

Alternatives fuel more fleet replacements

More federal, state and local agencies are adding alternative-fuel vehicles to their fleet operations, most often when they replace or upgrade existing equipment.

STRICTER EMISSION STANDARDS

and the need to contain costs are combining to create a wider market in the United States for alternative fuels. With these technologies now available on heavy trucks and at a greater number of refueling locations, more federal, state and local agencies are adding alternative-fuel vehicles to their fleet operations. Most often they do it when replacing or upgrading existing equipment.

Compressed natural gas (CNG), hybrid electric, biodiesel and ethanol are among the most common alternatives. CNG is one that is holding its own in municipal fleets in Wisconsin.

Two examples of public sector fleets adopting CNG technology are the cities of Milwaukee and Oshkosh. Jeffrey Tews, Fleet Operations Manager for the City of Milwaukee, has been part of that city's experiments with CNG since as far back as 1980.

Oshkosh is newer to the technology but Public Works Field Operations Manager Kevin Uhen and Garage Manager Robert Knaup have a solid, well-documented two years of running CNG vehicles on the city's streets.



City of Oshkosh camera truck, used in sewer operations, has separate CNG engines to power it and run a compressor.

Evolving technology

The newest natural gas vehicles generally perform similar to gasoline or diesel vehicles. Because CNG has lower energy density, vehicles cover fewer miles between fill-ups, not an issue for most municipal fleets.

Milwaukee's earliest experiment with CNG, a converted city pickup truck, proved the technology was not ready for widespread use 34 years ago. Tews recalls the truck had little starting power and did not go far on a tank of fuel. Refueling took up to 16 hours and there were few locations to do it. Another drawback was loss of cargo space because of the large fuel tank. And there was resistance from operators who misperceived the fuel as explosive.

By the mid-1990s, when vehicle technology had advanced to on-board computerized diagnostics that controlled the fuel system, the city converted nine vehicles to CNG. The tanks were less bulky and the engines produced more power, but fueling locations still were scarce. However, Tews explains, the city's interest in CNG as a way to reduce environmental impact and lower fuel costs remained strong.

Significant improvements came in 2010. The new engines had more power—as high as 320 horsepower and good enough for quick acceleration. Tews decided to test the technology in larger vehicles and ordered 21 refuse trucks built to run CNG. The city found help subsidizing the \$36,000 added cost per truck for specialized equipment through grants from Wisconsin Clean Cities, the State Energy



Milwaukee refuse trucks do double duty clearing streets of snow in winter, including this CNG-powered model.

Office, the U.S. Department of Energy (DOE) and the Congestion Mitigation and Air Quality (CMAQ) Improvement Program administered by the Federal Highway Administration. CMAQ gives state and local governments a way to fund transportation projects that meet the requirements of the Clean Air Act (CAA) and its amendments. These include purchase of alternative fuel vehicles or conversions, and installation of refueling facilities.

Since Milwaukee uses its refuse trucks to plow snow during the winter, it was important the new vehicles had the power to do the job. Tews says the newest additions to the fleet get high marks for performance. They also run about 50 percent quieter than the diesel fleet and have fewer emissions.

"Our only real concern was how well they would start from a standing stop," he notes. "Turns out they have great power."

Feasibility guides decision

Public Works Operations Manager Uhen says the City of Oshkosh decided to test the alternative on refuse trucks because there already is extensive use of CNG in sanitation fleets and they could benefit from the experience of others. The Winnebago County community shifted its operation to automated collection in 2012 so it was an ideal time to purchase new side-loading garbage trucks that ran on CNG. The city fleet started with five and now has 14 CNG-powered vehicles, including vans, pickup trucks and a five-ton dump truck the parks department uses to plow parking lots during winter operations. A camera truck used in sewer operations has two CNG engines, one to power the truck and another to run a small compressor.

"We look at each potential replacement to determine if it's feasible for CNG," Uhen notes. "Does the tank location impede how the vehicle functions for the intended task, can it maneuver on city streets? These are some of the questions we ask."

Knaup, who manages fleet garage operations, says he sees little difference in performance between the city's CNG- and gas-or-diesel-powered vehicles. "They can be a little sluggish on take off but enough power overall," he explains. "And the

operators are happy with them because they run quieter and give a more comfortable ride."

