

Clean Air Forum

Information on alternative fuels from around the state, with useful tips for consumers.

Use of Biodiesel Improves Air Quality

Typically, most school buses in the United States use diesel fuel, as do most heavy-duty trucks used for hauling goods across the nation. If you have been in an automobile behind a vehicle using diesel fuel, chances are you smelled the sooty, volatile smell in the exhaust gases that are a by-product of using diesel. Undoubtedly you remember it from your days as a student as well. There is no doubt that diesel engine exhaust contributes to air pollution. However, strides have been made in recent years to lessen diesel fuel's impact on our atmosphere. The mandated use of ultra-low sulfur diesel fuel (ULSD) means that today's diesel fuel contains 97% less sulfur than pre-2006 levels.

Diesel engine exhaust emissions contain hundreds of chemical compounds, some of which are emitted as gases, and others as fine particulate. The main gases emitted are carbon dioxide, oxygen, carbon monoxide, sulfur dioxide, nitrogen oxides, and hydrocarbons, as well as water vapor. Hazardous constituents of the hydrocarbon portion include benzene, toluene, and acrolein. The fine particulates emitted in diesel engine exhaust are particularly troubling, as they are so small they can avoid many of the human respiratory system's defense mechanisms and enter deeply into the lungs. Diesel engine exhaust has been linked as a trigger to people who suffer from asthma, and is considered "likely to be carcinogenic to humans by inhalation" by the U.S. Environmental Protection Agency.



A Monongalia County school bus fills up with biodiesel. Photo by Ron Snow.

However, due to the power and durability of diesel engines, they are used in most school buses in the U.S. The West Virginia Department of Education has an economic incentive in place for the use of alternative fuels, and as biodiesel availability becomes widespread, more and more county school systems are taking advantage of biodiesel (see map on page 3). West Virginia Department of Environmental Protection employees recently toured the bus fleets at the biodiesel-using county school systems of Marion and Monongalia counties, which pioneered school bus biodiesel use in the state, and rode on biodiesel-fueled buses. We observed that even when standing

directly behind the exhaust of a school bus using B20 biodiesel, that there was little of the characteristic smell, and almost no evidence of the black sooty particles that normally accompany diesel engine exhaust.

B20 biodiesel is a combination of petroleum diesel and 20% biodiesel. Biodiesel is typically derived from soybeans, although other plants such as rapeseed are also used. Most

West Virginia county

school systems also use B5 biodiesel (5% biodiesel) in the wintertime to alleviate fuel gelling issues due to colder temperatures. The use of biodiesel by school systems results in cleaner air and a healthier environment for students and drivers, and will only increase as the use of this cleaner alternative fuel becomes more prevalent.

Biodiesel Conference Set

The first West Virginia Friends of Biodiesel Conference is from 8 a.m. to 4:30 p.m., Tuesday, October 2, at the Days Hotel Conference Center in Flatwoods, West Virginia.

The conference brings together biodiesel users and potential users in an effort to spread knowledge about this renewable fuel and its potential for reducing emissions that contribute to air pollution.

Biodiesel, a clean-burning alternative fuel produced from domestic, renewable resources such as soybeans, does not contain petroleum. Using domestically produced biodiesel can help to reduce dependence on foreign sources of petroleum, one of the goals of West Virginia's new energy plan. The fuel can be used in diesel engines only, in a variety of blends along with petroleum diesel.



Twenty-two county school systems and one public transit authority in West Virginia fuel their buses with some blend of biodiesel.

Invited participants to the conference also include biodiesel marketers, who supply the state with the fuel; new West Virginia biodiesel producers, who will have the capacity to make more than 30 million gallons annually (*see story on page 8*); and state agencies with ties to the fuel, including environmental and regulatory bodies.

