Propane Fleet Applications

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National Alternative Fuels Training Consortium

West Virginia University
Ridgeview Business Park
1100 Frederick Lane
Morgantown, WV 26508

Phone (304) 293-7882
Fax (304) 293-6944
E-mail: al.ebron@mail.wvu.edu
Web site: www.naftc.wvu.edu

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Introduction

There are many options available for fleet managers who wish to convert their fleets to alternative fuel vehicles. The previous section provided an overview of alternative fuel options and their benefits and drawbacks. This section will provide information specific to the use of propane as an alternative fuel.

The use of propane as an alternative fuel has remained predominantly in a niche market for certain fleet vehicles. Some obstacles to propane's broader use are associated with limited propane fueled vehicles and a limited network of distribution centers. Propane as a fuel has been used in certain applications such as forklifts and industrial equipment for years.

The goal of this chapter is to provide the information necessary for fleet managers to determine if using vehicles fueled by propane is a viable alternative for their fleet.

Objectives

- Explain how to implement green fleets
- Learn about incentives for converting to propane fleets
- Learn about the availability and cost of propane
- Identify the advantages of using propane
- Understand how to safely handle propane

Greening of Fleets

There can be challenges to starting a green fleet, or converting an existing fleet to the use of alternative fuels. According to some industry experts, a successful plan to reduce fuel consumption and carbon emissions requires a long-term vision, incremental change, support from top management, and flexibility to make changes along the way.

There are compelling reasons *why* fleets should be green and deliberate steps on *how* to implement alternative fuels.[1]

Why Use Green Fleets?

- **Reduce operating costs** by improving efficiency, reducing life cycle costs, and reducing vulnerability to volatile fuel prices.
- **Reduce greenhouse gas emissions** by implementing the use of propane in vehicles, which are the primary source of greenhouse gases and urban air pollution.
- **Improve corporate image** by branding business strategies and appealing to public concerns about energy conservation and ecological sensibilities.

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How to Implement Green Fleets

- **Get buy-in** from all management and staff levels, and be sure to communicate information about the benefits, goals, and targets frequently.
- **Create long-term objectives** and tangible goals based on best practices in the industry (such as baselines, benchmarks, and progress reports).
- **Avoid setting reduction goals in absolute numbers** for growing fleets or fleets just starting because absolute goals can impede growth.
- **Anticipate obstacles**, such as driver resistance, lag time between original equipment manufacturers' technology and market availability, and slower return on investment.
- **Move slowly** and implement change over time.
- **Improve vehicle use** with selection analysis and education of drivers.
- **Track and report progress** and share successes with employees, shareholders, and the public.

Propane Fleets

Propane is an odorless, colorless gas that is a byproduct of the process of refining oil (petroleum) or natural gas (methane). Similar to natural gas, an odorant, ethyl mercaptan is added to propane to help detect leaks. Propane can produce fewer harmful emissions when compared to conventional gasoline and diesel. Propane naturally occurs as a gas, but is pressurized for storage in liquid form. It has less energy per pound when compared to natural gas, but more than gasoline. However, in gaseous form it has less energy by volume than liquid fuels.

Propane is a common fuel used by consumers in household applications. It is a common fuel for home heating, cooking stoves, gas dryers, along with perhaps the most common use as a fuel for outdoor grill applications. It burns with a pale blue flame that is nearly invisible in daylight (see **Figure 1**).

Figure 1: *Propane flame. Source: NAFTC.*

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Propane presents no threat to soil, surface water, or ground water. Propane has a high octane rating and excellent properties for spark-ignition in internal combustion engines (ICEs). Its octane rating ranges from 97-112 compared to conventional gasoline's typical values of 87-93. Engines that are designed to use higher octane fuels can use greater compression ratios. Higher compression ratios mean an engine operates more efficiently. In order to decrease volume of fuel storage tanks, gaseous propane is compressed to moderate pressures. These pressures depend on temperature (usually 100-200 psi), but less than 300 psi. When pressurized at ambient temperatures the gas liquefies and is referred to as liquefied petroleum gas (LPG).

Just as conventional gasoline engines have evolved to provide more fuel efficiency and power, and lower emissions, propane engines also have evolved. Older propane engines or propane conversion kits operated much like carburetors. These older systems are still common on industrial equipment such as forklifts (see **Figure 2**). This system utilized vaporizers, regulators, and mixers to convert LPG to gas form for entry into the main intake for combustion.

