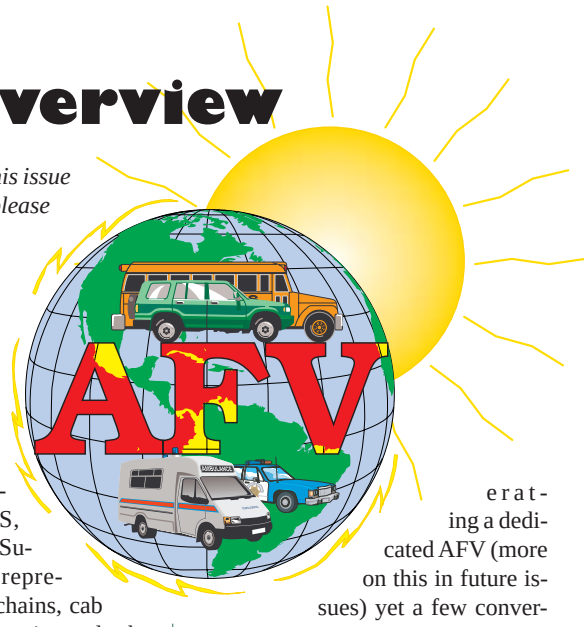
# Alternative Fuel Vehicles — A Market Overview

*Editor's note: In the last issue of TechNews, we discussed Alternate Fuel Technology and the twin goals of cleaner air and energy independence. In this issue we discuss the market forces which both drive and inhibit integration of Alternate Fuel Vehicles (AFVs) into the marketplace. For more information, please contact Bob Rodriguez at NATEF. Phone: 703-713-0100 ext 241. E-mail: brodriguez@asecert.org.*




## Mandates

Alternate fuels are not new to the automotive world. Both steam and electricity were powering vehicles a hundred years ago. Today, both road and non-road vehicles are powered by a variety of alternate fuels such as propane, natural gas, electricity, ethanol, methanol, bio-diesel, synthetics and even hydrogen. But availability, delivery to the end user, and sometimes price remain obstacles to their widespread acceptance. Federal programs have helped promote the use of alternate fuels to help clean the environment and to conserve energy. At the federal level, the EPA's Clean Air Act and the CAA Amendment of 1990 target air quality improvements for non-compliance areas of our nation plus offer benefits to fleets using alternative fuel vehicles (AFVs) in support of clean air.

While no less concerned with air quality, the U.S. Department of Energy targets energy efficiency and the use of domestic fuel supplies to offset foreign imports and related defense costs with its 1992 Energy Policy Act (EPAct). Federal, state and local governmental incentives help to offset the higher costs of AFVs and the cost of installing fill and charging stations. Under EPAct '92, federal, state and municipal fleets, fuel suppliers and others are required to include increasing percentages of AFVs in their annual vehicle acquisitions. Next comes proposals for advancing AFV use among private fleets; yes, private fleets are expected to do their part too.

Why all the emphasis on alternative fuels? Because we're spending too much on foreign oil, and alternative fuels are the logical near-term solution to our energy concerns. The overall goal is to displace foreign oil imports with domestically supplied energy sources. Some alternate fuels, like petroleum, are non-renewable. Others, like ethanol, methanol, and biodiesel are produced from wood, agricultural products, used cooking oil or even waste products. Hybrid vehicles will cut down on energy consumption, and further down the road, most of us may be driving hydrogen powered fuel-cell vehicles—but we're not quite there yet.

For now, which vehicles have the greatest potential for displacing oil imports with domestic alternative fuels? Obviously, those which rack up high annual mileage and consume large amounts of fuel—in short, fleet vehicles: trucks, buses, shuttle vans, and similar applications

*This Ford Taurus flexible fuel vehicle (FFV) comes with the 3.0L V-6 engine and runs on ethanol (E85), gasoline, or any combination of the two fuels.*

## Factors affecting AFV market acceptance

What we've learned over the years is that AFVs are not for everyone, but that they are good for specific "niche markets." We've also learned that mandating AFV use won't work. Rather, the market must *embrace* AFV use, and this will only happen when it is economically beneficial for fleet owners and operators to do so. The generally higher initial (incremental) cost for some types of AFVs has slowed purchases despite the mandates. Lack of range for EVs and CNG vehicles has hindered their acceptance. Even "flexible fuel" ethanol/gasoline vehicles (FFVs) have been purchased with good intent only to find that operators must drive too far to a fill station, so drivers couldn't (or didn't) "use the fuel." In most areas, propane fill stations don't exist, and EV charging stations are just now starting to appear.

In the absence of local fill stations, gaseous fueled vehicles—CNG and LPG (propane)—require centralized refueling. Where less expensive slow-fill CNG stations can be installed wherever CNG is available, slow-filling means vehicles must be parked typically overnight to get a full 3000–3600 psi charge. The same situation applies to electric vehicles in the absence of fast charging. A propane fill-up takes only minutes, but again, propane is not routinely piped to local fill stations, hence the name "bottled gas," which adds to the cost.

Taking all this into account, it should be remembered that ultimately it's the fleet owner and operator with their concerns for safety, vehicle driveability, fuel availability and convenience, and yes, economy, which play a major role in integrating AFVs into the marketplace.

## Successes

Government fleets such as the GSA, the armed forces, and the U.S. Postal Service have successfully integrated AFVs into their motor pools; the U.S Postal Service has the world's largest fleet of AFVs, including EVs, CNG, LPG, and alcohol fueled vehicles. Likewise, county and municipal governments have incorporated AFVs for use by police, fire and rescue, hospital, school bus, parks and rec. and other applications. Private fleets like UPS, SunLine Transit and Super Shuttle—those representing hotels, food chains, cab companies, fuel companies and others—have successfully converted to AFVs to move people, produce and products. Those responsible for non-road vehicle uses like airport baggage and warehouse material handling are also realizing the economic and environmental advantages of AFVs.

