Fueling the Future

NGV operators are finding savings in fuel cost while gaining public approval for going green. By Peter Hildebrandt

The Town of Smithtown, NY, population 118,000, was the first community outside of California to have 100% of its refuse collection fleet running exclusively on compressed natural gas (CNG). These operations started on January 1, 2007. Since that conversion, they’ve gone on to other municipal operations using CNG, including such public works applications as trucks picking up road debris or related work, according to Russ Barnett, environmental protection director with the town of Smithtown.

Smithtown runs Crane Carrier and Autocar equipment using the Cummins Westport L-Gas Plus Engine, as opposed to the current ISLG model. The community has had a good experience with the engines, according to Barnett. A number of their highway department or department of public works vehicles operate on CNG. These include Freightliners, Schwartz Sweepers, and a fleet of Honda Civic GX sedans for inspectors and code enforcement personnel.

“Performance has been fine and reliability good for the CNG engines on our refuse collection fleet,” he says. “When Smithtown’s new CNG vehicles were introduced, we received just one complaint. An elderly gentleman was in the habit of bringing his can out in the morning to avoid animals getting into it during the night. Three weeks into the launch, he’d missed collections three times because the trucks were quieter than he’d been used to.”

Barnett, who also serves as municipal manager of this segment of the operations, explains that with diesel fuel prices escalating over two years from $1.30 per gallon to over $3 per gallon, this wreaked havoc on the town’s budget. The community looked for a cheaper alternative fuel, one with a more stable price than diesel.

The report Greening Garbage Trucks, by the environmental advocacy group Inform, helped the town reach its decision. The report was based on a survey done of refuse use in California. The 1,000 CNG-run vehicles there were found to be quiet and reliable. Barnett started calling people to ask them their experiences with the vehicles. He found Allied Waste was operating a single CNG-fueled refuse collection vehicle up on the Harvard University campus. Barnett visited the operation and noted the satisfaction with this vehicle’s performance.

“These systems met our need for stable, long-term, fixed fuel prices,” says Barnett. “That’s why we made the conversion. Typically, here in Smithtown we don’t like to take on new things—those we feel we don’t have a history with. But we did research and ended up contracting with Clean Energy in Seal Beach, California. Clean Energy built the fueling station.

“We’re a conservative town. We don’t experiment with tax...
dollars. We did our research and found it was a proven, even if not a widely known, technology. We privatized the construction of the new fueling station by contracting with Clean Energy of Seal Beach, California. They built the station without any capital investment by the town, and they offered us long-term fixed fuel prices for our fleet. We privatized that side of the operation.”

Barnett worked with Brookhaven, NY, helping that community do a fleet conversion, which took place in 2009. This town is just under half of a million in population. Brookhaven is now 100% CNG on its refuse truck fleet.

Long Island’s NG infrastructure has been sufficient. It is managed by National Grid. Clean Energy built all three fast-fill energy stations for those refuse fleets. Gas is removed from the gas network. It is compressed into onsite storage cylinders, and then the trucks can fill in seven to 10 minutes, taking on 70 diesel-gallon equivalents—filling as quickly as a diesel truck can be filled.

“Universally, the drivers have told me they’ve much preferred the trucks to diesel because they went home at the end of the day not smelling of diesel fumes,” adds Barnett. “And they told me the cabs were quieter and a much better working environment.

“We figured out it’s costing less to operate the trucks. They’re cleaner, better for the operators, and we place importance on the idea that the NG is a domestically produced fuel as opposed to diesel’s origins from foreign sources.”

Barnett feels people should pay attention to NG, because it’s a lot cheaper to run, better for the environment—burning much cleaner with no particulate emissions and reductions in both nitrogen oxide (70%) and greenhouse emissions (20%) are reduced by up to 25%.

Since the launch in 2007, Barnett has received a steady stream of inquiries from around the country, from both municipal managers and private fleets. From follow-up calls, Barnett has learned there have been other fleets converted around the country. These calls have come from municipal managers from New Jersey, Maryland, Pennsylvania, Colorado, Washington, Michigan, and Texas.

NGV at Work
Jeff Campbell, Cummins Westport’s director of product marketing, notes that government tax incentives and credits for natural-gas vehicles in the US are helping to generate some interest. “The technology works, the fuel costs less, and operators save money, making NG vehicles competitive on a bid basis. It gives people something to differentiate their fleets with a greener technology.”

The chance to use landfill gas has certainly attracted some attention as well. There is a landfill-gas facility in Waste Management’s Altamont, CA, facility, where the company produces its own liquid natural gas (LNG) and uses it in transfer trucks. Several municipalities are also working with greenwaste, using anaerobic digestion to create methane. The city of Toronto is an example of a city looking seriously at such systems, according to Campbell. Its first of three trucks has recently arrived.

Such large players as Waste Management, Republic Services, Veolia among others, use the ISL G Cummins Westport engine, according to Campbell. fleets in the cities of Los Angeles, Seattle, and New York are other larger users.

“NGVs are certainly creating opportunities in terms of reducing dependence on foreign oil and reducing greenhouse gases,” he says. “Fuel availability is still a factor, but I think NG is a good fuel source over time. In the refuse industry, this application is a really good fit.”

CNG Fueling Compression Equipment
Over the years, there’s been continued interest in CNG. It all may have intensified in the late 1980s when there was a lot of talk about going green, according to Steve Davis, vice president of sales, Universal Air Products Corp. “The problem was, back then, diesel fuel was 75 cents to $1 a gallon and natural gas was $1 per gallon, so it was pretty difficult to make that happen. Now the tides are turned. Natural gas remains $1.50 to $2 per gallon equivalent, while diesel fuel is typically over $3 per gallon.”

Universal specializes in air and gas compressors, filtration, and drying systems. It has partnered with some major suppliers and is considered a leading packager in the country for natural-gas refueling, according to Davis. The company is also involved in the design, installation, and service of its compression equipment.

“We have plenty of NG in North America. It is renewable through biological processes, including tapping into methane from landfills. We control it. It’s clean. Look at the carbon footprint to create a gallon of ethanol, and then look at the one involved with the natural gas; there really isn’t one. It has already been washed away by time. It’s cleaner and costs us far less than oil.”

Universal’s CNG stations are found around the country and the world. The Midwest to the eastern US forms its biggest market currently, though it has done work all over the country. “California is definitely hot for us, and Pennsylvania is good due to extensive NG reserves,” adds Davis. “Even here in Virginia, we’re seeing a lot of success.

“With CNG, you’re going to save money whenever you fill your vehicle. And CNG is a long-term fix; it’s not a band-aid. Once we can get the infrastructure in place and we get CNG mainstreamed, we will never leave it. The resources in this case are extensive, though it’s difficult to estimate the extent of the amount of NG in reserves in the US.”

Fueling solid waste vehicles and other vehicles is no problem; everything comes down to design details. “Refuse truck-sized vehicles are easily manageable, and I would say half of our discussions and half of our orders go for solid waste and/or buses,” adds Davis. “So worries about size of vehicles are not an issue at all.

