

DOE Award Number: DE-FG36-04GO14240

**Missouri Soybean Association
Biodiesel Demonstration Project**

Final Report



Missouri Soybean Association

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Overview

The Missouri Soybean Association (MSA) and the National Biodiesel Board (NBB) partnered together to implement the MSA Biodiesel Demonstration project under a United States Department of Energy (DOE) grant. The goal of this project was to provide decision makers and fleet managers with information that could lead to the increased use of domestically produced renewable fuels and could reduce the harmful impacts of school bus diesel exhaust on children. This project was initiated in September 2004 and completed in April 2011.

The project carried out a broad range of activities organized under four areas:

1. Petroleum and related industry education program for fuel suppliers;
2. Fleet evaluation program using B20 with a Missouri school district;
3. Outreach and awareness campaign for school district fleet managers; and
4. Support of ongoing B20 Fleet Evaluation Team (FET) data collection efforts with existing school districts.

Technical support to the biodiesel industry was also provided through NBB's Troubleshooting Hotline. The hotline program was established in 2008 to troubleshoot fuel quality issues and help facilitate smooth implementation of the RFS and is described in greater detail under Milestone A.1 - Promote Instruction and Guidance on Best Practices. As a result of this project's efforts, MSA and NBB were able to successfully reach out to and support a broad spectrum of biodiesel users in Missouri and New England.

The MSA Biodiesel Demonstration was funded through a FY2004 Renewable Energy Resources Congressional earmark.¹ The initial focus of this project was to test and evaluate biodiesel blends coupled with diesel oxidation catalysts as an emissions reduction technology for school bus fleets in the United States. The project was designed to verify emissions reductions using Environmental Protection Agency (EPA) protocols, then document – with school bus fleet experience – the viability of utilizing B20 blends. The fleet experience was expected to support ongoing industry efforts to collect existing data and to increase awareness and knowledge among school district fleet managers.

However, three years into the project, the original intent of the engine verification was no longer deemed by equipment manufacturers to be of sufficient economic interest to enter into a partnership. In response, MSA requested a project extension and re-scope to eliminate the aftermarket equipment verification and replace it with a petroleum education program. The revised project maintained four task areas with the following modifications. The first component was directed at increasing national compliance with newly initiated state level fuel blend mandates through a distributor education program. Component two was modified to eliminate the verification element and, instead, document operational data from biodiesel use in a district school bus fleet. Components three and four were unchanged and maintained their purpose of expanding upon the existing knowledge base of biodiesel use in school bus fleets.

¹ Renewable Energy Resources House Report 108-357 – *Making Appropriations for Energy and Water Development for the Fiscal Year Ending September 20, 2004 and for Other Purposes.*

DOE approved a no-cost extension in December 2008 and the re-scope was awarded in June 2009.

MSA is a statewide membership organization established in 1976 to represent Missouri soybean producers. MSA's mission is to increase the profitability of soybean farmers through legislative advocacy, public policy initiatives and education efforts across the state.

NBB is the national trade association representing the biodiesel industry as the coordinating body for research and development in the US. State soybean commodity groups founded the organization in 1992 to support biodiesel research and development. Since that time, NBB has developed into a comprehensive industry association, which coordinates and interacts with a broad range of cooperators including industry, government, and academia. NBB's membership is comprised of state, national, and international feedstock and feedstock processor organizations, biodiesel suppliers, fuel marketers and distributors, and technology providers.

This final report reviews the milestones and deliverables completed over the course of the project. Following the overview, project activities are discussed. They are organized by task and milestone. A summary list of the milestones, deliverables and their date of completion are provided in Appendix A. The publications and presentations produced are listed in Appendix B.

Project Activities

Task A - Petroleum and Related Industry Education Program for Fuel Suppliers

1. Planned Activities:

The original purpose of this task was to verify biodiesel blends coupled with diesel oxidation catalysts as an emissions reduction technology for school bus fleets in the United States. However, in the early stages of the project, newer technology (diesel multistage filters) became available and MSA was unable to secure a partner for whom the project parameters were economically viable. Working with their partners, MSA determined the project's goal to reduce engine emissions and exposure of children to diesel exhaust could be met alternatively through an education program directed at petroleum distributors. This portion of the project was re-scoped to develop useful information for those that service school bus fleets as well as school bus procurement personnel. This information would help lead to a seamless transition to a biodiesel blend and provide distributors and procurement personnel with practical information on biodiesel best practices and supply. Outreach topics were expanded to also include renewable fuel standards, the macro-benefits of biodiesel, the food vs. fuel misnomer and introduction of bioheat ².

Specific activities included:

- Promote instruction and guidance on best practices specific to fuel distributors responsible for sourcing biodiesel and biodiesel blends from terminals to be delivered to the end-user with special emphasis on those that supply school bus fleets. Information addressed in this segment would include, but was not limited to,

² Bioheat refers to biofuel (mainly biodiesel) used as heating oil. Bioheat can be used in any oil-fired heating equipment.

biodiesel 101, general policy on truck plaques, fuel quality, fuel procurement guidelines, fuel cold flow properties and management, fuel troubleshooting, Renewable Fuel Standard 2 (RFS2) and fuel renewable identification numbers (RINS).

- Coordinate Industry leadership with state petroleum associations responsible for disseminating and delivering real time information to a broad base of constituents seeking guidance on all emerging issues such as biodiesel.
- Develop market communication to be distributed through petroleum supply chain.
- Provide professional resources and advice for answering questions from NBB staff and contractors, fuel distributors, and school bus procurement personnel on issues specific to distribution of biodiesel.

