

Grant No. PLA-04-53
CITY OF EAST LANSING
BIOFUEL INFRASTRUCTURE GRANT
FINAL REPORT

The City of East Lansing, Department of Public Works and Environmental Services (DPW) received grant assistance from the State of Michigan, Department of Labor and Economic Growth, Michigan Energy Office to install fueling infrastructure at its new building location at 1800 East State Road in East Lansing. The grant was awarded on June 7, 2004.

The City installed a 25,000 gallon underground storage tank for the storage of B-20 biodiesel fuel. In addition to the tank, the City installed necessary infrastructure in order to dispense the fuel to the City's fleet of diesel vehicles, including fuel dispensers, a canopy, concrete pad, etc. The primary users of the B-20 fuel are the City's fleet of seven refuse and recycling vehicles. These vehicles are running daily between the hours of 7:30 a.m. and 2:30 p.m. The entire fleet of City vehicles which require diesel fuel will use B-20, including fire engines, light and heavy duty pick up trucks and other pieces of equipment such as a wood chipper.

Installation of the tank and fueling infrastructure occurred during the construction of the Department's new office building, vehicle storage garage and maintenance garage. Completion of the majority of the project, including the 70,000 square foot DPW facility occurred on April 28, 2005. Department employees moved into the building on April 29, 2005. The building was open for public use on May 2, 2005. The City received its first drop of B-20 biodiesel on April 28 and began using the fuel on April 29.

The grant between the State and the City of East Lansing requires the City to utilize B-20 biodiesel for a minimum of three years. The City estimated it will consume at least \$30,000 in incremental costs of B-20 and about 125,000 gallons of the fuel.

The total cost for installation of the tanks and refueling infrastructure was estimated at \$213,575. The City received grant funding for \$24,500. The actual cost for installation of the tanks and refueling infrastructure was \$215,348.

The goals for the project were:

- Install two 25,000 gallon underground storage tanks and related infrastructure including fuel system product lines, vent piping, electrical service, fuel island, concrete pad, fuel dispensers, pump system, monitoring system, fuel point system and canopy.
- Purchase B20 biodiesel fuel for use in the City's diesel fleet, primarily the seven refuse and recycling trucks.
- Promote the DPW's use of biodiesel through press releases, publications, a grand opening event, etc.

The objectives for the project were:

- Introduce B20 biodiesel fuel to the City's fleet and evaluate its performance.
- Utilize approximately 30,000 gallons of the fuel annually over the next several years.
- Increase public awareness of biofuels and their benefits.
- Increase the use of biofuels in the region and help create a public demand for its use.

Tasks Completed:

Prior to receiving the biodiesel infrastructure grant, the City hired BETA Design Group to perform site planning and design work. BETA provided three broad services to the City including:

Preliminary Design

- Met with the City to define project goals and requirements
- Finalized functional design of the site
- Reviewed geo-technical data and assessed the need for additional subsurface information
- Worked with the City to determine functional needs and code requirements
- Developed potential site designs, prepared schematic drawings and presented them to the City of East Lansing
- Prepared construction cost estimates

Construction Documents

- Met with the City to coordinate design
- Develop and approve schematic design
- Selected the appropriate structural systems
- Prepared the design development phase
- Finalized dimensions and location of the facility
- Prepared construction drawings
- Prepared project manuals and bid documentation
- Updated cost estimates and time schedule
- Assisted the City in obtaining necessary permits.
- Assisted the City in choosing a construction manager

Construction Administration

- Reviewed bids and assisted in choosing contractors
- Provided construction oversight to ensure construction in accordance with specifications
- Conducted meetings with subcontractors throughout the process
- Prepared change orders and drawing revisions
- Reviewed final construction to ensure construction in accordance with specifications

With the assistance of BETA, the City hired The Christman Company to perform construction management services. Specifically, Christman provided the following services:

- Bid administration
- Contract administration
- Project scheduling
- Trade coordination
- Cost management
- Communication between the City and BETA
- Close out and warranty service
- Jobsite supervision
- Safety inspections
- Quality control
- Technical inspection
- Troubleshooting

Specific to the grant, the following tasks were completed:

- 1) The tank area was excavated, a pad was poured for the tank, and the tanks were set and the area backfilled from October 11-15, 2004.
- 2) Installation of the canopy footings and concrete anchor slabs occurred between October 15 and October 29.
- 3) Canopy bases as well as fuel system product lines, vent piping and electrical services occurred between October 15 and November 11.
- 4) The concrete pad above the tanks and fuel island was installed from November 4 - 11.
- 5) Installation of the canopy occurred between December 10 and December 15.
- 6) The Gasboy fuel controls along with the fuel dispensers were installed during the first two week of March, 2005.
- 7) The first drop of B-20 biodiesel fuel was delivered on April 28.
- 8) Fuel dispensers were put into operation and City vehicles began fueling on April 29.

Major Barriers Encountered:

There were no major barriers encountered specific to the installation of the underground storage tank and related infrastructure. Construction of the overall site was delayed due to poor soil conditions at the site and the need to assess alternative building footing foundation options. This delay was only in relation to an anticipated start date and occurred prior to the start of construction. There were no major delays during construction and no delays to the installation and use of the fueling system. The poor soils issue was resolved through engineering special stone column support beams for the foundation of the building.

