ALTERNATIVE MOTOR VEHICLE FUELS IN LOUISANA
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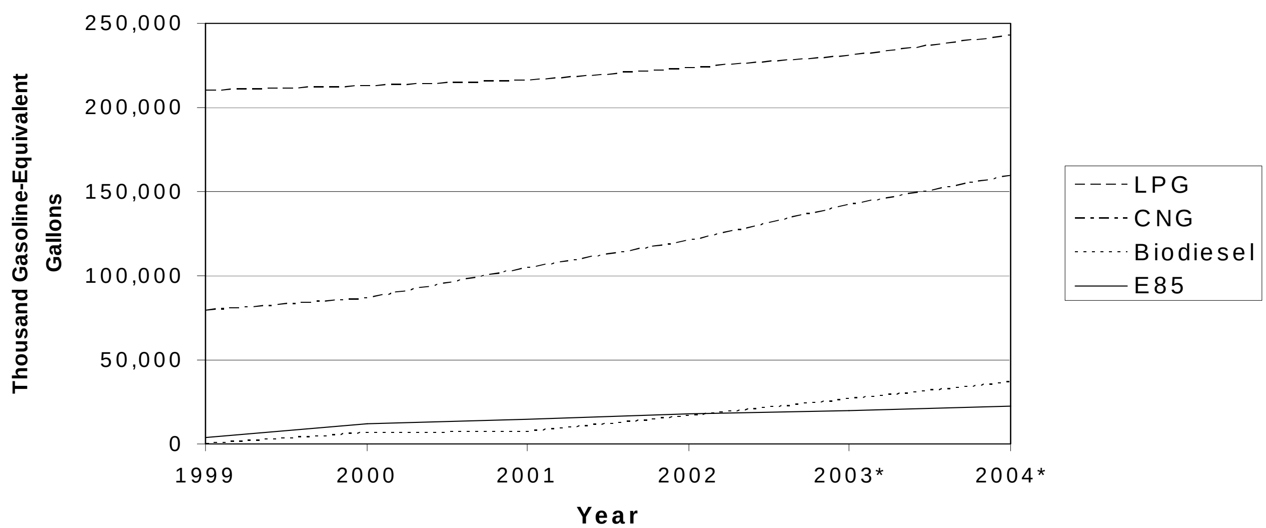
by

Bryan Crouch, P.E.

Executive Summary

Alternative fuel usage in the U.S., as well as in Louisiana, remains a minor fraction of total motor vehicle fuel consumption. In 2004, motor vehicles in the U.S. consumed over 177 billion gasoline-equivalent gallons of fuel [1] (a gasoline-equivalent gallon, also referred to as a gallon-gasoline equivalent, or gge, is a unit that expresses different fuels on an equivalent energy per volume basis). Of the 177 billion gge of fuel consumed, about 2.5 billion gge (less than 1.5% of the total) were alternative fuels, which includes about 2 billion gge of ethanol used to blend with gasoline to make gasohol. **Figure 1** shows the estimated consumption of the four most used alternative motor vehicle fuels in the U.S.

Figure 1. Estimated Alternative Fuel Consumption in the U.S.



* Projected

Typical motivations to use alternative motor vehicle fuels include energy security, energy sustainability, and environmental sustainability. Additionally, recent high oil prices and a post-911 awareness of the vulnerability of our oil supplies have served to increase national attention on alternative fuels. In Louisiana, these effects have been amplified by the Baton Rouge area's classification as an ozone non-attainment area by the U.S. Environmental Protection Agency (EPA);

1. U.S. Department of Energy, Energy Information Administration. 2004. Alternatives to Traditional Transportation Fuels 203 Estimated Data. URL: http://www.eia.doe.gov.cneaf/alternate/page/datatables/atf1-13_03.html.

this has served to increase interest and activity related to alternative fuels. The major obstacles to wide-spread alternative fuel usage continue to be the generally higher cost of alternative fuels and vehicles, and the lack of fueling infrastructure.