2. Actual Accomplishments

During the period between September 2010 and March 2011, MSA was successful in completing all the milestones and the deliverable for this task within budget and on-schedule. A summary of the activities are organized by milestone.

Milestone A.1: Promote instruction and guidance on best practices.

MSA partner NBB implemented a range of activities directed at educating and providing technical support to the petroleum industry. NBB and its subcontractor, Advanced Fuel Solutions (AFS) participated in a number of industry conferences as a speaker or exhibitor and authored multiple articles on biofuels for industry publications.

- Presented at 11 conferences and workshops:
 1. NBB presented, “Renewable Fuel Standard and Political Drivers,” at the Northeast Biomass Conference, Boston, MA, on Aug. 4-6, 2010. Two hundred participants attended. The presentation provided an update on the state of the biodiesel industry, RFS2, fuel quality, BQ9000 and other related issues affecting the industry. This presentation was also given at the Sustainable Biodiesel Workshop (see event #2).
 2. NBB presented, “Renewable Fuel Standard and Political Drivers,” at the Sustainable Biodiesel Workshop held at the University of Rhode Island, on Sep. 8, 2010. The workshop was attended by more than seventy participants representing various sectors of the petroleum industry in the New England region.
 3. NBB gave a presentation and participated in a panel discussion titled, “The Alternative Fuel and Vehicle Technology Portfolio” at New York City’s Alternative Transportation Future Conference held at Lehman College, City University of New York on Sep. 24, 2010. One hundred forty participants attended. The presentation provided an overview of the biodiesel marketplace, current legislation, supply/demand, and protocols for fuel storage, handling, blending and distribution. NBB also participated in a round table discussion during the conference.

4. NBB provided an update on biodiesel and bioheat at a meeting of the Board of Directors of the Oil Heat Council of New Hampshire on Sep. 24, 2010. Seventy-five participants attended.
5. NBB presented, “Biodiesel Market Status,” to the Marketer Operations Committee at the Society of Independent Gasoline Marketers (SIGMA) annual meeting held on Nov. 12, 2010. Forty participants attended the session. The presentation provided an overview of federal and state legislative activities and a discussion of RFS2 and RINS applicability. The SIGMA meeting is attended each year by hundreds of petroleum distributors, terminal owners and major oil companies interested in industry developments including CEOs from some of the most successful wholesale and retail operations in the petroleum industry.

Following the presentation at the SIGMA’s November conference, AFS and NBB have been able to count on SIGMA’s support to publicize national webinars and distribute publications featuring biodiesel success stories, fuel quality information, and bioheat fuel dealer marketing materials. Several of these materials were developed under this project. SIGMA has been an invaluable education partner and frequently invites biodiesel industry leaders to address their members.

6. NBB presented the “Future Outlook for Biodiesel” at the Maine Energy Marketers Association (MEMA) 2011 spring conference held in Augusta, Maine on Apr. 5, 2011. Approximately one hundred thirty participants attended. The presentation provided an overview of biodiesel with a focus on bioheat. Topics included: the status of OEM (original engine manufacturer) and ASTM (American Society for Testing and Materials) standards; market share growth; bioheat benefits; fuel quality considerations; best practices and the BQ-9000® program³.
7. NBB presented, “Biodiesel Quality,” at the Maine Board of Underground Storage Tank Installers Conference held in Augusta, Maine, on Apr. 26, 2011. One hundred eighty participants attended. The presentation covered background on petroleum consumption in US transit and introduction of biodiesel. Topics covered supply chain management, retail management, purchasing, storage tank considerations, fuel tank maintenance, and purchasing biodiesel blend fuel.

³ The National Biodiesel Accreditation Program, BQ-9000®, is a cooperative and voluntary program for the accreditation of producers and marketers of biodiesel fuel. The program is a unique combination of the ASTM standard for biodiesel, ASTM D6751, and a quality systems program that includes storage, sampling, testing, blending, shipping, distribution, and fuel management practices. BQ-9000® is open to any biodiesel manufacturer, marketer or distributor of biodiesel and biodiesel blends in the United States and Canada. <http://www.bq-9000.org/>

8. NBB presented, "Bioheat" at two meetings of the New Jersey Fuel Oil Merchants held in New Jersey and Philadelphia (see event #9) on Apr. 19, 2011. The topics covered included: operations, storage and blending, BQ-9000® program, quality assurance, ASTM specifications and other topical information on the biodiesel industry.
9. The presentation, "Bioheat" was given at a second meeting of the New Jersey Fuel Oil Merchants held in Philadelphia also on Apr. 19, 2011. Both the New Jersey and Philadelphia presentations were attended by a combined total of approximately fifty people.
10. NBB presented the base presentation, "Bioheat" at the Bioheat Dealer Seminar during the New York Oil Heating Association conference on Apr. 20, 2011. Approximately fifty participants attended. NBB covered the same topics discussed at the events in New Jersey and Philadelphia (see #8 and #9).
11. NBB presented, "The Business of Bioheat" at the Atlantic Regional Energy Exposition held in Atlantic City, New Jersey on May 3-5, 2011. Approximately one hundred sixty participants attended NBB's educational track and 800-1100 participants attended the trade show where NBB had a booth. The presentation focused on bioheat education and outreach to oil heat distributors.

In conjunction with the Expo, NBB's petroleum liaison, Paul Nazzaro, also addressed a meeting of the 65-member Board of the Empire State Petroleum Association (ESPA). His presentation covered an overview of biodiesel and addressed technical concerns regarding biodiesel use. The presentation and subsequent discussion were instrumental in answering questions and influencing the Board's position toward biodiesel. The Board went on to approve efforts to support a 2% blend of biodiesel and future biodiesel legislation.