Figure 2: *Propane warehouse equipment. Source: NAFTC.*

Later versions utilized systems similar to gasoline electronic fuel injection systems. The fuel injectors were different in that they injected gaseous propane fuel into the intake. These systems usually had one injector per cylinder. In order to obtain better performance, engine control, and lower emissions, a new system has been developed within the past decade. This system is similar to multiport electronic gasoline fuel injection systems. In order to use LPG in its densest form, these systems inject the propane into the intake in liquid form. This system provides for better control and efficiency while eliminating some of the older system components and downfalls associated with early propane vehicles and conversions. An example of an LPG injection system can be seen in **Figure 3**. This vehicle utilized a modified gasoline engine from Chrysler.

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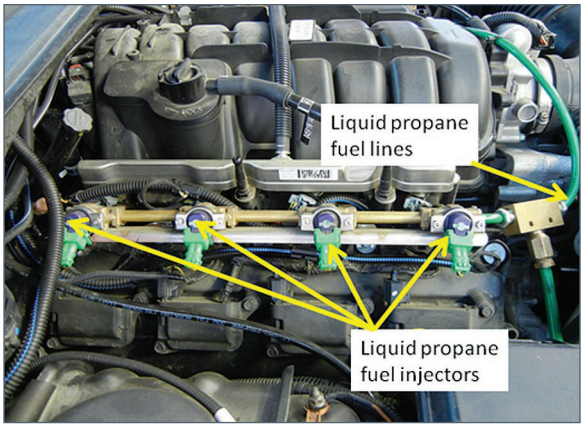

Figure 3: *Liquid propane fuel injection system on Chrysler beta vehicle. Source: NAFTC.*

Incentives for Using Propane in Fleets

Incentives propagate the growth and purchasing power within organizations that are needed for strong commercial markets. Incentives include partnership initiatives and pooled resources, financial subsidies, and informational tools. The following section discusses incentives available to fleet managers that augment efforts to implement use of propane in their fleets.

Recent industry surveys have confirmed that fleet operations are voluntarily purchasing alternative fuel vehicles to meet specific EPAct regulations and mandates by the federal government. Unfortunately, alternative fuel and advanced technology vehicles cost more than their conventional gasoline counterparts, and determining how to pay for these more expensive vehicles has become a growing concern for fleet managers across the country. There is, however, financial help available.

Did You Know?

Argonne National Laboratory developed a graphical user interface-based calculator called AirCRED that calculates air pollutant emissions based on specific fleet variables. These emissions "credits" are used to determine excise tax credits.

To learn more, visit:
www.transportation.anl.gov/pdfs/TA/80.pdf

Despite the fluctuating economy and budget woes, there are a record number of grants and incentives for funding alternative fuel vehicles that have been made available. For example, in 2009, the U.S. Department of Energy (DOE) made nearly $300 million of American Reinvestment and Recovery Act (ARRA) funding available through the Clean Cities program. This single grant funding opportunity is responsible for putting more than 9,000 alternative fuel and energy-efficient vehicles on the road and establishing 542 fueling stations across the country.

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Tax Incentives

In the past decade there have been many federal and state tax incentives for alternative fuels and advanced technology vehicles. For example, a tax credit is available for the cost of propane (LPG) fueling equipment placed into service after December 31, 2005. The credit amount is up to 30% of the cost, not to exceed $30,000 for equipment placed into service in 2011.[2] Other major tax incentives included the alternative fuel excise tax credit. Incentives and legislation change on a yearly basis so it is best to check often for updates and changes.

Federal Grant Funding

When it comes to grant opportunities, the federal government is by far the largest and most consistent source of funding. Many federal agencies offer funding opportunities, but the majority of funding for alternative fuel vehicles and transportation related projects comes from a handful of federal agencies, such as the U.S. Department of Energy (DOE), Department of Transportation (DOT), Environmental Protection Agency (EPA), and U.S. Department of Agriculture (USDA). These agencies have information on their funding opportunities available on their respective websites.