He adds that reports CNG would pose a problem in cold winter temperatures because of condensation buildup proved groundless. "Cold as it got this winter, we didn't have any issues with the new trucks functioning properly."

Filling up

Oshkosh purchases its natural gas supplies from fueling stations run by Kwik Trip at two store locations in the city. They are among the more than 100 stations Kwik Trip operates in Wisconsin, Minnesota and Iowa that have the capacity to supply the alternative-fuel needs of large trucks.

Joel Hirschboeck, Superintendent of Commercial Fuels for the Wisconsin-based company, says the program began by serving private fleets 15 years ago. It provides fueling stations for diesel, gasoline and alternatives like CNG. The commercial fuels program expanded eventually to include public fleets and now Kwik Trip has fuel contracts with towns, cities and counties across the three-state region.

They also have 75 CNG vehicles in their own fleet, which Hirschboeck says gives Kwik Trip technicians ongoing experience with advances in the technology.



Wisconsin-based Kwik Trip supplies public fleets with alternative fuels, including CNG. More than 100 of its stations have refueling bays like these for large trucks.

As part of the fuels program, they provide maintenance and installation of specialized equipment, and help train customer fleet technicians to maintain their own equipment.

Uhen says his fleet department benefits from Kwik Trip's experience with alternative fuels. But he adds that plans in Oshkosh to construct a new public works facility raises the question of whether to invest in a city-run CNG fueling operation, something that would allow the city to meet and manage the cost of expanding alternative-fuel needs in future.

Milwaukee uses a We Energies fueling station and two filling stations on city property (both also available to the public) for

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Milwaukee uses both fast-fill and time-fill methods for refueling its CNG fleet. In fast fill (left), the vehicle hooks up for a full fill on the spot. The station can service 11 trucks with a full fill in one hour. Time fill (right) takes longer but handles several trucks overnight when they are not in use and electricity rates to run the pumps are lower. Milwaukee's time-fill process also keeps data on fuel consumption by truck to document exact costs.

CNG fleet replacements

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its current fleet of CNG-powered trucks. Tews says they designed the existing city-owned stations, built using federal dollars, to manage an increase in the city's fleet of CNG-powered vehicles over five years. He anticipates adding more city-owned stations to reduce wait times for fill-ups and give fleet operations more control over costs.

Budget bottom line

Compressed gas costs half as much or less than traditional fleet fuels and price fluctuations are modest. Comparisons reported by the U.S. Department of Energy Alternative Fuels Data Center show the cost of CNG as of April was \$2.15 gge (gasoline gallon equivalent), \$3.65 per gallon for unleaded gasoline and \$3.97 per gallon for diesel. Milwaukee and Oshkosh both claim measurable savings from the use of CNG in fleet vehicles.

"That fact alone makes adopting CNG worthwhile," observes Milwaukee's Tews when talking about the payback on the city's investment in alternative-fuels technology. He says Fleet Operations currently saves \$6,500 per year for each truck using CNG, meaning overall fuel costs will decrease with every vehicle they add to the fleet. That could come soon with eight light-duty CNG vehicles and 22 more CNG refuse vehicles on order. "Once we have



A side-load refuse truck in the Milwaukee CNG fleet.



Oshkosh's CNG fleet includes vans like this one.

more trucks running CNG, I expect savings of around \$270,000 a year on fuel costs overall."

In Oshkosh, two years of data comparing CNG to diesel shows the shift to the alternative produced a good return. Knaup says with a savings of 33 cents per mile on fuel and the lower cost of maintenance on the new vehicles, the city found CNG 70 cents cheaper to run than diesel. After just two years, that is significant.

Eco bottom line

Decreasing the carbon footprint of its fleet operations is a sustainable goal for many public agencies. Kwik Trip's Hirschboeck follows the data and reports that CNG-powered vehicles reduce greenhouse gases by 25 percent and particulate matter by 90 percent.

Milwaukee's Tews believes the numbers are real. "We don't know just how much our alternative fuel efforts contributed to EPA reports of a considerable reduction in emissions in Milwaukee over the last year," he observes. "But Fleet Operations is doing its part."