The conference will present information on the proper handling, storage and use of biodiesel. Cold weather can cloud and even gel any diesel fuel, including biodiesel. Generally, the standard storage and handling procedures used for petroleum diesel can be used for biodiesel. It is critically important to know whether the biodiesel used meets a strict industry specification called ASTM D6751, which will ensure that it performs properly. The West Virginia Friends of Biodiesel Conference will also cover fuel and marketing standards.

The conference will stimulate networking and an exchange of ideas between biodiesel users and potential users, providing a venue to educate key segments of West Virginia's biodiesel market and encourage the replication of the fuel's use.

The conference's sponsoring organization is the West Virginia Clean State Program, the state-level facet of the U.S. Department of Energy's Clean Cities Program. Clean

Cities advances the nation's economic, environmental and energy security by supporting local decisions to adopt practices that contribute to the reduction of petroleum consumption. Clean Cities carries out this mission through a network of more than 80 volunteer coalitions, which develop public/private partnerships to promote alternative fuels and vehicles, fuel blends, fuel economy, hybrid vehicles and idling reduction. The West Virginia Clean State Program is housed in the West Virginia Division of Energy, a West Virginia Department of Commerce agency.

For more information about the conference, contact Kelly A. Bragg, coordinator of the West Virginia Clean State Program, at (800) 982-3386 or (304) 558-2234 or via e-mail at kbragg@energywv.org.



West Virginia Friends of Biodiesel Conference

**Tuesday, October 2
8 a.m. to 4:30 p.m.**

**Days Hotel
Conference Center
Flatwoods, W.Va.**

Register online
[www.wvdo.org/community/
WVFOBregistration.html](http://www.wvdo.org/community/WVFOBregistration.html)

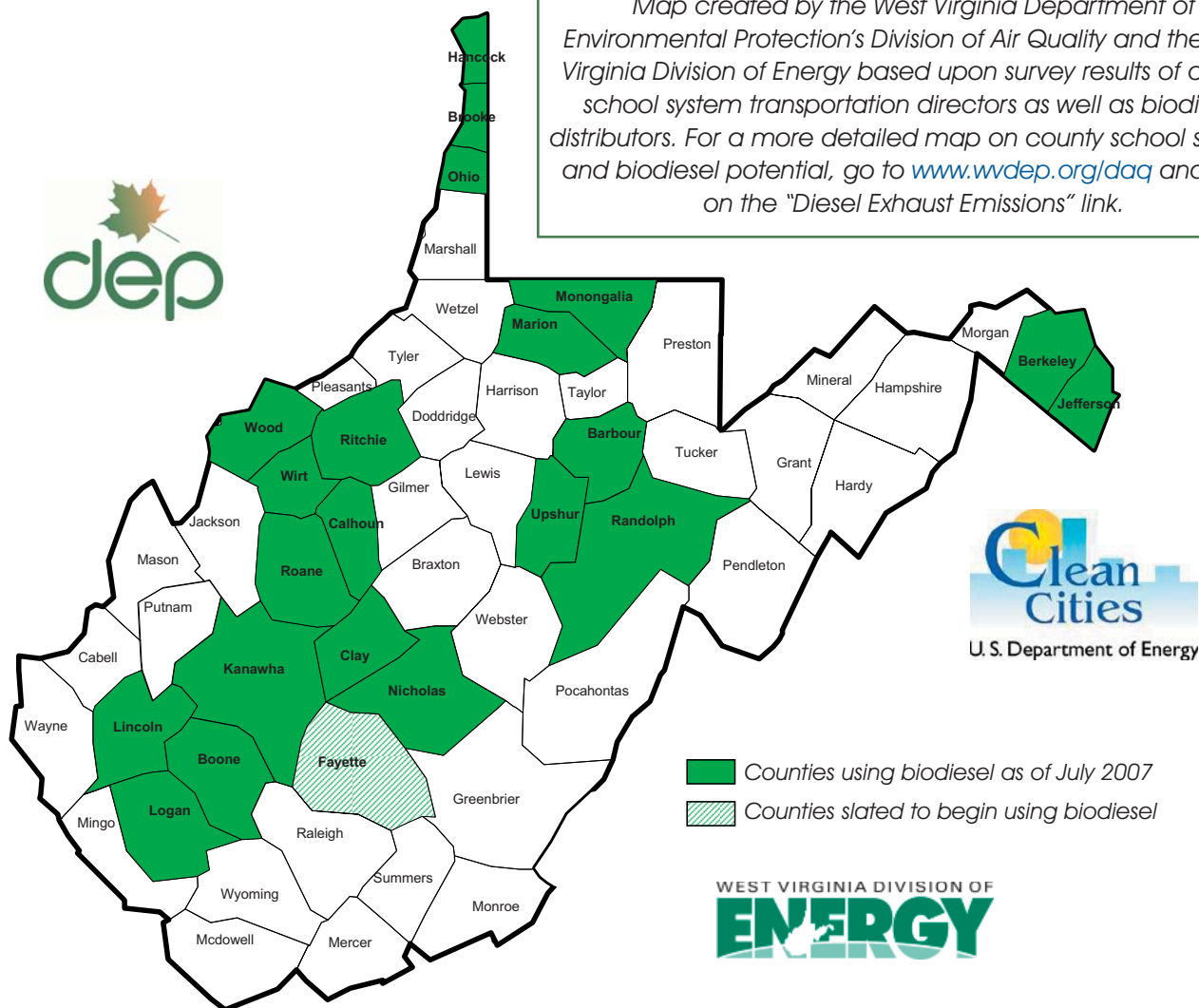
For more information, contact
Kelly A. Bragg, coordinator of
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558-2234 or kbragg@energywv.org.



