

PTI 2012-2013 SOLUTIONS AWARDS

City of Raleigh

Population C: 350,000-749,999

Category: Sustainability

Title: City of Raleigh Police Vehicle Propane Hybrid Conversion



Fueling cruiser using Fuel Master System



Installing propane tank in trunk of cruiser

Abstract:

The City of Raleigh Office of Sustainability partnered with the Police Department to convert 20 Ford Crown Victoria patrol cars to propane hybrids. The technology used for the conversions allows the cars to run primarily on propane, reducing carbon emissions, and making the cars more efficient in major emergencies or disasters.



Installing technology under hood of cruiser

As an alternative fuel propane has many Benefits relative to gasoline including: lower fuel costs and longer maintenance intervals; improved performance of the cars; reduced emissions resulting in a 20% reduction of greenhouse gases (GHG); and it is 90% domestically produced, which increases energy independence.

Onsite infrastructure allows convenient refueling that encourages use of propane over gasoline. The tank and pumping unit were installed by Alliance Gas, the propane provider. A *FuelMaster®* Fuel Management System was installed to automate control and accountability of fuel. This technology allows fuel usage and savings to be tracked and ensures the more efficient propane is being used as the primary fuel.

City of Raleigh Vehicle Fleet Services employees were trained during this project, making the City Shop one of only a few in the nation certified to perform installation and maintenance of this technology.

Department of Energy grant funds from Triangle Clean Cities Coalition Blue Skies Grant and the Energy Efficiency and Conservation Block Grant were used to fund this project.

Statement of the Problem:

The police put a lot of miles on their patrol cars and they are used 24/7, using a large quantity of gasoline. The rising increase in cost of gasoline was placing a significant financial strain on the budget with expenses soaring.

In addition, in 2008 the City of Raleigh made a commitment to reduce Greenhouse Gas emissions and to reduce its carbon footprint. A Greenhouse Gas study was completed to identify sources and opportunities, and the "Roadmap to Raleigh's Energy Future" was developed.

(<http://www.raleighnc.gov/environment/content/AdminServSustain/Articles/ARoadmapToRaleighSEnergyFuture.html>). This indicated a need for fleet transformation and the use of alternative fuels and technologies. The City of Raleigh considers itself to be a leader in innovation and searches for ways to pilot projects that accomplish greater efficiencies and utilize emerging technologies.

Skepticism regarding safety, reliability, convenience, and questions of actual bottom line savings were raised during the discussions concerning implementation. This technology was instrumental in providing the tools necessary to convince all parties that this was a feasible and prudent project.

Response:

Propane is a cleaner burning fuel than gasoline that allows for a higher compression ratio in the engine and greater engine efficiency, due to a higher octane rating, than gasoline. Based on the advantages of propane, it was decided to install this technology in 10 Ford Crown Victoria patrol cars as a pilot project. The first conversions were placed in service over a period of several months mid-2011 using an out of state vendor. They proved to be so successful and were so well received, that an additional 10 conversions were requested and placed in service May 2012.

The second set of conversions provided an opportunity to train the City of Raleigh Vehicle Fleet Services staff to install and maintain the Liquefied Petroleum Gas (LPG) Bi-Fuel Hybrid Alternative Fuel Systems in-house so the cars do not have to be sent to an out of state vendor, making the City Shop one of a few in the nation certified to perform installation and maintenance of this technology. These mechanics are able to remove the technology and install in a different car in the event that a host car has to be taken out of service. This results in less time out of service for the cars and employees transporting them to a vendor out of the area.

A *FuelMaster*® Fuel Management System

(http://www.myfuelmaster.com/products/details/fuelmaster_3500_plus/) was installed along with the fuel storage tank during the initial conversions to control access to fueling and allow tracking of data for evaluation of the project. This technology communicates propane and gasoline usage data for each car. The price per gallon for each type fuel is recorded with the transaction. The report (see copy attached) makes it clear whether the propane is being used preferentially and is used to track savings, which can be used to convert more cars.

Safety and reliability were major concerns for the officers. The cars have countless fail safes to ensure the safety of the occupants. Propane tanks are typically 20 times more puncture resistant than gasoline tanks, and the fuel has the lowest flammability range in its liquid state of any alternative fuel.

In order to achieve maximum use of the cars and savings, 2 officers were assigned to share each car. The cars average 3,000 miles per month. They were assigned to officers that would use them the most, as well as supervisors, in order to encourage overall acceptance of the vehicle's reliability and safety.

Results:

A number of positive results were revealed, including:

- 1) Improved performance. This technology proved to be very safe, the handling of the cars was not affected, and the officers indicated they felt the cars had more "pep" during take-off.
- 2) Reduced maintenance to the car. Since propane has a higher octane rating there is less carbon and oil contamination that increases time between oil changes.
- 3) Longer engine life. According to the EPA Alternative Fuels Data Center (<http://www.afdc.energy.gov/vehicles/propane.html>) the use of propane has resulted in documented engine life of up to 2 times that of gasoline engines.
- 4) Emergency Response. The cars provide an added convenience in that they can also run on gasoline or E85 ethanol fuel in addition to propane. Both tanks can be filled to capacity allowing them to have 2 tanks of fuel, which makes the cars essential tools in emergency or disaster response, since the cars are able to run for 36 to 40 hours without having to refuel.
- 5) 20% Reduction of GHG
- 6) Increased acceptance of new technologies throughout the City and industry.
- 7) Certified Vehicle Services Fleet Shop trained to install and maintain systems in house.
- 8) Statistics. Since being placed in service between May 2011 and May 2012, the 20 hybrid propane-powered patrol cars have been driven a total of 490,000 miles, using 66,126 gallons of propane and displacing the use of 59,513 gallons of gasoline. Fuel cost savings have amounted to \$86,400.
- 9) With an initial investment of \$116,820 for 20 units and mechanic training, ROI should be recognized in less than 3 years considering the direct fuel savings, decreased maintenance, and the extended life of the vehicle.

This pilot project has been the catalyst for several other opportunities and considerations:

- 1) The Police are expecting to convert an additional 85 cars with multiple infrastructure sites using the savings from the conversions to cover the cost.
- 2) There is discussion with the gas provider about installation of a sub-station.
- 3) Conversions are being considered by other departments.
- 4) There is discussion about the possibility of installing public infrastructure.
- 5) Serves as a model for other municipalities and agencies.

This innovative technology has provided an opportunity to reduce our environmental impact, increase energy independence, reduce expenses, increase the life of assets, raise awareness, prove a strong business case for conversions, and be a leader in fleet transformation and integrating technology in local government.

Key Participants:

City of Raleigh Office of Sustainability, City Manager's Office
Raleigh Police Department
City of Raleigh Vehicle Fleet Services
Triangle Clean Cities Coalition, RTP, NC

Triangle J Council of Governments, Durham, NC
Alliance Auto Gas, Greenville, SC
Baker Equipment, Richmond, VA
American Alternative Fuel, LLC, West Coxsackie, NY

Contact Information:

Paula Thomas, Sustainability Manager, 919-996-4658, paula.thomas@raleighnc.gov
Paula Stroup, Sustainability Budget & Financial Specialist, 919-996-4256,
paula.stroup@raleighnc.gov