AGENDA ITEM #2B
December 11, 2007

Action

MEMORANDUM

December 7, 2007

TO: County Council

FROM: Keith Levchenko, Senior Legislative Analyst

SUBJECT: **Action**: Resolution to Establish a Working Group to Study the Potential Local Generation of Biodiesel Fuel from Restaurant Grease

Transportation and Environment Committee Recommendation: Approve

On December 4, the Council introduced a resolution sponsored by Councilmembers Leventhal, Ervin, Floreen, Berliner, and Elrich that would create an interagency working group to study the potential local generation of biodiesel fuel from restaurant grease for use by the County agencies' diesel fleets.

This issue was first discussed at the Council on October 25, 2007 by the Management and Fiscal Policy and Transportation and Environment Committees.

Participants at the October 25 discussion included staff from various departments including: Public Works and Transportation (DPW&T), Environmental Protection and Economic Development. Staff from the Washington Suburban Sanitary Commission (WSSC), Maryland-National Park and Planning Commission (M-NCPPC), and Montgomery County Public Schools also participated. The Committees also heard from Melissa Rice, President of the Montgomery County Student Environmental Activists, a group which analyzed the concept of Montgomery County turning restaurant grease into biodiesel fuel.

The meeting included a discussion of the environmental benefits of biodiesel fuel (including the benefits of utilizing biodiesel generated from restaurant grease as compared to agriculturally-derived biodiesel), current County agency efforts regarding the use of biodiesel fuel as well as regional, State, Federal, and private efforts, and some implementation issues regarding the increased usage of biodiesel in County agency fleets.

Also discussed were WSSC's current efforts to reduce fats, oils, and greases improperly disposed of in the sewer system and its research into possible reuses of yellow grease and trap grease.

Resolution

The T&E Committee later discussed and supported the creation of a Working Group to further develop this initiative.

The attached resolution (see ©1-2) would create an interagency working group charged with developing this biodiesel initiative and reporting back to the Council within one-year. As noted in the resolution the goals of the initiative to be developed are to explore the potential for:

a. the countywide collection of used vegetable oil and grease from restaurants.
b. the creation of capacity for the local processing of this waste product into biodiesel fuel.
c. the utilization of this biodiesel fuel in County agency vehicles.
d. the provision of extra biodiesel production for sale to the public.

MCPS, WSSC, M-NCPPC, and County Government would have staff representatives on the Working Group. The Working Group would be chaired by the Council Staff representative.

Background

For additional information, Council Staff has attached below excerpts from the joint Committee packet from the October 25 meeting (with some information updated).

As described in an Environmental Protection Agency (EPA) fact sheet (see ©3-4) biodiesel is:

> "a renewable fuel produced from agricultural resources such as vegetable oils. In the United States, most biodiesel is made from soybean oil; however canola oil, sunflower oil, recycled cooking oils, and animal fats are also used."

Biodiesel should not be confused with ethanol (another biofuel which is an alcohol product produced from corn, wheat, sugar cane, and biomass and used as an additive in gasoline).

Biodiesel can be used as a pure fuel (B100) or blended with regular diesel in any percentage and has been registered by EPA for legal use in vehicles.

Biodiesel use in the United States is growing. The estimated sale of B100 has increased from 25 million gallons in Federal FY2004 to over 250 million gallons Federal FY06. However, biodiesel usage is still a tiny fraction of total gallons of on-road diesel fuel consumption in the United States (approximately 34 billion gallons per year).

In addition to the environmental benefits (see below) biodiesel is an attractive alternative fuel because diesel vehicles do not need significant alterations to run on biodiesel and biodiesel can be provided through existing refueling infrastructure.

Environmental Benefits of Biodiesel

Biodiesel has many demonstrated significant environmental benefits in terms of reduced emissions including: greenhouse gas emissions reductions (B100 reduces lifecycle greenhouse gas (GHG) emissions by more than 50%. B20 reduces GHG by at least 10%), as well as reductions in carbon monoxide, particulate matter, sulfates, and hydrocarbon and air toxics emissions.

Studies regarding nitrogen oxide (NOx) emissions and biodiesel fuel vary in the results with some studies showing slightly increased NOx emissions and others showing slightly less.

In terms of the energy efficiency of producing biodiesel, according to a 2006 report of the National Academy of Sciences (Environmental, Economic, and Energetic Costs and Benefits of Biodiesel and Ethanol Biofuels, study attached on ©5-13), the production of biodiesel generated from soybeans has a net energy balance[1] of 93% (compared to ethanol which has a net energy balance of 25%).

The use of biofuels generated from agricultural products (either ethanol or biodiesel) to replace petroleum based gasoline and diesel is constrained. According to the National Academy of Sciences study, if all of the corn and soybean production in American were dedicated to these two fuels, 12% of gasoline consumption and 6% of diesel demand would be met. However, new technologies and agricultural fuel sources are being pursued that might increase the agricultural efficiency of these products in the future.

In Montgomery County, according to Department of Economic Development data, there are 62 corn farms covering 12,425 acres and 43 soybean farms covering 13,794 acres (see ©14). If used exclusively for ethanol and biodiesel production, one could produce 5.2 million gallons of ethanol (assuming a yield of 420 gallons per acre of corn) and 827,640 gallons of biodiesel (assuming a yield of 60 gallons per acre of soybeans).

At the October 25, 2007 discussion, Councilmember Trachtenberg cautioned that the increased agricultural production required to generate biofuels could have a deleterious impact on water quality and potentially on food prices. She referred to two studies which Council Staff distributed to Councilmembers on November 5. These studies focus mostly on issues regarding ethanol production although some similar concerns can be raised with regard to biodiesel

[1] Net Energy Balance (or NEB)) is the biofuel energy content compared to the fossil fuel energy inputs.

production. However, as noted earlier, the use of restaurant grease, rather than soybeans, to produce biodiesel avoids these agricultural-related issues.

Use of Vegetable Oil and Recycled Greases

Vegetable oil and recycled greases can also be used to either directly power diesel engines or can be processed into biodiesel fuel.

In order to be used directly in a vehicle, a diesel vehicle must be retrofitted. Most of these retrofits result in Bi-Fuel systems. The original diesel system is still intact and is used to start the engine or run the engine when no vegetable oil is available. Once the engine is hot the system can be switched to burn vegetable oil. However, vegetable oil, if not otherwise processed into a biodiesel product, is not considered biodiesel and is not registered by the EPA for legal use in vehicles.

Utilizing waste vegetable oil/grease suitable for the production of biodiesel (yellow grease collected from restaurants for instance) would appear to offer a number of additional benefits beyond those obtained from agriculturally produced biodiesel. First, the land use and energy requirements of farming land to grow soybeans are avoided. Second, if the biodiesel can be produced and used locally, then the impacts of transporting the raw materials and later the fuel are also greatly reduced. Third, a successful waste vegetable oil and grease collection program reduces the chances of this waste material clogging up sewer lines and/or polluting local streams.

Current Biodiesel and Used Vegetable Oil Efforts in Montgomery County and the Region

Currently there is no retail biodiesel fueling facility (public or private) in Montgomery County. The National Institutes of Health (NIH) has a biodiesel refueling facility at its Bethesda campus for government use only. Biodiesel availability in the State of Maryland is presented on the Department of Energy website (see ©16). Below is a summary of some biodiesel-related activities going on in Montgomery County, the region, and the State of Maryland.

Department of Public Works and Transportation (DPW&T)

DPW&T's Division of Solid Waste Services (DSWS) initiated a biodiesel pilot program at the County's compost facility in Dickerson this past May (see ©17). A 9,000 gallon fuel tank was emptied and specially cleaned (to eliminate the potential for the transfer of debris in the tank to the fuel systems in the vehicles.) and was then filled with B20. All of the equipment and trucks at the facility are now using B20 (approximately 5,500 gallons per month) without any problems.

DPW&T's Fleet Management is in the process of planning the conversion of a fueling station to biodiesel.[2] DPW&T is currently working out the logistics with its customers to ensure this potential changeover does not disrupt the operations of its customers, including Highway Services, Police, and Fire and Rescue. As noted above, the process of converting a tank to biodiesel requires the emptying and special cleaning of a fuel tank.

With regard to vegetable oil and grease, the DSWS opened a drop-off facility at the Shady Grove Transfer Station in September 2006 (see ©18). Residents may bring up to 5 gallons of cooking or vegetable oil. DSWS gives the oil to a private contractor for reuse (it is either turned into animal feed or into biodiesel fuel). About 1000 pounds per month are collected.

DSWS also has a vegetable oil exchange program (see copy of advertisement on ©18 and news story on ©19-21) that provides a means for those seeking to dispose of the product to connect with those seeking to obtain the product. All exchanges are required to be free of charge.

Department of Economic Development (DED)

In order to provide additional market opportunities for farmers, DED is looking into a public/private partnership to produce biodiesel from locally grown soybeans (see ©15).

Montgomery County Public Schools

Montgomery County Public Schools recently received a small federal grant to assist in converting its bus fleet to run on a B5 blend of biodiesel. MCPS has identified some vehicle warranty issues based on its discussions with its bus engine manufacturers.

Washington Suburban Sanitary Commission

The Washington Suburban Sanitary Commission has a FOG (fats, oils, and grease program as part of its effort to reduce discharges that could potentially clog the sewer system. Restaurants, cafeterias, hotel kitchens, church kitchens, hospital cafeterias, bars, and any other commercial or industrial operation that discharges grease laden wastewater are required to get a food service wastewater discharge permit. All plumbing fixtures that may contain grease are required to be connected to a grease treatment unit that is maintained at regular intervals.

There are several firms which WSSC has been in contact with that have experience dealing with FOG and waste vegetable oil (WVO). These firms have expressed an interest in

[2] The County has a public refueling facility for ethanol (E-85) next door to DPW&T's Fleet Management offices on Crabbs Branch Way

providing contract O&M services to produce biofuel from the FOG, and biodiesel from the WVO – and have pilot scale experience providing these services. There appears to be an opportunity for WSSC and Montgomery County to possibly partner and each could achieve their goals. There may also be an opportunity to use a site such as WSSC's abandoned Rock Creek Wastewater Treatment Plant for such an effort.

WSSC's fleet has not yet converted to the use of biodiesel. WSSC has some unresolved vehicle warranty issues, especially with regard to International, which is the manufacturer of many of WSSC's largest work vehicles.