West Virginia County School Systems Using Biodiesel



Map created by the West Virginia Department of Environmental Protection's Division of Air Quality and the West Virginia Division of Energy based upon survey results of county school system transportation directors as well as biodiesel distributors. For a more detailed map on county school systems and biodiesel potential, go to www.wvdep.org/daq and click on the "Diesel Exhaust Emissions" link.



Biodiesel Production

Biodiesel is produced from any fat or oil such as soybean oil, through a refinery process called *transesterification*. This process is a reaction of the oil with an alcohol to remove the glycerin, which is a byproduct of biodiesel production. Fuel-grade biodiesel must be produced to strict industry specifications (ASTM D6751) to ensure proper performance. Biodiesel is the only alternative fuel to have successfully completed the health effects testing requirements of the 1990 Clean Air Act Amendments. Biodiesel that meets ASTM D6751 and is legally registered with the U.S. Environmental Protection Agency becomes a legal motor fuel for sale and distribution. Raw vegetable oil cannot meet biodiesel fuel specifications; it is not registered with the EPA and it is not a legal motor fuel. – From the Official Site of the National Biodiesel Board.



Hybrid Electric Vehicles

Hybrids – also known as hybrid electric vehicles – offer a good opportunity for consumers to reduce emissions, improve air quality and lower driving costs. Because of their high fuel economy (some get as much as 60 miles per gallon), they also reduce the nation's dependence on foreign oil.

Ford, General Motors, Honda, Nissan and Toyota offer several models of light-duty hybrid vehicles including cars, trucks and even sport utility vehicles. Options also exist for buying heavy-duty hybrid buses, trucks and shuttles.

The latest list of hybrids from the Alternative Fuels Data Center includes Ford's Escape Hybrid and Mercury Mariner; General Motors - Saturn's VUE Green Line; Honda's Accord and Civic; Nissan's Altima; and Toyota's Camry, Highlander, Lexus GS 450h, Lexus RX 400h and Prius. The Alternative Fuels Data Center is the U.S. Department of Energy's vast collection of information on alternative fuels and the vehicles that use them.

Typically, these vehicles cost more than their gasoline-only powered counterparts. The lower costs associated with using less fuel along with a federal tax incentive help offset this incremental cost. The federal tax credit is based on formulas involving vehicle weight, technology and fuel economy as well as on tailpipe emission criteria. You can read more about the

tax incentive and compare various makes and models of hybrid vehicles at www.eere.energy.gov/cleancities/hev/.