- Authored 8 articles:

1. "The Fuel Quality and Tank Design Disconnect," *LUSTLine Bulletin* #67, March 2011, pg. 11. This article addresses the challenges associated with fuel storage tank longevity. Published three times a year, LUSTLine is a national bulletin on underground storage tanks. Funded with support from EPA's Office of Underground Storage Tanks, LUSTLine keeps state and federal UST regulators, consultants, contractors, and tank owners informed about UST and LUST activities, cleanup fund issues, spill remediation, and prevention technologies.
2. "Phoenix Conference Reveals," *Oilheating Journal*, Mar. 2011. This article reviewed opportunities to expand the use of biodiesel in oil heat markets through the RFS2 program as shared during the National Biodiesel Conference in Phoenix, Arizona held in February 2011.

3. "Over Promising, Under Delivering, Buyer Beware," *Oilheating Journal*, Dec. 2010. Although Bioheat is a household word in the northeast and mid-Atlantic regions, NBB subcontractor, AFS used this space to explain to fuel dealers that it will be the careful balance of both ultra-low sulfur heating oil and biofuel blends that will shape the industry.
 4. "Distinguish Yourself, Today!" *Oilheating Journal*, Nov. 2010. The article discusses why oil companies must differentiate their services to garner customer attention and the advantages bioheat offers them to get ahead of the curve in a changing industry.
 5. "Exploring our Future," *Oilheating Journal*, Oct. 2010. The article discusses biodiesel production in Nebraska and mid-western support for promoting Bioheat in the northeast.
 6. "A Decisive Decision to Go Green Today," *Oilheating Journal*, Oct. 2010. The article discusses a bill signed in August 2010 by the New York City mayor requiring all heating oil sold post October 2012, must contain at least 2 percent biodiesel. The efforts of petroleum organizations
 7. "Vitamins for a Changing Fuel Composition," *Oil & Energy Magazine*, Sept. 2010. The article addressed fuel quality standards and the use of fuel additives in heating oil. This monthly online publication has a readership of 8,000 to 10,000 retail and wholesale home energy fuel providers.
 8. "The Uncertainty Syndrome," SIGMA, *Independent Gasoline Marketing Magazine (IGM)*, 2011. IGM has a circulation of 2,100 subscribers composed of oil company CEO's and presidents, family-owned businesses, fuel suppliers and service providers. The power of "the human element," i.e. individual commitment to change is an important counter-balance to economic volatility and legislative unpredictability facing the biofuel industry. Consumer education and outreach are a means for communicating a bioheat message to customers.
- National Biodiesel Troubleshooting Hotline - In addition to the presentations and publications listed above, NBB supported a biodiesel quality hotline at 1-800-929-3447. The hotline was established in 2008 to troubleshoot fuel quality issues and help facilitate smooth implementation of the RFS. In recent years, a variety of factors have contributed to an increase in the number of biodiesel customers reporting fuel problems or being denied warranty claims such as the introduction of ultralow sulfur fuel, increased use of biodiesel and out-of-specification biodiesel in the market. Although fuel suppliers and distributors are the number one source for addressing these issues, there are instances when they are unable to provide the support needed.

Under this project, NBB provided human resources to support three regional “emergency response centers” during fiscal year 2009. This component of the project accomplished the following:

1. The National Biodiesel Troubleshooting Hotline was maintained and staffed. In FY09, primary hotline staffing was done by a combination of Meg Corp and the use of strategically located regional subcontractors, AFS and Gorge Analytical, with management by NBB. AFS is located in the upper east coast, while Gorge Analytical is located on the upper west coast. The choice of AFS and Gorge was based not only on their technical expertise, but also because of their proximity to states considering statewide mandates at that time (Washington/Oregon; Pennsylvania) that would potentially need increased hotline support. **Please note that NBB’s match for this project reflects only the expenses of Meg Corp, Gorge Analytical and NBB management.** AFS’ costs were not included in the match and were covered by separate funding.
2. The hotline was advertised at a total of 68 seminars in FY09.
3. The hotline addressed 6 major complaints, 37 minor complaints and a total of 178 minor inquiries in FY09.⁴ Several of the major complaints involved customers experiencing some form of filter plugging issues resulting from high water concentration, microbial growth, presence of sediment, or some combination of the above. Callers were advised of appropriate action to take to correct their situation. Minor complaints were down somewhat compared to that anticipated, likely due to the delay of mandated fuel quantities from the federal RFS2.

Deliverable A.1: Develop market communications to be distributed through petroleum supply chain

Three advertisements were developed targeting the petroleum supply chain.

- Quality you can trust, America’s First Advanced Biofuel...Biodiesel.
- Driving America Forward, America’s First Advanced Biofuel...Biodiesel.
- Advanced-Sustainable, American’s First Advanced Biofuel...Biodiesel.

These ads were designed to promote biodiesel as an advanced biofuel to petroleum decision makers throughout the supply chain and feature the biodiesel industry’s commitment to quality, environmental stewardship and general universal market applications. The ads were approved by DOE and credit this grant for funding.

Each of the ads was placed in two large petroleum industry membership directories, the Empire State Petroleum Association (ESPA) directory and the Mid-Atlantic Petroleum Distributor’s Association (MAPDA) directory. The ads were also placed in two premier oil heat industry trade journals, *Indoor Comfort Marketing* (formerly *Oilheating Journal*) and *Energy & Oil*. ESPA represents 300 petroleum marketers

⁴ A complaint was considered major if 10 or more vehicles were affected and minor if the number was less.

throughout the state of New York. MAPDA represents more than 200 active members throughout Maryland and beyond, including Pennsylvania, Virginia, West Virginia, Delaware, Connecticut, and Washington, D.C. MAPDA members distribute fully 90% of the residential fuel oil sold in Maryland, and more than one third of the gasoline sold in the state.