City of Gaithersburg

In September 2006, the City of Gaithersburg began using B20 for its diesel fleet (see ©22).

State of Maryland

On September 12, the Board of Public Works approved a policy to have 40% of state vehicle purchases over the next three years to be cars and trucks that operate on biofuels (principally ethanol and biodiesel) (see article on ©23-24).

In November 2006, the Maryland Energy Administration established a biofuels grant program. This program grants awards for the installation of E85 ethanol and biodiesel (minimum blends of B20) fueling infrastructure at commercial fueling stations. However, the program appears to be suspended (no grant applications are currently being accepted).

Arlington County, Virginia

Arlington County began using B20 fuel in its vehicle fleet in 2002. Currently, over 400 large trucks and school buses use B20.

Private Sector

The first biodiesel plant in the State of Maryland opened in June 2006 in Berlin, Maryland. The plant had an initial capacity of 500,000 gallons per year but is expected to increase this capacity up to 1.5 million gallons per year (see ©25). Another biodiesel plant is slated to open in Baltimore next year (see ©26-29).

In Montgomery County, Federal Realty, which leases a number of properties to restaurants, is participating in a vegetable oil collection program. Federal Realty has partnered with a private company which collects the oil and then processes it for sale to customers who have modified their diesel vehicles to run on vegetable oil products.

Pepco is using a B20 blend for its diesel fleet.

City of San Francisco Initiative

On November 20, San Francisco Mayor Gavin Newsom announced the launching of SFGreasecycle. This program involves the collection of restaurant grease free of charge from City restaurants for the production of biodiesel for use in the City fleet. The City's 1,500 vehicle diesel fleet will run on B20. The Mayor's press release (see ©30-31) touts this initiate as the first of its kind in the country.

Formation of Interagency Working Group

Given the environmental benefits of biodiesel and the availability of used vegetable oil/grease in the County (and the need to properly dispose of this product), Councilmember Leventhal asked Council Staff to draft a resolution later supported by the T&E Committee (resolution attached on ©1-2) calling for the creation of an interagency working group to research and develop (within one year) a biodiesel initiative for consideration by the County Executive and County Council. This initiative would include the following goals:

1. Provide for the countywide collection of used vegetable oil and grease from restaurants.
2. Create the capacity for the local processing of this waste product into biodiesel fuel.
3. Utilize this biodiesel fuel in County agency vehicles.
4. Make this biodiesel fuel available to the public.

The details of how to achieve the above goals and what the County's role would be in this initiative are to be developed by the Working Group. The Working Group would include representatives from County Government, Montgomery County Public Schools, Maryland-National Capital Park and Planning Commission, and WSSC. The Working Group will bring in outside experts as needed on particular issues.

It is anticipated that this initiative will involve some level of partnering with private sector organizations. The Working Group will also consider the potential for regional cooperation through the Council of Governments and/or through direct coordination with neighboring jurisdictions.

Attachments

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Resolution: _____
Introduced: _____
Adopted: _____

COUNTY COUNCIL
FOR MONTGOMERY COUNTY, MARYLAND

By: Councilmembers Leventhal, Ervin, Floreen, Berliner, and Elrich

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Subject: Establishment of a Working Group to Study the Potential Local Generation of Biodiesel Fuel from Restaurant Grease

Background and Purpose

1. Compared to regular diesel fuel, biodiesel has many environmental benefits in terms of reduced emissions including: greenhouse gas emissions reductions of more than 50%, as well as reductions in carbon monoxide, particulate matter, sulfates, and hydrocarbon and air toxics emissions. Studies regarding nitrogen oxide (NOx) emissions and biodiesel fuel vary in the results with some studies showing slightly increased NOx emissions and others showing slightly less.

2. The environmental benefits of biodiesel would be even greater when agricultural and transportation impacts are minimized through the local production of biodiesel from used vegetable oil/grease from County restaurants.

3. Montgomery County agency fleets use approximately 5.8 million gallons of diesel fuel per year.

4. There is currently no public or private retail refueling facility in Montgomery County for biodiesel.

5. The Washington Suburban Sanitary Commission requires that food serve establishments having the potential to discharge fats, oils, and grease (FOG) have a discharge permit. As part of this permit, these establishments are required to have FOG abatement systems and follow best management practices in order to minimize the amount of FOG discharge into the sewer system. Waste haulers of this material are also required to have a discharge permit and dispose of this material at approved WSSC facilities.

6. Based on per capita annual estimates of restaurant grease produced, Montgomery County restaurants generate approximately 8.7 million pounds of yellow grease and 12.5 million pounds of trap grease annually. The yellow grease could be used to produce

approximately 1.2 million gallons of biodiesel fuel annually or could be blended with regular diesel fuel to produce approximately 6.0 million gallons of B20 biodiesel. The trap grease could also potentially be used to produce biodiesel or other biofuel.

7. Although some restaurants have companies collect their yellow grease and trap grease for uses such as in animal feeds and for biofuel, there is currently no formal voluntary or mandatory countywide restaurant grease collection effort in place in Montgomery County for the reuse of restaurant grease.

Action

The County Council for Montgomery County, Maryland, approves the following resolution:

1. A Biodiesel Working Group is hereby established to research and develop a biodiesel initiative for consideration by the County Executive and the County Council.

2. The Working Group must provide a report to the County Council and the County Executive within one year of approval of this resolution.

3. The Working Group will explore and report on the potential for:
   a. the countywide collection of used vegetable oil and grease from restaurants.
   b. the creation of capacity for the local processing of this waste product into biodiesel fuel.
   c. the utilization of this biodiesel fuel in County agency vehicles.
   d. the provision of extra biodiesel production for sale to the public.

4. The Working Group must be composed of a staff person that the Council invites each of the following to designate:
   a. The Chief Administrative Officer
   b. Montgomery County Public Schools
   c. County Planning Board
   d. Washington Suburban Sanitary Commission
   e. Staff Director of the County Council

5. The chair of the Working Group must be the member designated by the Staff Director of the County Council. The chair is responsible for the normal duties of a committee chair, including calling meetings, appointing chairs of subcommittees, and other duties as appropriate.

6. In addition to its official members, the Working Group is expected to seek out experts from within the County agencies and from other jurisdictions and levels of government as well as from the private sector to provide advice and information.

This is a correct copy of Council action.

Linda M. Lauer, Clerk of the Council

EPA420-F-06-044
October 2006

SmartWay® Transport Partnership
U.S. ENVIRONMENTAL PROTECTION AGENCY

Alternative Fuels: Biodiesel

Biodiesel is a renewable fuel produced from agricultural resources such as vegetable oils. In the United States, most biodiesel is made from soybean oil; however canola oil, sunflower oil, recycled cooking oils, and animal fats are also used.

How It's Made

To make biodiesel, the base oil is put through a process called "esterificiation." This refining method uses an industrial alcohol (ethanol or methanol) and a catalyst (substance that enables a chemical reaction) to convert the oil into a fatty-acid methyl-ester fuel (biodiesel).

Biodiesel in its pure form is known as "neat biodiesel" or B100, but it can also be blended with conventional diesel, most commonly as B5 (5 percent biodiesel and 95 percent diesel) and B20 (20 percent biodiesel and 80 percent diesel). Biodiesel is registered with the U.S. Environmental Protection Agency (EPA) and is legal for use at any blend level in both highway and non-road diesel vehicles.

Most diesel engines can run on biodiesel without needing any special equipment. If you are interested in using biodiesel in your vehicle or equipment, check with the manufacturer for any recommendations and information regarding engine warranties. In addition, once you have determined the proper blend for your vehicle, make sure to purchase your fuel from a reputable dealer selling commercial grade biodiesel.

Biodiesel -vs- Vegetable Oil

In 1895, Dr. Rudolf Diesel invented the diesel engine with the intention of running it on a variety of fuels, including vegetable oil. In fact, when he demonstrated his engine at the World Exhibition in Paris in 1900, he fueled the vehicle with peanut oil. However, biodiesel and vegetable oil are very different. Raw vegetable oil or recycled greases (also called waste cooking oil) that have not been processed into esters are not biodiesel, and are not registered by EPA for legal use in vehicles. In addition, vehicles converted to use these oils would likely need to be certified by the EPA; to date EPA has not certified any conversions. These conversions may also violate the terms of the vehicle warranty. For more information on the certification process, please visit EPA's Web site at: www.epa.gov/otaq/cert/dearmfr/cisd0602.pdf.

Performance

Vehicles have similar horsepower and torque as conventional diesel when running on biodiesel. Chemically speaking, biodiesel has a higher cetane number, but slightly lower energy content than diesel. To the average driver, this means better engine performance and lubrication, but a small decrease in fuel economy (2-8 percent). Biodiesel vehicles can also have problems starting at very cold temperatures, but this is more of an issue for higher percentage blends such as B100 and easily solved the same way as with conventionally fueled vehicles -by using engine block or fuel filter heaters or storing the vehicles in a building.

Availability

In 2004, 25 million gallons of B100 were sold. By 2005, that number had tripled. Today, approximately 600 fleets nationwide use biodiesel blends in their diesel engines, and biodiesel is available in its various blends at approximately 800 locations across the United States. A complete list of stations is available at www.biodiesel.org.

Affordability

The price of biodiesel blends varies depending on geographic area, base material (corn, soybeans, etc.), and supplier. Although biodiesel can cost more than petrodiesel, diesel drivers can transition to biodiesel without purchasing new vehicles. In the case of fleets, managers can transition to biodiesel without acquiring new spare parts inventories or rebuilding refueling stations.

Maintenance

Generally, the use of biodiesel does not cause many maintenance issues. However, when used for the first time, biodiesel can release deposits accumulated on tank walls and pipes from previous diesel fuel, initially causing fuel filter clogs. As a result, vehicle owners should change the fuel filter after their first tank of biodiesel. Also, biodiesel can degrade rubber fuel system components, such as hoses and pump seals. This is especially true with higher-percentage blends, and older vehicles. Many newer vehicles have biodiesel-compatible components, but it is best to consult your owner's manual or contact your vehicle manufacturers for specific information.

Benefits

Biodiesel has a number of important benefits. As an alternative to diesel, it can help reduce U.S. dependence on foreign oil. Biodiesel also provides significant greenhouse gas (GHG) emission reductions. B100 reduces lifecycle greenhouse gas emissions by more than 50 percent, while B20 reduces GHG emissions by at least 10 percent.