Hybrids combine a conventional vehicle's combustion engine and the electric motor of an electric vehicle, eliminating the need for the vehicle to be plugged in to recharge. The vehicle's technology allows it to operate in electric-only mode under certain conditions, with no emissions and using no gasoline. Of course, the vehicle operates in the gasoline mode too, at times, with a corresponding increase in fuel use. It is the combination of the two modes that allows hybrids to have lower emissions and reduced fuel use.

According to the U.S. Department of Energy's Clean Cities website, "conventional vehicles release harmful chemicals, or pollutants, through their tailpipes. These chemicals, such as oxides of nitrogen, volatile organic compounds, particulates, carbon monoxide and carbon dioxide, are produced through the combustion of fossil fuels. In addition to causing smog and possibly contributing to global warming, these chemicals have been determined to cause or aggravate human respiratory diseases, including bronchitis and asthma. HEVs, with their increased fuel economy and reduced use of fossil fuels, emit fewer of these pollutants." For more information, visit Clean Cities at www.eere.energy.gov/cleancities/hev/hev_faq.html.

Check Your MPG

Knowing how many miles per gallon your car gets is important if you want to take steps that will save you money and reduce your use of gasoline. Once you begin regularly charting your fuel use, you can see when the actions you take – such as keeping your tires inflated properly, avoiding excessive use of your brakes, combining trips and carpooling – make a difference.

You'll be more likely to keep charting if you keep a notebook and a calculator in your glove box or on your console.

Here's how to calculate your car's fuel efficiency, also known as miles per gallon (MPG):

1. Fill up your fuel tank
2. Write down the mileage on your car's odometer. This is Mileage 1.
3. Continue to drive normally until your tank is less than half full.

4. Fill up your fuel tank again.
5. Record the mileage again. This is Mileage 2.
6. Also record the number of gallons it took to fill up the tank.
7. Subtract Mileage 1 from Mileage 2 to get the number of miles you drove since your last fill-up.
8. Divide your answer by the number of gallons needed to fill up your tank. You now know how many miles per gallon your car gets.
9. Keep doing this. Over time, you'll get an accurate picture of how many miles per gallon you get. Keep notes on what kind of driving you did: city or highway; lots of stops versus a long car trip.

Below is a sample chart you can use with some sample mileages and notes:

Mileage 1	Mileage 2	Miles traveled	Gallons	MPG	Notes on driving
42466	42813	347	10.078	34.4 (347 ÷ 10.078)	Highway driving; one long car trip
42813	43165	352	10.688	32.9 (352 ÷ 10.688)	No long trips; drove to work and back
43165	43448	283	10.378	27.3 (283 ÷ 10.378)	Work and back; two trips to Lowe's

Simple Steps for Drivers

How can dropping off the kids at soccer practice, running by the bank, and picking up dinner contribute to cleaner air? Trip chaining – combining errands into one sensible trip – is just one of the many simple things you can do to help improve air quality and reduce traffic congestion in your community.

Ground-level ozone caused partly by vehicles contributes to air pollution, but a small change in the choices we make can have a big impact. A well-maintained vehicle produces 20% less ozone-related emissions, saves money on fuel and means less traffic congestion due to breakdowns. In addition, properly inflating your tires can save you up to 18 gallons of gas per year. Carpooling, using mass transit, walking or bicycling – just one day a week for a year – can save the typical commuter about 1,200 miles on their vehicle and about \$455 in total driving costs.

According to the U.S. Department of Energy and the U.S. Environmental Protection Agency, you can improve your gas mileage by using the manufacturer's recommended grade of motor oil. Motor oil that says "Energy Conserving" on the performance symbol of the American Petroleum Institute contains friction-reducing additives that can improve fuel economy. Also, check and replace air filters regularly. Replacing clogged filters can increase gas mileage up to 10%.

