The Right Choice?

Fleets report on biodiesel's real-world performance

Designated an alternative fuel in 1992, biodiesel has become the fastest-growing alternative to diesel in the country, according to the U.S. Department of Energy. Four years ago, for example, there were just three major fleets using B20, a biodiesel blend. Today, more than 300 public, utility and government fleets nationwide are using the cleaner-burning fuel, running more than 45 million miles in a wide variety of applications.

Biodiesel is an alternative fuel produced from domestic, renewable resources such as agricultural products like soybean oil or recycled cooking oil. In its purest form, the fuel is known as B100 or 100 percent biodiesel. For most vehicle applications, biodiesel blends are used. For example, a blend of 20 percent biodiesel and 80 percent petrodiesel by volume is referred to as B20. A 5 percent blend is called B5.

Although biodiesel use is growing fastest among centrally fueled fleets, growth is also taking place due to expanded public availability at retail pumps. Because biodiesel produces fewer regulated emissions, interest in the alternative fuel is being propelled for environmental reasons. Testing has also shown that biodiesel poses a much lower risk to human health, has the highest energy content of any alternative fuel, and contributes to reducing engine wear due to its high lubricity. In addition, proponents argue, biodiesel use contributes to energy security and a reduction in the depletion of non-renewable resources.

Across the country, a number of fleets have been increasing their use of biodiesel blends as an alternative to petroleum-based diesel fuel. Their reasons include positive environmental, economic and energy security benefits. In addition, since there isn't a need for investment in new vehicles and infrastructure, biodiesel often is the least cost option among alternative fuels. Why are they using it? How long have they used it and in what applications? Where are they buying it? How have its performance and cost compared to conventional diesel? In a series of interviews with *Fleet Executive*, five fleet managers offer their experience with biodiesel and provide answers to these and other questions.

Clark County Public Works Department, Vancouver, Washington

"Clark County was the first agency in the Portland, Ore., area to bring biodiesel into the picture," states Charles Masco, operations manager for the Clark County Public Works Department in Vancouver, Wash. "Clark County started using B20 in March 2002 and uses the fuel in its entire fleet of diesel vehicles and heavy equipment, including one-ton, five-yard, and ten-yard work trucks, school buses, and paving and off-road equipment. Also, several outside agencies are purchasing the fuel from us for about 200 pieces of equipment."

Clark County operates eight fueling sites, which are supplied with biodiesel by a local fuel distributor. "We were the first to convince the distributor to bring the product to this area," Masco states. "Since then, eight other public agencies in the area have converted to B20. Overall, we now have eight to nine local public agencies, including counties, school and utility districts, and the GSA, using the blend.

"From the onset of the biodiesel program," Masco also reports, "there was minimal effect on equipment due to clogged fuel filters. This was anticipated but was not nearly as severe as expected. We also had a problem last winter with the B20 gelling in cold temperatures but that was easily resolved by the distributor with a fuel additive. Otherwise, there have not been any noticeable changes in engine performance."

Clark County, according to Masco, is using biodiesel to reduce particulate emissions in its fleet of vehicles and heavy equipment by as much as 20 percent. Data on some of the fleet's vehicles show positive results in terms of emissions reduction. For example, opacity readings on a 1994 Freightliner FL-70 equipped with a Cummins 8.3 liter, 250-HP engine dropped from 8.3 using petrodiesel to just 3.4 after the B20 blend was adopted. Similarly, a 1995 Ford F350 one-ton dump truck with a 7.3-liter V8 engine had opacity readings drop from 8.2 to 3.8 after biodiesel was introduced, and a 1992 International five-yard dump truck's readings fell from 26.8 to 18.8.

While the environmental impact of biodiesel is important, there is an incremental cost—which fluctuates around 20 cents per gallon—to consider. Annual diesel fuel usage for the operation is approximately 189,000 gallons. Offsetting the higher cost of biodiesel for Clark County are fuel economy improvements with biodiesel-powered vehicles.

Town of Breckenridge, Colorado

"Our town council has a strong desire to do the right thing," says Dan Bell, assistant director of public works for the Town of Breckenridge, Colo. "Biodiesel was a way for us to implement an alternative energy project at a very low start-up cost. We started using B20 as a pilot project in seven vehicles a little over one year ago. We now use the blend in our entire fleet of 60 vehicles, including dump trucks, front-end loaders, snowplow trucks and transit buses.

