its point of production to bulk distribution terminals via pipeline, railroad, barge, truck, or tanker. Propane marketers fill trucks at the terminals and distribute the fuel to end users, such as retail fueling stations.

Is propane safe for vehicle use?

Yes. Propane vehicles must meet the same safety standards as gasoline vehicles and have passed rigorous crash testing. In addition, propane has a narrow flammability range, and its tanks are 20 times more puncture-resistant than gasoline tanks.

Are propane vehicles available?

Yes, two types of propane vehicles are available: dedicated vehicles that run

solely on propane and bifuel vehicles that have two separate fueling systems, which enable them to run on propane or gasoline. Vehicles can either be converted to use propane or delivered as dedicated propane vehicles directly through select original equipment manufacturers' (OEM) dealerships. Certified technicians can install U.S. Environmental Protection Agency (EPA) and/or California Air Resources Board certified propane conversion systems on a variety of vehicles. A list of certified systems can be found on the EPA Web site at <http://iaspub.epa.gov/otaqpub/publist1.jsp>. Medium-duty propane vehicles and heavy-duty propane engines are also available. To find them, use the Heavy-Duty Vehicle and Engine Search on the Alternative Fuels and Advanced Vehicles Data Center (AFDC) Web site at www.afdc.energy.gov/afdc/vehicles/heavy.

How do propane vehicles work?

Propane vehicles operate much like gasoline vehicles with spark-ignited engines. There are two types of fuel-injection systems available: vapor and liquid injection. In both types, propane is stored as a liquid in a relatively low-pressure tank (about 300 psi). In a vapor-injected system, liquid propane is controlled by a regulator or vaporizer, which converts the liquid to a vapor. The vapor is fed to



Lower maintenance costs are a prime reason behind propane's popularity for high-use vehicles, such as school buses.
Photo from Propane Education & Research Council

a mixer located near the intake manifold where it is metered and combined with filtered air before being drawn into the combustion chamber and burned to produce power, just like a gasoline engine. In a liquid-injected system, fuel is delivered into the combustion chamber, or intake port, in a liquid form (instead of a vapor). This way, the fuel combusts more fully and provides optimal power and throttle response.

How do propane vehicles perform?

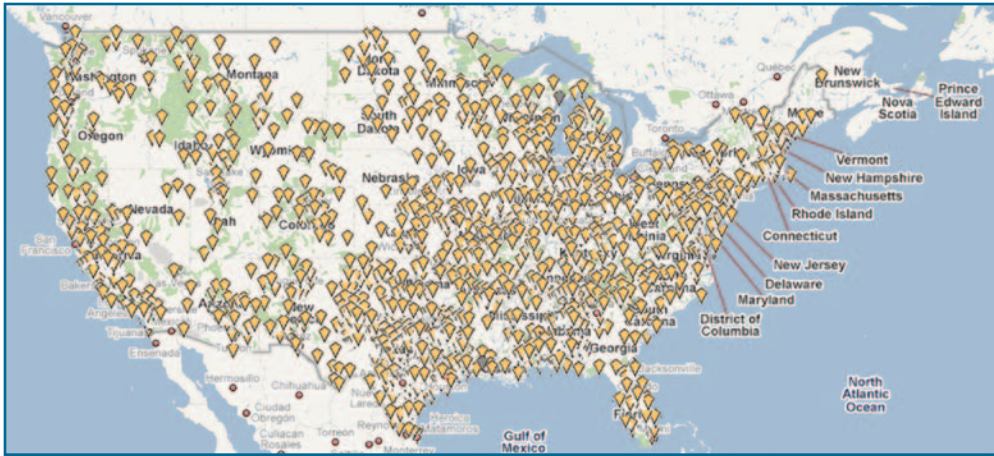
Propane vehicles are similar to their gasoline counterparts with regard to power, acceleration, and cruising speed. The driving range of bifuel vehicles is comparable to that of gasoline vehicles, and the fuel economy of dedicated propane vehicles is slightly lower due to propane's lower energy content. Larger storage tanks can increase range, but the additional weight displaces payload capacity.

¹ World LP Gas Association 2009 (<http://worldlp-gas.com/gain/key-autogas-data>)

² Energy Information Administration Web site (www.eia.doe.gov)

³ Propane Education & Research Council Web site (www.usepropane.com/climate)





According to the AFDC Stations Count, there are more than 2,400 LPG stations available to fuel the country's more than 270,000 propane vehicles.

How much do propane vehicles cost?

OEM delivered light-duty propane vehicles can cost several thousand dollars more than comparable gasoline vehicles. However, federal tax credits may offset the increased vehicle cost and many states have additional incentives that further incentivize the purchase of a propane vehicle. Vehicle conversions may also qualify for tax credits and other incentives. For the latest information on incentives for both OEM and converted vehicles, visit the Federal and State Incentives and Laws section of the AFDC at www.afdc.energy.gov.

Lower maintenance costs are a prime reason behind propane's popularity for high-mileage vehicles. Propane's high octane rating (104 to 112 compared with 87 to 92 for gasoline) and low-carbon and oil-contamination characteristics have resulted in documented engine life of up to two times that of gasoline engines.⁴

How much does propane cost?

The price of propane is typically based on the volume of fuel used. For the best

⁴ AFDC (www.afdc.energy.gov/afdc/vehicles/propane_what_is.html)

success, fleets should develop relationships with their local propane marketers and station operators who can provide them with the fair pricing and help them establish onsite infrastructure at little or no cost if a fuel contract is executed. When fleets fuel their vehicles at locations where there is no relationship with the fuel marketer or station operator, the fuel price may be equal to or higher than gasoline. Local propane marketers are present in most every community across the United States and can provide expertise and technical assistance in establishing infrastructure.

Tax credits and incentives may also be available that can help reduce the cost of propane. For more information, see the AFDC's Federal and State Incentives and Laws section at www.afdc.energy.gov.

Where is propane available?

Propane is widely available. According to the AFDC, there were more than 2,400 propane stations in the United States as of February 2010. To find propane station locations in your area, visit the Alternative Fueling Station Locator on the AFDC Web site at www.afdc.energy.gov/stations. As previously mentioned, fleets can work with their

local propane marketer to establish new fueling infrastructure at little to no cost depending on the fuel contract and the complexity of the equipment being installed.

Is it easy to fuel a propane vehicle?

Filling a propane vehicle is similar to fueling a conventional vehicle and takes about the same amount of time. In addition, spillage and ground contamination are not concerns with propane because any fuel that might escape dissipates into the air quickly and harmlessly. As with all vehicles, however, proper safety precautions—such as no smoking or cell phone use—must be recognized when refueling a propane vehicle.

How do propane vehicle emissions compare with gasoline vehicle emissions?

Compared with gasoline vehicles, propane vehicles produce significantly lower carbon monoxide, nitrogen oxide, hydrocarbon, particulate matter, and greenhouse gas emissions. In addition, propane is not a greenhouse gas when released directly into the atmosphere.

Where can I learn more about propane?

To learn more about propane as a transportation fuel, visit the AFDC's Propane Fuels and Vehicles sections (www.afdc.energy.gov), contact your local Clean Cities coordinator (www.cleancities.energy.gov), or visit the Propane Education & Research Council (www.propanecouncil.org), and the National Propane Gas Association (www.npga.org) Web sites.