Because the ads are not time-specific, they can be used over an extended period. One highly recognized biodiesel producer requested permission to use the ads with their petroleum organization clients.

Milestone A.2: Coordinate industry leadership with state petroleum associations and deliver real time information to a broad base of constituents.

In collaboration with industry leadership, NBB prepared a multi-session webinar on the RFS2 program and developed three advertisements on biodiesel ensuring the material presented was relevant to the audience and provided current information associated with biodiesel use, legislative activities and industry testing. NBB subcontractor, AFS also coordinated two visits by interested oil companies to a biodiesel facility to observe blending and loading operations. These activities are described here.

- A webinar series was developed and offered to obligate parties titled, “RFS2 Ready: Biodiesel Producers Ready to Meet 2011 RFS2 Requirements.” The webinar provided information on EPA’s RFS2 program. Five 90-minute sessions were held on February 24, March 10, 24, 31, and April 7. An average of fifty-five participants attended each webinar reaching a combined total of over two hundred fifty people. The series was aimed at building awareness throughout the petroleum supply chain. NBB worked with industry organizations to build attendance such as the Petroleum Marketers Association of America (PMAA), the Independent Liquid Terminals Association (ILTA), SIGMA, and the National Oilheat Research Alliance (NORA). A flyer announcing the webinars was widely circulated (see Appendix 4). Responses to questions fielded following the presentation included an explanation of RINS upward delegation and the 800 million gallon 2011 requirement. An electronic copy of the power point presentation was forwarded to all attendees and post-event questions were answered directly via e-mail or telephone. Outreach of this kind will help ensure the goals of RFS2 are met. To date, this has been a challenge due to numerous issues associated with compliance.
- AFS coordinated visits by two oil companies, Husky and Guttman Oil, to observe blending and loading operations at the Global Company biodiesel facility in Chelsea, Massachusetts. Both visits were held on Nov. 22, 2010. The initial meeting was held at Global Company’s headquarters in Waltham, MA followed later in the day by a tour of their Chelsea, MA terminal. At the Chelsea location, Husky and Guttman staff walked through Global Company’s comprehensive electronic rack blending systems engineered to offer biodiesel blends of B2 to B99. They were able to see how biodiesel was delivered to the terminal, off-loaded, stored, and tested for in-tank quality parameters and how the product was loaded into a fuel dealer’s truck. The terminal visit was aimed at helping Husky with their final infrastructure development plans.

Milestone A.3: Provide professional resources and advice on responding to questions from NBB staff and contractors, fuel distributors and school bus procurement personnel

In a rapidly evolving industry, providing a timely response to industry questions is critical. Inquiries from fuel distributors were answered monthly through NBB's "Ask Ben" Biodiesel Education Network website.⁵ AFS also facilitated responses to inquiries from NBB staff, contractors, and fuel distributors on issues specific to distribution. Under this project, NBB:

- Responded to a total of 108 queries on the "Ask Ben" website. All questions were reviewed, researched and resolved. Through an alliance with the Petroleum Marketers Association of America (PMAA), the "Ask Ben" website is a reliable source for biodiesel information. Users can submit questions on the website as well as access up-to-date information on biodiesel topics. Questions covered a range of subjects including the RFS2 program, biodiesel availability in the petroleum supply chain, RINS valuation, impact of advanced biofuels on biodiesel markets, BQ-9000® program⁶, feedstocks, and handling, storage, blending and marketing of biodiesel;
- Responded to 16 direct inquiries from NBB to ensure compatibility in materials developed for NBB Advanced Biofuel campaign;
- Reviewed presentations on the subject of RINS and ensured materials compiled for presentations reflected the current status of industry testing and legislative activities;
- Coordinated communications between staff/contractors on petroleum related issues;
- Assisted NBB with developing two sessions on Bioheat and Handling Storage Protocols for the 2011 Biodiesel Conference and Expo held in Phoenix, AZ and ensured materials compiled for each specific presentation reflected the current status of industry testing and legislative activities;
- Participated in NBB weekly staff and contractor conference call; and
- Coordinated communications between staff and contractors on all petroleum industry related issues.

Task B - School Bus Fleet Evaluation Program

1. Planned Activities:

Task B was modified under the re-scope to eliminate the verification component and document instead operational data including performance (drivability), fuel consumption and mileage and vehicle/equipment maintenance and service management on biodiesel use in the Hazelwood School District, Missouri. The demonstration would evaluate four to ten buses for a period of six months or more. The MSA Biodiesel Award would be utilized to collect the data, and, reimburse the school district for the incremental costs of

⁵ <http://www.biodiesel.org/askben/top10/>

⁶ The National Biodiesel Accreditation Program, BQ-9000®, is a cooperative and voluntary program for the accreditation of producers and marketers of biodiesel fuel. The program is a unique combination of the ASTM standard for biodiesel, ASTM D6751, and a quality systems program that includes storage, sampling, testing, blending, shipping, distribution, and fuel management practices. BQ-9000® is open to any biodiesel manufacturer, marketer or distributor of biodiesel and biodiesel blends in the United States and Canada. <http://www.bq-9000.org/>

using a biodiesel blend. Hazelwood would provide buses for the evaluation, fuel storage, and commit personnel for the project. A report of the evaluation would be presented at the MSBA conference in October 2010.

2. **Actual Accomplishments:**

Milestone B.1: Evaluate 4-10 buses for a period of six months or more to achieve a combined total of at least 10,000 miles.