“CNG is the right thing to do. It breaks the ties to foreign oil, strengthens our country, strengthens our economy, is safer, and we never have to turn around and go back the other way.”

The Shifting Market from Diesel to CNG
Vocational Energy, Tampa, FL., has been building natural-gas fueling stations for two years now. The company helps with everything from truck disposal to station building to post-construction maintenance programs for its stations, providing help with the whole conversion and switchover, along with a good business model so operators understand what they’re getting into. The company deals with all aspects of setup as a true 100% turnkey provider from A to Z, according to co-owner Scott Edelbach.

At first the only real interest in CNG came from operators in southern California, where really tight air-quality mandates
dictated that refuse trucks needed to be cleaned up, according to Edelbach. Natural gas was actually the only option available to meet this goal.

But several factors shifted the market. “First, the technology of the engine improved, from 600 pounds of torque in power in the early years, to 1,000 pounds of torque in 2007—a huge increase in power. Reliability increased, along with the additional muscle.”

Second, the EPA mandated new nitrogen-oxide regulation on the diesel markets, requiring diesel trucks to become a lot more complicated, more costly, and more unreliable. “There was a paradigm shift between the two types of equipment,” adds Edelbach. “One type of system was going from more expensive and unreliable to more reasonably-priced and reliable and the other—diesel engines—were going in the exact opposite direction.

“Third, in 2008, the $3.50–to $5-per-gallon diesel fuel prices threw a lot of people for a loop and was really painful for a lot of haulers. They pretty much had about $3 per gallon for diesel built into their budgets. Anything over that starts to sting; an increase in only 50 cents per gallon could add on an additional $7,500 per truck per year—times hundreds of trucks.

“It is now possible to produce energy for only about $1.50 DGE. And Southern California, which originally started the fuel-emissions mandate, is now making this work—without federal dollars in stimulus money.”

According to Edelbach, several states also have removed the state road taxes when such alternative fuels as CNG are used. This results in a removal of up to 40 cents extra per gallon for diesel. Florida, for instance, is one of the states removing the road tax and when government incentives and lower costs are factored in, CNG can run as low as 70 cents per gallon.

“The spread between that amount and $3.50 for diesel fuel means economics has really become a factor. Depending on their size, some refuse collection truck operations can save as much as a million dollars a year. Few fuel alternatives have the clear benefits that CNG has.”

**CNG Fueling Stations**

Trillium USA specializes in turnkey CNG station solutions, including designing and building the station and then operating and maintaining it for the long term. The company works extensively in California and New York, and has plans to expand operations down the eastern seaboard and into Texas.

Trillium has CNG refueling packages available for the refuse industry, most based on time-fill technology that incorporates overnight fueling. With this type of system, refuse trucks simply hook up to fueling posts when they are parked in the yard and the compressors run during the night to fuel the fleet. This system also supports fast fueling at any time of the day or night.

“When fleets switch to CNG, they’ll phase out their old diesel trucks and build their CNG infrastructure around the new vehicles,” according to William Zobel, Trillium senior vice president. “For refuse fleets building their own stations, there are often considerable upfront equipment and construction costs. However, the long-term fuel savings will offset the cost of that infrastructure. With your own CNG station, you’re going to see significant savings as compared to diesel. Fuel savings could be a dollar per gallon or more depending on the size of your fleet.

“CNG stations are big investments, so you want to ensure you maximize the return on your investment,” Zobel says. “To do this you need to look at the life cycle costs of the equipment and its operating costs. It’s important to consider the quality of both the equipment and the service provided by your vendor. A well-designed, well-built, and well-maintained CNG station will last for 20 years or more, whereas a cheap, poorly maintained system needs major repairs and potential replacement in just a few years. It’s important to remember you get what you pay for in this business.”

Station financing can be arranged in a variety of ways for companies that may not have the ability to pay the upfront station equipment and construction costs. The first choice is often to seek grants from local, state, and federal sources. These funding opportunities are meant to support projects that reduce petroleum use and promote clean air, something that CNG fueling excels at. Federal tax credits and incentives are also available to help reduce the cost of CNG stations and vehicles.

Banks also offer financing for CNG projects. Interest rates are extremely low right now and are even less for municipal clients who qualify for government rates. With bank financing, fixed-rate payments can be made over multiple-year terms. This gives the customers the opportunity to use part of the fuel savings they realize each month toward the infrastructure payment. Essentially, the fuel cost savings can pay for the project.

Finally, fuel providers, such as Trillium and others, can provide financing for qualified projects and include the CNG station costs in a per-gallon cost for fuel. The customer is able to avoid upfront charges and combine the station, ongoing service, and fuel costs into one low price per gallon. This is an excellent option because customers can essentially outsource their CNG equipment and maintenance to industry experts and remain focused on their own core businesses. One simple per-gallon charge covers every aspect of the station and service. It’s a compelling solution to the issue of how to switch to CNG fuel.

**Bridging the Gap Between CNG and the Refuse Industry**

Raymond Burke has 30 years in the waste industry, 25 of which were with Waste Management. He’s vice president of business development, refuse, for Clean Energy in Seal Beach, CA.

Burke himself was the first to place NG in a refuse truck, back in 1997. Waste Management had the franchise contracts for the municipalities in the Palm Springs area. Palm Desert asked Burke to eliminate its diesel refuse collection trucks in an effort to clean up the air. The only engine available at that time...
was a Cummins L-10, the first of its kind. “I committed to converting their fleet but had all kinds of problems, as transit buses, some of which were running on NG then, have different work and needs than refuse vehicles. The fuel and fuel station infrastructure was never really a problem. But the engine designs at first were poor.

“From 1997 to 2002, many manufacturers got into the business and then got out. None of them worked well. The horsepower and torque were weak, dependability poor, and these didn’t run very well. While the engine technology and performance of the truck were challenging, I was able to secure a lot of business by emphasizing that this was one way to clean up the environment.

“In 2002 it got a little better. In 2004 it got closer, and finally, in 2007, the Cummins Westport ISLG came out. That’s what we’re using today. Its performance is comparable to diesel. In fact, it’s comparable in performance to 2010 diesel engines or may even outperform them.”

To run a CNG truck is not a significant challenge anymore, according to Burke. They’re very dependable. They work, have the horsepower and everything a diesel truck has and more—plus all the environmental and economical benefits are included. He points out the slow, steady growth by citing that from 1996 through 2008, the company built 15 NG fueling stations. From 2009 to 2010, it will have built approximately 23 stations in 13 states.

Southern California has even mandated CNG for refuse truck fleets of 15 or more vehicles in a number of its southern counties, according to Burke. This push has expanded to the Seattle market and to Allied Waste sites in Boise, ID, as well as in Texas, New York, Georgia, and Florida.

“CNG not only is cleaner but quieter,” adds Burke. “It’s cheaper and, when all the numbers are in, a better way to operate. The industry is figuring that out, and that is why growth has started to take off.

“At Waste Expo and WasteCon in 2007, no one really knew or understood NG in the context of waste collection. None of the trucks on display or body manufacturers had NG. At the most recent show I think there were seven or eight on display. Now there’s a whole NG section at Waste Expo. It’s really come a long way in terms of visibility; everyone is aware of it. Our phone rang off the wall with people wanting to know more about it.”

