

The Importance of Biodiesel:

Awareness and Outreach

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National Alternative Fuels Training Consortium

A Program of



The Importance of Biodiesel

This material will discuss the importance of biodiesel and biodiesel vehicles. The advantages and reasons to consider adopting biodiesel vehicles will be explored, as well as a discussion of the health, environmental, economic, and energy security benefits associated with alternative fuel technology. Finally, suggested actions to support and resources to learn more about alternative fuels such as biodiesel will be presented.

Objectives

- Describe how biodiesel may help improve public health
- Describe the benefits of biodiesel to the environment
- Explain how biodiesel may help stimulate the economy
- Describe what energy security is and how using biodiesel can help attain it
- Explain the future of biodiesel
- Explain the suggested actions to support biodiesel

Why Consider Biodiesel?

There are many reasons to consider the use of biodiesel. Overall, combining biodiesel with diesel produces a cleaner-burning fuel. Since biodiesel can be made from new or waste vegetable oil, or plant and animal matter, it promotes growth of the U.S. agricultural sector. The reduced emissions of diesel-powered school buses alone can contribute significantly to the health of children in this country.

The reduced emissions of biodiesel-powered school buses alone can contribute significantly to the health of children in this country. As shown in **Figure 1**, reduced vehicle emissions are also achieved by blending biodiesel with diesel.

Biodiesel Emission Results

Emission Type	B2	B20	B100
Total Unburned Hydrocarbons	-2.2%	-20%	-67%
Carbon Monoxide	-1.3%	-12%	-48%
Particulate Matter	-1.3%	-12%	-47%
Oxides of Nitrogen (NO _x)	+2%	+2%	+10%

Figure 1: Emission reductions achieved by the use of biodiesel blends when compared to diesel. Source: NBB.

Notes

Additional Points to Consider

In general, vehicles equipped with diesel engines tend to be more expensive than conventional gasoline vehicles. A decrease in diesel vehicle costs could allow for more vehicles to be purchased and use biodiesel.

SPECIAL NOTE: NEVER use any clean or used grease or vegetable oil that has not been processed for biodiesel usage. Source: *Fueleconomy.gov*.

As temperatures become cold, biodiesel can become thick and create challenges with regard to its viscosity or flow in the engine. In-line fuel heaters and varying blends are often used to improve the flow properties of biodiesel in cold climates.

Biodiesel is also known to increase some emissions, like oxides of nitrogen (NO_x) when compared to conventional diesel. Selective catalytic reduction (SCR) systems have been developed to clean up the oxides of nitrogen produced by diesel engines. These systems work just as well for NO_x reduction on engines fueled with biodiesel. As these systems are put into production, biodiesel promises to become an extremely clean, environmentally friendly fuel.

Biodiesel Benefits

There are also other benefits in expanding the use of biodiesel to fuel vehicles – for the betterment of human health and the environment, economy, and national energy security, and to help reduce the dependence on foreign oil.



Health Benefits

Independent tests have demonstrated that biodiesel significantly reduces virtually all regulated emissions, while showing that biodiesel poses no threat to health.



Did You Know?

The direct benefits from the 1990 Clean Air Act Amendments are estimated to reach almost \$2 trillion for the year 2020, a figure that dwarfs the direct costs of implementation (\$65 billion).

Source: *EPA Second Prospective Report, released April 2011*

In 2000, biodiesel became the only alternative fuel in the country to have successfully completed the EPA-required Tier I and Tier II health effects testing under the Clean Air Act. These independent tests conclusively demonstrated biodiesel's significant reduction of virtually all regulated emissions, helping to improve overall air quality that impacts health (see **Figure 3**).



Figure 3: Clean air quality. Source: NAFTA.



Environmental Benefits

Pure biodiesel (B100) is nontoxic, biodegradable, and can result in a substantial reduction of carbon monoxide, unburned hydrocarbons, and particulate matter, all of which contribute to a cleaner and healthier environment.

Plants remove carbon from the atmosphere. Since biodiesel can be made from plant materials, burning biodiesel does not add carbon to the atmosphere. Biodiesel emissions are a natural link in the carbon cycle. In fact, since using biodiesel only puts back into the atmosphere the amount of carbon that the crops took out, it is considered carbon-neutral. Burning coal and oil puts carbon that is millions of years old into the atmosphere, increasing the net amount; fossil fuels are not carbon-neutral.