State Grant Funding

Many states have developed aggressive grant funding programs during the past few years. While each state has different grant funding sources, the designated State Energy Office (SEO) is typically the largest alternative fuel vehicle grant funding source in each state. To make it easy to identify each state's SEO, the National Association of State Energy Officials (NASEO) publishes a directory of State Energy Offices online. The DOE's Alternative Fuels Data Center (AFDC) also publishes an interactive web-based map that allows users to click on any state in the country to get information on alternative fuel vehicle incentives and funding sources.[3] There is a multitude of state-level funding programs for clean air vehicle and transportation projects, but visiting the NASEO and AFDC websites will provide the starting points for any fleet manager interested state-level funding programs.

Tools to Help!
Every state has some form of tax credit or rebate for using alternative fuels.
To find state-specific tax incentives, visit: *www.afdc.energy.gov/afdc/laws/search*

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Incentives for Propane Production

A major incentive for propane production is nearly 90% of current U.S. propane is produced domestically. Demand and production increases will yield more job opportunities and economic benefits.

Today, the U.S. government is working to provide natural gas companies incentives for more production of natural gas. More than half of U.S. LPG is a byproduct of natural gas processing. These incentives will increase natural gas and propane production. There are many more locations to fuel nonvehicle propane tanks compared to vehicle fueling stations. There are government incentives available to help fleets purchase equipment to distribute propane as an alternative fuel for vehicle applications.

Propane Availability and Cost

According to the Propane Education and Research Council (PERC), there were more than 270,000 on-road propane vehicles in the U.S. at the beginning of 2012. This number includes private businesses and municipal government agencies. In 2010, the Department of Energy's Alternative Fuels Data Center (AFDC) streamlined certification requirements for vehicle conversions in an effort to reduce costs associated with alternative fuel aftermarket conversions and expand the availability of conversion systems.

Propane is produced from the refinement of natural gas and oil. Propane is then shipped from its point of production to bulk distribution terminals via pipeline, railroad, barge, truck, or tanker ships (see **Figure 4**). Placards are required on bulk shipments to help emergency responders recognize the material and respond appropriately in the event of an emergency.

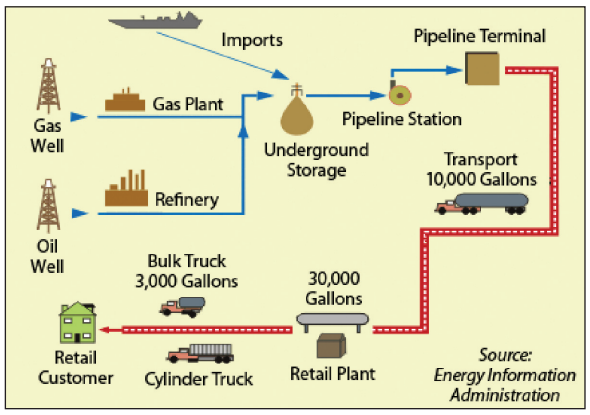

Figure 4: *Schematic of a typical propane distribution route. Source: EIA.*

As of March 2012, there were approximately 2,680 propane fueling stations in the United States, according to data from The Alternative Fuels Data Center (AFDC) (see **Figure 5**).

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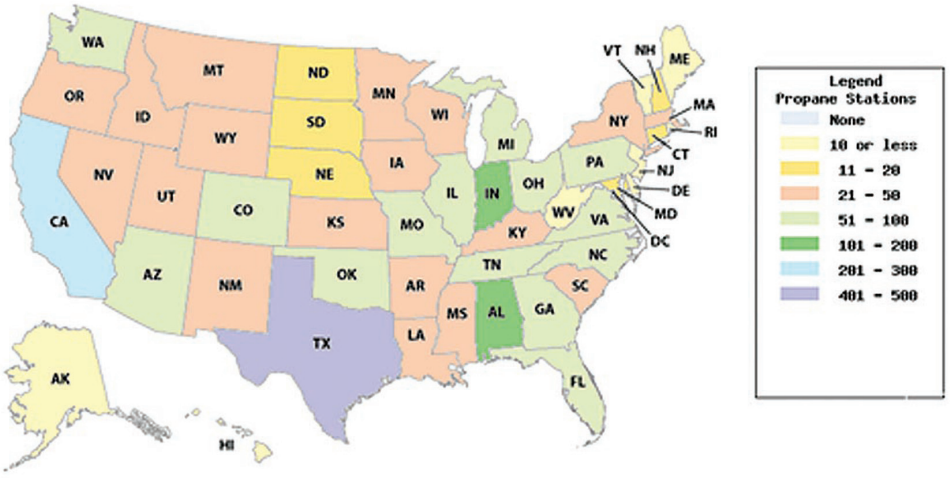

Figure 5: *Propane fueling stations. Source: AFDC.*

The GGE price gap has decreased over time as is seen in **Figure 6**. The difference between propane and gasoline was $1.91 in 2009 and fell to $0.89. Propane price fluctuations with seasons can actually narrow the gap even more. Location can also lower the difference such that in some locations at certain times of the year, the GGE price of LPG is lower than conventional gasoline.