In addition, biodiesel offers several criteria emissions benefits for the existing vehicle fleet. It reduces emissions of carbon monoxide, particulate matter (PM), and sulfates, as well as hydrocarbon and air toxics emissions.

A 2002 EPA summary analysis of existing data suggests vehicles using biodiesel may emit slightly more nitrogen oxide (NOx) (about 2% for B20 and 10 percent for B100). Subsequent studies have yielded mixed results, with some showing small increases and others showing small decreases. EPA plans a further investigation to fully assess this issue, including the emissions impact of using biodiesel in vehicles equipped with PM traps and NOx aftertreatment designed to meet strict new emission standards.

For More Information

EPA Grow & Go Web Site: www.epa.gov/smartway/growandgo

EPA Alternative Fuels Web Site: www.epa.gov/otaq/consumer/fuels/altfuels/altfuels.htm

DOE Alternative Fuels Data Center Web Site: www.eere.energy.gov/afdc

National Biodiesel Board Web Site: www.biodiesel.org

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From the Cover
BIOLOGICAL SCIENCES / SOCIAL SCIENCES / ECOLOGY / SUSTAINABILITY SCIENCE-SS

Environmental, economic, and energetic costs and benefits of biodiesel and ethanol biofuels

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Contributed by David Tilman, June 2, 2006

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•Substance via MeSH
Hazardous Substances DB
•ETHANOL
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Highlights in Sustainability Science

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Negative environmental consequences of fossil fuels and concerns about petroleum supplies have spurred the search for renewable transportation biofuels. To be a viable alternative, a biofuel should provide a net energy gain, have environmental benefits, be economically competitive, and be producible in large quantities without reducing food supplies. We use these criteria to evaluate, through life-cycle accounting, ethanol from corn grain and **biodiesel** from soybeans. Ethanol yields 25% more energy than the energy invested in its production, whereas **biodiesel** yields 93% more. Compared with ethanol, **biodiesel** releases just 1.0%, 8.3%, and 13% of the agricultural nitrogen, phosphorus, and pesticide pollutants, respectively, per net energy gain. Relative to the fossil fuels they displace, greenhouse gas emissions are reduced 12% by the production and combustion of ethanol and 41% by **biodiesel**. **Biodiesel** also releases less air pollutants per net energy gain than ethanol. These advantages of **biodiesel** over ethanol come from lower agricultural inputs and more efficient conversion of feedstocks to fuel. Neither biofuel can replace much petroleum without impacting food supplies. Even dedicating all U.S. corn and soybean production to biofuels would meet only 12% of gasoline demand and 6% of diesel demand. Until recent increases in petroleum prices, high production costs made biofuels unprofitable without subsidies. **Biodiesel** provides sufficient environmental advantages to merit subsidy. Transportation biofuels such as synfuel hydrocarbons or cellulosic ethanol, if produced from low-input biomass grown on agriculturally marginal land or from waste biomass, could provide much greater supplies and environmental benefits than food-based biofuels.

corn | soybean | life-cycle accounting | agriculture | fossil fuel

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High energy prices, increasing energy imports, concerns about petroleum supplies, and greater recognition of the environmental consequences of fossil fuels have driven interest in transportation biofuels. Determining whether alternative fuels provide benefits over the fossil fuels they displace requires thorough accounting of the direct and indirect inputs and outputs for their full production and use life cycles. Here we determine the net societal benefits of corn grain (*Zea mays* ssp. *mays*) ethanol and soybean (*Glycine max*) **biodiesel**, the two predominant U.S. alternative transportation fuels, relative to gasoline and diesel, the fossil fuels they displace in the market. We do so by using current, well supported public data on farm yields, commodity and fuel prices, farm energy and agrichemical inputs, production plant efficiencies, coproduct production, greenhouse gas (GHG) emissions, and other environmental effects.

To be a viable substitute for a fossil fuel, an alternative fuel should not only have superior environmental benefits over the fossil fuel it displaces, be economically competitive with it, and be producible in sufficient quantities to make a meaningful impact on energy demands, but it should also provide a net energy gain over the energy sources used to produce it. We therefore analyze each biofuel industry, including farms and production facilities, as though it were an

"island economy" that is a net energy exporter only if the energy value of the biofuel and its coproducts exceeds that of all direct and indirect energy inputs (see Tables 1–6 and *Supporting Text*, which are published as supporting information on the PNAS web site).

Biofuel production requires energy to grow crops and convert them to biofuels. We estimate farm energy use for producing corn and soybeans, including energy use for growing the hybrid or varietal seed planted to produce the crop, powering farm machinery, producing farm machinery and buildings, producing fertilizers and pesticides, and sustaining farmers and their households. We also estimate the energy used in converting crops to biofuels, including energy use in transporting the crops to biofuel production facilities, building and operating biofuel production facilities, and sustaining production facility workers and their households. Outputs of biofuel production include the biofuels themselves and any simultaneously generated coproducts. For purposes of energy accounting, we assign the biofuels themselves an energy content equal to their available energy upon combustion. Coproducts, such as distillers' dry grain with solubles (DDGS) from corn and soybean meal and glycerol from soybeans, are typically not combusted directly; rather, we assign them energy equivalent values.

Results

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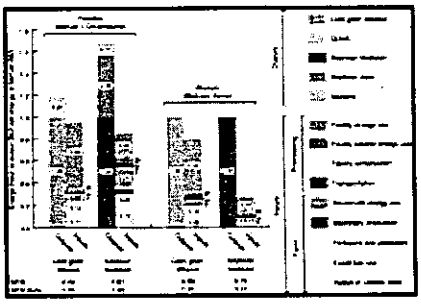
Net Energy Balance (NEB). Despite our use of expansive system boundaries for energy inputs, our analyses show that both corn grain ethanol and soybean **biodiesel** production result in positive NEBs (i.e., biofuel energy content exceeds fossil fuel energy inputs) (Fig. 1; see also Tables 7 and 8, which are published as supporting information on the PNAS web site), which reinforce recent findings (1–5). Although these earlier reports did not account for all of the energy inputs included in our analyses, recent advances in crop yields and biofuel production efficiencies, which are reflected in our analyses, have essentially offset the effects of the broad boundaries for energy accounting that we have used. Our results counter the assertion that expanding system boundaries to include energetic costs of producing farm machinery and processing facilities causes negative NEB values for both biofuels (6–8). In short, we find no support for the assertion that either biofuel requires more energy to make than it yields. However, the NEB for corn grain ethanol is small, providing ≈25% more energy than required for its production. Almost all of this NEB is attributable to the energy credit for its DDGS coproduct, which is animal feed, rather than to the ethanol itself containing more energy than used in its production. Corn grain ethanol has a low NEB because of the high energy input required to produce corn and to convert it into ethanol. In contrast, soybean **biodiesel** provides ≈93% more energy than is required in its production. The NEB advantage of soybean **biodiesel** is robust, occurring for five different methods of accounting for the energy credits of coproducts (see Table 9, which is published as supporting information on the PNAS web site).

Fig. 1. NEB of corn grain ethanol and soybean **biodiesel** production. Energy inputs and outputs are expressed per unit energy of the biofuel. All nine input categories are consistently ordered in each set of inputs, as in the legend, but some are so small as to be nearly imperceptible. Individual inputs and outputs of ≥0.05 are labeled; values <0.05 can be found in Tables 7 and 8. The NEB (energy output – energy input) and NEB ratio (energy output/energy input) of each biofuel are presented both for the entire production process (*Left*) and for the biofuel only (i.e., after excluding

(7)



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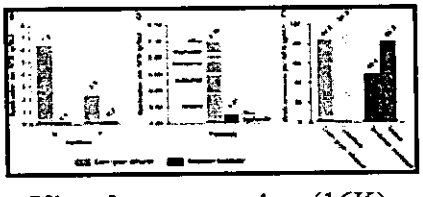
coproduct energy credits and energy allocated to coproduct production) (*Right*).

Life-Cycle Environmental Effects. Both corn and soybean production have negative environmental impacts through movement of agrichemicals, especially nitrogen (N), phosphorus (P), and pesticides from farms to other habitats and aquifers (9). Agricultural N and P are transported by leaching and surface flow to surface, ground, and coastal waters causing eutrophication, loss of biodiversity, and elevated nitrate and nitrite in drinking-water wells (9, 10). Pesticides can move by similar processes. Data on agrichemical inputs for corn and soybeans and on efficiencies of net energy production from each feedstock reveal, after partitioning these inputs between the energy product and coproducts, that **biodiesel** uses, per unit of energy gained, only 1.0% of the N, 8.3% of the P, and 13% of the pesticide (by weight) used for corn grain ethanol (Fig. 2*a*; see also Table 10, which is published as supporting information on the PNAS web site). The markedly greater releases of N, P, and pesticides from corn, per unit of energy gain, have substantial environmental consequences, including being a major source of the N inputs leading to the "dead zone" in the Gulf of Mexico (11) and to nitrate, nitrite, and pesticide residues in well water. Moreover, pesticides used in corn production tend to be more environmentally harmful and persistent than those used to grow soybeans (Fig. 2*b* and Table 10). Although blending ethanol with gasoline at low levels as an oxygenate can lower emissions of carbon monoxide (CO), volatile organic compounds (VOC), and particulate matter with an aerodynamic diameter ≤ 10 μm (PM10) upon combustion, total life-cycle emissions of five major air pollutants [CO, VOC, PM10, oxides of sulfur (SO_x), and oxides of nitrogen (NO_x)] are higher with the "E85" corn grain ethanol–gasoline blend than with gasoline per unit of energy released upon combustion (12). Conversely, low levels of **biodiesel** blended into diesel reduce emissions of VOC, CO, PM10, and SO_x during combustion, and **biodiesel** blends show reduced life-cycle emissions for three of these pollutants (CO, PM10, and SO_x) relative to diesel (5).



View larger version (16K):
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Fig. 2. Environmental effects from the complete production and combustion life cycles of corn grain ethanol and soybean **biodiesel**. (*a* and *b*) Use of fertilizers (*a*) and pesticides (*b*) per unit of net energy gained from biofuel production (Table 10). (*c*) Net GHG emissions (as CO_2 equivalents) during production and combustion of biofuels and their conventional counterparts, relative to energy released during combustion (Table 11).

