Ethanol Fleet Applications

Notes

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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 ethanol as an alternative fuel in fleets.

The most popular alternative fuel vehicles produced in America are flexible fuel vehicles. These vehicles are capable of utilizing any ethanol blend up to E85. Nearly every vehicle manufacturers offer flexible fueled versions of their light-duty cars and trucks. Ethanol is a proven fuel and the main roadblock to wider use is fuel availability.

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

Objectives

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

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 ethanol 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.

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.

Ethanol Fleets

Ethanol is a fuel made from corn, sugarcane, wheat, and other agricultural products. Corn, one of America's most widely produced agricultural products, is a carbohydrate — meaning that it is especially high in sugars — making it an ideal feedstock in producing ethanol (see **Figure 1**). In fact, corn is the feedstock used for more than 90% of current U.S. ethanol production.

Figure 1: *Corn is a primary feedstock in ethanol production. Source: NAFTC.*

There are a variety of ways in which ethanol may be produced. The most common is generally synonymous to how strong alcoholic beverages are distilled. Frequently, ethanol is produced through a process called dry milling. Dry milling is the process of grinding up corn or another grain into a flour or meal and then mixing it with water to form what is called mash. The mash is heated, and enzymes are added to the mash to break down the starch or sugars. Yeast is added during the fermentation process, so the sugars convert to ethanol and carbon dioxide. After fermentation, the raw material is distilled to separate the ethanol. The energy produced by a gallon of ethanol is equal to about two-thirds the energy of a gallon of gasoline.

Nearly all gasoline sold in the U.S. today contains a percentage of ethanol. In fact, any gasoline-fueled vehicle can use mixtures with up to 10% ethanol. E10, which consists of 10% ethanol and 90% gasoline. All conventional gasoline vehicles have the ability to use E10 as their fuel, and many automakers recommend its use because of the high performance and clean-burning characteristics. Currently about 97% of America's gasoline contains some ethanol. Vehicles that are designed to run on blends of E85 (up to 83% ethanol) are called FFVs.

According to the American Coalition for Ethanol (ACE), there are more than 8.5 million FFVs on U.S. roads in the today. As the number of FFVs increases, so does the amount of E85 fueling stations. It is important to point out that when E85 is not available, FFVs have the option of running on conventional gasoline or any ethanol blend up to E85.

Flexible fuel vehicles are the most widely available alternative fuel vehicles on the road. Almost every vehicle manufacturer produces a vehicle that is capable of using E85 fuel. Almost all auto manufacturers will offer ethanol vehicles in future model years at no additional cost to consumers. General Motors predicts to have more than 20 million ethanol capable vehicles on the road by 2020. Most FFVs have badges to show that they may utilize ethanol fuels (see **Figures 2** and **3**).

Figure 2: *GM flexible fuel vehicle badge. Source: GM.*

Figure 3: *Ford flexible fuel vehicle badge. Source: Ford.*

Unlike many other alternative fuel technologies, the transportation and distribution of ethanol is well under way since ethanol fuel can use the existing gasoline infrastructure with minor modifications. Ethanol reduces greenhouse gas (GHG) emissions and poses no health threat. Since it is domestically produced, ethanol may help reduce U.S. dependence upon foreign oil.

Incentives for Using Ethanol 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 ethanol in their fleets.

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

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.

Tax Incentives

There have been various federal tax incentives to facilitate increased production and use of ethanol blended fuels over the past few decades. These incentives have helped provide over $20 billion dollars in subsidizing to the ethanol industry. Laws and tax credits change often so fleet managers should check the Alternative Fuels Data Center (AFDC) website for updated information.

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.

Tools to Help!
For more information on all federal ethanol incentives and laws, visit:
http://www.afdc.energy.gov/afdc/ethanol/incentives_laws_federal.html

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 to get information on alternative fuel vehicle incentives and funding sources.[2] 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 in 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*

Incentives for Ethanol Infrastructure

There are multiple programs that provide incentives and tax breaks to producers of biofuels such as ethanol on large and small scales. Perhaps the most notable ethanol program is the Rural Energy for America Program (REAP). This program provides loans and grants to small business and agricultural producers to make improvements in energy efficiency. These systems include flexible fuel equipment to blend and dispense ethanol blends. Grants range from around $20,000 to $25 million dollars. Other incentives are also available to assist in infrastructure changes to allow for the broader use of ethanol-based fuels and for continued and increased ethanol production. The U.S. Congress continues to increase target goals of biofuel-production. The current 2020 goal is more than 36 billion gallons, of which 15 billion gallons can be conventional corn-based ethanol.