Despite the pollution created, liquid energy petroleum fuels like gasoline and diesel years ago beat the competition for a longer lasting on-board energy supply. With a vast system of pipelines and storage facilities, the fueling infrastructure has long been well established, and thus more readily supports a change to liquefied bio, alcohol or synthetic alternate fuels. Often, vehicles run well on these fuels without major modifications. On the other hand, CNG and propane must be either piped in or transported in pressurized tanks, adding to the inconvenience and cost of delivery to the end user.

## AFV Conversions

Given the initial lack of AFVs from OEs, fleet owners wishing to run gasoline vehicles on compressed natural gas (CNG), liquefied natural gas (LNG), or liquified petroleum gas (LPG – propane) had to convert their vehicles. Conversion kits were supplied by a variety of conversion outfitters and some converted vehicles ran well as bi-fuel or even as dedicated AFVs. Some did not, however, sometimes due to faulty component design, mismatched applications to engines, or simply due to faulty installation and setup.

While the fleet owner's intent was to run cleaner and more economical vehicles, in reality, many converted vehicles ran poorer, with higher tailpipe emissions than before they were converted. This not only hindered the acceptance of AFVs, but also, once the EPA got wind of the problem, resulted in conversion standards being more tightly enforced, which in turn drove many conversion companies out of business.

Today, more OEs are supplying a variety of AFVs to the marketplace, and the OE warranty serves as an added enticement to purchase factory equipped AFVs rather than to convert. There are technical advantages to operating a dedicated AFV (more on this in future issues) yet a few conversion companies are still in business supplying high quality products both to OE manufacturers and to the aftermarket. Such companies have certified their engine applicationsto EPA standards.

Overall however, there has been a significant drop in aftermarket conversions, thus changing the AFV landscape from what it was a few short years ago. For example, a recent survey of gas utility fleet operators running CNG vehicles (*National Gas Fuels Magazine*, Sept. 1999) showed that the majority of CNG vehicles presently in fleets (72%) are conversions. However, projected year 2000 vehicle additions to the fleets include only 27% aftermarket conversions, as compared to 62% OE purchases. A 1995 NATEF survey of training providers found that over 70 offered classes on conversions and engine management system integration; today, only a handful offer conversion training. Today, many training providers which offer alternative fuel programs have few or no takers. Those which are active are offeringAFV orientation and safety classes, basic theory and service heavy-duty vehicle training for truck and transit companies, or are offering AFV training on non-road applications such as forklifts.

## The chicken and the egg

As the market for AFVs becomes lucrative, we'll see fleet operators and individuals alike accept their role as responsible "environmental stewards" by giving up imported petroleum powered vehicles in favor of AFVs—from line haul LNG powered trucks traveling interstate highway "clean corridors," to taxis and school buses, to small neighborhood EVs and electric bikes. More AFVs means more demand for alternate fuels from energy providers available at convenient fill / charging stations. With that, the loop closes and we'll see more AFVs on the road as more fleet operators and individuals become willing to "make the alternative choice".

*Next issue—a deeper look at some alternative fuel vehicles and the technology driving them.*

### AFV Training for Automobile Technicians

In 1995, in anticipation of the increased need for skilled AFV technicians, the U.S. Department of Energy launched the Certification of Higher-learning in Alternative Motorfuels Program (CHAMP). Under CHAMP, NATEF worked with industry to establish voluntary national standards for AFV training.

The following AFV training providers have achieved ASE certification, or are in the final stages of becoming certified. Students and working technicians interested in AFV training should contact these training providers directly for more information about their programs.

| AFV Training Provider | Program Type | Certified Courses+ | Phone |
|---|---|---|---|
| Long Beach City College, Long Beach, CA | Entry-level | CNG, LPG | 562-938-3067 |
| College of the Dessert, Palm Dessert, CA* | Entry-level | CNG, LPG | 760-773-2596 |
| Rio Hondo College, Whittier, CA | Entry-level | CNG | 562-692-3430 |
| Gateway Community Technical College, No. Haven, CN | Entry-level | CNG | 203-234-3318 |
| Morton College, Chicago, IL* | Entry-level | CNG | 708-656-8000 |
| Northwestern College, Lima, OH | Entry-level | CNG, LPG | 419-227-3141 |
| Cypress College, Cypress, CA* | In-Service | CNG, LPG, EV | 714-484-7258 |
| Community College of Baltimore County, Baltimore, MD | In-Service | CNG | 410-455-4747 |
| Central Community College, Columbus, NE | In-Service | CNG, LPG | 402-562-1280 |
| City University of New York, Bronx, NY* | In-Service | CNG | 718-289-5411 |
| Mid-Del Technical Center, Midwest City, OK | In-Service | EV | 405-672-6665 |
| New England Institute of Technology, Warwick, RI | In-Service | CNG | 401-739-5000 |

+Other AFV-related courses are typically offered by training providers.
*ASE certification in process.

Other schools offer entry-level and in-service technician AFV training as well. Contact NATEF for a current listing. Phone: 703-713-0100.


*"Fast-fill" compressed natural gas (CNG) refueling is as easy and as quick as gasoline refueling. This airport passenger van is typical of the vehicles best suited for alternate fuel use- it is centrally refueled, travels local routes, and racks up high mileage. Note the CNG diamond which must be displayed on the rear of the vehicle. Watch for similar emblems required on LNG and Propane powered vehicles as you travel the nation's highways.*