The Hazelwood School District in the St. Louis, MO metropolitan region implemented a 40-month commercial demonstration of the use of biodiesel blend fuels (B5, B11 and B20) in a large-scale school bus fleet from May 2006 through August 2010. Covering an area of 78 square miles, the school district is comprised of 35 schools attended by 22,512 students. The district currently operates 136 diesel-powered school buses, as well as almost 30 diesel-powered tractors, several generators and six maintenance trucks. Biodiesel blend fuels have been used in all of these vehicles and equipment, since 2006, with great success.

The school district began using biodiesel fuel blends on its own initiative, initially starting with B5 (135 buses) in May 2006. B20 (20 buses) was added to the program in August 2006, with fuel supplier support from the Missouri Soybean Association. The school district has since replaced B5 with biodiesel blend fuel B11 (81 buses). The entire fleet of vehicles and equipment now operates on either B20 (55 buses) or B11 (81 buses). The biodiesel blend fuels are purchased in fully blended form from Hazelwood's fuel supplier who provides B100 blend stock manufactured in a BQ-9000® certified facility.

There were, and currently are, no "control" school buses operating on diesel fuel, since the confidence gained from the initial operation with B5 suggested that there was no need for a side-by-side comparison with diesel fuel vehicles. Experience comparisons were determined from Hazelwood's prior diesel fuel use over many years.

Since the biodiesel blend fuel program began, the fleet manager reported that there were no noticeable operational or drivability problems associated with the use of any of the blend levels. In fact, overall good performance (attributable to good preparation measures) at the beginning of the program has allowed Hazelwood to expand the use of B20 and increase the blend level from B5 to B11.

Compared to the Hazelwood school bus fleet's prior operation on diesel fuel, the fleet manager reported there have been no additional vehicle maintenance requirements or operational issues that needed to be performed to allow continued use of either the B20 or B11 biodiesel fuel blends. No additional maintenance was required for any of the fuel storage and dispensing equipment, although as a "good housekeeping" measure, the fleet's two underground fuel storage tanks were cleaned and additional filters were installed prior to the change to biodiesel blend fuels. Because Hazelwood has underground fuel storage, winter storage temperature is not an issue. As is typical of fleets operating out of a single facility with many vehicles departing at approximately the same time, fuel is pumped into a fueling truck, which then dispenses the fuel to each vehicle. Hazelwood has operated trouble free with this system for years.

Deliverable B.1: Results of the evaluation will be summarized in a report.

MSA's contractor, NBB, submitted to DOE a completed report from their sub-contractor, Emission's Advantage (EA), summarizing the school bus evaluation. Evan Mueller, DOE project monitor confirmed in 2nd quarter 2011 that the report completed the deliverable for this project. NBB sent the final report to participants who had requested a copy while at the 2010 MSBA conference.

Milestone B.2: This milestone was removed under the 2010 project re-scope.

Task C - Outreach and Education

1. Planned Activities:

MSA would collaborate with the Missouri School Board Association (MSBA) on a series of decision maker outreach and education activities. MSBA represents locally elected boards of education throughout Missouri and provides services and products to schools. MSBA has two video production studios. Under this project, MSA would conduct at least two school bus decision maker workshops in Missouri. These workshops would be designed to educate decision makers (school bus fleet managers, contracted fleet operators, school board members, and other interested personnel) about the use of biodiesel blends. Topics would include health effects, emissions reductions, fuel quality, storage and handling guidelines, procurement specifications, and pricing. The Missouri School Board Association (MSBA) would provide e-blasts to inform members of available information and workshops. Although invitations for the workshops would not be geographically limited, it was envisioned that most attendees would be from the region (Illinois, Missouri, and Kansas). In addition to the decision maker workshops, the project would create education material to be utilized by school bus fleets. Existing biodiesel educational materials produced by NBB would be utilized when possible.

2. Actual Accomplishments:

Milestone C.1: *Complete two school bus workshops or video-conferences in Missouri.*

Two live broadcasts, 60 minutes in length, were aired on March 12 and March 18, 2008 on the Education Solutions Global Network (ESGN), an internet protocol television service of MSBA. An advisory was sent out, prior to the webinars, to schools and to school bus transport media. Anecdotal feedback suggested the broadcasts were well received. Contacts about the broadcasts were directed to MSBA and all comments about the programs were positive in nature. MSBA received requests for CD copies of the broadcasts. The program was available for viewing on ESGN through October 1, 2008. MSBA provided NBB with DVD and CD copies of the Internet broadcasts for on-going benefit.

Milestone C.2: *MSA will attend workshops and share the results of the fleet evaluation.*

MSA's partner, NBB attended two MSBA annual workshops.

- **2008 MSBA Annual Conference**
MSA partner, NBB attended the MSBA Annual conference in October 2008. While at the meeting, discussions were held with fleet managers and school administrators on implementing biodiesel in school bus fleets. NBB highlighted school district biodiesel usage, case histories and testing results.
- **2010 MSBA Annual Conference**

NBB participated in the MSBA Annual Conference held in Missouri in October 2010. NBB staffed an exhibit at the conference featuring the Missouri Biodiesel Demonstration. More than 1,200 individuals attended the conference including school board members, district superintendents, district staff members, school administrators, teachers, other school staff, presenters, and exhibitors. The MSA/NBB booth was on display for both days of the trade show, from Friday afternoon through mid-day Saturday for a total of approximately eleven hours. Over the course of the conference, approximately 60 people visited the booth. Visitors identified themselves as district and school transportation directors, school administrators responsible for transportation decisions, and many interested vocational technology teachers. These teachers are interested in implementing new program curriculum that includes alternative fuels. The question most frequently asked by visitors to the booth was related to costs of biodiesel use, followed by general biodiesel performance issues and common biodiesel myths such as food versus fuel and confusion between biodiesel and other alternative fuels. Copies of the Hazelwood School District produced under Task 2 report were distributed following the event.

