

The Beautiful Smell of French Fries

by Dave Conz

In his January 2007 State of the Union¹, President Bush declared that “it’s in our vital interest to diversify America’s energy supply -- the way forward is through technology. We need to ... expand the use of clean diesel vehicles and biodiesel fuel....At the same time, we need to reform and modernize fuel economy standards for cars....” This makes sense. As part of a repertoire of alternative technologies, such as ethanol (which can be used in gasoline engines), hydrogen fuel cell vehicles, hybrid-electric vehicles, advanced engine designs, and new materials that reduce weight and increase mileage, biodiesel stands out. Unlike hydrogen fuel cells, it is compatible with our current infrastructure. It can be made from any vegetable oil or animal fat (including waste vegetable oil from fast food restaurants), it is produced domestically, it pollutes far less than petroleum fuel², it is available in all fifty states, it can be blended in any proportion with petroleum diesel fuel, and it works in diesel cars, trucks, trains, buses, ships, generators, and even as a substitute for heating oil.

In the early 1980s, Americans could buy diesel-powered Cadillacs, El Caminos, Chevettes, as well as imports from BMW, Mercedes-Benz, Volkswagen, and Peugeot (many of which are still on the road due to the longevity of the diesel engine). In 2005, US consumers could purchase a new diesel-powered Beetle, Golf, Jetta, or Passat from Volkswagen or diesel Liberty from Jeep. Yet today, while diesel pickup trucks and SUVs are available in the US, there are no new diesel passenger cars on the market with the exception of the luxury 2007 Mercedes-Benz E320, which costs over \$60,000.

In an era when affordable and environmentally beneficial alternatives to fossil fuels ought to be a national priority, we have been moving consistently in the wrong direction. Why? The story is complex, and illustrates what happens when regulatory policies can’t keep pace with technological change, and vice-versa. If, for example, advances in post-combustion exhaust emissions treatment technology outpace uniform adoption of fuel quality standards and improvements in the fuel refining process, catalytic converters on cars won’t work right and will fail emissions tests. Moreover, it is the very flexibility of diesel technology that gets it into trouble. Diesel engines are particularly difficult to regulate because they can run off many different “fuels.” In the UK, the “frying squad” sniffs tailpipes to detect the tell-tale aroma of fish and chips and fines drivers for evading hefty fuel taxes by using vegetable oil instead of diesel fuel.³ In the US, home heating oil is dyed red to prevent truckers from using it in their big rigs. Troopers take fuel samples at interstate weigh stations; if even a tinge of pink is detectible, drivers are fined, again for tax evasion.

Rudolf Diesel (1858-1913) envisioned his engine would replace the inefficient steam engines of his day.⁴ His quest for efficiency and durability can be seen in his early engine designs and patents; he intended his engine to run on a variety of fuels, including petroleum. Diesel thought his engine would help empower small-scale users who would otherwise be alienated from the means of production during the industrial revolution. He intended that users would burn whatever fuel was available – vegetable and animal oils, coal dust suspended in alcohol, and petroleum fuel. While Diesel originally designed his engine to run on a variety of fuels, because petroleum was cheap and plentiful at the turn of the 20th century, his engine was eventually modified to run best on petroleum fuel.⁵ In this sense, the promise of biodiesel today resurrects Diesel’s original vision of a multi-fuel engine.

Indeed, because the chemical reaction for making biodiesel is quite simple (given the proper ratios of additives, that is), it can be accomplished on any scale - from several ounces to thousands of gallons - by using relatively crude equipment. Many homebrewers use 55 gallon drums as reaction vessels, equipping them with small mixing motors and pumps. The difference in scale allows biodiesel to be produced easily by individuals, using equipment as simple as a counter-top blender, while petroleum diesel fuel must be made in a large distillation tower as part of an oil refinery. In other words, biodiesel homebrewers are realizing Rudolf Diesel’s dream by operating independently and locally, on a small scale.