Ethanol Availability and Cost

Ethanol has widespread availability around the globe. Ethanol is one of the most commercially viable forms of alternative fuel because of the ease with which it can utilize existing infrastructure with minor modifications.

As of February 2012, there are more than 2,500 fueling stations that dispense E85 across the country. [3] If E85 is not available at a particular fueling station, these FFVs can operate on straight gasoline or any ethanol blend up to E85. Today more than 75% of America's gasoline contains some ethanol, most as the E10 blend. **Figure 4** shows how many E85 stations are available in each state.

The per-gallon cost of ethanol is usually similar to or less than the national average cost of gasoline. The average price of a gallon of E85 in 2012 was $0.23 cheaper than gasoline (see **Figure 5**).

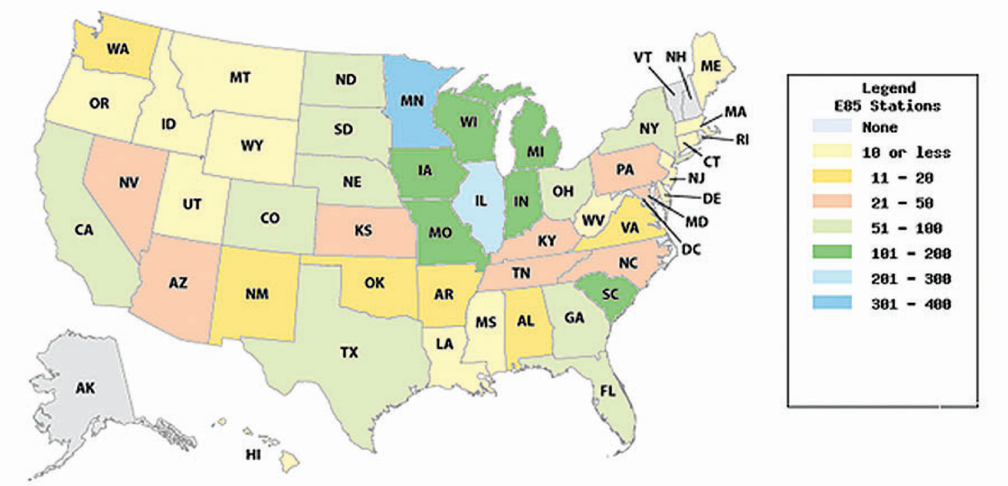

Figure 4: *Ethanol E85 fueling stations. Source: AFDC.*

Fuel	Area	2012 Cost	2009 Cost
Conventional Gas	National Average	$3.37	$1.86
Ethanol (E85)	National Average	$3.14	$2.13

Figure 5: *E85 and conventional gasoline cost comparison, 2009-2012. Source: AFDC.*[4]

Ethanol has about 75% of the energy density (by mass) of gasoline and a better comparison is done by comparing the GGE of E85 with gasoline. Based on energy content the 2012 price of E85 is $1.07 more than gasoline (see **Figure 6**). However, engines that are designed to run on ethanol may utilize higher compression ratios and operate more efficiently due to its higher octane rating.

Fuel	Area	2012 Cost	2009 Cost
Conventional Gasoline	National Average	$3.37	$1.86
Ethanol (E85)	National Average	$4.44	$2.56

Figure 6: *GGE price comparison of E85 and gasoline. Source: AFDC.*

The cost of ethanol, much like the cost of conventional gasoline, depends on a variety of factors. One of these factors is the amount of ethanol in the fuel blend. A high ethanol ratio, such as E85, will cost more when adjusted for energy content. Much of the commercially available "gasoline" in the U.S. is, in fact, E10. The agricultural crops that supply the raw material for ethanol are based on seasonal weather. A poor crop may lead to higher ethanol prices while an especially abundant crop may lead to lower prices at the E85 pump. Costs also can be affected by processing and distribution. Because of its high water solubility, ethanol is usually not transported through pipelines – it will pick up excess water and other impurities. The only commercially viable way to transport ethanol is by truck, rail, or barge. This can result in increased distribution costs, therefore location also can influence the price of E85 at the pump.