These motivations translated into goals are to: reduce crude oil imports, find a replacement for crude oil, and reduce emissions resulting from fuel combustion. Two of the more recent developments that are gaining momentum nationally, and helping to accomplish these goals, are hybrid-electric vehicles and biodiesel. Making gasoline or diesel fueled vehicles more fuel efficient also helps to reach these goals. Such is the case with hybrid-electric vehicles (HEVs). HEVs are not alternative fuel vehicles (they use gasoline or diesel), but employ advanced technology to increase miles per gallon. HEVs are rapidly increasing in sales and availability, and their use reduces both emissions and our nation's dependence on imported crude oil. Biodiesel is a newer alternative fuel that is rapidly gaining popularity due to its ease of use, emission reduction benefits, and renewable status. Biodiesel also has much potential as an additive to regular diesel to restore the lubricity that will be lost when EPA regulations take effect in mid-2006 that require the sulfur content in diesel to be reduced from 500 parts per million to 15 parts per million.

Fuel cells probably have the greatest potential for replacing internal combustion engines in vehicles. Fuel cell vehicles and related technologies continue to advance, but still remain in the experimental stage. Several test fleets are in operation in the U.S. and Japan, and are providing valuable data to manufacturers. Many technology and economic barriers still exist and must be overcome before mass produced fuel cell vehicles and fueling infrastructure becomes a reality.

Highlights

Biodiesel

Biodiesel is a renewable fuel that can be made from virgin or waste vegetable oils, animal fats, and even algae by reacting the base oil (vegetable oil, etc.) with alcohol and a catalyst. Unlike vegetable oil, biodiesel has combustion properties very similar to crude-based diesel and is biodegradable, non-toxic, and sulfur free. Using biodiesel reduces volatile organic compound emissions by 67%; carbon monoxide and particulate matter emissions by almost 50%; and carbon dioxide emissions by almost 80%. Oxides of nitrogen are increased by approximately 10%. Biodiesel can be blended with crude-based diesel in any proportion and is referred to as "BXX" with the "XX" standing for the percentage of biodiesel in the blend. Common blends are B2, B5, and B20. The term "biodiesel" refers to B100, or pure biodiesel. Only B100 qualifies as an alternative fuel under the Energy Policy Act of 1992 (EPACT) regulations, but EPACT covered fleets earn one credit per 450 gallons of B100 purchased if used in blends of 20% or higher.

Any biodiesel blend can be used in any diesel engine subject to the following cautions. Biodiesel has excellent solvent properties and, as such, can dissolve deposits left behind by regular diesel, which can clog fuel filters. Fuel filters should be changed more frequently until the biodiesel has had sufficient time to remove deposits. The second caution concerns cold weather usage. Just like regular diesel, biodiesel can gel at low temperatures. The temperature at which biodiesel becomes problematic is higher than that of regular diesel, but the same methods of intervention that are used for regular diesel, external heating and additives, can be used for biodiesel. As a general rule, B20 has a 3° - 5° F increase in cold flow properties over regular diesel. The higher the blend, the higher the temperature at which gelling will occur.

Biodiesel production has grown from 5 million gallons in 2000 to over 25 million gallons in 2003. No biodiesel is currently produced in Louisiana. B100 costs range from $2 to over $3 per gallon. B20 currently sells for $0.20 - $0.30 per gallon more than regular diesel.

Biodiesel is also an excellent lubricity additive for regular diesel fuel. A diesel engine relies on the inherent lubricity of diesel fuel to lubricate its fuel injection system. Diesel fuel derives most of its lubricity from the sulfur it contains. In 2006, federal ultra-low sulfur diesel regulations go into effect and will reduce the amount of sulfur in diesel to below 15 parts per million and, thereby, reduce lubricity to unacceptable levels. A B2 blend can restore the lost lubricity.

The National Biodiesel Board is the premier trade association for the biodiesel industry. Their website (URL: http://www.biodiesel.org/) contains a wealth of information on all things related to biodiesel.

Hybrid Electric Vehicles

HEVs use electrical and mechanical energy to propel the vehicle by combining an internal combustion engine with an electric motor(s) and batteries. The result is a vehicle that is operated and fueled like a conventional vehicle, but is much more fuel efficient, and thus, less polluting.