Biodiesel also mobilizes an oddly diverse coalition of social groups: academic scientists; businesses such as Rockland Materials; environmentalists; famous actors and musicians—Darryl Hannah, Willy Nelson, and Neil Young; farmers, especially Midwest soybean growers; federal government officials from the USDA, DOT, EPA, IRS, as well as state and local officials; lobbyists, such as the National Biodiesel Board (NBB); Original Equipment Manufacturers (OEMs) of diesel engines and related systems such as Volkswagen, Daimler-Chrysler, Bosch, and John Deere; policy makers at all levels of government; and rendering and processing companies, who collect and process animal and vegetable oils. Each views biodiesel from a different perspective. Here is a brief discussion of four of these groups.

¹ Available at <http://www.whitehouse.gov/stateoftheunion/2007/>

² Particulate matter and sulfur emissions are nearly eliminated by using 100% biodiesel, while hydrocarbons and CO decrease significantly. One highly contested exception is NOx emissions, which may go up or down depending on which biodiesel blend is used, what type of fat the biodiesel is made from, and which government scientist is asked.

³ http://www.guardian.co.uk/uk_news/story/0,3604,807299,00.html

⁴ Donald E. Thomas, Jr. (1987) Diesel: Technology and Society in Industrial Germany

⁵ Greg Pahl (2005) Biodiesel: Growing a New Energy Economy

GOVERNMENT AGENCIES: The Environmental Protection Agency, the Internal Revenue Service, Congress, and state and local governments are concerned with collecting taxes and regulating air and fuel quality. Some government organizations have heralded the use of biodiesel. Various school districts (including Kyrene and Deer Valley in Arizona), The National Parks Service, US Postal Service, and US Military have all used biodiesel and many state and local governments (including Flagstaff and Scottsdale) are using it in their bus systems, fire engines, and garbage trucks. This use is encouraged primarily through the Environmental Protection Act as revised in 1992, which mandated that government fleets adopt clean-fuel vehicles and fuels. However, there are no incentives for individuals to make or use biodiesel fuel, and there are no consistent quality standards for biodiesel blends. And due to loopholes that offered up to 100% state-funded rebates to businesses and individuals in Arizona that purchased certain vehicles in 2000, taxpayers had to foot the bill for hundreds of millions of dollars, and "alt fuel" became a taboo topic.⁶

TRADE AND LOBBYING ORGANIZATIONS: The National Biodiesel Board's (NBB) mission is to increase the demand of *commercially produced* biodiesel in the United States through education, communication, and *quality assurance programs* and by serving as the national coordinating entity and clearinghouse of information."⁷ While the NBB has influenced policy to help build the biodiesel industry, they have ignored consumer outreach, a crucial component of widespread acceptance of biodiesel and diesel technology. The NBB funded million-dollar health effects studies in order to gain EPA approval of biodiesel as a clean-air fuel. Many homebrewers feel the test data should be accessible for free so that they too might register their homemade fuel with the EPA, but the NBB considers the data proprietary and charges hefty dues and royalties in order to access the data.

ORIGINAL EQUIPMENT MANUFACTURERS: OEMs such as Volkswagen, Ford, Daimler-Chrysler, General Motors, Caterpillar, John Deere, and International are generally opposed to the use of any but the smallest percentage biodiesel, fearing potential warranty issues. Yet, they can't resist touting the environmental benefits of biodiesel. In January 2005, John Deere announced that, to show their commitment to clean air, they would fill the diesels leaving their factory with "biodiesel." Upon closer inspection, they were referring to a B2 blend of 98% petroleum diesel. Not to be outdone, Chrysler announced that its new Jeep Liberty turbo diesel would leave the assembly line with B5 in the tank (95% petro-diesel). Volkswagen of America allows B5 under their warranty and Daimler-Chrysler announced in 2006 that it is considering increasing its approval of B5 to allow B20 blends. While this is a boon to the biodiesel industry, many homebrewers saw the small percentages as misleading and an affront to their goal of promoting the use of B100.