Remember when you got your chores done all at once so you could go out and play? Trip chaining is the same idea – only you'll save the air in addition to saving time. When you start your car after it's been sitting for more than an hour, it pollutes up to five times more than when the engine's warm. That's why combining errands into one sensible trip is more effective and reduces air pollution. This means more time in your life, less traffic congestion and less pollution. Make a list, plan your route and trip chain. You'll be saving a lot more than just time.

Aggressive driving (speeding, rapid acceleration and braking) wastes gas. It can lower your gas mileage by 33% at highway speeds and by 5% around town. Sensible driving is also safer for you and others, so you may save more than gas money.

Observe the speed limit. While each vehicle reaches its optimal fuel economy at a different speed (or range of speeds), gas mileage usually decreases rapidly at speeds above 60 miles per hour. As a rule of thumb, you can assume that each 5 miles per hour you drive over 60 miles per hour is like paying an additional 20 cents per gallon for gas. On the other end of the spectrum, remember that idling gets zero miles per gallon.

Avoid keeping unnecessary items in your vehicle, especially heavy ones. An extra 100 pounds in your vehicle could reduce your miles per gallon by up to 2%. The reduction is based on the percentage of extra weight relative to the vehicle's weight and affects smaller vehicles more than larger ones. Also avoid packing items on top of your car. A loaded roof rack or carrier creates wind resistance and can decrease fuel economy by 5%.

In hot weather, gasoline vapors escape when you refuel your car's gas tank and, combined with sunshine and heat, create ground-level ozone, an air pollutant that is harmful to our lungs. By refueling during cooler periods of the day and in the evening, you can reduce ozone pollution. Also remember when you gas up, don't top off the tank. It keeps gas from spilling on you, it's safer and it helps keep the air clean.

Information compiled from www.italladdsup.gov/drivers/, www.fueleconomy.gov and FTC Consumer Alert.

10 Simple Steps to Improving Air Quality

- **Trip chain more often.** Chances are, you're already doing it – combining your errands into one trip. It helps you get things done and it helps reduce traffic congestion and air pollution. When you first start a car after it's been sitting for more than an hour, it pollutes up to five times more than when the engine's warm.
- **Take mass transit, share a ride or car pool.** Even if you do it just once or twice a week, you'll reduce traffic congestion and pollution and save money. The average driver spends about 56 cents per mile including ownership and maintenance.
- **Have fun – ride your bike.** It's a great way to travel and it can help you and the air get into tip-top condition. Vehicles on the road create more than 25% of all air pollution nationwide.
- **Take things in stride.** Walk or in-line skate instead of driving. They're easy ways to get exercise and they're easy on the air.
- **Care for your car.** Regular maintenance and tune-ups, changing the oil and checking tire inflation can improve gas mileage, extend your car's life and increase its resale value. It can also reduce traffic congestion due to preventable breakdowns and it could reduce your car's emissions by more than half.
- **Get fuel when it's cool.** Refueling during cooler periods of the day or in the evening can prevent gas fumes from heating up and creating ozone.
- **Don't top off the tank.** It releases gas fumes into the air, which cancels the benefits of the pump's anti-pollution devices. Stopping short of a full tank keeps gas off of you, is safer and reduces pollution. And, don't forget to click the gas cap three times to ensure you are not losing vapors.
- **Telecommute.** Work at home if possible. You'll save time and money and reduce emissions and traffic congestion.
- **Know before you go.** If your area has a travel and transit information network, use it by calling, visiting the website or tuning into the cable station. Get travel and transit updates before you leave home and you won't get stuck in a jam.
- **Spread the word.** If everyone took just a few of these simple, easy steps, it could make a big difference.

www.italladdsup.gov/drivers/

Cellulosic Ethanol

Ethanol, an alcohol-based alternative fuel currently made in the United States from corn, barley and wheat, is blended with gasoline to make E85. The number 85 refers to the percentage of ethanol in the fuel, with the remaining 15% coming from gasoline.