If CO_2 from fossil fuel combustion was the only GHG considered, a biofuel with NEB > 1 should reduce GHG

emissions because the CO_2 released upon combustion of the fuel had been removed from the atmosphere by plants, and less CO_2 than this amount had been released when producing the biofuel. However, N fertilization and incorporation of plant biomass into soil can cause microbially mediated production and release of N_2O, which is a potent GHG (13). Our analyses (see Table 11, which is published as supporting information on the PNAS web site) suggest that, because of the low NEB of corn grain ethanol, production and use of corn grain ethanol releases 88% of the net GHG emissions of production and combustion of an energetically equivalent amount of gasoline (Fig. 2*c*). This result is comparable with a recent study that estimated this parameter at 87% using different methods of analysis (1). In contrast, we find that life-cycle GHG emissions of soybean **biodiesel** are 59% those of diesel fuel. It is important to note that these estimates assume these biofuels are derived from crops harvested from land already in production; converting intact ecosystems to production would result in reduced GHG savings or even net GHG release from biofuel production.

Economic Competitiveness and Net Social Benefits. Because fossil energy use imposes environmental costs not captured in market prices, whether a biofuel provides net benefits to society depends not only on whether it is cost competitive but also on its environmental costs and benefits vis-à-vis its fossil fuel alternatives. Subsidies for otherwise economically uncompetitive biofuels are justified if their life-cycle environmental impacts are sufficiently less than for alternatives. In 2005, neither biofuel was cost competitive with petroleum-based fuels without subsidy, given then-current prices and technology. In 2005, ethanol net production cost was $0.46 per energy equivalent liter (EEL) of gasoline (14–16), while wholesale gasoline prices averaged $0.44/liter (17). Estimated soybean **biodiesel** production cost was $0.55 per diesel EEL (16, 18), whereas diesel wholesale prices averaged $0.46/liter (17). Further increases in petroleum prices above 2005 average prices improve the cost competitiveness for biofuels. Even when not cost competitive, however, biofuel production may be profitable because of large subsidies. In the U.S., the federal government provides subsidies of $0.20 per EEL for ethanol and $0.29 per EEL for **biodiesel** (19). Demand, especially for ethanol, also comes from laws and regulations mandating blending biofuels in at least some specified proportion with petroleum. Ethanol and **biodiesel** producers also benefit from federal crop subsidies that lower corn prices (which are approximately half of ethanol production's operating costs) and soybean prices.

Potential U.S. Supply. In 2005, 14.3% of the U.S. corn harvest was processed to produce 1.48×10^{10} liters of ethanol (20, 21), energetically equivalent to 1.72% of U.S. gasoline usage (22). Soybean oil extracted from 1.5% of the U.S. soybean harvest produced 2.56×10^{8} liters of **biodiesel** (20, 23), which was 0.09% of U.S. diesel usage (22). Devoting all 2005 U.S. corn and soybean production to ethanol and **biodiesel** would have offset 12% and 6.0% of U.S. gasoline and diesel demand, respectively. However, because of the fossil energy required to produce ethanol and **biodiesel**, this change would provide a net energy gain equivalent to just 2.4% and 2.9% of U.S. gasoline and diesel consumption, respectively. Reaching these maximal rates of biofuel supply from corn and soybeans is unlikely because these crops are major contributors to human food supplies through livestock feed and direct consumption (e.g., high-fructose corn syrup and soybean oil, both major sources of human caloric intake).

Discussion

Among current food-based biofuels, soybean **biodiesel** has major advantages over corn grain ethanol. **Biodiesel** provides 93% more usable energy than the fossil energy needed for its production, reduces GHGs by 41% compared with diesel, reduces several major air pollutants,

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and has minimal impact on human and environmental health through N, P, and pesticide release. Corn grain ethanol provides smaller benefits through a 25% net energy gain and a 12% reduction in GHGs, and it has greater environmental and human health impacts because of increased release of five air pollutants and nitrate, nitrite, and pesticides.

Our analyses of ethanol and **biodiesel** suggest that, in general, biofuels would provide greater benefits if their biomass feedstocks were producible with low agricultural input (i.e., less fertilizer, pesticide, and energy), were producible on land with low agricultural value, and required low-input energy to convert feedstocks to biofuel. Neither corn grain ethanol nor soybean **biodiesel** do particularly well on the first two criteria: corn requires large N, P, and pesticide inputs, and both corn and soybeans require fertile land. Soybean **biodiesel**, however, requires far less energy to convert biomass to biofuel than corn grain ethanol (Fig. 1) because soybeans create long-chain triglycerides that are easily expressed from the seed, whereas in ethanol production, corn starches must undergo enzymatic conversion into sugars, yeast fermentation to alcohol, and distillation. The NEB (and perhaps the cost competitiveness) of both biofuels could be improved by use of low-input biomass or agricultural residue such as corn stover in lieu of fossil fuel energy in the biofuel conversion process.

Nonfood feedstocks offer advantages for these three energetic, environmental, and economic criteria. Switchgrass (*Panicum virgatum*), diverse mixtures of prairie grasses and forbs (24, 25), and woody plants, which can all be converted into synfuel hydrocarbons or cellulosic ethanol, can be produced on agriculturally marginal lands with no (24, 25) or low fertilizer, pesticides, and energy inputs. For cellulosic ethanol, combustion of waste biomass, such as the lignin fractions from biomass feedstocks, could power biofuel-processing plants. Although gains may be somewhat tempered by higher transport energy requirements, higher energy use for construction of larger and more complex ethanol plants, and possibly greater labor needs, resultant NEB ratios may still be >4.0 (26, 27), a major improvement over corn grain ethanol with its NEB ratio of 1.25 and soybean **biodiesel** with its NEB ratio of 1.93. Cellulosic ethanol is thought to have the potential to become cost competitive with corn grain ethanol through improved pretreatments, enzymes, and conversion factors (28, 29). The NEB ratio for combined-cycle synfuel and electric cogeneration through biomass gasification (30) should be similar to that for cellulosic ethanol and may convert a greater proportion of biomass energy into synfuels and electricity than is possible with cellulosic ethanol. In total, low-input biofuels have the potential to provide much higher NEB ratios and much lower environmental impacts per net energy gain than food-based biofuels.

Global demand for food is expected to double within the coming 50 years (31), and global demand for transportation fuels is expected to increase even more rapidly (32). There is a great need for renewable energy supplies that do not cause significant environmental harm and do not compete with food supply. Food-based biofuels can meet but a small portion of transportation energy needs. Energy conservation and biofuels that are not food-based are likely to be of far greater importance over the longer term. Biofuels such as synfuel hydrocarbons or cellulosic ethanol that can be produced on agriculturally marginal lands with minimal fertilizer, pesticide, and fossil energy inputs, or produced with agricultural residues (33), have potential to provide fuel supplies with greater environmental benefits than either petroleum or current food-based biofuels.

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Energy Use in Crop Production. We use 2002–2004 U.S. Department of Agriculture data on fertilizer, soil treatment, and pesticide application rates for corn (Table 1) and soybean (Table 2) farming. Our estimates of the energy needed to produce each of these agrichemical inputs are derived from recent studies (2–7). We also estimate per-hectare (ha) energy use for operating agricultural equipment, for manufacturing this equipment and constructing buildings used directly in crop production (Table 3), and for producing the hybrid (corn) or varietal (soybeans) seed planted. We transform these estimates of per-hectare energy use into per-biofuel-liter energy use based on crop to biofuel conversion efficiencies of 3,632 liters/ha for corn grain ethanol and 544 liters/ha for soybean **biodiesel**. Because this island industry cannot operate without laborers, we also estimate the per-biofuel-liter energy use to sustain farm households (Table 4).

Energy Use in Converting Crops to Biofuels. We estimate the energy used to build the facilities used to convert crops to biofuels (Table 6), transport crops to these facilities, power these facilities, and transport biofuels to their point of end use (Table 5). As with farm labor, we estimate the energy used by households of industry laborers (Table 4).

Energy Yield from Biofuel Production. The energy output of biofuel production includes the combustible energy of biofuels themselves and energy equivalent values for coproducts that typically have uses other than as energy commodities (Table 5). We assign coproduct credits as follows. For DDGS and glycerol we use an "economic displacement" method whereby we calculate the energy required to generate the products for which each serves as a substitute in the marketplace (i.e., corn and soybean meal for DDGS and synthetic glycerol for soybean-derived glycerol). For soybean meal, which does not have an adequate substitute in the marketplace based on both its availability and protein quality, we estimate its coproduct energy credit by a "mass allocation" method as the fraction of energy, based on the relative weight of the soybean meal to the entire soybean weight processed, used to grow soybeans and produce soybean meal and oil. We also apply alternative methods of calculating coproduct credits including issuing energy values based on caloric content and market value (Table 9).

We determine the NEB of a biofuel by subtracting the value of all fossil energy inputs used in producing the biofuel from the energy value of the biofuel and its coproducts. Similarly, we calculate the NEB ratio by dividing the sum of these outputs over that of the inputs.

Environmental Effects. When measuring the life-cycle environmental impacts of each biofuel, we expand the island industry model to include total net emissions from biofuel combustion as well as production. Given the NEB of each biofuel and current fertilizer and pesticide application rates, we calculate for each biofuel the amount of each agricultural input applied per unit of energy gained by producing the biofuel (Table 10). For our estimates of GHG savings in producing and combusting each biofuel in lieu of a fossil fuel, we first calculate the life-cycle GHG savings from displacing the fossil fuel (i.e., from the energy gained in producing the biofuel) and then add to this amount the net GHG emissions released on the farm.

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Footnotes

Abbreviations: NEB, net energy balance; GHG, greenhouse gas; EEL, energy equivalent liter; DDGS, distillers' dry grain with solubles.

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Author contributions: J.H., D. Tilman, and S.P. designed research; J.H., E.N., D. Tilman, S.P., and D. Tiffany performed research; J.H., E.N., D. Tilman, S.P., and D. Tiffany analyzed data; and J.H., D. Tilman, and S.P. wrote the paper.

