

FROM FOOD

to

FUEL

*Used Vegetable Oil Among the
Ingredients for Biodiesel*

Companies in urban locales across the U.S. are implementing plans to convert food wastes—including used vegetable oil—into biodiesel fuel. The contribution to overall biodiesel output is small, experts say, though reliable production figures are not readily available. Still, policymakers are starting to take note, their interest piqued by the promise of tackling a variety of urban environmental woes at once.

By Rona Cohen



If you eat out in New York City, the grease from your next order of french fries could one day end up in your fuel tank.

That is, if all goes according to the plans of one local environmental advocate-turned businessman, whose company, Tri-State Biodiesel, aims to convert used vegetable oil into biodiesel fuel for the region's cars, trucks and buses starting next year.

"We're recycling a nuisance product," said CEO Brent Baker, explaining that if the grease gets dumped, it can clog drains and attract rodents.

Baker is one of a flood of entrepreneurs seeking to jumpstart the market for domestically produced energy at a time when interest in biofuels is exploding. In his State of the Union address, President Bush called for a mandatory fuels standard of 35 billion gallons of renewable and alternate by 2017, five times the 7 billion gallons currently being produced. Farmers are hoping to capitalize on the trend by boosting their plantings of the two main crops used to make biofuels in the U.S.: corn and soybeans.

But several recent studies warn that there are significant downsides to the biofuels frenzy. For one, growing crops for fuel instead of food could raise prices for animal feed and consumer products—a side effect that could hit the poor particularly hard. A recent report from the Government Accountability Office forecasts that 30 percent of the U.S. corn crop will go to ethanol production by 2012, and lift corn prices to record highs. In Germany, beer prices are already creeping up as farmers eschew traditional crops like barley in favor of biofuels grains like rapeseed and corn. Rising soybean and grain prices in China are boosting prices for pork and eggs there.

But unlike the bulk of biofuels producers, Tri-State and a handful of other companies scattered across the U.S. are dedicated to making the fuel entirely from waste grease instead of raw oil gleaned from fresh crops. Their contribution to overall biodiesel output is small, experts say, though reliable production figures are not readily available. Still, policymakers are starting to take note, their interest piqued by the promise of tackling a variety of urban environmental woes at once.

From Sewer Pipes to Tailpipes

Biodiesel is produced by a chemical process and can be made from an array of crops, used vegetable oils or animal fat. It can be injected directly into diesel engines with few or no modifications.

Benefits include significantly lower emissions of pollutants linked to global warming and acid rain than regular diesel—but biodiesel also increases emissions of nitrogen oxide, a key ingredient of smog, some studies show.

By producing biodiesel from leftover restaurant oil, known as yellow grease, Tri-State's business plan addresses air pollution and solid waste management conundrums at the same time: The company is making cleaner-burning fuel from a product that could otherwise end up in a landfill, but sometimes ends up being dumped illegally in the city sewers, where it can cause blockages over time.

A 2004 report by the International Energy Agency projected that the U.S. produces enough waste grease to make 500 million gallons of biodiesel a year. New York City alone could produce 53 million gallons of biodiesel annually from the used vegetable oil that it generates. That's about five times the annual diesel fuel consumed by the city's entire public transit system, according to the report, titled "Biofuels for Transport."

Finding a productive use for the greasy urban menace is a critical policy objective for municipalities across the U.S.

In San Francisco, where sewer operators spend \$3.5 million a year ridding municipal pipes of blockages caused by waste oil, officials a few years ago began to consider biodiesel. They started by asking the city's 2,600 restaurants to stop disposing of processed vegetable oil in the city sewer system.

But officials quickly learned that what seemed like a simple solution led to another dilemma: Less dumping would mean restaurants would need to pay more to rendering companies to pick up the unwanted oil and cart it away.

"So, that led us to realize that of course you're going to have the mom and pops in the dead of night turning on the hot water and pouring the stuff down the drain," said Lewis Harrison, water pollution prevention program manager at the San Francisco Public Utilities Commission. "We asked, 'How could we make this into a program that's a win-win?'"

The answer, said Harrison, was to create an incentive for restaurants to keep the oil out of the waste stream—and then find a clean, marketable use for it. City officials speculated that if they could provide free yellow grease collection from restaurants, they would have a cheap and abundant feedstock for making biodiesel that could in turn power city vehicles.