If ethanol is made from cellulosic biomass such as trees and grasses, it is referred to as cellulosic ethanol. Because West Virginia has a large amount of wood and crop residue – 4.78 million tons annually – cellulosic ethanol is seen as a good fit for the state's economy.

The technology to produce ethanol from various types of biomass is progressing. The U.S. Department of Energy's Bioethanol Pilot Plant, operated by the National Renewable Energy Laboratory in Golden, CO, for example, tests bioprocessing technologies for production of ethanol or other fuels or chemicals from cellulosic biomass.

Capitalizing on the nation's renewable resources will increase energy and economic security, reducing our dependence on foreign sources of petroleum. West Virginia has a role to play in this effort.

The number of U.S. corn-based ethanol plants and refueling stations continues to increase. According to the U.S. DOE's Alternative Fuels Data Center, 81 plants in 20 states can produce nearly 4.4 billion gallons annually. Sixteen more plants are under construction with another 750

million gallons of capacity. There are more than 1,000 public E85 stations in the U.S.; two are in West Virginia, although most are in the

Midwest. For more information about ethanol and to locate stations, visit www.eere.energy.gov/afdc/altfuel/ethanol.html.

All gasoline vehicles can use gasoline/ethanol blends with up to 10% ethanol. Not every vehicle can use E85. There is a broad range of makes and models known as Flex Fuel

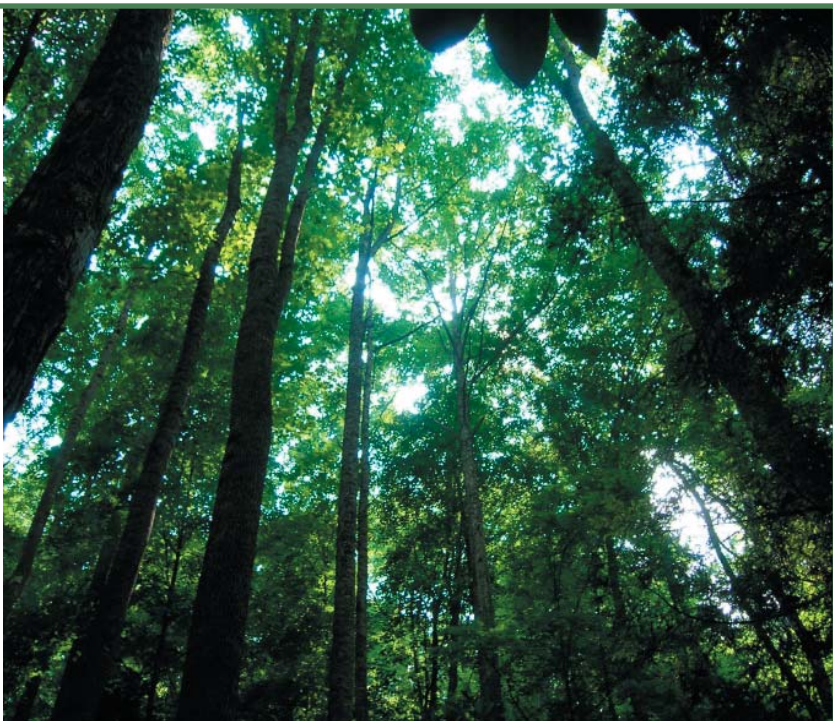
Vehicles, which can use the fuel. They are called flex fuel vehicles because they can operate on ethanol or gasoline. There are more than 6 million FFVs on the road in the U.S. but many owners may be unaware that they may fuel with E85. FFV makers include Daimler Chrysler, Ford, General Motors, Isuzu, Mazda, Mercedes, Mercury and Nissan. Visit www.e85fuel.com/e85101/flexfuelvehicles.php for a database that can help you discover whether your car can use E85.



Appalachian Woody Biomass to Ethanol Conference

The Appalachian Woody Biomass to Ethanol Conference, September 5 and 6 in Shepherdstown, West Virginia, drew buyers, sellers and producers of wood residues to discuss possible impacts of regional wood-based ethanol production on the Appalachian forest products industry.