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References

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1. Farrell, A. E., Plevin, R. J., Turner, B. T., Jones, A. D., O'Hare, M. & Kammen, D. M. (2006) *Science* **311**, 506–508.[Abstract/Free Full Text]
2. Wang, M., Saricks, C. & Wu, M. (1997) *Fuel-Cycle Fossil Energy Use and Greenhouse Gas Emissions of Fuel Ethanol Produced from U.S. Midwest Corn* (Argonne Natl. Lab, Argonne, IL).
3. Graboski, M. S. (2002) *Fossil Energy Use in the Manufacture of Corn Ethanol* (National Corn Growers Association, St. Louis, MO).
4. Shapouri, H., Duffield, J., McAloon, A. & Wang, M. (2004) *The 2001 Net Energy Balance of Corn-Ethanol* (U.S. Dept. of Agriculture, Washington, DC).
5. Sheehan, J., Camobreco, V., Duffield, J., Graboski, M. & Shapouri, H. (1998) *Life Cycle Inventory of Biodiesel and Petroleum Diesel for Use in an Urban Bus* (Natl. Renewable Energy Lab, Golden, CO), NREL Publ. No. SR-580-24089.
6. Pimentel, D. (2003) *Nat. Resources Res.* **12**, 127–134.
7. Patzek, T. W. (2004) *Crit. Rev. Plant Sci.* **23**, 519–567.[CrossRef]
8. Pimentel, D. & Patzek, T. W. (2005) *Nat. Resources Res.* **14**, 65–76.
9. Vitousek, P. M., Aber, J. D., Howarth, R. W., Likens, G. E., Matson, P. A., Schindler, D. W., Schlesinger, W. H. & Tilman, D. G. (1997) *Ecol. Appl.* **7**, 737–750.[CrossRef]
10. Carpenter, S. R., Caraco, N. F., Correll, D. L., Howarth, R. W., Sharpley, A. N. & Smith, V. H. (1998) *Ecol. Appl.* **8**, 559–568.[CrossRef]
11. Downing, J. A., Baker, J. L., Diaz, R. J., Prato, T., Rabalais, N. N. & Zimmerman, R. J. (1999) *Gulf of Mexico Hypoxia: Land and Sea Interactions* (Council for Agricultural Sci. and Technol, Ames, IA).
12. Brinkman, N., Wang, M., Weber, T. & Darlington, T. (2005) *Well-to-Wheels Analysis of Advanced Fuel/Vehicle*

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Systems: A North American Study of Energy Use, Greenhouse Gas Emissions, and Criteria Pollutant Emissions (Argonne Natl. Lab, Argonne, IL).
13. Robertson, G. P., Paul, E. A. & Harwood, R. R. (2000) *Science* **289**, 1922–1925.[Abstract/Free Full Text]
14. U.S. Department of Agriculture: National Agricultural Statistics Service (2005) *Feed Grains Database* (Dept. of Agriculture, Washington, DC).
15. Tiffany, D. G. & Eidman, V. R. (2005) in *Agriculture as a Producer and Consumer of Agriculture* eds. Outlaw, J., Collins, K. J.& Duffield, J. A. (CABI, Cambridge, MA).
16. U.S. Department of Energy, Energy Information Administration (2006) *Natural Gas Monthly* (Dept. of Energy, Washington, DC), DOE Publ. No. EIA-0130(2006/04).
17. U.S. Department of Energy, Energy Information Administration (2006) *Petroleum Marketing Monthly* (Dept. of Energy, Washington, DC), DOE Publ. No. EIA-0380(2005/06).
18. Fortenbery, T. R. Department of Agricultural and Applied Economics Staff Paper No. 481 (2005) ***Biodiesel** Feasibility Study: An Evaluation of **Biodiesel** Feasibility in Wisconsin* (Univ. of Wisconsin, Madison, WI).
19. Shapouri, H. & Gallagher, P. (2005) *USDA's 2002 Ethanol Cost-of-Production Survey* (Dept. of Agriculture, Washington, DC), Agriculture Economic Rep. No. 841.
20. Interagency Agricultural Projections Committee (2006) *USDA Agricultural Baseline Projections to 2015* (Dept. of Agriculture, Washington, DC), DOE Publ. No. OCE-2006-1.
21. Renewable Fuels Association (2006) *Industry Statistics* (Renewable Fuels Assoc, Washington, DC).
22. U.S. Department of Energy, Energy Information Administration (2006) *Annual Energy Outlook 2006 With Projections to 2030* (Dept. of Energy, Washington, DC), DOE Publ. No. EIA-0383(2006).
23. National **Biodiesel** Board (2005) *How Much **Biodiesel** Has Been Sold in the U.S.?* (Natl. **Biodiesel** Board, Jefferson City, MO).
24. Tilman, D., Reich, P. B., Knops, J. M. H., Wedin, D., Mielke, T. & Lehman, C. (2001) *Science* **294**, 843–845. [Abstract/Free Full Text]
25. Tilman, D., Reich, P. B. & Knops, J. M. H. (2006) *Nature* **441**, 629–632.[CrossRef][Medline]
26. Sheehan, J., Aden, A., Paustian, K., Killian, K., Brenner, J., Walsh, M. & Nelson, R. (2004) *J. Ind. Ecol.* **7**, 117–146.
27. Morey, R. V., Tiffany, D. & Hatfield, D. (2005) *Biomass for Electricity and Process Heat at Ethanol Plants* (Am. Soc. Agricult. Biol. Engineers, St. Joseph, MI), ASABE Paper No. 056131.
28. Aden, A., Ruth, M., Ibsen, K., Jechura, J., Neeves, K., Sheehan, J., Wallace, B., Montague, L., Slayton, A. & Lukas, J. (2002) *Lignocellulosic Biomass to Ethanol Process Design and Economics Utilizing Co-Current Dilute Acid Prehydrolysis and Enzymatic Hydrolysis for Corn Stover* (Natl. Renewable Energy Lab, Golden, CO), NREL Publ. No. TP-510-32438.
29. Tiffany, D. G. & Eidman, V. R. (2005) in *Food, Agriculture, and the Environment: Economic Issues* eds. Defrancesco, E., Galletto, L.& Thiene, M. (FrancoAngeli, Milan), pp. 325–340.
30. Larson, E. D., Williams, R. H. & Jin, H. (2006) *Presented at the 8th International Conference on Greenhouse Gas Control Technologies, 2006, Trondheim, NorwayFuels and Electricity From Biomass With CO_2 Capture and Storage*.
31. Fedoroff, N. V. & Cohen, J. E. (1999) *Proc. Natl. Acad. Sci. USA* **96**, 5903–5907.[Free Full Text]
32. U.S. Department of Energy, Energy Information Administration (2006) *International Energy Outlook* (Dept. of Energy, Washington, DC), DOE Publ. No. EIA-0484 (2006).
33. Perlack, R. D., Wright, L. L., Turhollow, A. F., Graham, R. L., Stokes, B. J. & Erbach, D. C. (2005) *Biomass as Feedstock for a Bioenergy and Bioproducts Industry: The Technical Feasibility of a Billion-Ton Annual Supply* (Oak Ridge Natl. Lab, Oak Ridge, TN), ORNL Publ. No. TM-2005/66.

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Comprehensive Study on the County's Equine Industry

In 2001, the County completed a 2 year comprehensive study on the importance of horses and their economic contribution as part of the County's Agricultural Industry. This study was conducted in cooperation between the Montgomery Soil Conservation District and the Agricultural Services Division; the results are available on the division's website. Through the study, a new database of horse operations was developed for use in conjunction with the County's Geographic Information System (GIS).

Agricultural Emergency Drought Assistance Program (Ag. EAP)

The lack of normal rainfall during the 1990's created tremendous economic hardship for County farmers. The droughts of 1997 and 1999 will be recorded as some of the worst during the 21st Century. In an attempt to provide financial assistance to

Agricultural Statistics

Economic Contribution to County's Economy

Over 179 County farms have annual sales of $10,000 or more. The average farm size is 130 acres and 40 percent of the farms are greater than 50 acres in size.

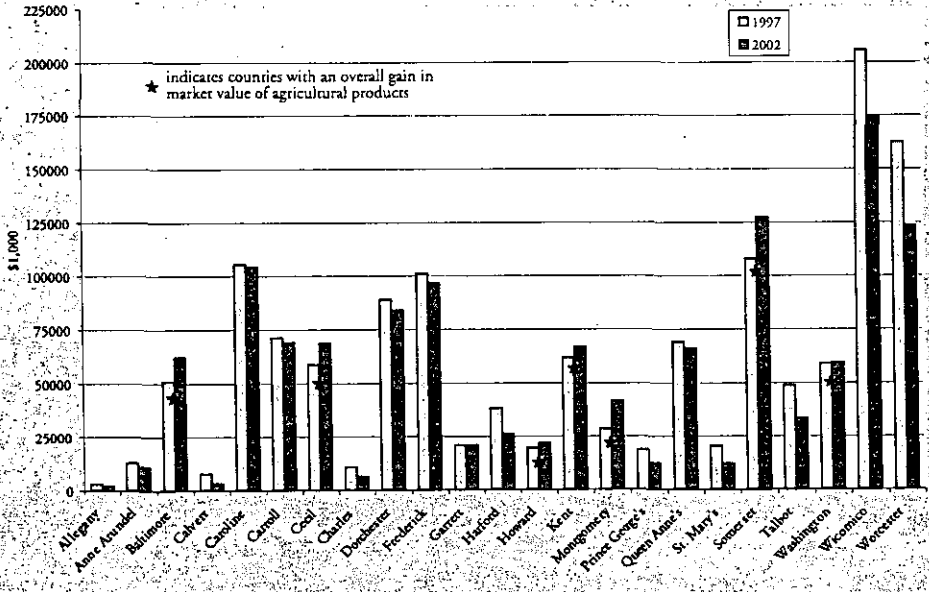
Traditional Agriculture	$41,634,000
Horticultural Industry	$125,330,000
Equine Industry	$84,855,896*
Total	$251,819,896

**Annual Costs*

Montgomery County Agricultural Industry

Total Land in Montgomery County: 316,800 acres
Agriculturally Assessed Lands: 82,346 acres
Land in Farms: 75,077 acres
Percent of Land in Farms: 24%
Number of Farms: 577 farms
Number of Horticultural Businesses: 350
Average Farm Size: 130 acres
Total Cropland: 53,209 acres
Harvested Crop Land: 44,161 acres
Pasture Land: 12,536 acres
Woodland (Public 31,513 and Private 57,487): 89,000 acres
Average Age of Operator: 57.4 years
Percentage of Principal Occupation Farmers: 50.0%

Market Value of Agricultural Products in Maryland Counties: 1997 & 2002



Farms by Type of Enterprise

Crop or Livestock	Number of Farms	Amount Produced	
Beef	104	2,201 Cows	
Horse	783	12,000 Horses	
Dairy	7	1,546 Cows	
Sheep	47	952 Sheep	
Corn for Grain	48	1.04 Million Bushels	11,121 Acres
Corn for Silage	14	20,805 Tons	1,304 Acres
Wheat	34	313,107 Bushels	4,717 Acres
Soybeans	43	403,042 Bushels	13,794 Acres
Hay	192	26,145 Tons	11,524 Acres
Fruits, Vegetables, Flowers	33	3,000 Acres	
Christmas Trees	18		
Production Nurseries and Greenhouses	175	900 Acres	
Sod	26	4,500 Acres	
Landscape, Arborist, Lawn Care	150 businesses		

Statistics provided by United States Department of Agriculture (Census of Agriculture1992/1997/2003) and University of Maryland Cooperative Extension - Prepared by: Montgomery County Department of Economic Development Agricultural Services Division 301-590-2823 May 2006

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farmers, Montgomery County created the first County-funded Drought Assistance Program in the nation.