Fuel	Area	2012 Cost	2009 Cost
Diesel ($ per gallon)	National Average	$3.37	$1.86
Gasoline ($ per gallon)	National Average	$3.46	$2.19
Propane ($ per GGE)	National Average	$4.26	$3.77

Figure 6: *Fuel type cost comparison, 2009-2012. Source: AFDC.*[4]

The cost of propane depends on the availability and cost of natural gas, and costs associated with refining petroleum, both of which are used to produce LPG. As natural gas and petroleum prices increase, propane prices also will increase; however, the increase appears to be at a slower rate. During winter seasons, prices may increase as the demand for LPG used in homes increases. Transportation and distribution costs of propane from production facilities via pipelines, bulk tanker trucks, on trains, and on barges correlate directly to the consumer price.

Cost Factors

The price of liquefied petroleum gas, just as conventional fuels, depends on a variety of factors.

- *Availability of natural gas and oil used to produce LPG*
- *Seasonal weather effects on demand for LPG used as fuel for heating*

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Propane Advantages

As with all alternative fuels, there are advantages and things to consider when switching fleets to propane gas.[5]

Advantages

- Reduced greenhouse gas emissions by more than 20% and less particulate matter when compared to conventional fuels
- The cost of operating LPG vehicles is lower than that of conventional fuel vehicles
- A little more than half of U.S. LPG is produced from natural gas processing. Nearly 90% of natural gas is produced domestically
- Can be used with higher compression ratio engines for increased engine efficiency

Things to Consider:

- Limited number of original equipment manufacturer (OEM) dedicated or bi-fuel vehicles
- Limited number of fueling stations when compared to conventional gasoline and diesel
- The cost of LPG may be higher or lower when compared to conventional fuels and fluctuates during winter seasons when it is in demand as home heating fuel

Propane Performance and Safety

Performance and safety are key considerations in the successful application of alternative fuels. Using alternative fuels in fleets should not sacrifice operating performance and should provide a safe alternative to conventional fuel.

Performance

Few differences have been noted in the performance of LPG vehicles. Power, acceleration, and cruising speed are comparable to those of conventional fuel vehicles. Likewise, the driving range of a propane vehicle is similar to conventional fuel counterparts. Downfalls in early propane vehicles can mainly be attributed to the use of conversions that did not utilize the properties of propane as a dedicated fuel. New dedicated and bi-fuel propane vehicles utilize advanced injection and control technologies that have significantly improved performance.

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Propane is a high-octane fuel that allows for the use of a higher engine compression ratio and greater engine efficiency. Propane combustion can also produces fewer harmful emissions when compared to gasoline and diesel counterparts which provides for fewer negative health and environmental effects from its use.

The driving range of a propane vehicle is similar to conventional fuel counterparts.[6] Propane has a higher energy density by mass, but the volume required is larger than conventional fuels. LPG fuel tanks are sized such that they are only filled to 80% capacity, which requires even more additional space. However, for dedicated vehicles it is easier to utilize a larger tank without affecting consumer acceptability. For bi-fuel vehicles, more cargo room may be sacrificed to allow for both incorporation of both gasoline and LPG tanks. Even though the performance based on driving range can be acceptable, those converting to LPG fleets may want to consider the limited locations of fueling stations. This could be a detriment for fleets that operate over long distances.

Propane Performance Summary

- *Similar performance to conventional fuel vehicles*
- *Higher octane rating*
- *Similar driving range*
- *Fewer emissions*

Safety

Propane vehicles and tanks have a good safety record due to their many integrated safety features. Propane tanks are designed and built to withstand 1000 psi even though normal propane operating pressures are less than 300 psi. Propane vehicle tanks are constructed from carbon steel under a code developed by the American Society of Mechanical Engineers (ASME). A propane tank is 20 times more puncture resistant than a typical gasoline tank. In addition, a properly installed propane tank can actually add to the structural strength of a vehicle.