Ethanol Cost Summary

Key factors for the cost of ethanol include the following:

- *Amount of ethanol used in blend*
- *The raw materials used to produce ethanol*
- *Seasonal weather effects on ethanol production*
- *Processing and distribution expenditures (location)*

Ethanol Advantages

There are advantages and things to consider when using ethanol as an alternative fuel. Below is a list of factors that affect decisions to use ethanol in fleets.[5]

Advantages

- Produced domestically from renewable resources
- Fewer emissions, both particulate matter and greenhouse gases
- Relatively harmless if spilled on land or water
- Requires only minor changes to existing fueling infrastructure
- Will create a new job market and help support local economies
- Operations help rural development
- Flex-fuel vehicles are available from most manufacturers

Things to Consider

- Lower fuel economy based on reduced energy density by mass and volume
- Higher volatility when warm; this can result in evaporative emissions problems
- Cannot be transported through conventional gasoline pipelines
- Number and location of E85 fueling stations, however, flexible fuel vehicles can still utilize conventional gasoline

Ethanol Performance and Safety

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

Performance

One of the primary concerns of converting to an alternative fuel fleet is the wide spread belief that when switching to an alternative fuel, vehicle performance suffers. This is far from the truth, especially where ethanol is used. Performance aspects of ethanol vehicles are comparable to conventional vehicles.

Ethanol vehicles have the same power, acceleration, payload, and cruise speed when compared to their gasoline counterparts. Ethanol fuel also has the ability to absorb moisture, preventing fuel line freeze-up that can occur in cold weather. Its detergent properties help reduce the buildup of harmful deposits, keeping engines running smoothly and fuel injection systems clean, resulting in improved performance. However, ethanol is corrosive and for any vehicle conversion, all appropriate fuel system components would require replacement with ethanol compatible components. These systems also would require calibration due to energy content differences.

Ethanol is a higher octane fuel that is made up of about 35% oxygen by weight. Adding oxygen to a fuel mixture makes it burn more completely, reducing harmful tailpipe emissions. A higher octane rating reduces the possibility of engine knock. A common octane rating of E85 is 95, compared to conventional gasoline ratings of 87-93. Engines that are designed to utilize higher octane fuels typically have higher compression ratios. Higher compression ratios mean increased engine efficiency.

When compared to other alternative fuels, E85 vehicles also may have a shorter driving range. This has been easily addressed on most vehicles by increasing the fuel tank size to account for the energy density differences. Unlike other vehicles that would require planning of fuel station locations, flexible fuel vehicles can operate on any blend of gasoline and ethanol up to E85.

Safety

Vehicles fueled by ethanol are required to meet all government safety standards that conventional gasoline and diesel vehicles meet. Ethanol is a relatively safe alternative fuel when compared to conventional gasoline. Ethanol is environmentally friendly with fewer greenhouse gas emissions while demonstrating nontoxic and biodegradable properties.

Ethanol Performance Summary

- *Comparable in all aspects to gasoline*
- *Reduces engine knock*
- *Reduces emissions*
- *Vehicles can operate seamlessly on any ratio of gasoline and ethanol up to E85*

Ethanol is more biodegradable than conventional gasoline. E85 will mix with water, though in high enough concentrations of water, the ethanol in E85 will begin to separate itself from the fuel. Both pure ethanol and E85 are less toxic than gasoline. Pure ethanol does not contain the carcinogenic compounds present in gasoline. E85 contains conventional gasoline and is classified as potentially carcinogenic. Ethanol of any form is denatured, making it unsafe for human consumption.