In 1997, the County approved $500,000 which was distributed to 67 farmers and covered 26,254 acres. In 1999, $1.0 million was approved and these funds were distributed to 94 farmers, covering over 36,590 acres. The AgEAP program was administered by the Agricultural Services Division and serves as an example of Montgomery County's commitment to preserving both farmland and the business of farming. Many farmers would not be in business today if the County Government, through the Duncan Administration, had not created this critical program to help farmers in their time of need.

Request for a Comprehensive Tree Trimming Program

Through the Agricultural Services Division, a Tree Trimming Survey was conducted throughout the County's agricultural community in 2002. The results indicated the need for the County Government to establish a County-wide tree-trimming program. Public roads, whether urban or rural, need to meet the needs of the citizens and businesses that use them each day. A comprehensive tree-trimming program can reduce the costs incurred from damaged vehicles, school buses, fire trucks and farm equipment and it demonstrates the County's concern for the safety of all those who use County roads. Tree trimming is a recurring maintenance need due to the growth rate of vegetation, and will remain a high priority in the Agricultural Reserve.

Weed Control

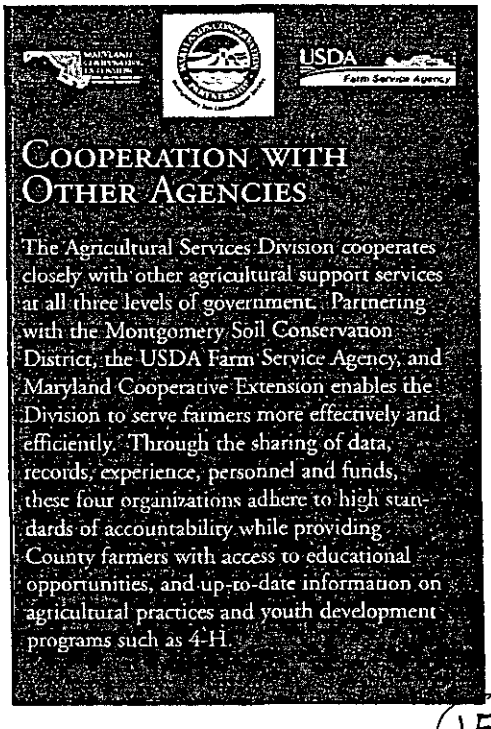
Weeds such as Johnsongrass, shattercane, thistle and multiflora rose pose a danger to the productive capability of all non-forested lands, and three of these four weeds have been classified as noxious and prohibited by State law. Landowners are obligated to control these weeds on any lands they own or operate in the State of Maryland. In cooperation with the Agricultural Services Division and the Maryland Department of Agriculture, Montgomery Weed Control, Inc. provides a service to farmers and other landowners in need of control options for these noxious weeds.

Bio-Fuels

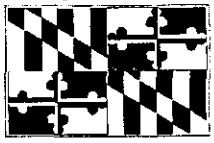
The rising cost of traditional energy has created a demand for alternative fuel-energy sources. An opportunity is evolving for County agriculture to participate more fully in the production of bio-fuels from crops such as soybeans and corn. Bio-fuels have multiple environmental and economic advantages over oil-based fuels, and give farmers an additional market for their crops. Increasing the production of bio-fuels will provide the United States with a reliable, renewable domestic energy supply while providing some alternatives to foreign oil.

Ethanol E-85 Program – The Maryland Grain Producers Association in cooperation with the Montgomery County Department of Public Works and Transportation established an Ethanol E-85 Program for County fleet vehicles and the general public. The use of ethanol fuel furthers public policies that mandate the reduction of air pollution and the creation of alternative markets for grain products. The demand for ethanol by the County Government represents a future market opportunity for farmers who grow corn, the crop that is used to produce this alternative fuel.

Bio-Diesel – Montgomery County is exploring a public/private partnership to invest County resources in feasibility studies for the production and distribution of bio-diesel fuel in northern-central Maryland. Locally-produced bio-diesel can provide an alternative market for County soybeans, give farmers more options in the purchase of fuel-energy for farm equipment, and further the County's reputation as a forward-thinking, economic leader.



U.S. Department of Energy - Energy Efficiency and Renewable Energy
Alternative Fuels & Advanced Vehicles Data Center



Biodiesel Fueling Stations in Maryland

Select the "Details" button to get additional information about each station including phone number and hours of operation. The "Map It" button will take you to maps provided by Google. You also have the ability to use the Alternative Fuel Station Locator to map stations near a specific address or city location, and you may choose to route your trip using the Route Mapper Application.

Details	Name	Address	City	Type of Access	Map It
Details	Andrews Air Force Base		Andrews AFB	Private - government only	Map
Details	Cropper Oil & Gas	10535 Ocean Gateway	Berlin	Public - card key after hours	Map
Details	National Institutes of Health	9000 Rockville Pike	Bethesda	Private - government only	Map
Details	Tri Gas & Oil Company	3941 Federalsburg Highway	Federalsburg	Public - call ahead	Map
Details	Taylorsville Shell	2605 West Liberty Road	New Windsor	Public - see hours	Map
Details	Tevis Oil Company - Bare Truck Center	Route 140	Westminster	Public - see hours	Map

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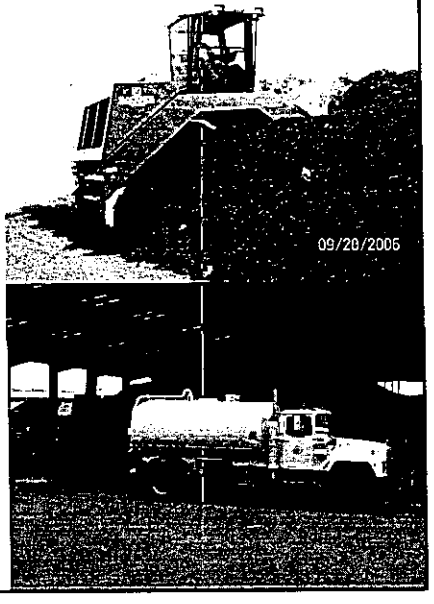
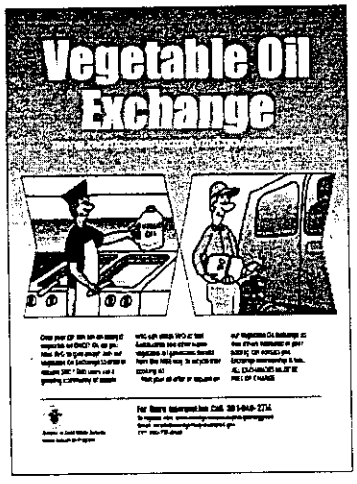
Biodiesel Pilot at DPWT Compost Facility

- Program started 5/15/07
- Started with empty 9,000 gallon fuel tank
- Cleaned tank thoroughly
  - Special cleaning contractor
- Then filled with B20
- All equipment and trucks on site are now using B20

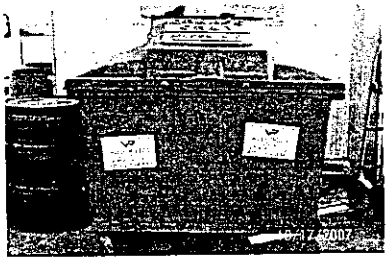


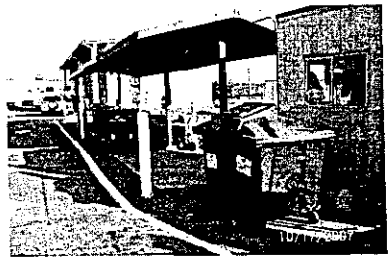
Biodiesel Pilot at DPWT Compost Facility

- Contract price fluctuates,
  - Tied 20% to a Bio-diesel market index, and 80% to the Diesel index.
- Site Consumption
  = 5,500 gal/month
- There have been no problems with equipment or trucks
- Will monitor effect of winter on equipment and trucks



This ad, launched in early September, is an entirely web-based program that matches those who use vegetable oil as fuel with generators, usually restaurants. So far, 18 members have signed on including two restaurants.





Waste cooking oil drop-off started in Sept06. The container is supplied by Valley Protein and holds approximately 300 gallons. It is picked up twice per month for a total of 1000 pounds per month.

Veg. oil will soon power a DPWT diesel pick-up truck. Stay tuned!

Gazette.Net
Maryland Community Newspapers Online

Wednesday, Oct. 17, 2007

Montgomery greases the skids for grease-fueled vehicles

County helps owners find vegetable oil to power their converted cars

by Kenneth R. Fletcher | Capital News Service

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Like most restaurants, the Barking Dog tavern in Bethesda fills up a metal drum with grease that has fried its share of wings, then pays to have the oil hauled away by a rendering company.

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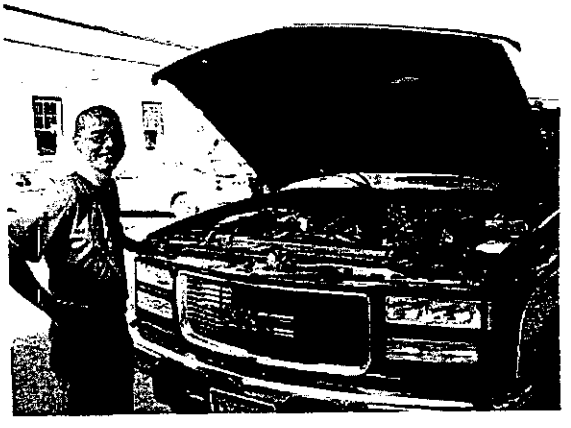
But the Barking Dog also siphons some of the used oil back into 5-gallon jugs and leaves them by a rear exit, hoping someone will pick up the oil and pour it into his car.