CNG maintenance

The main difference between maintaining a CNG-powered vehicle and a conventional vehicle is the fact they require more frequent spark plug replacement. Replacements are costly but Oshkosh's Knaup says there are long-term savings that include less downtime.

Tews says another item on the maintenance list for CNG vehicles is the periodic inspection and recertification of the fuel tanks, a federal requirement.

Local governments also need to make sure maintenance facilities are adequate for handling CNG vehicles safely. Milwaukee is working to refurbish the

garage areas where maintenance crews work on the vehicles by upgrading ventilation systems, machinery and light fixtures to comply with NFPA (National Fire Protection Association) codes. Improvements include methane sensors that activate the ventilation system to do an air exchange and keep running until methane levels drop. Milwaukee's Fleet Operations also trains operators and mechanics in proper maintenance practices and safe operation for CNG equipment.

Growing numbers

Private and public sector fleets that want to cut costs and reduce polluting emissions represent a growing market for U.S. equipment manufacturers developing new heavy-duty natural gas vehicles. For some fleets, using qualified system retrofitters to convert conventional fuel vehicles to natural gas is a viable option to replacing them.

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There is growing interest in alternative fuels among local governments in Wisconsin. Milwaukee and Oshkosh are two of 17 local public agencies in the state that belong to the Wisconsin Smart Fleet program (<http://wismartfleet.org>). The program is a joint effort of the Wisconsin State Energy Office and Wisconsin Clean Cities (WCC), a trade association that promotes the use of alternative fuels and technologies. Smart Fleet provides public and private fleets with help evaluating where they can add clean, renewable fuels to their operations while keeping costs under control.

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Local governments can learn more about the benefits of adding CNG or other alternatives to their fleets by checking out the resources provided here and contacting fleet managers who are putting these alternatives to the test. ■



The Oshkosh Parks Department attaches a plow blade to this CNG-powered one-ton truck to clear parking lots of snow in winter.

Madison tests hybrid electric trucks

ELECTRICITY is another source government fleets are testing to power select vehicles. The City of Madison deployed two heavy-duty hybrid electric utility trucks and one heavy-duty plug-in hybrid electric three years ago for erecting and maintaining traffic signals.

Battery-powered electric motors power all three vehicles along with internal combustion engines that run on conventional or alternative fuels. The batteries charge up when the operator uses the brakes or the engine runs. The plug-in hybrid also can use an electric power source to recharge.

Madison Fleet Service Program Manager Art Meyer reports the city's Traffic Engineering crews like the fact the trucks run silently in electric operating mode when standing stationary at a work site all day. In that situation, the trucks operate for six hours or more off the battery. When it gets low, the combustion engine powers up automatically and completes an 80 percent recharge in about 15 minutes.

Madison purchased its hybrid electric vehicles with funds from the Wisconsin Clean Transportation Program (WCCTP), a joint four-year project of the Wisconsin State Energy Office and Wisconsin Clean Cities. (WCC). The program's goal was to reduce petroleum consumption and emissions by increasing the use of alternative fuel technologies. It also presented a chance to advance the technologies, says Lorrie Lisek, WCC Executive Director. "Our primary goal of



getting vehicles on the road so Wisconsin could start the shift to cleaner fuels had the added benefit of giving manufacturers useful information for fine-tuning the equipment," she explains.

A final report on results from the program is due soon. But early data shows participating agencies replaced more than 6.4 million gallons of petroleum during that time with alternatives like hybrid electric.

Meyer describes Madison's experience with hybrid electric technology as largely positive but says they did encounter maintenance issues related to integration of the hybrid system with that of the chassis manufacturer, and reliability of the first-generation hybrid components. "Since we are operating early versions of the hybrid units, it is difficult for us to know what's possible with the newer and technologies out there now," Meyer notes. "What we did see were the benefits of a no-idling alternative for sign and signal maintenance along with its potential for use in other operations." ■

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Resources

www.afdc.energy.gov/fuels/

U.S. Department of Energy Alternative Fuels Data Center discusses current and emerging fuels, tools for comparing alternatives and costs.

www.energyindependence.wi.gov

Wisconsin State Energy Office website with links to fuel technologies and information on vehicles.