

Greening Garbage Trucks: Trends in Alternative Fuel Use

Refuse trucks provide an invaluable service, improving the quality of life in cities and towns across the country as they haul away thousands of pounds of solid waste every day. However, the more than 136,000 refuse trucks that travel America's streets also contribute to air and noise pollution. Nearly 99 percent of these vehicles run on diesel fuel, and the emissions from their diesel engines pose a serious threat to public health. Diesel exhaust contains particulate matter, hydrocarbons, carbon monoxide, and nitrogen oxides, which can irritate the eyes and respiratory tract, cause neuro-physiological symptoms, exacerbate allergies and asthma symptoms, and pose a cancer risk.

In 2003, INFORM Inc., a New York City-based nonprofit organization whose mission is to enable business and industry to safeguard natural resources and human health through practices that make environmental stewardship and economic progress mutually supportive, published *Greening Garbage Trucks: New Technologies for Cleaner Air*, an analysis of the refuse truck sector. The study found that a number of fleet operators, particularly in California, were beginning to purchase natural gas trucks, which perform much more cleanly and quietly than their diesel counterparts.

Since the publication of that report, the refuse collection industry has encountered several challenges that could dramatically alter its approach to fuels and pollution prevention. First, new heavy-duty engine emissions standards came into effect in 2007, and even stricter standards will follow in 2010. To meet these standards, diesel engines will

require costly after treatment systems, while natural gas engines already meet the 2010 standards. Second, the prices for diesel, gasoline, and natural gas have fluctuated, rising to their highest levels in recent history. By increasing operating costs, these higher prices encouraged fleet operators to explore alternative fuels as a way of managing fuel costs. Third, members of congress and other government officials are supporting strategies, such as the use of alternative fuels, to reduce America's dependence



on foreign oil. Not only is natural gas a secure, domestically produced fuel, but its use reduces the demand for petroleum-based fuels and imported oil.

Refuse Trucks in 2005

INFORM revisited the refuse truck industry in 2005 to see what effects these changes have had on its use of natural gas, other alternative fuels, and advanced technologies. The new report is entitled *Greening Garbage Trucks: Trends in Alternative Fuels Use, 2002-2005*. The organization also sought

feedback from fleet operators to learn about their experiences with natural gas trucks.

The research confirmed the use of 1,071 natural gas refuse trucks in 31 fleets in the U. S. and, through secondary research sources, identified another 425 trucks whose use could not be verified. Even though natural gas trucks constitute only about one percent of the overall refuse truck fleet, this sector is the second leading market for heavy-duty natural gas vehicles in the U. S. after transit buses.

The number of natural gas refuse trucks operating in the U.S. tripled between 1998 and 2002, then doubled between 2002 and 2005. In 2002, fleet operators predicted that the number of natural gas refuse trucks being used would increase to 2,221 by 2010.

A review of international programs discovered that the number of natural gas refuse trucks being used worldwide has also increased. In addition to confirming the continued use of natural gas refuse truck fleets in Japan and the Netherlands (as reported in 2003), recent research found new fleets in Spain, France, and Belgium. Combined, these fleets operate more than 800 natural gas refuse trucks.

The research also examined the use of other alternative fuels and advanced technologies in the refuse collection industry. INFORM found that some fleets are experimenting with fuels such as biodiesel and bio-methane, while others are exploring hybrid drivetrains, particularly hydraulic-hybrid and hybrid-electric technologies. However, these programs are relatively small, and the use of these fuels and technologies is not expanding as rapidly as that of natural gas.

Influencing Factors

By analyzing data gathered during interviews with fleet operators, INFORM identified the positive and negative factors that influence refuse truck fleet operators when they decide which fuels to burn and technologies to use. Seven factors that favored the use of alternative fuels in the refuse truck sector between 2002 and 2005 were:

- State incentives that promote alternative fuel vehicle use.
- Rising prices of petroleum-derived fuels.
- National energy security concerns.
- New stringent engine emission standards.
- Strong industry presence in the refuse truck market.
- Increasing concerns about public health.
- Recognized benefits of less noise.