Because of issues with diesel, people are looking at other options. Burke is seeing a lot of people converting to NG. “For every gallon of diesel it is the equivalent of 139,000 BTUs,” says Burke. “Doing the math involving the commodity market, the price for NG comes out to 38 cents per gallon versus $3 per gallon for diesel. Infrastructure, federal tax, sales tax, and other things must be added in [on top of the commodity costs], but when you look at the economics involved, we’re saving customers between 60 cents, up to $1.50 per gallon. NG is cleaner. I think there’s lots of outside activity driving people toward this vision of ‘maybe this is what we should be doing.’

“Boone Pickens educated us on the fact that out of the 85 million gallons of oil produced daily, our country uses 21 million, yet we have only 5% of the world’s population. Seventeen million gallons of that 21 is imported from countries that don’t like us, and 71% of all our oil is used for vehicles.

“For heavy-duty vehicle applications, NG is the answer, not the battery, which is good for smaller vehicles. Pickens works hard in congress to help subsidize these 18-wheelers with NG. Around 10% of the vehicles in the waste industry are now being replaced with NG. I see the percentage increasing over the next five years. And I’m more of a conservative than optimist. I think at least 30% of the trucks coming off the line in the next five years are going to be NG vehicles.

“Of the over four million NG cars around the world, only 100,000 of those are in the US. In Europe there are 19 different car models available with NG engines. In this country the Honda Civic is the only NG car obtainable from a dealer. Aftermarket retrofit kits are available, and we’ve done airport shuttle vans, buses, lift trucks, and all kinds of different things with these. A lot of taxis at airports are now required by airports to run on NG—but they’re all outfitted with aftermarket products.

“Everyone says hydrogen’s the future, and eventually we’ll probably get there. But NG will give us a couple hundred years to figure hydrogen out.”

**Awaiting the Future—for Over 20 Years**

Xebec Adsorption Inc. provides natural-gas drying for NG fueling stations as well as clean energy solutions to corporations and governments looking to reduce their carbon footprints. Xebec designs, engineers and manufactures products to transform raw gases into marketable sources of clean energy using a strategy involving a focus on markets where demand has grown for biogas upgrading, natural gas dehydration, and hydrogen purification.

Headquartered in Montreal, QC, Xebec has two state-of-the-art manufacturing facilities in Montreal and Shanghai, an R&D facility in Vancouver, BC, and a sales and distribution network in North America, Asia, and Europe.

Among the biggest improvements made in the CNG and LNG market are the increased funding offered through the American Recovery and Reinvestment Act, according to Phil Tashereau, Xebec sales manager. This has increased the market, mostly for mass transit agencies. “These grants helped boost the market for additional vehicles as well as upgrades and new fueling stations. Industry leaders in engine manufacturing and those owning and operating stations have really helped push for market improvements.”

Tashereau adds that green incentives—including concerns about greenhouse gases and carbon footprints—and the desire to reduce dependency on foreign oil are key issues involved.

“Also, the push by major manufacturers to include NGV and hybrid vehicles in their offerings, the recent skyrocketing price of oil and the buzzword of shale gas throughout North America all have gotten out the word that this industry is well aligned to boast the fuel of the future.

“By switching to NGVs, cost reductions in annual fuel bills are realized,” he says. “Cities or companies gain an improved image for going green. Other benefits come, potentially through self-sufficient fueling, like biomethane and pipeline-quality gas from landfill and wastewater treatment plants, and the availability of grant money from federal government to offset some on the initial costs.”

Tashereau sees, in some cases, the availability of fueling stations as an issue. Others include the cost to convert/upgrade may not be financially feasible, or simply that fleet managers are not willing to change. “But Xebec has been involved in and supportive of the NGV market for over 20 years, witnessing a lot of great changes and progress stirring over those years,” he says. “With the NATGAS Act very near on the horizon, we also look forward to an ever-growing market in the next two to five years.”

**Availability and Quantity Increasing**

Greenfield Compression specializes in CNG refueling equipment, including compressors, dryers, storage, and
dispensing for CNG-powered vehicles. The company is part of Atlas Copco. Its factory is located in Richardson, TX.

Some of Greenfield’s predecessor companies actually started doing CNG in 1919, according to Scott Zepp, key accounts manager. “We’ve been providing our systems to the industry over the years (more specifically the last 10 years), and it’s not changed much at all. What has changed has been the quantity and availability of the vehicles that allow us to actually sell those systems to the municipalities or the private fleet users and make the projects economically viable.

“It’s specialized depending on what the vehicle fleet make-ups are and what the end user wants to do; it’s really making sure they are committed to moving their fleet to CNG, expanding their use, buying new vehicles, and keeping the industry going in that direction.”

**Resources for Looking Ahead**

National Grid is an international energy delivery company. It is the largest distributor of natural gas in the northeastern US, serving approximately 3.4 million customers in Massachusetts, New Hampshire, New York, and Rhode Island.

The good news on infrastructure, according to National Grid’s Ron Gulmi, is that there was a large amount of federal stimulus money awarded for many new CNG fueling facilities throughout the country. “There was $300 million awarded from the US Department of Energy Clean Cities Funding for alternate fuel vehicle programs, which is fuel neutral for a variety of different applications, but a little more than half of that went to CNG vehicles and infrastructure.”

“The natural-gas collection vehicles market has grown because the equivalent cost per gallon is at present 40% less, and emissions are at least half, explains Mel Kurtz, president of quasar energy group, which strives to produce affordable renewable energy from commercial and municipal organic biomass while improving the environment.

“Quasar energy group got involved with NGVs three years ago,” says Kurtz. “Our contribution to the NGV or CNG market involves the conversion of biomass (organic waste) to biogas, upgrading that to biomethane before pressurizing it to 3,600 psi for use as a motor vehicle fuel. The most enthusiastic feedback we’ve received from our customers is how much they love this energy that has amounted to being a $1.75 per-gallon gas equivalent fuel.”

*Writer Peter Hildebrandt covers topics related to science, technology, and industry.*
An often-cited perception is that “greening” any business invariably drives the business’s costs higher. But managers at two refuse companies that have made a major commitment to natural-gas vehicles (NGVs)—Republic Services Inc. and Choice Environmental Services Inc.—point out that adopting these vehicles is not only the right thing to do, but it also makes financial sense.

Phoenix-based Roy Svehla, senior manager of fleet maintenance for Republic, reports that the company operates more than 500 NGVs nationwide, mostly in coastal areas. “The West Coast has traditionally been more progressive on emission requirements and has really set the standard for the rest of the country,” he says. “They’ve been tighter than the rest of the country forever, but they’ve really been pioneers in terms of alternative fuels.” Republic has begun replacing some diesels in Denver, CO, and Boise, ID, and also operates 41 NGVs in Florida. The driver for adoption has been that of communities that want to go green, Svehla adds.

