

Biodiesel Pilot Program

Funding for this program was provided by the N.C. State Energy Office - <http://www.energync.net/>

The **Centralina Clean Fuels Coalition**, a Department of Energy Clean Cities program, received a grant from the N.C. State Energy Office in the Spring of 2006 to implement several small scale biodiesel pilot programs in the region. The purpose of these programs is to introduce targeted fleets to biodiesel and to gather data on these fleets fueled by biodiesel for the first time.



Two fleets agreed to participate in this program, including the **Town of Matthews** and the **Gaston County Landfill**. The Town of Matthews agreed to fuel its entire fleet of diesel vehicles with B-20 (this is a fuel blend consisting of 20% biodiesel mixed with 80% traditional diesel) as part of the program and Gaston County Landfill decided to fuel all of its off-road heavy duty equipment with B-20. The pilot program began for these fleets at the end of June 2006 and lasted for two months

during which time data was collected on fuel use, costs, maintenance and fuel economy. Stakeholders, **Thomas Petroleum Inc.** and **Monroe Oil**, assisted with logistics and provided the fuel for these programs. Funds were available to pay for any incremental cost of B20 over that of traditional diesel, however, during the pilot program's duration, B20 was equal to or less expensive than diesel.

What are the benefits of Biodiesel?

Biodiesel is a renewable diesel replacement fuel that is manufactured from vegetable oils, recycled cooking greases or oils, or animal fats. The advantages of using biodiesel include **reduced emissions, direct aid to U.S. farmers, local jobs creation in biodiesel production, and reducing dependence on foreign oil**. With air quality on the minds of many in the Charlotte Metro region, awareness about the harmful effects of traditional diesel exhaust has greatly increased. Diesel exhaust contains particulate matter and chemicals that are harmful to the public health and contribute to ground level ozone and fine particulate pollution. The chart below shows the **reduction in various pollutants** from using 100% and 20% blends of biodiesel:

Vehicle Emissions of Biodiesel v. Traditional Diesel		
Emissions:	B100	B20
Carbon Monoxide	-47%	-12%
Hydrocarbons	-67%	-20%
Particulate Matter	-48%	-12%
Sulfates	-100%	-20%
Nitrogen Oxides	+9%	+2%
Ozone formation (speculated Hydrocarbons)	-50%	-10%
PAH	-80%	-13%

Source: EPA

Although the data in the table above indicates a slight increase in nitrogen oxides (precursor to ozone formation) with the use of biodiesel, recent studies, including one done by the NC Department of Transportation, shows that in-service vehicles (versus engines operating alone in lab settings) running on biodiesel exhibit no increase in nitrogen oxides. (NCDOT report can be found at: <http://www.ncdot.org/doh/preconstruct/tpb/research/download/2004-18FinalReport.pdf>)

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In addition to improving air quality, biodiesel production and use directly addresses the fact that North Carolina imports virtually all of its fuel resources and currently spends \$5-10 billion annually on petroleum.

Does biodiesel cost more?

Over the last few years one major barrier to fleets using biodiesel has been cost. The cost of B-20 had historically been higher than traditional diesel. This changed in the first half of 2006 with traditional diesel costs rising to unprecedented levels and B-20 selling close to the cost of traditional diesel, often cheaper. Ultimately biodiesel affordability is driven by how high or low traditional diesel is running at any given time. Fortunately an advantage to using biodiesel is that fleets can switch between using biodiesel and traditional diesel without making any adjustments – this makes trying out the B20 easier for fleets without any permanent commitment to the new fuel.

Barriers to Using Biodiesel and Program Overview

Town of Matthews

The **Town of Matthews** has a total of 35 on- and off-road diesel vehicles in their public works fleet. After being contacted by the CCFC, the Town said they were interested in fueling their entire diesel fleet with B-20 for the program. Given fuel budgets, cost had been one concern preventing the fleet from trying biodiesel in the past. With B-20 priced near traditional diesel the Town decided to move forward with the pilot program.

Another concern of the Town was whether some of the older vehicles would have problems with their rubber seals. Several of the Town's off-road vehicles were manufactured in the early and mid-1980's and these were of most concern. According to the **Department of Energy** (DOE)'s *Biodiesel Handling and Use Guidelines* B-20 and lower blends minimize most issues associated with material compatibility, including nitrile rubber which is sensitive to higher biodiesel blends. With blends higher than B-20, there may be some compatibility issues in older vehicles.

The Town's diesel vehicles all fuel centrally from two 2,000-gallon aboveground tanks at their Public Works center – one is for on-road diesel and the other for off-road. **Monroe Oil**, the Town's regular fuel provider, supplied B20 for the duration of the program. The table below summarizes the Town's diesel vehicle fleet and its fuel consumption during the program. (Not all vehicles were fueled during the pilot program)

Table 1: Town of Matthews Biodiesel Pilot Program

Equipment Type	No. of Vehicles	Total Fuel Consumed (gal.)
Off-road	21	560
On-road	14	1,276
TOTAL	35	1,836

Gaston County Landfill

Gaston County Landfill had been considering the idea of using biodiesel for several years but several logistic issues and cost concerns had been holding the facility back from testing biodiesel. In June 2006, CCFC approached the Landfill to discuss some of these barriers.