The National Fire Protection Association (NFPA) has a standard hazard placard to identify ethanol at stationary facilities. The NFPA 704 hazard placard used for ethanol is shown in **Figure 7**. NFPA 704 is the standard system for the identification of the hazards of materials for emergency response. The "3" shown in the red area indicates that the fuel must be preheated before ignition can occur. In other words, ethanol becomes unstable if heated to 100°F (38°C). The "1" shown in the blue indicates that ethanol may cause slight to moderate irritation, and the "0" shown in the yellow area indicates that ethanol poses no reactivity hazards.

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

Figure 8: *Hazardous material description identification number UN 1170 for ethanol. Source: DOT, PHMSA.*

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 ethanol in transport with the hazardous material description identification number of UN 1170 (see **Figure 8**).

In the event of an ethanol fire, water spray will likely be insufficient because of the very low flash point of ethanol. When fighting a small ethanol fire, use of dry chemical, carbon dioxide, or alcohol-resistant foam. Large fires should be fought using alcohol-resistant foam, water spray, or fog. If an ethanol tank is on fire, the tank will need to be kept cool with water for a significant amount of time after the fire has gone out.

Dealing with an ethanol spill will require much the same procedures as those of a gasoline spill, with one important distinction. Unlike gasoline, ethanol and ethanol blends are conductors of electricity. Extra care must be taken when dealing with an ethanol spill to ensure that all equipment used is properly grounded. Responders to the spill should take care to avoid walking through the spilled ethanol.

Ethanol Safety Summary

- *Fewer greenhouse gas emissions*
- *Biodegradable*
- *Potentially carcinogenic as E85*
- *Conducts electricity*

Summary

This material develops the understanding of ethanol as an alternative fueling option for fleet managers and explains how to green fleets with ethanol and incentives to implement its use. Additional analysis describes the cost, advantages, and performance of ethanol. Millions of flexible fueled vehicles are already on the roads. Nearly every vehicle manufacturer produces ethanol passenger cars and trucks. The major setback in FFVs is currently the distribution network for fueling. However, with increase mandates on biofuel production, station numbers are growing. A key benefit of these FFVs is that they may utilize any blend of ethanol and gasoline up to E85 which allows for travel anywhere where gasoline stations are available.

Test Your Knowledge

1) **True or False:** The majority of gasoline sold in the U.S. is blended with ethanol.

2) Although ethanol can be produced from sugarcane, wheat, and other agriculture products, the majority of ethanol is produced from _____ .

3) **True or False:** The biggest obstacle for widespread E85 use in fleets is the limited number of fueling stations.

4) **True or False:** Pure ethanol is a renewable resource.

5) **True or False:** Ethanol is safe to drink.

Answers: 1) True; 2) Corn; 3) True; 4) True; 5) False — ethanol in any form is denatured to eliminate human consumption, E85 contains at least 15% gasoline, and is not safe to ingest.

Resources

American Recovery and Reinvestment Act

The 2009 American Recovery and Reinvestment Act (ARRA) included significant allotment for funding of biomass fuel production and related research and development. Up to $5.5 million dollars funded projects in both infrastructure development as well as outreach. Infrastructure developments included fueling station upgrades for compatibility with higher ethanol blend fuels. Outreach focused on distributing knowledge with new programs to ensure the understanding of ethanol and its properties to consumers.

Tools to Help!
Learn More at: *http://www1.eere.energy.gov/biomass/recovery.html*

- **Alternative Fuels Data Center – Ethanol** (http://www.afdc.energy.gov/afdc/fuels/ethanol.html) – Offers publications about the use of ethanol, a station locator, ethanol basics, and other helpful information about the fuel.
- **American Coalition for Ethanol** (http://www.ethanol.org/index.php) – Contains information about the ethanol industry in the U.S. and details on how to get involved with the acceptance of ethanol as a fuel.
- **Choose Ethanol** (http://chooseethanol.com/) – Provides general information about ethanol, its source, and up-to-date ethanol-related news stories.
- **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.
- **Clean Fuels Development Coalition** (http://www.cleanfuelsdc.org/) – Presents information about the increased use of ethanol and how it is an advantageous alternative fuel.
- **E85** (http://e85.whipnet.net/) – Shows a basic history of ethanol, a description of what ethanol is, and gives reasons to switch to ethanol.
- **E85 Vehicles** (http://e85vehicles.com/) – Offers a list of available flexible fuel vehicles and contains an E85 station locator.
- **Ethanol Across America** (http://ethanolacrossamerica.net/) – Presents information about the current status of ethanol in the U.S. and provides actions that can be taken to further the use of ethanol.
- **Ethanol Market** (http://www.ethanolmarket.com/) – Provides a technical analysis of the cur rent status of ethanol in the marketplace.
- **Ethanol Producers and Consumers** (http://ethanolmt.org/) – Contains information about upcoming events, allows users to search for E85 stations, and shows the location of ethanol production facilities.
- **Fuel Economy** (http://fueleconomy.gov) – Official U.S. government source for information pertaining to the fuel economy ratings and fuel efficiency.
- **Renewable Fuels Association** (http://www.ethanolrfa.org/) – Promotes legislation that will help advance ethanol research and production.