In Florida, Republic purchased natural-gas-powered Mack TerraPros equipped with Heil automated side loader bodies in 2010 after agreeing to a new residential trash collection with Polk County that required both natural-gas fuel and automated collection. “From a business perspective, we knew that this would be a very competitive bid and we had to find a method collection that would allow us to be cost-competitive, and one of the factors that played into that is the operating cost of natural-gas vehicles

Converting to NGVs affects the environment, maintenance, people, and the bottom line—overwhelmingly to the positive. By Don Talend
in terms of fuel cost versus the traditional diesel,” says Dave Kutschinski, assistant general manager of Florida Refuse Division operations for Republic. He adds that pro forma financial projections using cost data from Republic’s other regional operations indicated that NGVs would give the company a competitive advantage in Polk County.

“The other issue that comes into play is that you reduce the volatility of fuel costs because it is a home-grown energy source, if you will,” Kutschinski says of natural gas. “If you look at a 15-year price of volatility chart, you see that natural gas does not have nearly the up-and-down swings that you see in diesel.

“We are an environmental services company, and an environmental impact that drove the decision was the reduction in emissions, but another issue we looked at was the cost of operation as it relates to maintenance,” Kutschinski continues. “There was also the extension of oil-change intervals. Because natural gas is a cleaner fuel, we’re not putting some of the materials that diesel creates into the oil, which causes you to change your oil more frequently. So we know that we are saving financially by not changing the oil as much, but you also are not creating waste oil that’s got to be handled on a more frequent basis.”

NGVs are not a new concept to Republic on the West Coast, notes Pleasanton, CA–based Brian Beaudrie, regional maintenance manager, pointing out that the South Coast Air Quality Management District mandates that Republic use alternative-fuel vehicles. Beaudrie’s regional operations, which currently have large quantities of LNG trucked in and stored mitigated the limitations of natural-gas vehicles is that they have to have large quantities of LNG trucked in and stored mitigated the cost benefits of natural gas as a fuel source, Beaudrie says.

Following Republic’s 2009 acquisition of Allied Waste in 2009, the new management team decided to increase the number of NGVs throughout the new company. Republic utilizes Autocar chassis and either Heil or McNeilus bodies; the trucks are powered by Cummins Westport ISL G engines that are engineered to run on compressed natural gas (CNG). Beaudrie notes that his NGVs provide plenty of horsepower and torque.

Simply operating as an environmental services company was enough for Choice Environmental to add a dozen NGVs to its Fort Lauderdale, FL, fleet in late 2009. By the end of 2010, the company anticipated adding a 13th NGV and having a total of 30 in two years. Choice has already applied for a state grant to set up a CNG fueling plant at its Miami-Dade operations so that it can add NGVs there.

Glen Miller, Choice Environmental’s chief executive officer, whose company has about 150 trucks, more than 300 employees, six hauling locations, and three recycling facilities serving about 200,000 customers in southern Florida, sought to reduce the carbon footprint in the cities that Choice serves. He reports that acquiring NGVs has greenhouse gas emissions by at least 25%. Miller says that financial considerations also played a role in the adoption of NGVs. When diesel went above $4 per gallon in 2008, Choice began looking for a sustainable fuel alternative.

Also, “After going through several hurricanes in 2005 when we had them coming through here like crazy, fuel was very hard to get,” Miller says. “Knowing that we could have fuel pumped right into our yard and process it right there was a big benefit for us.”

A couple of years ago, the nearest CNG supply was in Atlanta, but Choice has since developed the necessary infrastructure to fuel its NVGs locally.

**Gas Infrastructure and Pricing**

A company with specialized expertise in constructing a CNG plant was needed to provide Choice with refueling infrastructure on the site of its Fort Lauderdale headquarters, and the company awarded a contract to Seal Beach, CA–based Clean Energy. “We decided that we do garbage really well, but we don’t know natural gas all that well and we’d better get the professionals,” says Miller. “We looked at two or three outfits to set up a plant for us, and Clean Energy presented a turnkey solution and gave us the comfort level that they could deliver on time.”

Choice had the CNG plant constructed along with a pipeline to the local gas company’s gas main located about a mile away, reports Ray Peraino, the company’s director of special projects. One main compressor is used for an overnight or “time-fill” process taking four to seven hours with another compressor serving as a backup. If needed, both compressors can be utilized if enough trucks require refueling at a given time. The plant also has a “fast-fill” port that can divert the entire fuel source to one truck, refueling it in about 15 minutes during a shift if necessary. Either way, no large storage tanks are needed—the plant compresses the natural gas on the spot.

Peraino points out that a plant like the one constructed in Fort Lauderdale can be designed for various combinations of time fill and fast fill. The capacity of the compressors depends on how much fast-fill capability management wants.

Svehla says that Republic has given some thought to ensuring that refueling during a shift is kept to a minimum. “One of the limitations of natural-gas vehicles is that they have to have enough range that you don’t have to refuel during the day,” he says. “What we try to do is give them the same capacity and range as if they had a diesel tank. You can control that on the front end by speccing the capacity of the gas that they carry—you don’t want to limit their range for good reason.” Svehla adds that he has noticed that a fast fill is not as complete a fill as a slow fill.

“When we specced these trucks for natural gas, we had to take into account what capacity we would need in order to allow our trucks to go out in the morning and come back again that day without having to fuel throughout the day,” adds Kutschinski.

“We make sure that we have 60-gallon diesel-equivalent tanks for natural gas. For the most part, that gets us through the day. If we run into a situation where a truck has runs of extended hours, we have four stanchions for fast fill, and within 20 minutes they can go from empty to full. The compressor is sized according to the size of fleet you anticipate you’re going to run.”

Kutschinski contends that entering a long-term agreement for natural gas can make a firm less susceptible to the fuel price fluctuations inherent in diesel pricing. “We negotiate distribution costs for diesel costs with large suppliers across the country,” he says. “However, we know that diesel is subject to daily fluctuations in the market, whereas with natural gas you can negotiate longer-

“If you look at a 15-year price of volatility chart, you see that natural gas does not have nearly the up-and-down swings that you see in diesel.”
term, more stable contracts that lock in your pricing for a longer time. That in itself provides stability so that you can you can project and budget your expenses accordingly.” Republic’s Florida operations are served by TECO Energy and the gas provider’s Peoples Gas division negotiates agreements on delivery and pricing of natural gas that gets piped from Louisiana and Texas.

**Less Maintenance, More Enjoyable Driving**

A major benefit of adopting NGVs is the potential for reduced maintenance, according to management at Choice and Republic. This also creates the potential for less environmental waste resulting from repairs.

Peraino reports that, after 13 months of operating NGVs, the maintenance staff at Choice says that the engines on the trucks are cleaner than the diesels. Even the oil is cleaner, Peraino says, and Miller adds that the company has been able to extend its oil-drain intervals.