"We have not noticed any measurable deterioration in performance with biodiesel," Bell continues, "and the entire process, in fact, has been seamless for us. We didn't have to make any changes or an investment in our fueling system, although with just one diesel storage tank we had to commit to using only B20. And while there are no public biodiesel supplies available in this area, our fuel supplier has been able to meet our needs."

The only downside to biodiesel in the Breckenridge fleet, according to Bell, is the higher cost of the alternative fuel, up between 12 percent and 18 percent. Still, he says, the environmental benefits clearly outweigh the additional cost.

WARRANTY WOES?

Does using biodiesel affect OEM engine warranties? Many fleet managers remain concerned about the answer to this question. Unanswered, the issue could slow acceptance and use of the alternative fuel.

The National Biodiesel Board (NBB), the trade association for the biodiesel industry, has been addressing the warranty issue. "Typically, an engine company will define what fuel the engine was designed for and will recommend the use of that fuel to its customers," the association's Web site notes. "If there are engine problems caused by a petrodiesel or biodiesel fuel, these problems are not related to the materials or workmanship of the engine, but are the responsibility of the fuel supplier and not the engine manufacturer.

"The most important aspect regarding engine warranties and biodiesel is whether an engine manufacturer will void its parts and workmanship warranty when biodiesel is used, and whether the fuel producer or marketer will stand behind its fuels should problems occur," the site also notes. "Most major engine companies have stated formally that the use of blends up to B20 will not void their parts and workmanship warranties. This includes blends below 20 percent biodiesel."

Several statements from engine companies, including Caterpillar, Cummins, Detroit Diesel, International and John Deere, are available on the NBB Web site at www.biodiesel.org. Some manufacturers have already specified that the biodiesel must meet the new ASTM D-6751 standard for biodiesel, while others are still in the process of adopting it or have their own set of guidelines for biodiesel use. Fleets should consult manufacturers for clarification. *(See sidebar for information about this standard.)*

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Florida Power & Light Company

"We've been using biodiesel to gain EPACT credits for close to four years," says Tim Calhoun, manager of acquisition & fuel at Florida Power & Light Company (FPL) in Riviera Beach, Fla. "Biodiesel is also less expensive than alternative fuel vehicles and it's readily available in our area. Two suppliers are meeting our needs for biodiesel, including Ocean Air Environmental (World Energy Lakeland) and Griffin Industries."

FPL, an investor-owned utility, operates 19 vehicle and maintenance facilities serving numerous departments and up to 3,400 vehicles. Biodiesel is now in use in 1,200 medium- and heavy-duty trucks.

"We've heard from our customers that there appears to be more torque with the biodiesel," Calhoun reports. "More importantly, there has not been any additional maintenance due to the B20 blend, despite the claim that we may experience clogged fuel filters."

City of Coconut Creek, Florida

Richard Cascio, property maintenance manager for the City of Coconut Creek, Fla., manages a municipal fleet of more than 480 vehicles and pieces of equipment, about 90 of which are diesel powered. Two years ago, he reports, the city started using pure biodiesel (B100), and continued that practice for about 14 months. For the past 16 months the fleet has been running a B20 blend.

Currently, the Coconut Creek fleet is using the B20 in light-duty diesel-powered trucks and in both light construction and turf equipment. The fuel is supplied in 4,000-gallon tanker loads. "Because of escalating pricing, we changed to the B20 blend," Cascio notes. "We'd prefer to use B100 but it is just too expensive and subsidies for this product are not adequate compared to what petroleum fuels enjoy. The price per

JUST THE FACTS: BIODIESEL IN DETAIL

The National Biodiesel Board, the trade association for the biodiesel industry, offers a wealth of information about the alternative fuel. The following represents a compilation of material available on its Web site, www.biodiesel.org.