- **U.S. Department of Energy – Clean Cities Program** (http://www1.eere.energy.gov/cleancities/) – Addresses the nation's energy security by supporting local actions and groups to reduce overall petroleum consumption in transportation.
- **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.
- **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. 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, State Incentives and Laws, www.afdc.energy.gov/laws/state, (updated June 15, 2011).

3 U.S. Department of Energy, Alternative Fuels Data Center, Alternative Fueling Station Total Counts by State and Fuel Type, http://www.afdc.energy.gov/afdc/fuels/stations_counts.html, (updated March 3, 2012).

4 U.S. Department of Energy, Alternative Fuels Data Center, Alternative Fuels Price Reports, http://www.afdc.energy.gov/afdc/price_report.html.

Notes

CASE STUDY

Location: Chapel Hill, NC

Company: University of North Carolina

Study: E85

Governments and consumers have increasingly become aware of petroleum use in the U.S. and the movement to reduce overall petroleum consumption. Seven years ago, the state of North Carolina mandated that all state-related agencies would reduce petroleum consumption by 20%. As a state institution, the University of North Carolina (UNC) decided it would use alternative fuels and advanced technology vehicles to reduce its petroleum consumption. The university consists of 17 institutions throughout the state. This case study focuses on the main campus at Chapel Hill. After looking at various alternative fuels it was determined that the easiest and best option for the Chapel Hill campus fleet was to convert to flexible fuel vehicles (FFVs). New E85-capable vehicles replaced conventional gasoline vehicles. These vehicles are capable of running on any blend up to E85. The ethanol is produced domestically from renewable resources, therefore reducing conventional petroleum consumption.

Decision Points

Varieties of biofuels exist and are available throughout North Carolina. Officials weighed a number of variables as they determined what technology to implement in order to meet the 20% reduction mandate. Laura Corin, of the Facilities Services Business Operations at UNC, addressed some of the aspects of the final decision to utilize E85 at the Chapel Hill campus. Corin said that, "It was great leadership on the part of the state government to implement a 20% reduction in petroleum by all state agencies." The Chapel Hill campus is considered hilly and the vehicles performance needed to be comparable to conventional vehicles. The easiest and most cost effective option for fleet vehicles was to utilize E85 and FFVs. It also should be noted that the Chapel Hill fleet purchased 26 electric vehicles for campus use. This number is small when compared to the number of FFVs. However, Chapel Hill's sister campus in Charlotte, North Carolina, is much flatter. At that campus, EVs have been the prime candidate for petroleum reduction. However, those vehicles are limited to campus-only use due to limited range and top speed of 35 miles per hour. For the larger and hillier terrain, FFVs offer unlimited range and conventional speeds for the Chapel Hill fleet.

As an example, FFV badges are shown above. Left: GM, Right: Ford. Photos courtesy of NAFTC.

UNC FFV car and truck. Photo courtesy of UNC.