Since biodiesel also can be blended with diesel. Compared to using diesel alone, blended fuel produces fewer emissions. Using biodiesel in a conventional diesel engine results in substantial reduction of carbon monoxide and particulate matter (soot) emissions.



Did You Know?

Biodiesel is less toxic than table salt and biodegrades as fast as sugar.

Source: National Biodiesel Board, 2011



Economic Benefits

The biodiesel industry has the potential to significantly contribute to the overall U.S. domestic economy.

Notes

The National Biodiesel Board (NBB) has released a study on the U.S. biodiesel industry's economic impact on job creation and household income generation. The domestic biodiesel industry is expected to create 74,000 jobs by 2015 while increasing household income by an estimated \$4 billion. In addition, the report projects that the biodiesel industry will generate nearly \$7.3 billion in GDP.

Along with jobs and economic growth, the biodiesel industry also is generating significant tax revenues. This year, the industry is expected to generate an estimated \$345 million in federal tax revenue and \$283 million in state and local tax revenues, the study says. By 2015, that would grow to \$873 million in federal revenues and \$718 million for state and local governments.



Energy Security Benefits

About half of U.S. crude oil is currently imported. As crude oil prices continue to rise, it is imperative that alternative fuel options be explored (see **Figure 4**). Because biodiesel can be manufactured using existing industrial production capacity and used with conventional equipment, it provides substantial opportunity for immediately addressing the nation's energy security issues. Taking advantage of the American feedstock production, the biodiesel industry can provide a solution to foreign oil dependency.

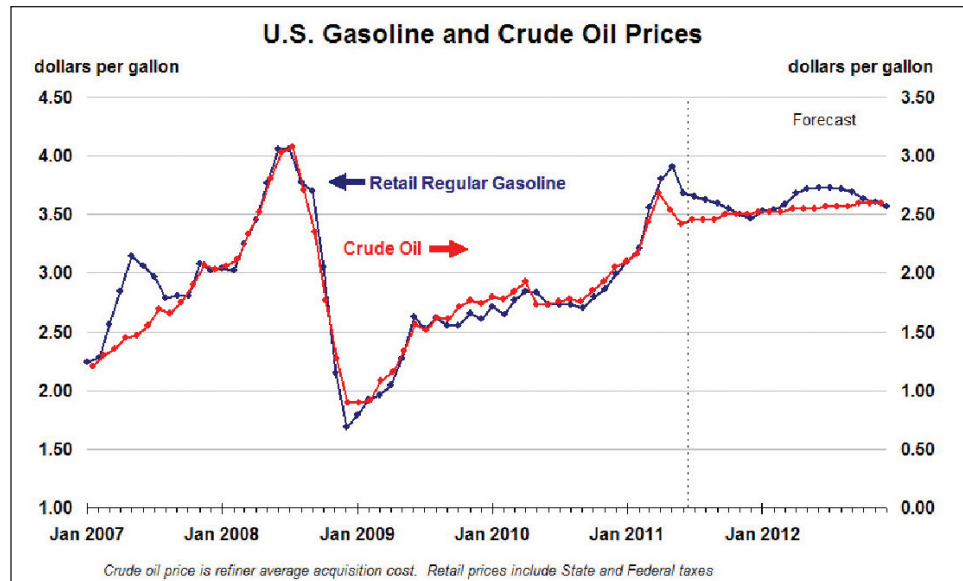


Figure 4: U.S. gasoline prices versus crude oil prices. Source: EIA.



Renewable Benefits

The renewability of a fuel is often referenced by the **energy balance**, or the ratio of how much energy is required to produce and distribute the fuel compared to the amount of energy the fuel releases when it is burned.

A higher **energy balance** ratio indicates a lower environmental impact because less fossil energy is needed to produce, refine, and distribute the fuel.

Biodiesel has a very high **energy balance** compared to other alternative fuels. Published research shows that for every unit of fossil energy needed to produce biodiesel, the return is **3.2 units** of renewable energy. For comparison, conventional diesel fuel delivers only 0.83 units of energy for every unit of fossil fuel energy used to produce it.