- Biodiesel is the common name of a cleaner burning alternative fuel produced from domestic, renewable resources such as soybean oil or recycled cooking oil. Biodiesel contains no petroleum, but it can be blended with petroleum diesel to create a biodiesel blend and used in compression-ignition (diesel) engines with few or no modifications.
- The Environmental Protection Agency (EPA) recently released a comprehensive technical report on biodiesel emissions that shows that particulate matter from pure biodiesel is about 47 percent lower than particulate matter emissions from diesel. The report also verified a 67 percent reduction in unburned hydrocarbons and a 48 percent reduction in carbon monoxide with pure biodiesel (B100).
- Biodiesel is the only alternative fuel to have completed the rigorous health effects testing required by the Clean Air Act. Results show biodiesel poses less of a risk to human health than petroleum diesel by reducing particulate matter by 47 percent. Biodiesel emissions also reduce by 80 percent to 90 percent potential cancer-causing compounds called polycyclic aromatic hydrocarbons (PAH) and nitrated PAH. For comparison, biodiesel is 10 times less toxic than table salt and biodegrades as fast as sugar.
- As a renewable resource made from domestically produced agricultural products, biodiesel contributes to domestic energy security. Biodiesel has the highest energy balance of any fuel. In other words, for every unit of fossil energy needed to produce biodiesel, 3.2 units of energy are gained and every gallon of biodiesel used has the potential to extend petroleum reserves by four gallons.
- Biodiesel has the highest energy content (BTU) of any alternative fuel and exhibits higher cetane levels and similar fuel economy, horsepower, and torque characteristics as petroleum diesel. It also offers significantly improved lubricity, which can reduce engine wear. An average flash point of 300°F makes it the safest fuel to use, handle and store.

One of NBB's most significant accomplishments was the development and passage of ASTM D 6751, a comprehensive set of fuel specification standards for biodiesel. "We have been working with the American Society for Testing and Materials (ASTM) for more than six years on this project," says Joe Jobe, NBB executive director. "In December 2001, the society passed the full biodiesel

gallon for B100 is around $1.53 and for B20 is about $1.03.

"There is no major difference between B100 and B20," Cascio also relates, "and in both cases we have seen improved lubricity and cleaner fuel systems. Even when we first used biodiesel and the fuel systems were cleaned up, filters were not the issue they have been for some fleets. We replaced filters on normal cycles. Most DOT-approved filters have no problems with either B100 or B20.

"B100," Cascio continues, "was rough on lower grades of rubber products, mostly found in older pieces of equipment. B20 does not have this issue. The most obvious problems occurred with fuel lines in off-road equipment and pony type engines where inexpensive lines with high natural rubber content are used. We found an easy fix for this problem with fuel lines for marine applications and general vehicle use. Vehicles older than 1997 may also see some fuel line issues."

In the Coconut Creek operation, fuel pump hoses were refitted or resealed with Teflon tape once biodiesel became the standard. "The course IPT threads on the hoses did show some seepage," Cascio says, "but the tape corrected this problem. Fuel tanks were filtered and cleaned after one year, a standard housekeeping practice, and because our tanks are fiberglass and less than 10 years old, residual sludge in the bottom of the tanks was not an issue.

"As an alternative fuel," Cascio concludes, "we will continue to use B20 and will hopefully be able to go back to B100 when its cost becomes more reasonable. Whatever the shortcomings are with biodiesel, we feel they are easily overcome. Biodiesel just makes sense. It's environmentally friendly, engine friendly, and regulatory friendly. And with it, we have taken a leadership role in the alternative fuels arena."

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specifications, setting standards for quality that will benefit fleets and other users. The standard covers pure biodiesel (B100) for blending with petrodiesel in levels up to 20 percent by volume (B20)."

ASTM D 6751 was developed by a committee comprised of fuel producers, engine manufacturers, and third parties including users, government agencies and consultants. ASTM fuel standards are the minimum accepted values for properties of the fuel. In cooperative discussions with the engine community early in the biodiesel industry's development, engine manufacturers strongly encouraged the biodiesel industry to develop an ASTM standard for biodiesel fuel which would allow them to provide their customers with a more definitive judgment on how the fuel would affect engine and fuel system operations.