Three factors that discouraged their use between 2002 and 2005 were:

- Continuing concerns about the costs of switching to alternative fuel refuse trucks.
- Truck performance.
- Need for stronger national leadership and support for alternative fuels use in refuse trucks.

Summary

In general, the fleet operators that were interviewed expressed a growing interest in alternative fuels, which reflects a changing perspective about which fuel is the best to use in refuse trucks operating in the urban environment. Local municipalities are becoming more and more concerned about worsening urban air quality and the rising price of diesel fuel. At the same time, greenhouse gas emissions and continued reliance on foreign oil are becoming national concerns. A summary of the research follows:

- Conventional diesel refuse trucks are no longer the only available option. Although refuse fleet operators can choose from several types of alternative fuel trucks, they prefer natural gas trucks.
- In the U. S., the vast majority of natural gas fleets are found in

California, where fleet mandates have been enacted and economic incentives are available.

- Natural gas refuse truck fleets are operating in several cities throughout Japan, France, Spain, Sweden, Belgium, and the Netherlands.
- Since 2002, the comparatively higher costs of purchasing and operating natural gas refuse trucks have been an obstacle to their use. However, four factors are changing the economic equation: the 2005 Energy Policy Act, the 2005 Highway Bill, the EPA's new engine certification standards, and rising fuel costs.
- When considering what new trucks to purchase, refuse truck fleet operators must consider several important factors, such as purchase cost, access to fuel, the need for new refueling infrastructure, costs for training workers, availability of public and private funding, ability to leverage current capital investments against future investments, emission reduction goals, noise reduction goals, and petroleum displacement goals.

The research identified an additional benefit of natural gas refuse trucks—using natural gas as a fuel may help the transportation sector switch to the use of hydrogen in the years ahead. Fleets that operate these trucks gain experience with gaseous fuel technology and the systems needed to handle gas under pressure. Also, the fueling equipment required for natural gas can be adapted to extract hydrogen from natural gas and provide fuel for the first generation of hydrogen fuel cell trucks.

Recommendations

- California has developed several programs that other states can replicate to encourage the use of natural gas, bi-methane generated by landfills and wastewater treatment plants, and other innovative technologies. Elements of these programs include economic incentives to offset capital costs, fuel use and engine mandates, public education programs, and educational workshops for refuse fleet operators.
- A national entity—whether government, trade association, or independent—is needed to track trends

in the truck fleet sector. Such an entity could be created within an existing natural gas vehicle trade association or within another organization such as the Solid Waste Association of North America (SWANA, www.swana.org). It could quantify the number of trucks operating in the U. S., assess the increasing use of alternative fuels and advanced technologies, help municipal governments and other organizations evaluate the practices of local refuse truck fleet operators, and enable those in the alternative fuels industry to track their own progress.

- The U. S. Department of Energy can encourage multi-sector government/industry/nonprofit partnerships that can help refuse truck fleet operators overcome obstacles and maximize their new truck investments. For example, local Clean Cities programs can explain the economic incentives available through the 2005 Energy Policy Act, and they can connect vehicle, fuel, infrastructure, and grant providers. Also, the National Renewable Energy Laboratory's performance comparisons of alternative fuel and advanced technology vehicles can show heavy-duty vehicle sectors how they can focus their investments most effectively.
- Joint efforts by national government agencies and industry leaders should include an integrated energy and technology export program to support the export of natural gas and other refuse truck technologies. Even though many technology export programs already exist in the government, alternative fuel technologies receive minimal attention. Likewise, business tax incentives have been used to attract businesses to different states, but they have generally not been offered to support companies that sell natural gas vehicle technology in global markets.

Greening Garbage Trucks: Trends in Alternative Fuels Use, 2002-2005 is available free of charge from INFORM, Inc. at www.informinc.org. For further information call 212-361-2400, extension 240.