Later this year, trucks will start picking up the yellow grease at eateries throughout the city and deliver it to a transfer station, pending permitting approvals. There, the grease will be filtered and sold to plants in the Bay Area that will convert it into biodiesel. The city plans to purchase the biodiesel and use it to power municipal buses and utility vehicles in a B20 biodiesel blend—20 percent biodiesel and 80 percent petroleum diesel, which is required of all city diesel engines.

Officials estimate that at least 1.2 million gallons of biodiesel can be produced annually from the leftover restaurant grease—enough to power the entire municipal fleet with a B20 blend, said Harrison.

He added that depending on the success of the program, officials might eventually provide yellow grease collection for households.

Urban Solutions

Employees at Philadelphia Fry-o-Diesel, LLC, also had waste reduction in mind when they set out to produce biodiesel from brown grease—the bits and pieces of food left on people's plates after a meal.

But company officials knew they had their work cut out for them, because few people had ever tried to make the fuel from



brown grease, which is contaminated with food particles and anything else that makes its way down the drain. Brown grease is also known as “trap grease” because by law restaurants are required to catch the substance in a grease trap before it can enter drain pipes. Trap grease is chemically different from yellow grease or raw vegetable oil.

“When we looked at this for the first time it was really unexplored,” said company president Nadia Adawi, who refers to the grease simply as junk. “We had to invent a whole new way of making biodiesel out of this stuff.”

Adawi said she and others at the company turned to trap grease largely because it was cheap and available. Making the fuel from soybeans seemed impractical, because they aren’t grown locally in large quantities and would need to be trucked in from another state. And they found that the market for yellow grease—which often is used to make animal feed—was already established.

In targeting brown grease, Adawi and her colleagues were intrigued by the option of finding a profitable use for a common waste that is costly to dispose of, has no real economic value, and often gets dumped illegally.

“We were trying to find some kind of urban model for making biodiesel,” Adawi said.

Nearly four years later, the company’s pilot plant in North Philadelphia is now producing small quantities of biodiesel that meets the national quality standard, said Adawi. Its fuel powers maintenance vehicles at the Philadelphia Zoo and a handful of other vehicles in the area. Fry-o-Diesel is currently awaiting patent approval for its technology, and is seeking financing to build a commercial facility.

Adawi is optimistic about the future prospects for making biodiesel from trap grease. More than 2 million gallons are collected each month in southeastern Pennsylvania and New Jersey, according to the company’s Web site. One recent government study suggests the amount of trap grease that could be harnessed for biodiesel exceeds that of yellow grease, she said.

“If you look at our overall diesel usage it’s a niche—but it’s a big niche,” said Adawi.

In the U.S., Fry-o-Diesel could be the first plant of its kind to produce the fuel from trap grease, Adawi said. In contrast, there are plants spread across the country that turn yellow grease into fuel—in states including California, Hawaii, Kentucky and Nevada—though little official information on actual production figures on biodiesel made from processed oil exists, said Tom Verry, director of outreach and development at the Missouri-based National Biodiesel Board.

One thing for certain is that demand is there. Production of biodiesel has skyrocketed in recent years, from 25 million tons in 2004 to an estimated 310 million tons this year, Verry said.

Some 85 percent to 90 percent of that will come from unprocessed oil, mainly from soybeans, said Verry.

Biodiesel made from recycled grease has some advantages: It has a higher energy content than other biofuels, especially when comparing its total life cycle with biofuels made from uncooked, or “virgin” vegetable oil, and factoring into account the fuel that goes into producing fertilizers, powering farm machinery and transport vehicles, Tri-State’s Baker said.

For example, for every unit of energy needed to produce a gallon of biodiesel from virgin vegetable oil, 3.2 units of energy are gained. The calculation includes soybean planting, harvesting, fuel production and transportation. That compares with 1.3 units for corn-based ethanol. By comparison, biodiesel made from used vegetable oil yields around seven units, said Verry.

But it also tends to gel at warmer temperature, which poses complications for drivers using the fuel in cold weather. An engine running on 100 percent biodiesel made from yellow grease will shut down at 52 degrees Fahrenheit, compared with 28 degrees when running on fuel made from unprocessed soybean oil, Verry said.

“That doesn’t mean it can’t be worked around,” said Verry.