It should be noted that the pressurized propane system should only be serviced by a certified technician. If propane leaks occur, the propane will fall to the floor or ground since it is heavier than air. Near the ground ignition sources should be eliminated to provide further safety.

As with CNG and hydrogen, fueling of a propane vehicle is different than conventional gasoline or diesel vehicles. Propane pumps are designed to fill storage tanks to only about 80% capacity and are designed to minimize propane leaks during fueling. The DOE Clean Cities program performed fueling tests on 105 different vehicles and found no major safety issues when fueling.

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Vehicle safety requirements must be met by all production vehicles, consumer safety concerns should be alleviated by knowing OEM propane vehicles must meet certain production criteria. Beyond vehicle safety propane vehicles are safer than conventional vehicles for human health and the environment. Propane exhaust emissions are cleaner than gasoline emissions. Propane is considered nontoxic in the case of environmental spills.

The National Fire Protection Agency (NFPA) has a standard hazard placard to identify propane at stationary facilities. The NFPA 704 hazard placard used for LPG is shown in **Figure 7**. The "4" shown in the red area indicates that the flash point is below 73°F (23°C). The "1" shown in the blue indicates that compressed natural gas may cause slight to moderate irritation, and the "0" shown in the yellow area indicates that compressed natural gas poses no reactivity hazards.

Figure 7: *NFPA 704 hazard placard for LPG. Source: NFPA.*

Placards and/or other markings are required on bulk shipments to help emergency responders recognize the material and respond appropriately in the event of an emergency. The U.S. Department of Transportation (DOT) identifies propane (LPG) in transport with hazardous material description identification number of UN 1075 (see **Figure 8**).

Figure 8: *LPG transport placard UN 1075. Source: DOT, PHMSA.*

Propane Safety Summary

- *Lower harmful emissions*
- *High ignition temperature*
- *ASME and DOT certified puncture resistant tanks*
- *No major fueling incidents*

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Summary

This material develops an understanding of propane as an alternative fueling option for fleet managers and explains how to green fleets with propane and incentives to implement its use. Additional analysis describes the cost, advantages, performance, and safety of using propane.

Propane vehicles have evolved alongside gasoline engines to increase performance, efficiency, and lower emissions. While the number of public vehicle fueling stations is low compared to conventional fuels, the major distribution and infrastructure already exists. As more propane vehicles are utilized, the demand for propane as a vehicle fuel will increase. This increase will require additional propane production and more LPG fueling stations. Private fueling stations are also an option for fleet managers that wish to use an alternative, domestically produced fuel.

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Test Your Knowledge

1) **True or False:** Like natural gas, odorants are added to propane during processing to aid in leak detection.

2) What does LPG stand for?

3) **True or False:** Most states have at least one publically accessible propane fueling station.

4) Some new LPG fueled vehicles inject propane into the engine intake in _____ form.

5) **True or False:** Compared to conventional vehicles, propane vehicles do not perform as well.

Answers: 1) True; 2) Liquefied petroleum gas; 3) True; 4) Liquid; 5) False — new propane vehicles offer similar vehicle performance and driving range when compared to conventional fueled vehicles.

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Resources

Propane Education and Research Act of 1996

The Propane Education and Research Council (PERC) was formed under the Propane Education and Research Act of 1996. The council still exists today and its mission is to promote the safe, efficient use of propane through safety programs, research and development, and proper training. PERC works in partnership with government agencies, state associations, universities, and private industry to obtain or provide grant funding for projects that advance the development, safety, environmental performance, and commercialization of propane-fueled products and applications.