Project Evaluation

Fuel Use and Cost

An initial drop of 12,003 gallons of fuel was delivered on April 29, 2005. The unit cost for this fuel was \$1.7310 per gallon. The incremental cost of the fuel was \$0.12 per gallon. The incremental cost paid by the City for this drop of fuel was \$1440.36. An additional drop of 12,403 gallons of B-20 was received on July 13, 2005. The unit cost for this fuel was \$1.972 per gallon. The incremental cost of the fuel was \$0.09 per gallon. The incremental cost paid by the City for this drop of fuel was \$1,116.27.

As of September 21, 2005, the City's fleet had consumed 20,302 gallons of B-20 Biodiesel since we began using it in April of this year. The total incremental cost of the fuel to date is \$2,556.63.

Vehicle Mileage

An evaluation of the fuel consumption and miles traveled can be best accomplished by comparing individual vehicles or groups of vehicles rather than the entire fleet of equipment that utilizes the B-20. Some pieces of equipment that are running on B-20, such as wood chippers, do not record mileage and therefore would skew data collected for the entire fleet. Therefore, an evaluation of the City's refuse and recycling vehicles (the primary users of the fuel) follows.

Since switching to the B-20 fuel, the City's two refuse vehicles averaged 1.52 miles per gallon (mpg). The City's two recycling vehicles have averaged 2.14 mpg. These vehicles average 7 hours of run time per day.

Historic data collected by the City's fleet management system did not track vehicle mileage prior to the installation of the new Gasboy system. However, data can be extrapolated by comparing the run time data. For example, the average run time for a recycling vehicle is 7 hours per day. Vehicles average 4.0 miles per 1 hour of run time or approximately 28 miles. Historic data indicates that these vehicles consume approximately 2.127 gallons for every 1 hour of run time. Therefore, it is estimated that the City's fleet of recycling vehicles averaged 2.05 mpg while running on standard diesel fuel and the City's refuse vehicles averaged 1.00 mpg.

Comparisons can also be made between individual vehicles. Recycling truck number 111 has averaged 2.18 miles per gallon since using B-20. While running on standard diesel, it averaged approximately 1.91 mpg. Refuse truck number 107 has averaged 1.40 mpg while utilizing biodiesel and an estimated 1.04 mpg with standard diesel.

It is important to note that the location of the new DPW facility may have an impact on vehicle mileage. The building location is significantly farther from a majority of residential areas and therefore these vehicles have to travel farther before they start their daily routes. It is assumed that this type of driving would lead to higher fuel efficiency as it has less idle time and less stop/starting activity than once the trucks are on their route. Other factors which were also not constant throughout the time period include changing

drivers, route changes, etc. All of these factors could influence vehicle mileage and fuel efficiency.

Maintenance

No maintenance has been necessary on any of the vehicles in relation to the use of B-20.

Staff Feedback

In a personal interview with Tony Bader, Supervisor of the Fleet Maintenance Division, he reported that there have been no mechanical difficulties as a result of switching to B-20 fuel and he hasn't received any complaints from his staff or those that operate vehicles which use B-20. He further indicated that there is a clear difference in tailpipe emissions when comparing vehicles using B20 and those that don't. In personal interviews with mechanics working on diesel vehicles, they report cleaner emissions when working on the vehicles. Mike Fox, City of East Lansing mechanic stated "when we work on a bus for one of the school districts that we service, the emissions make your eyes water. When working on our fire trucks or refuse trucks, this does not occur. There is a difference between vehicles running on the B-20 and those that are not!" Finally, Steve Gordon, Sanitation Department Supervisor stated that the operators of the City's refuse and recycling trucks, which are the primary users of B-20, have not reported any problems.

Recommendations for Future Projects

Because of the length of time the City will be using B-20 over the next 2-3 years, we do not recommend any additional projects for the City. Additional technical assistance would be helpful in regards to using the fuel during winter months to ensure that all equipment will run at all times. This is especially important for vehicles such as emergency equipment that are using the fuel.

Financial Report

Original Project Budget

	City of E.L.	State	Total
Cost Elements			
Labor	\$49,075		\$49,075
Equipment	\$15,000		\$15,000
Supplies & Material	\$120,000	\$24,500	\$144,500
Other (Education/promotion)	\$5,000		\$5,000
Total Direct Costs	\$189,075	\$24,500	\$213,575
BUDGET TOTAL			\$213,575

Final Project Budget

	City of E.L.	State	Total
Cost Elements			
Labor	\$45,000		\$45,000
Equipment	\$15,000		\$15,000
Supplies & Material	\$125,848	\$24,500	\$150,348
Other (Education/promotion)	\$5,000		\$5,000
Total Direct Costs	\$190,848	\$24,500	\$215,348
BUDGET TOTAL			\$215,348

Additional Information

An open house took place on Tuesday, June 21 for the public to tour the new facility. At the open house, several vehicles which are running on B-20 were on display, including the City's refuse and recycling vehicles. A display was set up in front of these vehicles with information on biodiesel and alternative fuels. Some of the information which was distributed at the event is attached.

All of the City's refuse and recycling vehicles have bumper stickers on them indicating that they are running on B-20. Staff is also working on other, more prominent decals to affix to these vehicles.

Project Pictures:

- CRG_4.jpg Building dedication ceremony and open house– Clark Construction Representative
- CRG_15jpg Building dedication ceremony and open house – Mayor Meadows