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## Butter Holds the Secret to the Latest Biodiesel Fuel

By **KENNETH CHANG**

Butter is not the fuel of the future, but it is possible to churn perfectly good diesel fuel out of it.

“It was something we wanted to show could be done,” said Michael J. Haas, a research biochemist at the [United States Department of Agriculture](#).

“It’s quirky,” he acknowledged of the dairy-to-diesel research, which was [published in June in the Journal of Agricultural and Food Chemistry](#).

The impetus was an 800-pound sculpture of [Benjamin Franklin](#) and the Liberty Bell. Each year the Pennsylvania Farm Show, held in Harrisburg, commissions a masterpiece made out of butter. In 2007, the organizers solicited suggestions for what to do with the work after the farm show ended.

Dr. Haas submitted the idea of making [biodiesel](#) fuel out of it, and that is what was done. “It had never been reported in the scientific literature,” he said.

Dr. Haas collaborated with [BlackGold Biofuels](#), a small Philadelphia company that has developed a process for making biodiesel fuel out of a wide range of nonedible, low-value “fog” — the industry shorthand for fats, oils and grease.

“Rancid butter is a fat,” said Emily Landsburg, chief executive of BlackGold. After dismantling the sculpture — “Not a typical day at the office,” Ms. Landsburg recalled — the BlackGold researchers melted the butter, removed the water and fed the rest into their chemical conversion process.

The structure of a molecule of fat, oil or grease looks like a [jellyfish](#). The head of the molecule is a compound known as glycerin, and tendrils of fatty acid chains hang off the glycerin.

In the conversion, a methanol molecule replaces the glycerin as the head of the molecule, producing diesel. Biodiesel is already readily made out of cooking oil, but BlackGold says its process is far more flexible in the range of material it can convert into fuel and is not thwarted when the fats turn rancid. (On the molecular scale, the fatty acid chains start falling off the glycerins.)

The 800 pounds of butter turned into about 75 gallons at the end, a mix of biodiesel fuel and a lower-grade bunker fuel. The beheaded glycerins are also collected for use at wastewater treatment plants.

The researchers are not advocating diverting the more than one billion pounds of butter produced each year in the United States toward fuel production.

“The cost of edible butter is too high,” Dr. Haas said, and Ms. Landsburg conceded, “The number of rancid butter sculptures in the U.S. is probably not significant.”

But her company does see that agricultural waste, including that of dairy farms, as one potential source of materials that could be turned into fuel. “We took the project on as a demonstration of just how robust our technology was, that it could handle all kinds of low-grade waste,” Ms. Landsburg said.

San Francisco has just built a biodiesel plant that uses the BlackGold technology, the first of its kind, with the hope of converting pan scrapings and other so-called brown grease — grimier and dirtier than cooking oil — from restaurants into fuel.

“We’re running tests of brown grease through it right now,” said Tyrone Jue, a spokesman with the city’s public utilities commission. “We’re optimistic we’re going to be up and running in the next couple of months. It could be as early as next month.”

The plant could eventually squeeze 330 gallons of biodiesel a day out of 12,000 gallons of greasy wastewater.

“What we’re trying to do is close the loop in the city,” Mr. Jue said, “What you’re trying to get rid of becomes a resource.”