Learn More about PERC: *http://www.propanecouncil.org/*

- **Alliance Auto Gas** (http://www.allianceautogas.com/) – Provides information about propane vehicles and why they make sense in today's economy.
- **Alternative Fuels Data Center** – Propane (http://www.afdc.energy.gov/afdc/fuels/propane.html) – Offers publications about the use of propane as a fuel, a station locator, and other helpful information about the fuel.
- **Clean Cities 2012 Vehicle Buyer's Guide** (http://www.afdc.energy.gov/afdc/pdfs/51785.pdf) – Offers model-specific information about vehicles that utilize alternative fuels.
- **Department of Energy Efficiency & Renewable Energy – Propane** (http://www.eere.energy.gov/basics/vehicles/propane.html) – Includes information about the benefits of using propane as a transportation fuel.
- **Fuel Economy** (http://fueleconomy.gov) – Official U.S. government source for information pertaining to the fuel economy ratings and fuel efficiency.
- **Gas Technology Institute** (http://www.gastechnology.org/) – Presents the organization's findings in relation to advanced propane technologies.
- **National Propane Gas Association** (http://npga.org/) – Allows members access to a directory of propane suppliers, producers, manufacturers, and transporters.
- **Propane – Exceptional Energy** (http://www.propane.com/fuel.html) – Offers different options for the utilization of propane as a fuel.
- **Propane Education and Research Council** (http://www.propanecouncil.org/) – Includes information about propane use in a variety of applications.
- **Propane Safety** (http://www.propanesafety.com/) – Provides education on the proper handling and utilization techniques related to propane.
- **Propane Vehicles & Equipment** (http://autogasusa.org/) – Highlights some of the vehicles that utilize propane as their fuel source and allows users to locate fueling stations.
- **U.S. Department of Energy (DOE)** (http://energy.gov/) – Agency that helps ensure America's security and prosperity by addressing energy related problems with emerging technologies.

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- **U.S. Department of Energy (DOE) Vehicle Technologies Program** (http://www1.eere.energy.gov/vehiclesandfuels/) – Develops more efficient transportation technologies that help reduce domestic dependence on foreign petroleum.
- **U.S. Energy Information Administration – Petroleum & Other Liquids** (http://www.eia.gov/petroleum/) – Discusses propane use and demand in a variety of different markets.
- **U.S. Environmental Protection Agency (EPA)** (http://www.epa.gov/) – Agency that acts to protect public health and the environment by writing and enforcing pertinent legislation.

Footnotes

1 Environmental Defense Fund, "Greening Fleets, A Roadmap to Lower Cost and Cleaner Corporate Fleets," http://business.edf.org/sites/business.edf.org/files/greening-fleets.pdf

2 U.S. Department of Energy, Alternative Fuels Data Center, Federal Incentives and Laws for Propane (LPG), http://www.afdc.energy.gov/afdc/laws/laws/US/tech/3254

3 U.S. Department of Energy, Alternative Fuels Data Center, State Incentives and Laws, www.afdc.energy.gov/afdc/laws/state (updated June 15, 2011)

4 U.S. Department of Energy, Alternative Fuels Data Center, Clean Cities Alternative Fuel Price Report (January 2012), http://www.afdc.energy.gov/afdc/pdfs/afpr_jan_12.pdf

5 U.S. Department of Energy, Energy Efficiency and Renewable Energy, Clean Cities 2010 Vehicle Buyer's Guide, http://www.nrel.gov/docs/fy10osti/46432.pdf

6 U.S. Department of Energy, Energy Efficiency and Renewable Energy, Vehicle Technologies Program, "Propane Basics," http://www.afdc.energy.gov/afdc/pdfs/46996.pdf

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CASE STUDY

Location: Las Vegas, NV

Company: Yellow-Checker-Star (YCS) Transportation

Study: Propane

YCS Transportation, located in Las Vegas, Nevada includes Nevada Yellow Cab Corporation, Nevada Checker Cab Corporation, and Nevada Star Cab Corporation. YCS is currently the largest propane (LPG) fleet operating in the U.S. with a taxi cab fleet of nearly 800 vehicles. The Ford Crown Victoria is the primary vehicle used in the fleet, which has been converted from conventional gasoline to propane. The company is in the process of converting 150 Ford Escapes for deployment in July 2012.

Decision Points

When Nevada Checker Cab merged with what is now YCS Transportation, the company inherited several compressed natural gas (CNG) vehicles. These were converted to run on propane by YCS because the time for filling, the driving range, and the space required for a CNG tank was a significant disadvantage. "It would take 30 minutes to fill a CNG tank and the cab could not operate for a whole shift," said Gene Auffert, chief executive officer for YCS Transportation. While the fill time and driving range has improved for CNG, Auffert believes propane is the better fuel choice to reduce the company's carbon footprint while maximizing profit through cost savings.