Deliverable C.DL.1: Educational materials

MSA was responsible for submitting copies of materials (such as storage and handling guidebook, presentations, or educational brochures) created for distribution to school bus fleets.

- MSA subcontractor, MSBA re-designed and produced a “Decision Maker” brochure to emphasize the positive health impact of biodiesel use. Five thousand copies were printed and distributed via US mail to school board members, superintendents, and school business officials in *all* of Missouri’s five hundred twenty-four school districts. MSBA also provided 2,500 brochures to NBB for their distribution at school bus related events.
- MSBA produced and distributed four thousand copies of a full-color glossy brochure targeting school bus fleet managers.

Task D - Support B20 Fleet Evaluation Team Data Collection

1. Planned Activities:

The purpose of this component of the project was to provide support to the B20 Fleet Evaluation Team (FET) originally set up by NBB, the National Renewable Energy Laboratory (NREL), and original equipment manufacturers (OEM). The B20 FET program collects field data from existing biodiesel fleets. The data is analyzed and shared with OEMs to encourage in house biodiesel testing in existing engines as required by each engine company. Under this project, a list of known school districts utilizing biodiesel blends was identified. These districts were contacted and categorized based on duration of use and if the district actively used biodiesel blends or oxidation catalyst technology was tested. School districts that used biodiesel with oxidation catalysts (and used B20 for an extended duration) would be the first districts contacted.

2. Actual Accomplishments:

Deliverable D.DL.1: Report findings on B20 FET data collection.

Data and information from five sites was provided to the NBB Technical Director for use with the B20 Fleet Evaluation Team. Specifically, activity for this component included

the collection of data from existing school bus fleets using B20 blends. Five site visits were conducted of participating school districts using B20 blends for an extended period of time. Relevant data was collected during these visits and was prepared in summary reports. The five school districts were:

- Medford School District-NJ
- St. John's Public Schools-MI
- Littleton Public Schools-CO
- Adam's 12 5 star Schools-CO
- Monroe County Community Schools-IN

The collected data was forwarded to the B20 FET program for their further analysis and follow-up. Data collected included: fuel consumption and mileage; vehicle / equipment maintenance and service management data; and performance related data reportable by the "end user / operator." NBB received a final summary of information from Alliance Technical Services (ATS). The information was reviewed and submitted to the B20 FET Evaluation Team. Activities for this task were completed and reported on in the 2nd quarter of 2008.

Task E - Project Management

1. Planned Activities:

MSA and its partner, NBB was responsible for all aspects of project management and reporting.

2. Actual Accomplishments:

On behalf of MSA, NBB worked with project monitor, Evan Mueller, to determine which documentation was required to complete this project.

Deliverable E.DL.1: Submit all close-out documents.

MSA has provided DOE with a final SF425 to accompany the final report.

Deliverable E.DL.2: Submit final report.

This document serves as MSA's final report thus fulfilling the deliverable.

Results and Conclusions

Over the past decade, the US government has recognized the positive role of biofuels in reducing unhealthy emissions and decreasing dependence on foreign oil. Through a combination of federal and state mandates, tax credits and other incentives, the government has sought to boost biofuel use. However, incentive programs are subject to political winds and can only go so far toward ensuring stable production volumes. It is also important that biodiesel achieve long-term consumer acceptance to create demand. This can be accomplished by reaching out to not only producers but also to distributors, retailers and users providing them with the information they need to feel confident about biodiesel use.

Two different audiences were targeted under the four task areas of the project. Task 1 focused on outreach to private sector fuel suppliers and policy makers. Tasks 2, 3 and 4

focused on outreach to public sector school bus fleet managers and decision makers. The results of these efforts are discussed here.

Petroleum and Related Industry Education Program and Troubleshooting Hotline

The impact of a quickly evolving industry was felt early in the project when it became clear the initial task of engine verification was no longer deemed necessary by the commercial project partners. Essentially, in the time it took to get the project rolling, the industry had moved on and certification was no longer needed. There is not a lot that can be done to prevent a change in circumstances such as this. Fortunately, it was in the project's favor, that the need for education and technical support were sufficiently great enough that MSA could shift project resources to these areas with DOE approval. The verification component of this project, Task A, was re-scoped to include petroleum and related industry education program for distributors aimed at increasing national compliance with newly initiated state level fuel blend mandates and generating confidence in biodiesel. A combination of articles, presentations, and webinars were developed and presented at a broad range of regional and national conferences. In addition to the outreach program, MSA supported a biodiesel quality phone hotline (1-800-929-3447) – managed by the NBB – responded to technical questions through its “Ask Ben” Biodiesel Education Network website, and placed ads in professional directories,

- **Responded to 108 inquiries** on NBB's Ask Ben Biodiesel Education Network on topics ranging from RFS2, availability of biodiesel in the petroleum supply chain, RINS valuation, impact of advanced biofuels on biodiesel markets, BQ-9000 program, feedstocks, and handling, storage, blending and marketing of biodiesel.
- **Addressed 6 major and 37 minor complaints and 178 minor inquiries** through the National Biodiesel Troubleshooting Hotline.
- Presented at 11 regional and national conferences and workshops **reaching a total of 1,160 participants** including marketers and distributors.
- Published **8 articles** in trade journals.
- Developed **three ads** published in 2 trade association **directories representing 500 petroleum marketers** and two premier oil heat industry trade journals.
- Developed and presented a series of **5 webinars on RFS2** for obligated parties attended by a **combined total of over 250 people**.