Anthony Cillo, Choice’s fleet manager, drove a refuse truck for many years and still test-drives the company’s NGVs after they are maintained. Cillo says that Choice worked out a few early glitches on the engines with its Autocar and Cummins dealer Expert Diesel, Hollywood, FL. “There are no fumes,” Cillo says of the company’s NGVs. “They run very, very clean. It takes a little getting used to as far as acceleration. Once you put your foot down to the floor, you get a little dead pedal where all of a sudden they surge and they jackrabbit. You’ve got to drive a little bit differently, but once you get used to it, they run pretty well. At idle, it works a little differently from a normal diesel engine, so if you’re doing municipal work, you have to know how to use the throttle without surging it too much so that you use a lot of fuel.”

Regarding maintenance, “When we do our intervals and we drain the oil, we’re seeing the oil go into the oil pan much cleaner than a diesel engine,” says Cillo. “When I pull certain filters, they’re coming out very, very clean. They do have to be changed, but it’s a much cleaner operation. I’m not seeing as much oil and soot on the engine.”

In Boise, Republic acquired 36 NGVs starting in April 2009 as part of its 135-truck fleet. “It’s a lot cleaner to change oil and filters and the oil comes out relatively clean,” says Billy Cecil, maintenance manager. Unlike injector-equipped diesel engines, the NGVs’ engines require spark plug changes every 1,350 hours at a cost of $360 in new spark plugs. “The plugs are not a big deal,” says Cecil. “If you look at the performance, the way the engines run, the efficiency, the quietness, it’s a win-win.”

Another incremental cost involved in the Boise operation’s acquisition of the NGVs was the need for mechanics to be trained on maintaining the new engines at a cost of $1,300 each. Cummins Westport sent trainers to Boise, because between Republic and the local bus company—which also purchased buses that run on natural gas—enough mechanics needed training.

Svehla sees benefits in switching from diesel to natural gas from both an environmental and a maintenance standpoint. “Those engines do run cleaner than diesels, and they produce less soot that would end up in the oil pan,” he says. “We’ve looked at extending oil drain intervals—that’s another good green initiative. Also, they don’t carry DPFs [diesel particulate filters] with them, so there’s no DPF to clog up or service.”

Kutschinski confirms that Republic has been able to extend oil-change intervals on NGVs compared with diesels in Polk County, FL. For a truck logging 2,500 hours a year, the Florida Refuse Division changes the oil at intervals of 600 to 700 hours, which equates to about one or two fewer changes per year than on a diesel. The savings is about $400 per oil change, or about $400 to $800 per truck annually. Kutschinski stresses that Republic relies on oil analyses to help establish these intervals and that different intervals might be appropriate for other companies. But he stresses that fewer oil changes means lower costs in the form of handling waste oil, not to mention the environmental benefits of saving energy that otherwise would be required to reprocess waste oil into a usable product and the hauling of the waste oil, likely by a diesel truck.

Less carbon buildup on the engine occurs in an NGV and, although a CNG engine seems to have marginally less torque than a diesel engine, the latter difference actually provides a maintenance benefit, according to Kutschinski. “Because [an NGV] is not like the traditional diesel that generates a lot of torque right from idle, you don’t get shock loading on your transmission and drivetrain and rear ends if the driver pushes the accelerator to the floor from house to house or from location to location,” he says. “It’s not going to take off as fast with so much power that you’re jerking on all of the components. So one of the upsides that becomes unexpected is that you don’t have that shock-loading damage. You’ll see that over the life of the vehicle, you didn’t have to replace the differential prematurely and you don’t have damaged u-joints or twisted driveshafts as a result of misuse.”

**Shop Modifications Considerable**

Developing the infrastructure for fueling and making modifications to the maintenance shop for handling CNG are not minor considerations, Svehla points out. Where Republic has added NGVs to its fleets, changes in ventilation have commonly been required, in addition to installing systems such as...
methane detectors and explosion-proof lighting—ostensibly due to the potential for conventional lighting ballasts to arc and act as an ignition source for a pressurized fuel source. But, Svehla stresses, local building codes dictate the details.

Beaudrie adds that refuse companies considering this conversion will probably need to consult with the local fire department. His regional operations have made the modifications at a cost of $150,000 to $175,000 per shop. Obtaining local permits to make the modifications has proved to be a time-consuming endeavor in California, Beaudrie reports: some cities have required Republic to install backup generators to operate methane detectors, and others have just required exhaust fans for methane gas. The main difference in running NGVs affecting maintenance has been the addition of safety precautions, Beaudrie adds. His staff runs the trucks out of fuel, is mindful of the presence of any static electricity, and avoids using propane torches to heat-shrink connectors. “Safety is important in anything we work on; here, we’re just a little more aware of what’s around us,” he says, being careful not to over-state any dangers inherent in using the new fuel source. “CNG is probably 100 times safer than LNG. If we have a CNG leak, it goes directly to the atmosphere; LNG wants to lie on the floor around your feet.”

In Boise, roughly half of Republic’s shop was modified for maintenance work on NGVs, says Cecil. Additions included an air makeup system, an audible alarm system for methane detection, and a lighting system at all entry doors. In the event of methane detection, the system shuts all systems down except for a fan; testing occurs monthly.

**Affinity for NGVs**

Miller reports that, with NGVs, the need for refueling during a shift is typically eliminated, much to the delight of Choice’s drivers. “One thing about time fill—the drivers really like it,” he says. “There’s no time waiting at the island, going to an offsite fueling station, or getting diesel fuel on their hands.” Miller adds that, at first, drivers were apprehensive about driving NGVs. But after being trained on driving them, they do not want to go back to diesels, he contends.

“We have solicited feedback from drivers, and I can tell you a couple of things,” says Kutschinski. “One is that the noise level in the cab is substantially diminished—you don’t have that low drone or guttural noise a diesel makes. You also have less vibration. It’s more automotive than it is heavy truck and so you don’t have as much vibration. The door latches stay tight. The driver himself is more comfortable.”

In the maintenance shop, “the engines that we’re running today give us very few problems,” says Beaudrie. “The drivers love them—they have just about as much horsepower and torque. Compared to the diesels trucks with the new 2007 and 2010 emissions regulations, we’re having fewer problems. They don’t have variable geometry turbo on them, we don’t have all of the emissions systems to fool with, and they’re more reliable.”

The fact that NGV engines do not include emissions-reduction equipment makes them easier to work on, adds Cecil. “You don’t have the DPFs and the urea tanks—all of the emissions equipment is basically gone,” he says. “You don’t deal with the extra-hot engine that has to run for the 2010 emissions regulations, and you don’t have to deal with the $4 a gallon for urea. Back in the 1980s, when they started putting all of the emissions equipment on car engines, you couldn’t find the engine. Look at the ’65 Ford Mustang. There’s no emissions equipment on it—the engine is wide open. You don’t have urea, all of the piping, all of the exhaust.

“Even the customers love them because they’re quieter. You don’t get the rattling or the smoke like you do with diesels.

**Today, we’re saving about $1,000 a month in fuel costs per truck over a diesel, so that’s a nice payback.”**

It’s the best decision we ever made.”

Adds Svehla: “We’re seeing customers ask for these trucks who traditionally did not. There’s not only the push to be green; it’s also reducing dependence on foreign sources of oil. The technology’s gotten better—it’s a win-win all the way around.”