Other cost savings comes from federal tax credits and incentives. YCS Transportation receives a $0.50 per gallon rebate incentive by taking advantage of the federal Alternative Fuel Excise Tax Credit, and the Aftermarket Alternative Fuel Vehicles (AFV) Conversion incentive that provides a tax credit equal to half of the conversion cost up to $5,000, which "slightly exceeds our [conversion] cost," Auffert said. It should be noted that this tax incentive has expired.

Tests conducted by the U.S. Environmental Protection Agency (EPA) show that propane-fueled vehicles produce 30% less carbon monoxide (CO) and about 80% of the particulate matter compared to their gasoline counterparts. Source: AFDC.

Fleet Facts

In total, the YCS fleet logs 50 million miles and uses five million gallons of propane per year. Each vehicle is equipped with a tank large enough to operate for an entire shift without needing to fuel. Using a dedicated propane system, unlike a bi-fuel system, vehicles run solely on propane and do not use any conventional gasoline to power the internal combustion engine (ICE). This type of conversion requires the conventional fuel tank to be removed and replaced with the propane tank and the vehicle's wiring and fuel system is modified to use propane, Auffert said.

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YCS propane storage tanks in the foreground are located adjacent to the fueling station seen in the background. Photo courtesy of YCS Transportation.

Fuel Supply and Infrastructure

While there are more than 50 public LPG fueling stations in Nevada, the company has two 60,000 gallon LPG storage tanks connected to a fueling station that can fuel up to eight vehicles at a time. Fueling is completed quickly and easily using the in-house fueling station and takes only three to four minutes to fill up.

For a large fleet, it is more efficient to have trained fueling technicians fill the tanks. Drivers pull into the filling station and leave the area while the vehicle is filled. This also provides an added measure of safety for the drivers and decreased liability for the company.

Costs Considerations

With a large fleet like YCS Transportation, tracking specific savings for each vehicle and for the entire fleet is difficult because of the high volume of vehicles operated by the company. The wholesale cost of propane fluctuates with the price of petroleum and seasonal use for household heating. However, it is generally less than conventional fuel. "The largest savings is created by the cleaner burning fuel that definitely extends engine life," Auffert said. Oil changes are only needed every 10,000 miles.

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QUICK FACTS

Fuel Type: Propane (LPG)

Vehicles: 650 Ford Crown Victorias

Annual Miles: 50 million

Annual Fuel Consumption: 5 million gallons

Time to Fuel: 3 - 4 minutes

Miles Between Scheduled Maintenance: 10,000

Also, like conventionally fueled high-mileage vehicles, engine and transmission wear-and-tear are expected and vehicles are replaced every five years. Like most alternative fuel vehicles, each converted vehicle must meet EPA certification standards. Of YCS's 1,800 employees, one is dedicated to overseeing annual EPA testing requirements, and another 100 work to convert and maintain the YCS fleet.

Maintenance and Satisfaction

LPG vehicle safety and performance is comparable or better than conventionally fueled vehicles. In the nearly two decades that YCS has been operating propane-fueled vehicles, no propane fires have been caused by vehicle accidents.

Vehicle performance of LPG vehicles (acceleration and cruising power) is identical or better than conventional fuel vehicles. "We are extremely satisfied with the performance level of using propane and the associated cost savings that are generated," Auffert said. "As for customer satisfaction, at least 98% of them do not know that they have been riding in a vehicle fueled by propane." The only noticeable difference is in starting the vehicle. The engine will turn over for several seconds longer than a conventional vehicle before starting. This is normal in propane conversion vehicles that require time for propane vaporization.

YCS transportation fueling station. Photo courtesy of YCS Transportation.

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Summary

Starting up an LPG fleet or converting an existing fleet can be pricey, but for fleets operating in a local area and employing in-house fueling, propane is a good, safe alternative that decreases greenhouse gases while maintaining a strong profit. YCS Transportation's experience shows that large fleets of 400-500 vehicles can benefit from using propane. "It's a viable option and [is] much cheaper," Auffert said. Looking forward, he thinks that over-the-road truck fleets would be a good fit for propane once public infrastructure is available on a large scale nationally.

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For questions or further information, please contact:
National Alternative Fuels Training Consortium
Attention: Executive Director
1100 Frederick Lane
Ridgeview Business Park
Morgantown, WV 26508
Telephone: 304-293-7882
Fax: 304-293-6944
http://www.naftc.wvu.edu

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National Alternative Fuels Training Consortium

Ridgeview Business Park
1100 Frederick Lane
Morgantown, WV 26508

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