

Alternative Fuel Tool Kit

Case Study on Biodiesel:

Metropolitan Sewerage District

Introduction

Metropolitan Sewerage District (MSD), located in Asheville, North Carolina, operates a 40 million gallon per day wastewater treatment facility. It serves 42,000 residences and businesses within Buncombe County. MSD has a total of 113 on road vehicles, 59 of which use biodiesel. These 59 vehicles span light, medium, and heavy-duty service, including pickups, dump trucks, and vacuum sewerage trucks. Additionally, 32 pieces of off-road construction equipment (e.g. backhoes, loaders, earth compactors) utilize biodiesel. The 91 units utilizing biodiesel comprise 81% of the total fleet and 100% of the diesel fleet. In addition to their “green” efforts with biodiesel, MSD has 2 GEM electric vehicles, 1 electric golf cart, and 2 electric Segways that are used for administrative and maintenance operations.

MSD began using biodiesel in 2003 for its environmental benefits, including improved air quality and reduced emissions. As one of the first users of biodiesel in the region, MSD has promoted the use of biodiesel by example for the past 10 years, and is a charter stakeholder in the [Land of Sky Clean Vehicles Coalition](#) (part of the [US DOE Clean Cities](#) program) serving Western North Carolina. MSD staff estimates they have used 700,000 gallons of B10 and B20 from 2004-2013

MSD has an on-site private fueling station (see Figure 1 above) that is used to dispense biodiesel for its fleet. Since this serves all of their diesel vehicles, there is no need for a separate dispenser for biodiesel.



Figure 1. MSD diesel vehicles fueling with biodiesel.

Motivation and Selection

This was a grass roots effort with the idea coming from the staff. MSD staff felt strongly about the environmental benefits of biodiesel. Biodiesel is a renewable fuel that is biodegradable, nontoxic and sustainably produced. Biodiesel also offers reductions in greenhouse gases, particulate matter, and hydrocarbon emissions compared to conventional diesel use.¹ Therefore, MSD staff made the case to upper management to embrace the use of biodiesel in the fleet on this basis. The MSD Board of Directors approved the use of biodiesel in the fleet in 2003.

B20, the blend of 20% biodiesel and 80% diesel was chosen because it can be used year-round in the region's climate. While many vehicle manufacturers approve the use of biodiesel blends such as B20 without affecting OEM warranties, the majority of the MSD fleet was past the warranty period by the time biodiesel was added into the fuel rotation.

Key Decision Factor: While other alternative fuels – ethanol, propane, and natural gas – were considered, the use of biodiesel required no equipment or vehicle purchases, and it could be used in the total diesel truck fleet for the greatest emissions benefit.

Neil Hall, Fleet Manager for MSD:
“This was the perfect opportunity to move to something cleaner for the environment.”

The organization's 3-year old fleet fueling infrastructure required no modifications or tank cleaning to utilize biodiesel, and was therefore a **zero up-front cost endeavor**.

Implementation

Early in the project, MSD staff attempted to source multiple fuel providers through a competitive bid process, but found that no biodiesel producers were available in the Asheville area and had to expand their search to areas outside the region. Currently, however, MSD is using biodiesel manufactured by Blue Ridge Biofuels, a local producer in Asheville, NC. Blue Ridge Biofuels exclusively uses reclaimed cooking oils in their biodiesel production, transforming this feedstock into fuel that meets biodiesel's ASTM D6751 standard.

The MSD General Manager familiarized the Board of Directors with the benefits of using biodiesel in the MSD fleet. This is an ongoing effort as the Board of Directors changes. The Fleet Manager familiarized the mechanics with biodiesel properties and maintenance procedures, such as initial filter changes due to the improved detergency of biodiesel. This orientation process is now part of fleet policy for new mechanics.

Because biodiesel is an excellent solvent, which strips build-up from the fuel system, there was a need for increased frequency of fuel filter changes at the start of the changeover to biodiesel. MSD staff took a proactive approach to prevent fuel filter clogs. To assure that the fueling

¹ Greenhouse gas emissions reduction and air-quality benefits are roughly commensurate with the blend. B20 use provides about 20% of the benefit of B100 use. Recent tightening of vehicle and fuel emissions standards have reduced the air quality benefits of choosing biodiesel instead of conventional diesel. However, using biodiesel in vehicles 2010 or older still offers significant air quality benefits. http://www.afdc.energy.gov/fuels/biodiesel_benefits.html

infrastructure did not have any sediment, they did a tank inspection. Because the system was less than 4 years old, tank cleaning was not required. Early on in the change-over, some vehicle filters needed to be changed 1-2 times during the first six months, until the vehicle's fuel system was cleaned by the use of biodiesel. Some newer vehicles, however, required no additional filter changes at all. Overall, there has been no detectable loss of performance.

Neil Hall, Fleet Manager for MSD: "The use of biodiesel has worked well in all of our diesel vehicles & equipment, with no problems at all after the initial startup period."

Fuel lubricity has an impact on engine and component wear and durability. To be more specific, the lubricity of a fuel is an indication of the amount of wear or scarring that occurs between two metal parts covered with the fuel as they come in contact with each other. Low lubricity fuel may cause high wear and scarring, whereas high lubricity fuel, like biodiesel may result in reduced wear and longer component life.

Biodiesel lubricity benefits can be realized with as little as 1-2% addition of biodiesel to number 1 or number 2 diesel.



Figure 2. Biodiesel vehicle decal.

All of the MSD diesel vehicles utilizing biodiesel have decals placed on the vehicles (see Figure 2 to left). This recognizes MSD as a user of biodiesel in the community, and helps to promote its use to others.

Impact

The MSD used 318,192 gallons of biodiesel from 2010-2013.

Table 1. B20 was used for 7 months of each year, and B10 was used for 4 months of each year.

Year	Gallons
2010	73,750
2011	72,075
2012	78,616
2013	93,751
4-Year TOTAL	318,192

The cost of fuel from 2010-2012 was approximately \$250,000, with an average cost of \$3.18/gallon for B10 & B20.² While MSD does not track biodiesel cost savings compared to conventional diesel, B10 & B20 has been sold to bulk commercial accounts like MSD at an average \$0.05/gallon discount to ultra-low sulfur diesel fuel during calendar year 2012. MSD's savings for 78,616 gallons used in 2012 was \$3,931.

² Fuel purchased as B10 and B20, not B100 blended into petroleum diesel.

In 2013 there was a 19% increase in usage of B20 to support more aggressive sewerage maintenance projects. B20 averaged a break even cost compared to conventional diesel in 2013 due to market conditions resulting in a higher cost for B20.

From 2010-2013, the use of B10 & B20 biodiesel in the MSD fleet reduced greenhouse emissions (GHG) by an estimated 711.2 tons, and reduced petroleum use by 77,590 gasoline gallon equivalents (GGE) as reported in the Clean Cities Land of Sky Clean Vehicles Coalition Annual Reports.

Lessons learned

Early on in biodiesel adoption, during the winter months, MSD did experience some fuel gelling problems. By teaming with a provider that produces biodiesel to ASTM standards and also meets the voluntary industry wide quality assurance requirements of BQ-9000 certification, there were no further issues. MSD was able work with the producer assuring fuel quality and that blending levels were appropriate for temperature performance. Thus, MSD transitions to B10 for the four coldest winter months (November, December, January, and February), and returns to using B20 for the remainder of the year.

Future Plans

All diesel equipment purchases will be required to run on at least a B20 blend of biodiesel. Peter Weed, Director, WRF Treatment and Maintenance stated, "MSD plans for a continued search for energy conservation opportunities and "green" alternatives in the fleet."