**Financial Impacts**

Managers at Choice and Republic say that, on balance, opportunities to reap financial benefits from various areas of the operation present themselves once NGVs are acquired.

For example, Choice’s Miller points out that electricity used for overnight time fill is less expensive than that used during daytime fast filling. He adds that, although an NGV costs more than a diesel, the added cost is generally offset by a federal tax credit that comes out to about $32,000 per truck. Fuel costs are about 20% lower than diesel and Miller expect to save even more with reduced engine maintenance and greater engine life.

Republic’s Cecil says that the company saves about $1.25 per gallon equivalent by utilizing natural gas compared with diesel. Kutschinski, noting that Republic made a $1 million commitment to the necessary infrastructure for running NGVs, focuses on the payback that the conversion can provide. He knows that an NGV costs more than a diesel but says that the payback from the investment only takes a few years. “In the past, if you were trying to go green or be environmentally conscious, it was going to cost you more,” he says. “Now, the reality is that the technology has gotten to the point where it costs you less to operate and the competitive advantage, if you will, goes away when everybody jumps on the bandwagon.”

According to Beaudrie, there was about a $35,000 difference between a natural gas and diesel engine three or four years ago. However, manufacturers have added so much cost to diesels with the 2010 emissions regulations that the spread is more like $10,000. And, “today, we’re saving about $1,000 a month in fuel costs per truck over a diesel, so that’s a nice payback.”

Beaudrie concludes that the greater the number of NGVs, the shorter the payback period. “We’ve taken the approach that we need a minimum of 20 trucks at a location for it to make sense,” he says. “A fueling station is going to run you anywhere from $700,000 to $1.2 million, and a new billing system will be another $175,000 to $200,000.”

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Fort Lauderdale, FL, has now completed its first year with its CNG refuse fleet. The vehicles have performed extremely well, according to Glen Miller, chief executive officer of Choice Environmental Services. The vehicles have required less maintenance than expected. “We’ve been very satisfied. Drivers were nervous when the vehicles were first introduced. These hesitations arose from the switch from diesel to NG, concerns on performance or safety issues, and also simply fear of the unknown.

“But once introduced, they’ve been pleased with their performance. They see no difference in operations except for the fact that diesel fuel odor no longer permeates their clothes, hands, and especially the cab of the truck. The vehicles are very comfortable, resulting in less driver fatigue. I don’t think you could take them away from our drivers if you wanted to.”

Aside from driver satisfaction, Fort Lauderdale is pleased to bring down emissions by dramatically bringing down carbon emissions and noise levels. “I can’t say enough good things about the Cummins Power Unit,” says Miller.

“I researched options for a year, driven mainly by high diesel fuel prices. Autocar suggested CNG to us, and I attended Cummins seminars before my final decision was made. Natural Gas is domestic fuel, is cleaner, and is less expensive. Choice Environmental is proud to be the industry leader for natural gas in the state of Florida. Choice has eight operation centers in central and southern Florida, and we’re looking to expand CNG to other areas of the state.”

Refuse Sector Is Growing Market
The refuse market is one of the fastest-growing segments of the natural-gas vehicle (NGV) business, according to Steph Yborra, director of the nonprofit Clean Vehicle Education Foundation (CVEF). According to CVEF, there are about 4,000 refuse trucks now using compressed natural gas (CNG) or liquefied natural gas (LNG), a number that has nearly doubled in just the last three years. “All the major refuse truck suppliers now offer natural gas,” says Yborra. “Environment, energy security, and economics drive the trend. While the latest ‘clean diesel’ technologies have reduced soot and nitrogen oxides, natural-gas engines still have the emissions edge there, and they produce 20% to 23% lower greenhouse gases than diesel. Nearly all the natural gas used here comes from North America. Conservative estimates put domestic supply at over 100 years, so we can reduce reliance on foreign oil suppliers, many who don’t particularly like us.”

Repetitive routes, high fuel use and “return-to-base” operations make refuse trucks a great fit for natural gas, according to Yborra. While some use public access stations, most fuel at time-fill or fast-fill stations built onsite. Due to their spark ignition, the 300- to 325-horsepower natural-gas engines used in collection trucks have lower compression ratios.

“This fact results in about 7% to
10% fuel efficiency differential,” adds Yborra. “However, that’s more than made up for by the fact that the price of NG is typically 30% to 50% lower than diesel. Recent advances in NG engine design have improved low-end torque to be on par with—if not better than—diesel engines. This is especially important for refuse trucks, with their constant stop-and-start duty-cycles.”

For big transfer trucks, which haul loads of 80,000 pounds or more, Kenworth and Peterbilt currently offer trucks powered by the Westport GX, an engine that runs mainly on NG with a small amount of diesel used as the pilot ignition. Based on the Cummins ISX platform, the compression-ignition GX uses HPDI (high-pressure direct injection) technology to achieve 475 horsepower and nearly 1,800 foot-pounds of torque. “The GX is already in use in a number of transfer fleets,” says Yborra.

Simplifying Truck Integration
Of the approximately 4,000 NG collection vehicles, most of them have Cummins Westport engines, according to Jeff Campbell, Cummins Westport director of product marketing. Cummins has had NG engines since the mid-1990s. The Cummins Westport venture was struck in 2002. The company has placed over 25,000 engines into the market globally. The majority of those engines are in North America, running in transit and refuse vehicles.

“The market has changed quite a bit over the last few years,” says Campbell. “The 2010 technology for NG is pretty simple in terms of truck and vehicle integration. Now it has a three-way catalyst muffler so there are no diesel particulate filters (DPFs) or selective catalytic reduction (SCRs) on the system. Those two systems are on the diesel engine, but not on the NG engines. When you package equipment and everything else on the vehicle, not having those two systems helps because we also need to install the CNG tanks on the trucks.

“The body builders are getting into that in a big way, and the tanks seem to be less of an issue. McNeilus, Heil, and others all package fuel systems now, and I think that’s a benefit to the customer, helping to reduce costs.”

New CNG-Burning Engines and Repowers
Jim Cole, cofounder of Emission Solutions Inc., a natural-gas, heavy-duty OEM engine manufacturer in McKinney, TX, manufactures heavy-duty natural-gas (NG) engines from the diesel core of Navistar International Corp.’s Maxx-Force DT. In the fourth quarter of 2010, Navistar announced its partnership with ESI to spec the ESI Phoenix NG 7 L (300 horsepower, 860 foot-pounds) at the Navistar facilities. Currently, ESI’s niche market space is in the short-haul distribution fleets (refuse, food/beverage, school buses, utilities, or delivery).

On the Navistar North American Sales website, Jim Hebe, senior vice president, points out that “the utility industry is very conscious about their public-facing environmental image. Recognizing the domestic raw material advantage the United States and Canada share with natural-gas resources, Navistar felt very compelled to invest in our products in such a way that enables our customers to expand their usage of very low emissions technologies through our engines. The use of natural gas certainly accomplishes this, and now ESI and Navistar are partners to install this advanced engine at the Navistar facilities.”