An HEV can be designed to operate in one of three modes; series, parallel, or a combination of the two. An HEV configured for series operation uses an internal combustion engine to run a generator which charges batteries, which powers an electric motor, which then drives the wheels. Series HEVs allow the internal combustion engine to constantly run at its most efficient speed, thereby reducing emissions, but require large, expensive batteries because all of the power required to propel the vehicle must come from the electric motor. An HEV configured for parallel operation can use the internal combustion engine, the electric motor, or both, in varying proportions, to drive the wheels. This configuration results in more power being available for acceleration, and allows the use of smaller, less expensive batteries. Parallel HEVs are also generally able to utilize smaller internal combustion engines due to the engines' proportion of motive energy being applied directly rather than first being converted to electrical energy. Finally, combination HEVs are configured such that they can operate in either series or parallel mode.

HEVs also use regenerative braking to help charge the batteries. Regenerative braking recovers some of the energy that would normally be lost while a vehicle is decelerating. It works by using the rotational kinetic energy of a vehicle's drive train, while the vehicle is decelerating, to drive a generator to charge the batteries. This, in turn, requires less use of the internal combustion engine to charge the batteries, which increases overall efficiency.

Currently, Honda, Toyota, and Ford have light-duty HEVs available ranging from a $20,000 small two-seater to a $50,000 mid-size sport utility vehicle. These HEVs sell at a $3,500 - $7,000 premium over comparable gasoline-only vehicles, and have fuel efficiencies ranging from 30 - 60 mpg. Several other major manufacturers will have light-duty HEVs for sale in the very near future. Heavy-duty HEVs, mainly busses and delivery vans, are available from several manufacturers. More information on HEVs, including a listing of available models, is available on the Clean Cities

Program HEV webpage (URL: http://www.eere.energy.gov/cleancities/hev).

Federal Tax Incentives

A federal tax deduction for clean-fuel vehicle property was authorized under EPACT according to the following schedule:

- Up to $50,000 for a truck or van with a gross vehicle weight rating over 26,000 lbs., or for a bus that seats at least 20 adults plus a driver.
- Up to $5,000 for a truck or van with a gross vehicle weight rating between 10,000 - 26,000 lbs.
- Up to $2,000 for any other on-road vehicle, including HEVs.
- Up to $100,000 per location for clean-fuel refueling property or recharging property.

A federal electric vehicle tax credit was also authorized under EPACT. The amount of the credit equals the lesser of 10% of the cost of an electric vehicle, or $4,000.

Both the clean-fuel vehicle property tax deduction and the electric vehicle tax credit were scheduled to be gradually phased out over the period from 2001 - 2004; however, the Working Families Tax Relief Act of 2004 extended the full amount of the incentives through 2005. The incentives will be reduced by 75% for 2006, and eliminated after that.

The American Jobs Creation Act of 2004 authorized an excise tax credit for producers and blenders of biodiesel and ethanol. The credit for ethanol is $0.51 per gallon; the credit for biodiesel is $1.00 per gallon for agri-biodiesel (biodiesel produced solely from virgin oils and animal fats) and $0.50 per gallon for any other biodiesel. The Alternative Fuels Data Center website contains up-to-date information on federal tax incentives (URL: http://www.eere.energy.gov/afdc/progs/search_state.cgi?afdc/US).

Louisiana Tax Incentives

Louisiana Revised Statute 47:38 offers a state income tax credit of 20% of the incremental cost of purchasing a factory-equipped AFV, 20% of the cost for converting a vehicle to alternative fuels, and 20% of the cost for alternative fuel refueling stations. If a taxpayer is unable, or elects not to, determine the incremental value of an OEM AFV, the taxpayer may claim a credit of 2% of the cost of the vehicle or $1,500, whichever is less.

The Louisiana Department of Revenue has issued two recent rulings regarding what qualifies for the alternative fuel income tax credit. Ruling 02-019 concludes that hybrid-electric vehicles qualify for the tax credit, and ruling 03-004 concludes that low-speed vehicles qualify for the credit. The text of the rulings is included in Appendix B, and is also available on the Department of Revenue’s website (URL: http://www.rev.state.la.us/sections/lawspolicies/pd.asp).

Where To Request A Complete Copy

The June, 2005 update of *Alternative Motor Vehicle Fuels in Louisiana* is now available. If you are not on our mailing list and would like to recieve a copy, email us at techasmt@la.gov, or call Jan Janney at 225-342-1270. An electronic version is available on our website at: http://dnr.louisiana.gov/sec/execdiv/techasmt/data/index_alternate.htm.