Through this project, MSA was successful at reaching a large number of people in a broad array of audiences. Speakers found the most effective communication approach to be face-to-face encounters such as workshops, conferences and exhibits. These allow for quick response to specific questions and post-event follow-up. On-site presentations also permit the presenter a second shot at addressing lingering concerns of participants. On the flip side, webinars are attractive because they provide cost and time savings for attendees and presenters. However, MSA is finding this medium to be less and less effective. Audiences are tending to be smaller in size and less engaged than those attending live presentations. Having professional industry networkers attend events reaps benefits. Even if they are not a featured speaker, a professional networker can respond quickly to concerns and misinformation on the part of conference participants.

Although biodiesel education is important throughout the petroleum supply chain, the biodiesel industry is finding terminal and distributor operators to be the most cost effective targeted audience to achieve market impact. They are a direct link to customers and

providing them with a simple and seamless message is important. Experienced industry professionals have observed that distributors often come with preconceived notions about biodiesel. They question stability and cost or that biodiesel won't survive without a tax incentive. All these concerns merit attention. Therefore, the first stage in outreach was to identify the targeted audience's reservations and immediately focus on addressing these concerns by providing information on how to successfully utilize biodiesel. Under Task 1 of the MSA Biodiesel Demonstration, NBB applied an approach aimed at teaching distributors how to take receipt of biodiesel, safely store it, blend it, and ship the customer a quality fuel blend. This was done by providing a comprehensive training package utilizing printed materials, videos, webinars, workshops, conferences and, in some cases, one-on-one visits. Additional technical support was provided through online web support (Ask Ben⁷) and phone-based hotline.

Further, NBB found that participation and speaking at major conferences were invaluable opportunities to build relationships with the private sector. A significant outcome this past year, was the support SIGMA gave NBB to promote biodiesel education and outreach activities as a result of industry participation in SIGMA's annual meeting last November.

Hazelwood Biodiesel Demonstration and Fleet Manager Outreach

Tasks B and C focused primarily on the public sector, specifically school bus fleets in Missouri. The Hazelwood School District in the St. Louis, MO metropolitan region implemented a 40-month commercial demonstration of the use of biodiesel blend fuels (B5, B11 and B20) in a large-scale school bus fleet from May 2006 through August 2010. The Hazelwood program was deemed a success by NBB. The program embodied the characteristics of how a good biodiesel fuel program should be structured to achieve operating results that are at least comparable to those with diesel fuel:

- Begin with low level blends (B5) to gain experience and address any "start-up" problems that may occur. Then, as experience is gained and issues are addressed, transition to higher lever blends (B11 and B20) in more vehicles.
- Institute "good housekeeping" practices and preventive measures that ward off potential use problems with fuel storage/dispensing systems and vehicle applications.
- Purchase biodiesel fuel from a BQ9000 certified supplier.

At the program's end, the entire fleet of **136 school buses in Hazelwood, MO School District were operating on either B20 (55 buses) or B11 (81 buses)**. The fleet manager reported there were no noticeable operational or drivability problems associated with the use of any of the blend levels. No additional maintenance was required for any of the fuel storage and dispensing equipment, although as a "good housekeeping" measure, the fleet's two underground fuel storage tanks were cleaned and additional filters were installed prior to the change to biodiesel blend fuels. Because Hazelwood has underground fuel storage, winter storage temperature is not an issue. A report of the Hazelwood demonstration was given to attendees at the 2010 Missouri School Board Association's (MSBA) annual conference. MSA collaborated with MSBA on a series of fleet manager and decision maker

⁷ Ask Ben Biodiesel Education Network, <http://www.biodiesel.org/askben/top10/>

outreach and education activities. MSBA represents locally elected boards of education throughout Missouri.

- Two live 60-minute broadcasts on biodiesel use in school buses were aired. Feedback from participants suggested the broadcasts were well received.
- Discussions were held with fleet managers and school administrators on implementing biodiesel in school bus fleets at both the 2008 and 2010 MSBA Annual Conferences.
- 5,000 copies of the “Decision Maker” brochure emphasizing the positive health impacts of biodiesel use were distributed to school board members, superintendents and school business officials.
- 4,000 copies of a full-color glossy brochure were distributed to school bus fleet managers.

Final Word

Education and outreach efforts do not end with the project. There are always new people coming into place and the need to educate is ongoing. A lot of good materials have been developed over the past several years. Although updates are needed periodically to stay current, adequate presentations are readily available. However, establishing confidence in new technologies such as biodiesel also requires developing a level of trust not only in the message but in the messenger. Skeptical audiences require face time to develop that confidence which goes beyond reading informational materials. People are overloaded with energy information. The biodiesel industry is competing for decision-makers’ attention. As evidenced through this project, an effective way of obtaining their attention is by working with the organizations that are well-connected and have the confidence of the targeted audience.