It's not a prank, but part of what is believed to be a first-in-the-nation government effort to link up restaurants that want to dispose of waste oil with enthusiasts who need it to fuel cars modified to run on the grease.

"For me it's a very practical application. I've got the grease sitting here," said Barking Dog owner John McManus, who would otherwise spend about $300 a year to get rid of the used oil.

The Barking Dog is the first restaurant to join an online forum that the Montgomery County Department of Public Works created in August after drivers started calling the county seeking used vegetable oil. Rather than bringing oil seekers to the county's crowded disposal area, the exchange hopes to send grease-car owners directly to restaurants, said Rick Dimont of the Montgomery County Division of Solid Waste.

People such as Frank Chu, an architect from Rockville, have eagerly



Kenneth R. Fletcher/Capital News Service
"I think it's great that the government is recognizing it on som level," Rockville architect Frank Chu says of Montgomery Co online forum for owners of vehicles powered by vegetable oil an oddity at this point."

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sought such a grease-swapping post.

Chu bought a 1994 GMC diesel Suburban two years ago and had it modified to run on straight vegetable oil after immersing himself in the Internet subculture of alternative-fuel enthusiasts. The conversion can be done on any diesel car with kits ordered online for about $1,000.

The Suburban has two fuel tanks, one for diesel and another that Chu fills by pouring vegetable oil from plastic jugs into a funnel. The engine runs for several minutes on diesel after starting, heating the oil until it is fluid enough to use. An automatic temperature sensor switches to the second tank and vegetable oil flows into the engine.

The car runs smoothly as the tailpipe belches french-fry-scented exhaust.

Chu estimates spending 10 to 15 hours a week on his hobby, including the time it takes to pick up waste oil, run it through pantyhose and denim to filter out particles left after the frying process and let it settle to separate water from the oil.

He does not get his grease from the Barking Dog but relies on a Rockville restaurant he found on his own, before the forum was created.

While Chu gets the same 14 miles per gallon around town that he would with regular diesel, h gets his fuel for free. The vehicle and conversion kit have paid for themselves in the 11,000 miles he has driven, he said.

Advocates claim that vegetable oil is a "carbon neutral" fuel, ideally emitting no more carbon into the air than is tak up by the plants grown to produce the oil, and not contributing significantly to the buildup of greenhouse gases.

But because of the legal gray area the fuel is mired in — the Environmental Protection Agency has yet to approve it use — and the potential for engine damage if used improperly, state officials say they are not yet endorsing the fuel.

"It's kind of odd. It hasn't really been accepted or unaccepted by the state," said Chris Rice, transportation program manager at the Maryland Energy Administration.

"We really have to be careful with what we promote," Rice said. "I'm not saying it's a bad idea and not saying it's

good idea."

Grease-car enthusiasts, who are modifying diesel engines in growing numbers as fuel prices rise, think Montgomery County is taking a step in the right direction.

"I think it's great that the government is recognizing it on some level," Chu said of Montgomery's online forum. "It an oddity at this point."

To Learn More

Go to www.montgomerycountymd.gov/veggieoil

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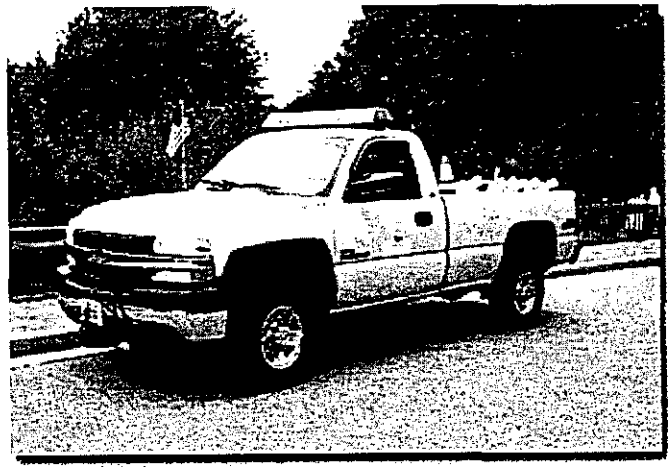
Gaithersburg Becomes First City in Maryland to Use Biodiesel Fuel

Posted 9/27/2006 Easy print



With air quality in the Washington, D.C. not meeting federal health standards for ground-level ozone and fine particles, the City of Gaithersburg is doing its part to cut down on air pollution by using biodiesel fuel. Caroline and Queen Anne's Counties on the eastern shore are also using biodiesel, but Gaithersburg is the first city in Maryland to commit to this increasingly popular alternative fuel source.

Biodiesel has become the fastest growing alternative fuel source. Nationwide, more than 300 public, utility and government fleets are using it because it burns cleaner than regular diesel, it emits fewer pollutants, and it is better for vehicle engines. As an added benefit, it is slightly less expensive than regular diesel fuel at this time.

Gaithersburg is now using B20 biodiesel, which is 20% vegetable oil and 80% diesel fuel. In this area, that vegetable oil comes primarily from soy beans. There are currently 98 vehicles in the City's diesel fleet, including trucks, buses and other heavy equipment. Those vehicles consumed just over 50,000 gallons of diesel fuel last year. Under the new initiative, diesel fuel consumption will be reduced by 10,000 gallons.

The switch to biodiesel did not require any modifications to the vehicles. However, the City's fuel storage tank was cleaned and improved filters were installed on the pumps prior to changing to biodiesel. In addition to reducing reliance on diesel fuel, the City is also helping with ongoing plans to reduce overall fuel consumption and emissions by including two hybrid passenger vehicles in its fleet, with plans to add more in the future.

For more information on the City's biodiesel program, please contact the Department of Public Works, Parks Maintenance and Engineering at **301-258-6370** or publicworks@gaithersburgmd.gov.

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www.baltimoresun.com/news/local/bay_environment/bal-md.cars13sep13,0,432632.story

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State pledges shift to buying biofuel vehicles

By Andrew A. Green

Sun reporter

September 13, 2007

State government is pledging to increase its use of ethanol- and biodiesel-powered cars and trucks and to triple the number of hybrids in its fleet by 2011.

The three-member Board of Public Works approved the policy yesterday, applauding the move as a way to bring Maryland into an eco-friendly future.

"Even though it is a small step, it is something that is concrete and solid and we can focus on it," said Comptroller Peter Franchot. "We're leading by example."

The cornerstone of the plan calls for 40 percent of state vehicle purchases over the next three years to be cars and trucks that operate on biofuels, principally ethanol and biodiesel.

Hybrids, because of price considerations, would account for a small part of the effort.

But the decision comes as the benefits of biofuels are being questioned. A report this month by the Chesapeake Bay Commission concluded that the increased use of ethanol could pose risks for the bay because of the fertilizer runoff associated with the crops usually grown to produce it.

And this week, the Organisation for Economic Co-operation and Development, an international research consortium, concluded that the total pollution caused by the production, transport and use of most kinds of ethanol and biodiesel is worse than the pollution caused by fossil fuels.

Previous academic studies have had mixed findings about the benefits of biofuels on the environment.

"In the short term, corn-based ethanol, grain-based ethanol, is here to stay," said Ann P. Swanson, the bay commission's executive director.

If the corn is grown using environmentally conscious "best management" practices, ethanol use "can be a very good thing," she said. "But without the 'best management' practices, not so."

Frank Dawson, an assistant secretary at the Maryland Department of Natural Resources, said the state's switch to using more ethanol and biodiesel could help drive the market for alternative fuels and, in turn, spur the development of

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biofuels that require less energy and less pollution to produce. Moreover, ethanol can replace other, more harmful additives in gasoline, he said.

"Just trying to encourage the idea of alternative fuels in our petroleum-based economy in and of itself is a good idea," Dawson said.

State officials did not provide a cost estimate for the policy change. At present, hybrid sedans cost nearly twice as much as the equivalent cars in the state fleet, but officials said it's difficult to predict how the increasing market for alternative-fuel cars will affect prices over the plan's four-year time frame.

There is little debate about the environmental benefits of hybrids -- whatever kind of fuel they use, they use less of it -- but those cars and trucks will make up a relatively small part of the state's vehicle fleet under the plan.

The state owns 30 hybrids -- about 0.3 percent of its 9,100-vehicle fleet. The goal is to bring that to 100, which would be about 1.1 percent of the fleet.

As part of the plan, the board approved four new kinds of hybrids for state use, including a sedan, a police pursuit sport utility vehicle and two kinds of pickup trucks. In a separate initiative, the Department of Transportation is testing hybrid buses to determine their durability and cost-effectiveness, said Transportation Secretary John D. Porcari.

Part of the reason the state doesn't have more hybrids, Budget Secretary T. Eloise Foster said, is that agencies have particular needs for which the hybrid market is limited -- about 18 percent of the state's fleet is made up of police cruisers, for example.

But Treasurer Nancy K. Kopp -- who rented a Toyota Prius on a recent vacation -- said the state should think harder about whether hybrids on the market could meet its needs, particularly in agencies where vehicles are used mostly in urban areas.

"It was a really good car to drive," Kopp said, "very enjoyable."

But, at least at this time, hybrids are more expensive. Larry Williams, the state's fleet manager, said most of the sedans the state buys are Dodge Neons or Chevy Cavaliers, for which it pays about $11,500. There are no hybrids in that price class, and the only hybrid sedan on the state's approved list, the Honda Civic hybrid, costs $21,000, he said.

Given the current price of gas -- $2.73 a gallon on average in Baltimore, according to AAA Mid-Atlantic -- state employees would have to drive a Civic more than 200,000 miles for the state to break even.

And that wouldn't happen: The state routinely stops using its vehicles after 100,000 miles. That means hybrid sedans would make economic sense for the state if gas cost $5.58 a gallon.

"They are a little bit more costly," Foster said. "But long range, our goal is to purchase more of them."

andy.green@baltsun.com

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Consumer Information

www.mdsoy.org

First Biodiesel Plant Opens in Maryland

Maryland Biodiesel CFO Virginia Warren proudly announced the Grand Opening of Maryland Biodiesel, Inc.-- the first biodiesel production facility located in the state of Maryland, June 19, 2006. Maryland Biodiesel is located in Berlin at 10535 Ocean Gateway (Rt. 50).