“Somehow many people think when you run a natural-gas engine you lose power,” adds Cole. “You don’t lose power; in fact, you can get better power and/or acceleration because of the 130 octane in NG. What you lose with CNG is energy efficiency, meaning one gas gallon equivalent is not exactly the same as a diesel gas gallon equivalent. However, you can easily make that up on the lower price of the NG.”

Three ways of measuring fuel efficiency, according to Cole, include looking at the number of hours on the meter, number of vehicle miles traveled or simply how much diesel fuel was used that day. “I spec my engines 110% to 120% more CNG than I normally do for a diesel. You just have to understand properties of NG. Over the last eight years or so, the new technology was not apparent to everybody, and subsequently education is one of my chief barriers to sales.”

Overcoming preconceived notions about NG is another challenge. It is not the fuel that was broke, it was the technology. During the big push to go with NG back in the late 1980s, many small firms arose with aftermarket kits that did not have EPA-CARB restrictions on them.

“With the technology available back then, people didn’t know the performance or durability of what they were selling,” says Cole. “It created all kinds of unscheduled downtime because reliability and the service methods were not in place, which cost the owner. With that, many AVF owners sued each other, and that left a bad taste in many people’s mouths and throughout the industry.

“You simply have to consider that fact when you knock on fleet manager’s door and they ask: ‘Why is it any different now than it was back then?’ What’s different now is when I have to certify our NG engine EPA and CARB. This means I’m committed to having a seven- to 10-year activity life on it; it’s got to meet current-year emission mandates for at least five years and performance that same period of time.

“If not, you’re going to pay the federal and/or state piper. It takes an AVF team to position natural gas in a diesel fleet. That is one reason I will never disparage anyone in this business. We’re all trying to do the right thing, and I don’t view others as my competitors but as companies validating my own market space. We need to be on the same wavelength. We all can help each other. You can’t afford to make a mistake in selling NG solutions, because the naysayers are going to be all over it.”

An application that truly separates ESI from most is that customers with older International diesel trucks can upgrade their diesel engine to a brand new model year 2010, EPA/CARB certified new clean burning CNG engine. “This process is called repowering the truck. When we repower International diesel engines with ESI Phoenix NG 7.6 L dedicated CNG engines it is seamless because the ESI Engine is built from the form-fitting functionality; nothing has to be changed out,” explains Cole. “Everything maps identically to the dashboard, the PTO, and transmission.

“The bottom line is ESI develops natural-gas engines to offer the fleet owner low-cost, safe, and predictable-cost fuel; a company recognized as a true environmental steward; engine simplicity and improved return on investment.”

This COE2 chassis features a behind-the-cab system with integral Fuel Control Module.
Building Fuel Tanks for CNG

Luxfer Gas Cylinders is the world’s largest manufacturer of high-pressure aluminum and composite cylinders. For the waste industry specifically, its product is a type-three composite CNG cylinder or fuel tank. Luxfer made the decision to get into building fuel tanks for CNG vehicles because it believed this market was going to grow.

The waste industry has been a big and growing industry for the company. Most of the refuse companies, depending on whose body or chassis they get (whether it’s McNeilus, Heil, Bridgeport, or others), will be responsible for installing the fuel system. Where the fuel tank is placed depends on the body-chassis combination.

Luxfer’s tanks consist of an aluminum liner with carbon fiber overwrapping containing an epoxy-resin impregnation. “We test our cylinders extensively to ensure their robustness to meet multiple standards,” says Dave Myers, Luxfer sales manager. Some of the tests we conduct include drop-testing, bullet testing with the tank at full pressure, and bonfire testing to ensure the thermal relief valves work properly. They’re built to a federal motor vehicle safety standard as well as an industry standard that is more stringent than the federal one.”

“The savings from CNG as opposed to diesel add up fast,” says Myers. “It’s a nice linear curve. But the payback on the trucks is fairly short because they’re going to keep the truck some seven or eight years; the incremental cost is paid back in about two years. Things accelerate because they’ve amortized the incremental cost—and they’re still saving that dollar per gallon on fuel.”

“When diesel gets back up around $4 to $5 a gallon, it will really make a difference. But I think the growth in the market is due to customers liking the quiet, the cleanliness, and the reduced expense for CNG.”

“Infrastructure is growing, but slowly. Places in the US such as Missoula, Montana, would love to do CNG for their refuse trucks, but no fuel is found in the area. They’d willingly install their own stations, but cannot, as no NG pipelines run anywhere close.

“We need to get away from spending billions of dollars each week, importing oil for diesel fuel,” says Myers. “I cringe when I read articles mentioning the offering of incentives for green fuels because there is nothing said about using a domestic fuel here today and able to impact us immediately like CNG.

“What I see is more and more waste haulers planning on more trucks with CNG. They wouldn’t be doing it if it weren’t working for them; those trucks have to be reliable because they pay their own way. Tax credits help them save even more money by offsetting their tax liability. And that just ices the cake.”

How NGVs Are Different

Autocar LLC is going to build close to a thousand NG refuse trucks this year and has been building NG garbage trucks for the last 15 years, according to Tom Vatter, vice president sales and marketing with Autocar Trucks. “Autocar builds more NG refuse vehicles than all the other low-cab-forward OEMs combined,” says Vatter.

Autocar uses Cummins Westport engines that have spark plugs instead of fuel injectors. The ISL G right now is 320 horsepower with 1,000 foot-pounds of torque. This is a little below some of the 11-liter diesels; however, the 11.9-liter Cummins Westport ISXG is going to be coming out in 2012. According to Vatter, it will give the same performance as any 11-liter diesel out there.

The fuel system is different, with more tanks on the trucks needed for the CNG to have the diesel equivalence. A 75-gallon diesel equivalent requires four CNG tanks which can be in different configurations on the truck.

There are different materials that carry the fuel from the tanks to the engine. There is a separator, like a filter between the fuel tank and the engine. It can be likened to a fuel-water separator on a diesel truck. It removes the moisture building up in the line and must be emptied once a day.

Specifications of the engine oil used for CNG engine trucks are different than those for a diesel engine. It’s the same grade as that used in other trucks, but just a different composition, according to Trevor Bridges, Autocar’s vice president powertrain and strategy.

“Another difference is that gas engines require spark plugs. These must be replaced on a more frequent basis than an injector in a diesel powered truck,” says Bridges. “On the upside, there is no DPF cleaning to worry about.”

Packaging and Integration

E-Z Pack manufactures and assembles refuse trucks. When the chassis come in to EZ Pack, it has the Cummins Westport engines installed. EZ Pack buys the CNG system that has the fueling tanks and plumbing, and it installs that and integrates it into the truck bodies. The body is actually no different than a diesel body other than that the tanks must be integrated.

“The trick is packaging,” says Jim Rogers vice president sales and marketing. “You have fairly limited amount of space to package these fuel tanks, which are nearly 6 feet long and fairly big around in diameter. To have a 60-gallon diesel equivalent, you need to have four tanks.

“What we’ve done is to package these up inside the body front wall. A lot of people put them on the top of the body, but we try to keep them off because low-hanging tree limbs can take them off the top. Since the tanks are under 3,500 pounds of pressure, they’re not something you want falling off into the street.”