BUSINESS OWNERS: Rockland Materials of Phoenix, AZ, uses B100 in its fleet of heavy-duty construction vehicles, arguing that the reduction in pollution is worth the added expense. Even though Rockland has received national recognition for its early adoption and voluntary use of biodiesel, CEO Grant Goodman wrote an editorial to the Arizona Republic⁸, in which he explains his frustration with an unresponsive political system, the lack of economic incentives and financial support, and the need for more public outreach. He even offers suggestions for possible alternative incentives that would not cost the state, county, or local governments any money: allowing his trucks to use the HOV (commuter) lanes, for example, which would save his company time and money. But because Arizona does not recognize biodiesel as an alternative fuel (due mainly to the alt-fuels scandal), Rockland Materials cannot enjoy the benefits of such incentives.

Biodiesel represents a lost opportunity to reduce dependence on foreign oil and reduce most emissions. The problem stems from regulatory agencies focusing on one small part of a complex socio-technical system, namely the fuel. By basing emissions standards on petroleum diesel fuel, the benefits of biodiesel remain untapped. These benefits include significantly less particulate matter, carbon monoxide, and hydrocarbon emissions, as well as "carbon neutrality" – that is, the plants used to make the biofuels produce oxygen when they are grown, offsetting the impact of carbon produced during combustion. Emissions from petroleum diesel fuel are carcinogenic and contribute to acid rain and smog formation by producing sulfur and therefore *should* be regulated. But as Grant Goodman points out, this should not preclude the legislative flexibility to allow the use of alternative fuels like biodiesel in the same engine. Gasoline-electric hybrid cars may drive in the commuter lane in Arizona (and across the country) with a single driver, presumably because they get higher mileage than regular gas cars. But diesel cars typically get 30-40% more miles per gallon than gas cars regardless of the fuel they are using. Disincentives prevent the very goals set forth by policymakers such as those outlined by President Bush.

But the myopia of focusing on one single part of a complex issue cuts both ways: according to a recent New York Times article⁹, efforts in Europe to promote biodiesel because it can help reduce carbon emissions have backfired. Increased demand for tropical palm oil as the biofuel of choice has incentivized palm growers in the South Pacific to use slash-and-burn land-clearing to make way for palm plantations. The result: thousands of tons of

⁶ <http://www.stateline.org/live/ViewPage.action?siteNodeld=136&languageId=1&contentId=14196>

⁷ <http://biodiesel.org/aboutNBB/whoarewe/>, emphasis added

⁸ Grant Goodman, November 24, 2001 editorial, The Arizona Republic, "Biofuel solves a big problem, so why is nobody listening?"

⁹ New York Times, February 5, 2007

<http://www.nytimes.com/2007/01/31/business/worldbusiness/31biofuel.html?ex=1327899600&en=e653a375e67e8e49ei=5088partner=rssnytemc=rss>

carbon are released into the atmosphere, outweighing – by orders of magnitude - any emission reduction detected in Europe.

The lesson is that action focused on a single component of a complex socio-technical system can result in unintended negative consequences elsewhere in the system. In the U.S. it is now impossible to buy a diesel automobile because of unacceptable emissions from burning petroleum diesel fuel. Yet by simply replacing the fossil fuel with biodiesel, the same car becomes a cleaner-burning, alternative fuel vehicle.¹⁰ In contrast, by focusing on a particular biodiesel feedstock – like palm oil – instead of a broad range of fats and oils, carbon emissions are actually increased.

But there is hope: it appears these setbacks might be temporary. “Waivers” are now available from the Air Resources Board in California for small producers to sell biodiesel. Honda promises to offer a turbo-diesel option of its popular Accord in the US by 2010, and Volkswagen diesels should be available for sale again by next year. Domestic biodiesel production has increased exponentially over the past ten years. And I’ve noticed more and more frequently the delicious aroma of french fries while driving behind other diesels. While biodiesel isn’t a solution to our oil woes, it’s a step in the right direction.

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¹⁰ This issue is far more complicated than I imply here; while there is general agreement that biodiesel greatly reduces most emissions, different government agencies argue whether biodiesel increases or decreases nitrogen oxide (NOx) emissions and whether NOx leads to smog.