"Biodiesel can be operated in any diesel engine with no modification to the engine or the fuel system," said Virginia Warren. "Biodiesel is better for the environment because it is made from renewable resources and has lower emissions compared to petroleum diesel. It is less toxic than table salt and biodegrades as fast as sugar. Since it is made in the USA from renewable resources such as soybeans, its use decreases our dependency on foreign oil and contributes to our own economy."

Special guests included federal, state and local government officials and industry leaders. Maryland Gov. Bob Ehrlich visited the grand opening to wish the Warrens well, and Congressman Wayne T. Gilchrest was on hand for the ceremonial ribbon-cutting.

Maryland Soybean Board staff were also on hand to congratulate the Warren family. "This is an exciting day for all soybean farmers in Maryland, to see the potential that biodiesel represents to our farmers and industry become realized," said Sandra Davis, executive director of the soybean checkoff board. The soybean checkoff board had been an active supporter of the Maryland Biodiesel plant, assisting the Warrens with information and educational opportunities as they pursued their business plan.

When complete the Maryland Biodiesel plant will produce 1500 gallons per day of B100 biodiesel, and even that won't be enough. "Demand already exceeds supply," says James Warren, President of Maryland Biodiesel, "And we have plans to expand. But our first priority is getting this facility up and running."

For more information visit www.mdbiodiesel.com.

Go Back to Consumer Information Main Page.

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Gazette.Net
Maryland Community Newspapers Online

Friday, Sept. 28, 2007

Brothers to launch biodiesel plant in Baltimore

Buckeystown company plans to start production in next year

by Rebecca McClay | Staff Writer

E-mail this article \ Print this article

Loops of hose, wiring and pipes wend their way around the propane tanks and fuel truck in the makeshift biodiesel production plant at Windridge Farm in Buckeystown.

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Chasing dreams without limits

For years, the Butz brothers — Edward, Thomas, Robert and Jeremy — have been tinkering like mad scientists with the biodiesel production process. They are now on the verge of launching what they hope will be their successful entry into the growing market for the alternative fuel.

In the next year, the Butzes' Chesapeake Green Fuel Corp., which includes partner Eric Franzoi, plans to start production in a plant in Baltimore's Curtis Bay that will annually churn out 10 million gallons of the relatively eco-friendly fuel.

Bill Ryan/The Gazette
"We've decided to take on biodiesel," says Jeremy Butz of Buckeystown, who, along with his brothers, plans to open a manufacturing plant in Baltimore.

Biodiesel, made from soy oil, chicken fat and other greasy organic products, requires a fine-tuned process that the engineers have been trying to perfect in their makeshift facility, a former tilapia warehouse in Buckeystown.

Biodiesel — which can be used by engines that use conventional diesel fuel — is the result of a chemical process in which fat, an alcohol and an enzyme are mixed and then heated. It's simpler than the ethanol production process, which uses products such as corn and is a fermentation process in which starches and sugars are converted into

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alcohol, Jeremy Butz said.

Butz said he hopes widespread use of biodiesel will relieve the United States of its dependence on foreign oil, while creating a fuel with multiple benefits for the environment. Biodiesel reduces net carbon dioxide emissions by 78 percent compared with petroleum diesel, according to the U.S. Department of Agriculture.

''We've decided to take on biodiesel," Butz said. ''Biodiesel is a renewable fuel. It's obviously good for the environment. Its aroma is a lot more pleasant" than gasoline or diesel fuel. It's been compared to the aroma of french fries.

Soybeans, chickensand restaurant grease

One production process uses a ''feed stock" such as soybeans, which are crushed to extract oil, with remnants fed to chickens. Or, less expensively, chicken fat could serve as the ''feed stock," with the byproduct, glycerine, which could be sold to asphalt plants for heating fuel, Butz said. Other sources of biodiesel include frying oil and yellow grease from restaurants, which are in great supply.

Including government subsidies, the process costs roughly $2.77 per gallon and the Butzes are aiming to keep that cost low so more customers will convert to the fuel. ''The whole purpose was to go after lower cost," Butz said.

''We weren't happy with any of the biodiesel systems that were out there. They failed or had to be revamped. Now, a lot of technology companies have caught up.

''Alternative feed stocks [like soy] are difficult to process," Butz said. Chesapeake Green Fuel ''may cater specifical to requests for particular fuel products, like soy-based products, but would have to pass those costs onto the custome We are trying to create a cost-competitive product."

Under the brand name ''Renovo," which is Latin for ''renew," the biodiesel from the Buckeystown plant is ready to enter the market, they said. It will likely first be sold in the next few months through fueling stations in Annapolis ar Baltimore.

The current pilot plant at the warehouse on Capstine Road will continue to operate as a research and development facility when the Baltimore plant opens next year. The Butz brothers will officially own the Baltimore plant within

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two months and will hustle to start production as soon as possible, they said.

They anticipate hiring upward of 25 employees through Maryland's Enterprise Zone program, which is used to revitalize areas of the state by offering incentives to businesses that locate within the zone.

Del. Paul S. Stull, who toured the Buckeystown operation Tuesday with several other members of the state's Environmental Matters Committee, said he thinks government could have a role in boosting the use of the alternative fuel.

"It's a good renewable fuel," said Stull (R-Dist. 4A) of Walkersville. "If we can keep that going, it's going to hopefully help with the price of gasoline."

Rep. Roscoe G. Bartlett (R-Dist. 6) of Buckeystown supports tax credits for biodiesel, which for producers are $1 per gallon for biodiesel derived from agricultural products and 50 cents per gallon for fat-based products, said his spokeswoman Lisa Wright.

Fat-based biodiesel is "an economically feasible and sustainable source of fuel," Wright said. "It has both technical and economic potential and could be very helpful to promote and explore alternative fuels."

Chesapeake Green Fuel collects low-cost grease door-to-door from restaurants and anticipates continuing the routine as well as increasing chicken fat and grease collections from companies throughout Maryland, when the Baltimore plant opens. The company has already secured seven patents for its process.

Butz is anticipating that larger companies such as Wal-Mart will be among the most eager to convert to biodiesel use "to reduce their carbon footprint."

"We intend to have a product that differentiates itself from others," Butz said. "We'll have a fuel that meets everyone's needs. ... Once it gets into the mainstream, I don't think you'll have many people switching back from biodiesel."

Biodiesel Locations

Locations of fuel stations that sell biodiesel are available at www.biodiesel.org.

Gallons of biodiesel sold in the U.S.

2006 250 million

2005 75 million

2004 25 million

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2003 20 million

2002 15 million

2001 5 million

2000 2 million

1999 500,000

Source: The National Biodiesel Board

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City and County of San Francisco
Office of the Mayor

11/20/07 - Mayor Newsom Launches SFGreasecycle - The Nation's First Citywide Program That Collects Waste Grease to Create Biofuel for Municipal Fleet

FOR IMMEDIATE RELEASE:
Tuesday, November 20, 2007
Contact: Mayor's Office of Communications, 415-554-6131
Tyrone Jue, SFPUC, 415-554-3247

***** PRESS RELEASE *****

MAYOR NEWSOM LAUNCHES SFGREASECYCLE - THE NATION'S FIRST CITYWIDE PROGRAM THAT COLLECTS WASTE GREASE TO CREATE BIOFUEL FOR MUNICIPAL FLEET

SAN FRANCISCO, CA - In an effort to reduce greenhouse gas emissions, combat climate change and curb the growing number of clogged sewers plaguing City residents and businesses, Mayor Gavin Newsom today launched an innovative solution to collect fats, oil and grease (FOG) free of charge from City restaurants and turn them into biofuel for City-owned vehicles. SFGreasecycle is the nation's first citywide program to turn FOG into fuel for municipal fleets and will save residents and businesses money, unclog City sewers, and reduce greenhouse gas emissions. The first SFGreasecycle restaurant waste grease pickup occurred today at Puccini and Pinetti in Union Square.

"San Francisco's entrepreneurial and environmental spirit is once again front and center with our innovative biodiesel creation program," said Mayor Newsom. "Our program will serve as a model for cities throughout the world who aim to transform their grease waste into useable, sustainable energy."

SFGreasecycle is a program that was developed by the San Francisco Public Utilities Commission (SFPUC) as a sustainable alternative to combat sewer blockages caused in part by excess cooking oils and fats discharged down drains from restaurants and homes. Each year, the SFPUC estimates that 50% of sewer emergency calls are related to backups caused by grease blockages costing their ratepayers $3.5 million a year in repairs.

"We're taking a serious City problem and using the best available technology to save our ratepayers' money and do something good for the environment," said SFPUC General Manager Susan Leal. "For every 5 gallons of grease we collect and keep out of our sewers, we displace 5 gallons of petroleum diesel. That is a net 100 pound reduction in carbon emission."

San Francisco, a national leader in initiatives to reduce greenhouse gas emissions, has a City fleet of more than 1600 diesel vehicles being retrofitted to accept the new biofuel source. In 2006, Mayor Newsom signed an executive directive mandating that the entire city fleet be converted by December 31, 2007. The City is currently on pace to meet that goal. Initially, biodiesel for the City fleet will be purchased through

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an existing city contract, with the future plan to procure all biodiesel generated from San Francisco's restaurant waste oil stream.

Recycled FOG from San Francisco restaurants is estimated to generate 1.5 million gallons of biofuel each year. 59 restaurants have already signed up for the SFGreasecycle program before its launch with more expressing interest every day.

"The SFPUC's SFGreasecycle program provides an immediate financial benefit to one of San Francisco's most important economic engines - the restaurant and food service establishment industry," said Golden Gate Restaurant Association President Kevin Westlye. "I encourage all restaurants and food service establishments to sign up for the program."

Mayor Newsom and the SFPUC also announced that this Thanksgiving, residents can drop-off their holiday waste cooking oil for conversion to biodiesel for the City fleet at Costco, located at 450 10th Street. The Costco drop-off location will be open from November 23-26 during their normal operating hours of Friday, 9-8:30pm; Saturday, 9:30-7:00pm; Sunday, 10-6pm; and Monday, 11-8:30pm.

For more information or to sign up for the SFPUC's free restaurant waste oil collection service, please call (415) 695-7366 or visit sfgreasecycle.org.

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