Topics included national and regional biomass availability, policies, conversion technologies and bio-based materials opportunities in the Appalachian Region. With its abundant woody biomass resources, West Virginia and the Appalachian region must explore the opportunities and obstacles they face if ethanol becomes a national focus. The production of cellulosic ethanol is explored in West Virginia's Energy Opportunities Document, available for public review and comment at www.energywv.org.



Assuring High Quality Biodiesel

What happens if you put poor quality biodiesel fuel in your refrigerator? In some cases, the golden clear liquid will turn to a white solid and this is not good for diesel-powered cars, trucks, tractors and stationary engines.

So how does the biodiesel industry assure that such poor quality biodiesel never reaches the pump? By imposing a stringent fuel standard and a rigorous process quality program.

All engines are designed and manufactured for a fuel that has certain characteristics. In the United States, the industry organization that defines the consensus on fuels is the American Society for Testing and Materials (ASTM).

ASTM fuel standards are the minimum accepted values for properties of the fuel to provide adequate customer satisfaction and/or protection. For diesel fuel, the ASTM standard is ASTM D975. All engine and fuel injection manufacturers design their engines around ASTM D975. In cooperative discussions with the engine community early in the biodiesel industry's development, ASTM approved the full standard for biodiesel, with the designation of D6751. This standard covers pure biodiesel (B100), for blending with petrodiesel in levels up to 20% by volume.

The ASTM D6751 specification defines the test methods and limits for certain characteristics of 100% biodiesel. At least five other nations as well as the European Union have adopted similar specifications.

The second piece to the quality puzzle is the adherence to a strong quality systems program that includes storage, sampling,

testing, blending, shipping, distribution and fuel management practices.

The National Biodiesel Board has established a National Biodiesel Accreditation Program called BQ-9000. The goals of this cooperative and voluntary program are to guide producers and marketers in producing and marketing a biodiesel fuel that meets the industry standard of ASTM D6751 in a consistent and repeatable manner. Accreditation to BQ-9000 is awarded following a formal review and audit of the applicant's processes and management systems, by certified auditors such as the Mid-Atlantic Technology Research and Innovation Center (MATRIC).

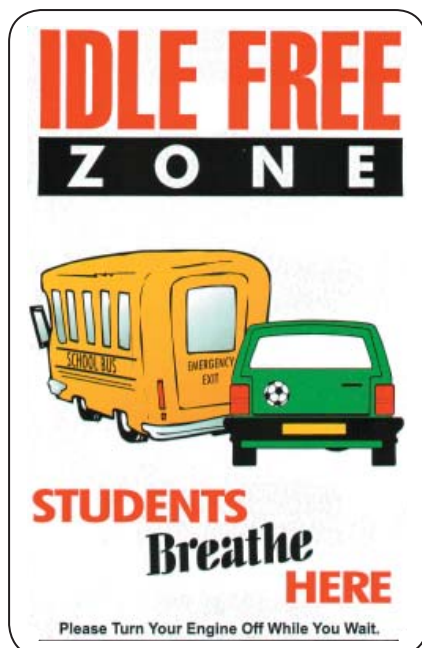
ASTM D6751 and BQ-9000 cover the "what is the product composition" and the "can you make the same quality product every time" questions.

The adoption of this biodiesel standard and the quality program has provided the engine community and consumers in the public with the information needed to assure trouble-free operation with biodiesel blends.

ASTM D6751 and BQ-9000 are rapidly becoming the minimum requirements used by most biodiesel distributors, such as Pilot Travel Centers and Exxon Mobil **On the Run** convenience stores, to choose the biodiesel producers that they will use to supply their pumps.

So whether you are an industrial purchaser, long-haul trucker or automobile driver, make sure that you are only purchasing biodiesel blends that meet ASTM D6751 and BQ-9000.