Biodiesel – Today and Tomorrow

Since biodiesel is produced domestically from renewable resources—that is, the crops are grown in the United States and the fuel is produced at plants in this country— the use of biodiesel promotes energy self-sufficiency and could create a new job market in America. Today, the biodiesel industry has contributed significantly to the domestic economy.

Biodiesel shows a potential to create economic growth and job development in the United States. Currently there are 51,893 jobs that pertain to biodiesel, and that number is estimated to grow by 25,000 by 2012. Biodiesel is a growing industry. Increasing biodiesel production from 800 million gallons in 2011 to 900 million gallons in 2015 will support an additional \$7.3 billion of GDP (National Biodiesel Board).

Since biodiesel does not require major modifications, the costs are relatively low to switch to biodiesel. When reviewing the high costs associated with other alternative fuel systems, many fleet managers have determined biodiesel is their least cost strategy to comply with state and federal regulations.

Not only is biodiesel growing in popularity with everyday consumers, many fleet managers, including school districts, have adopted biodiesel as a cost-efficient strategy to comply with state and federal regulations.

Horizontal lines for taking notes.

Notes



Clean School Bus Program

<http://www.epa.gov/cleanschoolbus/>

The goal of Clean School Bus USA program is to reduce children's exposure to diesel exhaust and the amount of air pollution created by diesel school buses.

Consider these facts:

- Twenty-four million American children ride school buses daily.
- On average, these students spend an hour and a half each day in a school bus.
- School buses drive more than 4 billion miles each year.
- School buses that leave their engines idling while standing, often very near schools, create indoor as well as outdoor air pollution problems.

The Future of Biodiesel

As concerns regarding the environment and energy resources continue to grow, it will become a necessity to explore and adopt additional alternative fuel methods, such as biodiesel. It is likely that biodiesel will continue to supplement existing diesel technology, including the use of higher biodiesel blends, and become more commonplace.

Biodiesel has already carved out a sizable niche in the fuel production industry. In the near future, it is likely to see even higher concentrations of biodiesel at fueling stations. As production increases and cost lowers, it is possible to see immediate changes at the pump. Pumps offering B5 will likely switch to a minimum of B20 because it is still under warranty by vehicle manufacturers.

Biodiesel is a sustainable option for powering U.S. transportation needs. As a result of an increase in production in comparison to current consumption, biodiesel remains a promising solution for future alternative fuel needs (see **Figure 5**).

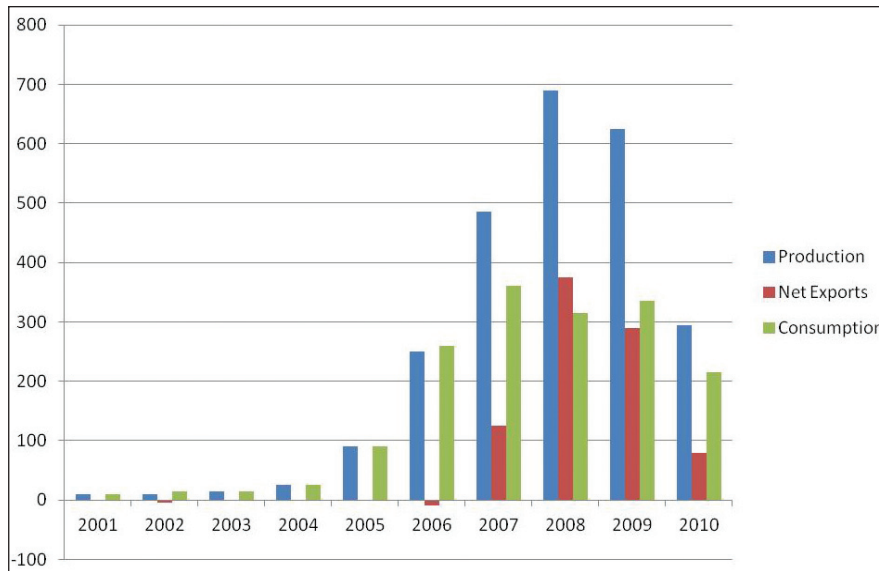


Figure 5: U.S. biodiesel production, exports, and consumption. Source: NAFTC.