EZ Pack’s solution is to place two tanks inside the body front wall and two saddle-mounted on the driver’s side. If a customer wants 75 gallons of diesel equivalent CNG, they will integrate five tanks onto the truck body. For 90 gallons of diesel equivalent, they will install six tanks.

“If you make the body too long in an effort to incorporate more tanks, it can make things too difficult in handling turns with the turning radius of the vehicle. On an automated truck, you have about a 210 wheel base, measured from the center point of the front axle to the center point of the two tandems. You’ve got to place the body on it and integrate the fuel system into that space with those tanks. If the wheel base is stretched out too long you can’t turn the truck in cul de sacs. The trick is packaging it in a limited amount of space and not increasing the wheel base, so you can still have a good turning radius and good weight distribution.”

Finding the Right Configuration

In the 1970s, Crane Carrier was one of the first heavy truck companies that produced a Class 8 vehicle with a CNG engine, according to Glenn Pochoki, vice president of sales and marketing. Over the last half dozen years or so there has been a surge of interest in the new CNG vehicles and they’re among the first companies out on the market with the current Cummins ISL G engines. Crane Carrier’s LET2 chassis product, a low entry tilt-cab configuration, has a remotely mounted radiator that sits behind the cab and over the engine.

“It is sized quite generously because of the location, which also allows the cab to sit lower to the ground and provides more open interior space,” says Pochoki. “Because the radiator is behind the cab and not under the cab, there’s
less heat that’s transmitted through the cab, giving the operator a more comfortable environment to operate in. We’ve been building that configuration since the mid-80s. The configuration works well for us in accommodating larger cooling systems for the higher heat rejections which the newer engine installations require.

The lower cab height provides a lower step-in height and reduces the engine cover space claim inside the cab. This in turn provides more space for the driver and the occupant along with easy access and visibility from one side of the vehicle to the other.

“One thing that differentiates us is that we install the engine, the fuel control module [FCM] and the fuel storage tanks,” adds Pochocki. “That improves the integrity of the CNG fuel system, by providing the FCM to manage the pressure from the fuel storage system which is stored at a high pressure [3,000 to 3,600 psi] to a lower delivery pressure at the engine.”

Choices include the company’s behind-the-cab (BTC) system, offering from 30 to 75 gallons diesel gallon equivalent (DGE). The BTC system is basically a fuel cell in a tower formation “behind the cab.” The cabinet used is 96 inches wide, side to side, 24 inches deep from the front to the back, and the height depends on how many cylinders are in it. Enviromech Industries, of Long Beach, CA produces the cabinets for Crane. Each cylinder has a capacity of 15 DGE.

The company offers 15-, 30-, 45-, 60- or 75-gallon DGE systems. The other design Crane offers is a “saddle-mount” system, which is a series of cylinders mounted in one or two cabinets along side the chassis frame rails. This system creates a saddlebag appearance on the outside of the vehicle’s frame.

The saddle-mount is basically a couple of CNG tanks mounted parallel to the frame on the side of the chassis frame with an aluminum-shrouded cover, similar to what might appear on a touring type motorcycle. The capacity available is approximately 30 DGE per system on either side of the truck frame.

“There are various types of CNG cylinders,” adds Pochocki. “We use the Type-3, which has an aluminum liner and is carbon fiber-wrapped.” When a user does a fast fill, the gas is introduced to the system rather quickly under high pressure (3,000 psi or higher), which warms the gas. Typically, the warm gas provides a higher (or false) pressure reading, which shuts the fuel fill off early. The Crane Carrier aluminum liner absorbs the heat and dissipates it, so a more accurate fast fill can be accomplished.

The most accurate fill, according to Pochocki, is from a slow tank fill, when the vehicles are parked overnight, plugged in and filled at a slow pace, shutting off automatically when the proper pressure is reached; the vehicles are left unattended more or less and therefore the operator’s time is not taken to fill the vehicle. The slow-fill method cannot always be used, which is why Crane Carrier’s solution to the downsides of the fast fill is welcomed by the industry.

“Our supplier provides a prepackaged BTC fuel cell system in a saddle system configuration. Similarly, body companies utilize a prepackaged, roof-mounted system, often used on transit buses,” explains Pochocki. “Many times space isn’t available on the frame, and it might not be desirable to locate a system behind the cab for various reasons, including lengthening the wheelbase. When you add a BTC system, you are adding about 24 inches to the length of the wheelbase. For example, if your body installation requires a 200-inch wheelbase, you would have to go to 224 inches to accommodate a BTC system. This is typically acceptable for rearloaders, recycling, and other applications, but not acceptable for frontloading applications.

CNG Is Making the Grade

Republic Services has been involved with LNG fuels for several years, and today the company runs about 100 vehicles in California powered by LNG. Republic’s move to CNG is driven primarily by cost and functionality considerations—and a belief that CNG will provide a favorable fuel cost comparison to diesel into the future.

In a frontloader application the fuel storage is either on the frame or “saddle-mounted.” Overall, the roof-mounted system is more popular. With a roof-mounted system, an operator can actually get more capacity, and it’s less likely there will be any interference of the system with the body installation, the geometry of the arms, or the forks that raise the containers at the front of the cab.
collection vehicles in the same applications and in the same manner it would use a diesel-powered collection vehicle. Republic has commercial front-loaders, residential automated slideloaders, residential rearloaders, and early in 2011, will add its first rolloff trucks powered by CNG.

“Our drivers love the trucks,” says Peg Mulloy, APR manager of media relations. “Obviously, they are new, so that’s a big plus to any driver. But more importantly, they perform as well or even better than comparable diesel trucks using the new 2010 emission technology. Driver and customer feedback has been overwhelmingly positive.

“CNG is a viable fuel alternative to diesel. We will continue to purchase CNG-powered trucks in the future because it is a financially smart, sound decision for our customers, our employees, our stockholders, and our country, from both an economic and an environmental perspective.”

Safety System for Quieter Trucks
Because the CNG trucks are so quiet, a pedestrian who is used to the noise of a diesel engine might not notice the truck backing up, giving the driver more of a challenge. Global Sensor Systems Inc. has 33 years of experience in the development of an infrared sensor system for the back ends of refuse trucks.

Three sensors cover the entire back of the vehicle in width and 10 inches past each corner. The range is set at 6 feet. When the vehicle is placed in reverse, it energizes the sensors, which then begin to emit an invisible infrared light over that protected area at the back of the vehicle. If anything enters that protected area, the sensors will react and put the brakes on automatically.

“The sensor also has very good peripheral vision, so that, when backing, you’re not going to back the truck into something,” explains Ray Glenn, general manager. “To my knowledge this is the only system to apply the brakes automatically. There are a lot of passive ones, like cameras and alarms. The big advantage we have is we’ve always been truly active.

“If you have to back up closer than 6 feet, there is an override for the automatic braking on the control box in the cab. It is important to know that the driver can reactivate the automatic braking by touching the ‘on’ switch on the control box, and the next time the vehicle is placed in reverse, the automatic braking is automatically reset.”

Writer Peter Hildebrandt covers topics related to science, technology, and industry.