— Keith A. Pauley, President, MATRIC



Idle Free Zones

Identifying ways to save on energy usage is a hot topic with rising fuel prices and the prevailing message to cut costs. One method of curtailing fuel costs while creating a healthy school environment is to create an idle free zone.

To assist in the effort to reduce vehicle idling, the West Virginia Department of Environmental Protection is promoting an "Idle Free Zone" for school buses, delivery vehicles and other vehicle traffic by providing signs at no cost to be posted around school campuses, particularly in bus drop areas.

West Virginia State Board of Education Policy 4336 was written to minimize idling and offer a smart, effective and immediate way to reduce diesel emissions at little or no cost. Reducing idling saves money because idling wastes fuel.

Recent studies have identified diesel engine fumes from school buses as a possible health hazard to children and school employees. Young lungs are particularly susceptible, as they are not completely developed.

For more information on the free signs, contact Tammy Mowrer at the DEP's Division of Air Quality, (304) 926-0499, Ext. 1237, or e-mail at tmowrer@wvdep.org.

West Virginia Biodiesel Production

Three different groups produce or plan to produce biodiesel in West Virginia, giving the state an annual capacity of more than 30 million gallons of the clean-burning alternative fuel.

In March, Illinois-based Emerald Biofuels announced plans to begin production of biodiesel at the Bayer CropScience Manufacturing Industrial Park in Institute, according to Emerald Biofuels' President and CEO David M. Drew. The company will make biodiesel from soybean oil and other seed crops. Engineering for the plant is under way and a construction firm has been selected. The company plans to have biodiesel flowing by the first quarter of 2008.

AC&S, Inc. is nearing completion of a 3 million gallon per year biodiesel plant in Nitro. AC&S began operations in 1986 as a railcar cleaning and repair service company. Shortly after opening, the company began construction of new facilities, which included expanded railcar services, chemical manufacturing units and a wastewater treatment facility. With continued growth in the company and its commitment to protecting the environment, a state-of-the-art environmental laboratory was established in 1990. The company's fully state-certified commercial laboratory provides analytical testing for permit reporting, waste analysis and environmental site investigations. AC&S expects to market

biodiesel to petroleum distributors and end users for on-highway and off-highway diesel fuel. The construction of the biodiesel production unit utilized existing chemical manufacturing equipment along with new instrumentation. The laboratory has been expanded to provide testing required for biodiesel quality certification in accordance with ASTM D6751 as well as standard fuels testing.

The West Virginia Biofuels/Green Fuel Crop Collaborative is an organization of individuals and institutions making biodiesel from locally produced waste vegetable oil. The group's main activity at the West Virginia State University biopex site in Institute has been to retrofit a 110-gallon biodiesel reactor in between batch runs. It will serve as the prototype for reactors at other biofuels/renewables co-ops around the state, the first expected in Fayetteville. West Virginia Biofuels prepared and submitted a grant to fund four production units around the state to produce biodiesel, solar and other renewable energies appropriate to each location, using net metering to get the energy onto the power grid. Institutions involved in this collaborative effort include Charleston Area Medical Center, West Virginia State University and Marshall University. Individuals interested in joining the co-op may contact Sally Shepherd at salshep@gmail.com.

West Virginia Energy Notes

The West Virginia Division of Energy was created by Gov. Joe Manchin III and the West Virginia Legislature to provide leadership for the state's energy development and policies. A primary goal of the new agency is to develop the West Virginia Energy Opportunities Document, a state energy plan. The document promotes increased energy efficiency, traditional fossil energy forms and renewable energy. The plan is available for public comment at www.energywv.org and at a series of Public Energy Authority meetings, which began this summer and will continue on Sept. 27 and Oct. 25 at the Summit Conference Center, 129 Summers St., in Charleston. Doors open at 2 p.m. and the meetings are from 2:30 to 5 p.m. For more information about the West Virginia Division of Energy, contact Acting Director Jeff Herholdt at jherholdt@energywv.org.

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