Beyond Food Crops

Looking at the broader picture, Baker hopes that by turning the waste oil into fuel that burns cleaner than regular diesel, his com-

“We need to dispose of the oil, and to be able to do it in an environmentally friendly way is like a win-win for us. We are really looking at it as recycling. We’re taking a product that is no longer useful to us and giving it a second life.”

—Jennifer McDonnell, green mission specialist
Whole Foods Market Northeast

State, Federal Incentives Offered

Tri-State Biodiesel is not the only biodiesel producer with big hopes for commercializing renewable fuel in New York City.

Another company, Metro Fuel Oil Corporation, is reportedly seeking approval to break ground on a plant that would be capable of producing 110 million gallons of biodiesel from raw vegetable oil annually. That would represent more than a third of estimated nationwide output this year.

Other energy-hungry northeastern states are fast becoming home to biodiesel refineries, partly due to favorable state policies and market forces. In New York, starting this year biodiesel is required to comprise at least 2 percent of the fuel used in state fleets, increasing to at least 10 percent by 2012. A minimum of 5 percent of the heating fuel used in state buildings must also be biodiesel by 2012.

Several other states have enacted measures to promote the use of biodiesel. Minnesota requires that all diesel sold in the state contain 2 percent biodiesel. Washington and Louisiana also require biodiesel blends in fuel supplied in the state, depending on in-state production capacity. New Mexico has a biodiesel requirement slated to take effect in 2012.

In New York, some policymakers have even begun to promote biodiesel over liquefied natural gas, which is already widely used in the U.S. and in recent years has been touted by industry, government officials and some environmentalists as a cleaner, more abundant option to petroleum.

“Natural gas is not renewable but biodiesel is—and it’s still coming from other parts of the world that we have no control over, and it’s not contributing to creating jobs in the state,” said New York State Assemblyman Marc Alessi.

Alessi has introduced a four-bill legislative package that would require the state’s fleet of vehicles and local school buses to be retrofitted to run on a blend of fuel containing at least 20 percent biodiesel. It would also encourage the use of biodiesel among farmers and in home heating oil.

“As a state, we should start looking at biodiesel as the alternative fuel of choice,” he said.

At the federal level, the 2005 Renewable Fuels Standard requires the use of 7.5 billion gallons of biofuels for transportation by 2012. And under the 2005 Federal Energy Policy Act, biodiesel blenders are eligible through 2008 for a \$1 per gallon federal tax credit for biodiesel made from raw vegetable oil and 50 cents per gallon for the fuel made from yellow grease. Congress is currently considering legislation that would extend those credits for two more years.

pany will also do its part to help the nation wean itself off foreign oil, curb global warming and improve public health.

But Baker concedes that biodiesel alone will not achieve those goals. Any sustainable shift away from petroleum-based fuels will require society to embrace an array of policies and technologies, and focus on becoming more energy efficient, he said.

Baker and others also see potential in crops other than soy, like safflower, canola, jatropha and, potentially, algae, which can produce far more pounds of oil per acre than soybeans.

“We also want to look at what are the most efficient crops to produce energy, and they’re not the same crops as we grow for food,” said Baker.

For now, Baker is setting his sights on producing 3 million gallons of biodiesel by next January. This month, his company is scheduled to break ground on its plant in the Red Hook section of Brooklyn.

In the meantime, the company has already begun setting up an infrastructure for collecting the fuel from restaurants throughout Manhattan. More than 100 eateries have signed on to provide their used cooking oil, and Baker hopes to expand the service to Brooklyn and other boroughs.

So far, the response has been positive at Whole Foods stores in Manhattan.

“We need to dispose of the oil, and to be able to do it in an environmentally friendly way is like a win-win for us,” said Jennifer McDonnell, green mission specialist at Whole Foods Market Northeast.

Each week, Tri-State’s trucks pull up to the company’s stores in Chelsea, Union Square and The Bowery, where oil that has cooked up food in fryolaters and rotisseries is stored in 55 gallon drums. A hose attaches to the drums and sucks out the grease.

“We are really looking at it as recycling,” McDonnell said. “We’re taking a product that is no longer useful to us and giving it a second life.”

—Rona Cohen is senior policy analyst in the Energy & Environment Program at The Council of State Governments/Eastern Regional Conference.