Fleet Facts

The fleet at the Chapel Hill campus is a large fleet at 886 total vehicles. Of that fleet, 271 vehicles are FFVs. This is slightly more than 30% of their entire fleet. Of the FFVs, 151 are owned by the university. These include vehicles such as cargo vans and pickup trucks. The other 120 FFVs include mostly passenger cars that are leased by the university. The university creates a yearly sustainability report that includes data on all of its owned vehicles. This report is submitted to the state legislature to ensure at least 20% of the University's total fuel consumption is from nonpetroleum fuels. University-owned vehicles traveled more than 3,142,000 miles in the 2010-2011 fiscal year. The owned FFVs traveled more than 654,000 of those accumulated miles. These FFVs consumed 61,632 gallons of E85 fuel. All gasoline-fueled vehicles on campus use E10, which is common, at most pumps in the U.S. FFVs use E85 when fueled on campus and E85 when available outside of campus operation. The FFVs include some campus police vehicles, but it was determined that these would only be fueled with E10 to ensure safety and readiness of these vehicles. The fleet is composed of FFVs from all major U.S. brands including Chrysler, GM, and Ford.

QUICK FACTS

Alternative Fuel Practice: E85 and E10

Number of Fleet Vehicles: 886

Flexible Fuel Vehicles: 271
E85 Price: $2.40 per gallon

Yearly E85 Use: More than 61,000 gallons

Infrastructure

Depending on U.S. location there may already be an E85 infrastructure available. However, to enable campus fleet fueling with E85, UNC installed an 8,000 gallon E85 tank and pump at its campus fuel station. The station is open to other state vehicles, but Corin said that more than 90% of the E85 is used for fueling University fleet vehicles. The station has been dispensing E85 for about four years. Nearly 400 gallons of E85 is sold daily at the station. Vehicle operators receive a university fuel card to use at these pumps. It is university policy that campus vehicles fueling at other locations use E85 when available. At this point, FFVs are only added to the fleet as older conventional vehicles are decommissioned. When this happens, new vehicles are required to be FFV since the university has invested in the E85 on-campus infrastructure. Corin said that due to the winter climate in NC, the winter ethanol blend is E70. This blend is 70% ethanol and 30% conventional gasoline. This is a common practice to ensure fuel stability and performance during the winter months.

E85 pump at the UNC fuel station. Photo courtesy of UNC.

Costs

The cost of E85 is cheaper for the university, but Corin said cost was not a major incentive in the switch to E85. The main focus she said was on the reduction of petroleum consumption. E85 has less energy per gallon of fuel when compared to conventional gasoline (E10). Due to the increased E85 consumption of these vehicles, the conversion had previously been an economic 'wash'. As the price of gasoline continues to skyrocket, however, Corin said the switch is actually beginning to save the university money. Since UNC is a state agency its fuel prices are different than those at public pumps. Its fuel suppliers are charging $3.40 per gallon of gasoline (E10). However, the price of E85 is lower at just $2.40 per gallon. In order to compare based on equivalent energy per gallon of fuel, the price of E85 can be divided by about 0.7. This yields a price of about $3.42 per gasoline gallon equivalent (GGE).

Satisfaction

The fleet of FFVs has been operational for four years at the UNC Chapel Hill campus. "We are very happy with conversions to E85 and will continue to use and purchase E85 vehicles in the future," Corin said. "We will also look into EVs as they continue to evolve." There have been no major problems or maintenance issues with the UNC E85 fleet. There was one incident reported where an FFV was calibrated to run on E10 instead of E85. Since the fuels have a different energy content this was a problem. However, reprogramming of the vehicle computer and fuel system was an easy and simple fix.

Summary

The state of North Carolina passed legislation in 2005 to reduce state agency petroleum consumption by 20%. The University of North Carolina at Chapel Hill decided to convert more than 30% of its fleet to flexible fuel vehicles and use an on-campus E85 fueling station to reduce its petroleum consumption. The university has surpassed the target of 20%. Not only does the University operate E85 vehicles around campus, is also uses B20 biodiesel in some campus buses and has purchased electric vehicles for on-campus use. The university also hosts a sustainability office that encourages many of the aspects of operating as a green university. These examples emphasize how large fleets can reduce petroleum consumption by using U.S. produced renewable resources and that E85 as a petroleum reduction technology really works.

Photo courtesy of UNC.

Take the Carolina Green Pledge at

www.carolinagreen.unc.edu

UNC has its own sustainability program. To find out more about UNCs petroleum reduction and sustainability check out their website, www.carolinagreen.unc.edu.

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