Suggested Actions

Since biodiesel is considered a biofuel, it is important to point out that biodiesel is not the same as ethanol. According to the National Biodiesel Board, biodiesel is a renewable biofuel made from a variety of materials and designed for use in diesel engines, while ethanol is a renewable biofuel made primarily from corn and intended for use in gasoline-powered engines.

According to the Clean Air Task Force, there are more than 13 million diesel vehicles on U.S. roads today, but the majority of these drivers do not realize that their vehicles are capable of running on biodiesel.

Remember that any diesel vehicle can run on some form of biodiesel. Check for the diesel emblem somewhere on the vehicle, perhaps on the gas cap itself (see **Figure 6**). You may also recognize an emblem that indicates the vehicle can run on a biofuel (see **Figure 7**).

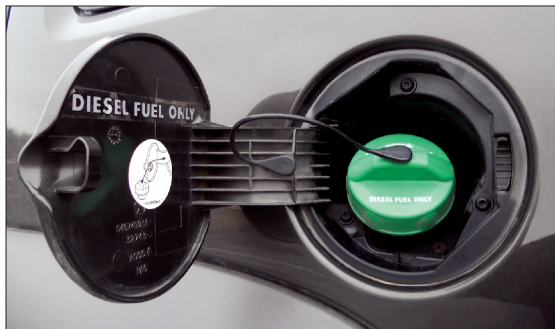


Figure 6: Diesel gas cap. Source: NAFTC.



Figure 7: Biofuel identification. Source: NAFTC.

Notes

So what about the majority of car owners who do not actually own a diesel engine vehicle? How exactly does supporting biodiesel production help the average consumer? According to the National Biodiesel Board Sustainability Blog, the DOE estimates that without biodiesel, gas prices would increase \$0.20 to \$0.35 per gallon. For a typical household, that means biodiesel saves approximately \$150 to \$300 per year. For the U.S. overall, this saves gas expenditures of \$28 billion to \$49 billion based on annual gasoline consumption of roughly 140 billion gallons.

When compared to conventional diesel vehicles, biodiesel vehicles reduce exhaust emissions. In addition, biodiesel can be combined with diesel to produce a cleaner-burning diesel fuel. Using biodiesel in a conventional diesel engine results in substantial reduction of carbon monoxide and particulate

matter (soot) emissions. The reduced emissions of biodiesel-powered school buses alone can contribute significantly to the health of children in this country.



Did You Know?

There are roughly 450,000 public school buses in the United States; 390,000 are powered by diesel fuel.

Source:
<http://www.epa.gov/cleanschoolbus/>

Check with your local and county school districts to see if they are using cleaner energy forms of transportation. Encourage school board members and local government officials to attend a Petroleum Reduction Technologies workshop and learn more about the importance of biodiesel.

Summary

Alternative fuel and advanced technology vehicles have the potential to virtually eliminate high gasoline prices, but the industry needs qualified, trained automotive service technicians to understand, diagnose, and maintain these vehicles to keep them on the road. Furthermore, it is imperative that everyday consumers understand how biodiesel and biodiesel vehicles work and the benefits that these alternative fuel vehicles offer to human health, the environment, and the economy.

Biodiesel and biodiesel vehicles use an existing infrastructure and agricultural supply to ensure America's energy independence.

Conclusion

Biodiesel is an extremely clean, environmentally friendly alternative fuel for the future. Conventional diesel fuel raises the same concerns as gasoline: exhaust emissions pollute the environment, and dependence on foreign oil supplies threatens this country's energy security.

Most of the diesel vehicles on the road today could substitute biodiesel for diesel with little or no modification. Blends of 20% biodiesel do not violate manufacturers' warranties.

Biodiesel is made from agricultural products that can be grown, processed, and distributed domestically. It is a viable alternative fuel, and its widespread use would greatly contribute to the country's clean air and energy independence.

Biodiesel offers many advantages when compared to conventional diesel vehicle fuels. Some of the benefits of these vehicles include:

- Reduced vehicle emissions
- Improved energy security
- Comparable vehicle performance
- Minimal infrastructure changes.

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www.naftc.wvu.edu/cleancitieslearningprogram
www.cleancities.energy.gov

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