Appendix 1: List of Milestones, Deliverables and Completion Dates

Task A - Petroleum and Related Industry Education Program for Fuel Suppliers	
Milestone A.1: Promote instruction and guidance on best practices.	Mar 2011
Milestone A.2: Coordinate industry leadership with state petroleum associations and deliver real time information to a broad base of constituents.	Mar 2011
Deliverable A.1: Develop market communications to be distributed through petroleum supply chain.	Dec 2010
Milestone A.3: Provide professional resources and advice on responding to questions from NBB staff and contractors, fuel distributors and school bus procurement personnel.	Mar 2011
Task B - School Bus Fleet Evaluation Program	
Milestone B.1: Evaluate 4-10 buses for a period of six months or more to achieve a combined total of at least 10,000 miles.	Aug 2010
Milestone B.2: N/A Removed under the 2010 project re-scope.	-----
Deliverable B.1: Results of the evaluation will be summarized in a report.	Jan 2011
Task C - Outreach and Education	
Milestone C.1: Complete two school bus workshops or video-conferences in Missouri.	Mar 2008
Milestone C.2: MSA will attend workshops and share the results of the fleet evaluation.	Oct 2010
Deliverable C.DL.1: Educational materials - MSA will submit copies of materials (such as a storage and handling guidebook, presentations, or educational brochures) created for distribution to school bus fleets.	Mar 2008
Task D - Support B20 FET Data Collection	
Deliverable D.DL.1: Report findings on B20 FET data collection.	Mar 2008
Task E - Project Management	
Deliverable E.DL.1: Submit all close-out documents.	Jul 2011
Deliverable E.DL.2: Submit final report.	Jul 2011

Appendix 2: Project Publications and Presentations

An electronic link to the publications and presentations prepared for Task A was made available for a period of 3 months to DOE at the time this report was written at <http://www.biodiesel.org/files/nbf/>. Copies of the 3 ads, the Hazelwood District school bus report and the outreach brochures were submitted to DOE with quarterly progress reports.

Task A - Petroleum and Related Industry Education Program for Fuel Suppliers

Speaking Events and Presentations

- “Renewable Fuel Standard and Political Drivers” presentation, Northeast Biomass Conference, Boston, MA, Aug. 4-6, 2010.
- “Renewable Fuel Standard and Political Drivers” presentation, Sustainable Biodiesel Workshop, University of Rhode Island, Sep. 8, 2010.
- Base biodiesel presentation and participation in panel discussion, New York City’s Alternative Transportation Future Conference, Lehman College, NYC, Sep. 24, 2010.
- Update on biodiesel and bioheat, Oil Heat Council of New Hampshire, Board of Directors meeting, Sep. 24, 2010.
- “Biodiesel Market Status” presentation, Marketer Operations Committee of the Society of Independent Gasoline Marketers Annual Meeting, Nov. 12, 2010.
- “Future Outlook for Biodiesel” presentation, “Maine Energy Marketers Association (MEMA) 2011 Spring Conference, Augusta, Maine, Apr. 5, 2011.
- “Biodiesel Quality” presentation, Maine Board of Underground Storage Tank Installers (MEUST) Conference, Augusta, Maine, Apr. 26, 2011.
- “Bioheat” presentation, New Jersey Fuel Oil Merchants’ meetings, New Jersey and Philadelphia, PA, 04/19/11
- “Bioheat” presentation, New York Oil Heating Association Conference, April 20, 2011.
- “Business of Bioheat” presentation, Atlantic Regional Energy Exposition, Atlantic City, New Jersey, May 3-5, 2011.
- Base biodiesel presentation, Empire State Petroleum Association Board meeting, Atlantic Regional Energy Expo. May 3-5, 2011.

Articles

- “The Fuel Quality and Tank Design Disconnect,” *LUSTLine Bulletin #67*, Mar. 2011, pg. 11.
- “Phoenix Conference Reveals,” *Oilheating Journal*, Mar. 2011.
- “Over Promising, Under Delivering, Buyer Beware,” *Oilheating Journal*, Dec. 2010.
- “Distinguish Yourself, Today!” *Oilheating Journal*, Nov. 2010.
- “Exploring our Future,” *Oilheating Journal*, Oct. 2010.
- “A Decisive Decision to Go Green Today,” *Oilheating Journal*, Oct. 2010.
- “Vitamins for a Changing Fuel Composition,” *Oil & Energy*, Sep. 2010.

- “The Uncertainty Syndrome,” SIGMA, *Independent Gasoline Marketing Magazine*, 2011.

Advertisements

- Quality you can trust, America’s First Advanced Biofuel...Biodiesel.
- Driving America Forward, America’s First Advanced Biofuel...Biodiesel.
- Advanced-Sustainable, American’s First Advanced Biofuel...Biodiesel.

Task B - School Bus Fleet Evaluation Program

- *Biodiesel Fuel Blend Experience Report*, Hazelwood School District, Florissant, Missouri, January 5, 2011.
http://www.biodiesel.org/resources/reportsdatabase/reports/sch/20110105_sch-0011.pdf

Task C - Outreach and Education

- NBB’s presentation at the 2008 MSBA Annual Conference in October 2008 (4th Qtr 08)
- School bus fleet manager handout (3rd Qtr 08)
- Decision maker brochure (2nd Qtr 08)
- Two live broadcasts were aired on March 12 and March 18, 2008 (2nd Qtr 08)
- School bus fact sheet prepared by NBB (3rd Qtr 09)

Appendix 3: Acronyms

AFS	Advanced Fuel Solutions
ASTM	American Society for Testing and Materials
DOE	Department of Energy
EA	Emissions Advantage
EPA	Environmental Protection Agency
FET	Fleet Evaluation Team
MEMA	Maine Energy Marketers Association
MSA	Missouri Soybean Association
MSBA	Missouri School Board Association
NBB	National Biodiesel Board
NREL	National Renewable Energy Laboratory
OEM	Original equipment manufacturer
PMAA	Petroleum Marketers Association of America
RFS2	Renewable fuel standard 2
RIN	Renewable identification number
SESI	Sustainable Energy Strategies, Inc
SIGMA	Society of Independent Gasoline Marketers
ULSD	Ultra-low sulfur diesel