The approval of ASTM D 6751 has provided both engine manufacturers and users with the information needed to assure trouble free operation with biodiesel blends. Other tips offered by NBB for biodiesel use include the following:

- Ensure the biodiesel meets the ASTM specification (ASTM D 6751) before blending with petrodiesel and that the fuel supplier will warrant this fact.
- Purchase fuel only from a reputable source. NBB has formed the National Biodiesel Accreditation Commission (NBAC) to audit fuel producers and marketers in order to enforce fuel quality standards in the U.S. NBAC issues a 'Certified Biodiesel Marketer' seal of approval for marketers that have met all requirements of fuel accreditation audits.
- Use stored biodiesel within six months. All fuels, including #2 and #1 petrodiesel, have a shelf life. This is also true with biodiesel blends.
- Check fuel filters on the vehicles and in the delivery system frequently upon initial biodiesel use, and change them as necessary. Biodiesel blends have excellent solvent properties. In some cases, petrodiesel leaves a deposit in the bottom of fuel lines, tanks and delivery systems. The use of biodiesel can dissolve this sediment and result in the need to change filters more frequently until the whole system has been cleaned of the deposits.
- Be aware of biodiesel's cold weather properties and take precautions as with #2 petrodiesel use in cold weather. A 20 percent blend of biodiesel with petrodiesel raises the cold weather properties at least 3°F (pour point, cloud point, cold filter plugging point). In most cases, this has not been an issue. However, solutions to biodiesel winter operability problems are the same used with conventional petrodiesel, including use of a pour point depressant or a #1 diesel blend, or engine block or fuel filter, line and tank heaters.
- Wipe painted surfaces immediately when using biodiesel. Since biodiesel is a strong solvent, it can, if left on a painted surface long enough, dissolve certain types of paints.

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Warwick Public Schools

"Three years ago, we became the first school district in the U.S. to use biodiesel to heat our facilities," says Robert Cerio, energy educator/manager for Warwick Public Schools in Warwick, R.I. "Today, we're heating 13 schools with it. We're also running a B5 blend in the 60 school buses we lease from First Student, Inc., and by the end of the year we plan to use a B20 blend of biodiesel and ultra low sulfur fuel in that equipment."

A keen proponent of biodiesel, Cerio is quick to note that the high lubricity of B20 adds to the longevity of equipment. In addition, biodiesel is an very good cleaning agent and offers the almost the same BTU content as number two diesel fuel.

"There are also environmental and economic benefits we can realize with biodiesel," Cerio states. "It helps reduce dependency on foreign oil, and because it is made from organic oils it can help farmers by boosting the cash value of certain crops. We're also working on a project to build a regional biodiesel production facility for the New England states, something that would provide jobs in the region."

Currently, a heating oil distributor supplies biodiesel for use in the Warwick bus fleet. B100 is delivered to the fleet's fueling facility by the supplier and splash blended in the bus company's 8,000-gallon tank to achieve the proper mix. The heavier biodiesel, Cerio explains, settles and mixes with the diesel fuel and does not separate. The fuel is sampled regularly, in fact, and no problems have been found. In the future, several other local suppliers are expected to offer B20 for vehicles and bulk purchases.

Cerio is also hard at work applying for an EPA biodiesel grant. Along with the school district's bus company, he is hoping to receive funding that will allow the use and evaluation of emissions reduction technologies—including particulate traps and catalytic converters— in conjunction with biodiesel and ultra low sulfur fuel. One projection in his grant application, for example, is that a B20 blend would meet upcoming sulfur emissions standards and reduce the amount of carbon emitted into the atmosphere.

In his mission to make biodiesel a common part of the Warwick school district operation, Cerio has also overcome questions about the higher cost of the alternative fuel. "We've been closely tracking fuel consumption and costs for three years," he says. "If we paid the average pump price it would have cost $1.50 per gallon. By purchasing fuel futures effectively, and adding the higher cost of biodiesel, we've spent between $1 and $1.15 per gallon. The fuel cost savings is at least 35 cents per gallon.

"The real savings, though, is not as easily measured," Cerio adds. "With biodiesel we're reducing emissions and the exposure our students have to harmful compounds."

Resources

Alternative Fuels Data Center
(800) 423-1363
www.afdc.doe.gov

Clean Fuel Fleets Program
(202) 260-2090
www.epa.gov/oms/cff.htm

Fleet Buyers Guide/National Alternative Fuels
(800) DIAL-DOE
www.fleets.doe.gov

National Alternative Fuels Hotline
(703) 934-3069
www.afdc.doe.gov

National Biodiesel Board
(800) 841-5849
www.biodiesel.org