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The largest impediment to using biodiesel had been the fact that the landfill fuels its vehicles from two small storage tanks (2,000 gallons each) and a fuel truck and needed small load deliveries every two weeks. The landfill had found that most fuel distributors did not want to deliver such small fuels loads of B-20. **Thomas Petroleum Inc.** became involved in the project and figured a way to work around this issue by delivering to another small customer in the area so that one truck could fuel both sites at the same time.

The other major issue standing in the way had been the incremental cost of B-20 compared to regular diesel fuel. At the start of the program, however, B-20 was actually selling several cents cheaper per gallon than regular diesel fuel. With both barriers removed the landfill was ready to go forward with the program.

The landfill decided to only fuel its off-road vehicles for the pilot program given some uncertainties about warranty issues on its on-road equipment. (See Resources below for more information on warranties) The equipment listed below used B-20 throughout the duration of the project. Also shown is the amount of fuel used by each vehicle type and the hours of operation of each.

Table 2: Gaston County Landfill Biodiesel Pilot Program

Equipment Type	No. of Vehicles	Total Fuel Consumed (gal.)	Hours in Operation
Compactors	3	5,330	791
Dozers	2	1,053	169
Track Loaders	2	785	135
Rubber Tire Loaders	2	113	86
Motor Grader and Track Hoe	2	389	83
Pans	3	3,176	370
TOTAL	14	10,846	1,634

Program Results:

Maintenance of Vehicles

Before starting using B-20 in their fleets, both fleet participants were made aware that there may be some additional start-up maintenance costs associated with using biodiesel. Because **biodiesel generally cleans out an engine**, a vehicle may need a fuel filter change shortly after switching to the new fuel. Aware of this issue we asked our participants to monitor this type of “fuel related” maintenance to evaluate the extra costs (if any) associated with using biodiesel. After two months of using biodiesel, both participants reported that they did not have any fuel related maintenance issues. One fleet had a scheduled filter change that was not impacted by the use of biodiesel. Fleets should continue to monitor filters and for possible leaks from non-compatible materials while using biodiesel.

Fuel Standards

Both suppliers for the biodiesel pilot program only supply fuel that meets the **American Society for Testing and Materials (ASTM) standards**. ASTM fuel standards are the minimum accepted values for properties of the fuel to provide adequate customer satisfaction and/or protection. In December of 2001, ASTM approved a full standard for biodiesel, with the new designation of D-6751. This standard covers pure biodiesel (B100), for blending with petrodiesel in levels up to 20% by volume. It is important to ensure that the fuel a fleet is using meets this ASTM standard to

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avoid any fuel quality issues. Before dealing with a biodiesel fuel distributor, a fleet manager should make sure the fuel meets the ASTM D-6751 standard.

Driver Issues

Following the conclusion of the pilot program, CCFC had the opportunity to meet with and **conduct a survey with drivers** from both fleets to get their feedback on the program. A total of 20 drivers (both on-road and off-road) participated. Overall, drivers had a positive response to the program giving it a rating of 3.61 on a scale of 1-5 with 1= negative impression and 5= positive impression. In addition:

- 19/20 drivers reported no driver related problems associated with biodiesel
- 16/17 drivers said that there was no difference in the performance of the vehicle (with 1 driver perceiving the performance to be “better”)
- Qualitatively, drivers were interested in using biodiesel because it helped provide domestic jobs, supported farmers, improved air quality and was a higher quality fuel



Costs

The cost of biodiesel continues to fluctuate, as does the cost of traditional diesel. During the timeframe of this pilot program (summer of 2006) the cost of biodiesel remained within a few cents per gallon of the cost of traditional diesel. Qualitatively one fleet felt that the B20 increased the fuel economy of their vehicles which is an additional cost savings, but given the short timeframe of the program this notion could not be substantiated.

Other Concerns

Several drivers and mechanics from both pilot programs expressed concern about using biodiesel in cold weather and whether there are any gelling issues with the fuel. Most fleets in North Carolina have **not experienced cold flow problems** with B20 or lower blends. Many fuel distributors also put cold flow additives into their B20 fuel to address this issue.

Lessons Learned and How This Program Could Help You

If you are interested in trying biodiesel in your fleet, start with the following:

- Research local fuel distributors and ask whether their fuel meets ASTM D6751 standards
- Figure out ahead of time how much fuel you use, how many vehicles, by type (off-road vs. on-road) and where they fuel up normally, and “map out” the size of your test project
- Identify any logistical barriers – i.e. fuel storage, frequency of needing fuel, etc.
- Once you are using the fuel, track data on fuel economy, cost, fuel-related maintenance, etc. so you can evaluate the effectiveness of the program at its conclusion

Resources

Biodiesel Handling and Usage Guidelines - www.nrel.gov/vehiclesandfuels/npcf/pdfs/40555.pdf

National Biodiesel Board - www.biodiesel.org

Warranty Info - www.biodiesel.org/resources/fuelfactsheets/standards_and_warranties.shtm

Biodiesel Retail Locations - http://www.4cleanfuels.com/BiofuelRetail_map-contacts.pdf

For more information about biodiesel and other alternative fuels and vehicles, please visit Centralina Clean Fuels Coalition at www.4cleanfuels.com