

An Opportunity in Renewable Energy for Students of Drexel RET '05 Teachers

Summary: Students work with Drexel University researchers and industrial/governmental partners to characterize restaurant “trap grease” as a potential feedstock for biofuel production. This characterization is part of a larger grease-to-fuel demonstration to Pennsylvania Department of Environmental Protection and the US EPA.

Target Audience: Highly-motivated individual students or small groups of students. Teachers are invited to participate as well.

Anticipated Laboratory Experience:

- Determination of water and solids content by thermal and gravimetric methods
 - Filtration and/or centrifugation of solids
 - Evaporative separation of grease and water
- Quantitative determination of trace metal concentrations by spectrometry
- pH measurements by titration or ion-selective electrode
- Measurement of sulfur and phosphorus content by standard methods

Anticipated Outcomes:

- Students gain hands-on application of classroom theory to a real-world project
- Results may be used as a science fair project, senior science project, etc.
- Tour of biodiesel pilot plant
- Work will be published in trade/peer-reviewed literature

Location: Flexible. Work can be conducted at Drexel or in a suitably equipped high school chemistry/biology laboratory. Supply costs will be covered by Drexel’s EPA grant.

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Grease and Go?

Drexel University Engineering Students Receive National Recognition for their Work on Biodiesel – (Short Version)

Trap grease pretreatment process is critical first step in biodiesel production.

PHILADELPHIA (August, 2005)—With talk of peak oil prices and energy independence dominating the national news, Drexel University students have risen to the challenge to help promote a local solution. Partnering with locally-based Philadelphia Fry-o-Diesel (PFoD), a student engineering team designed a new process to pre-treat restaurant “trap grease” that the company will convert into biodiesel fuel. Recently the Environmental Protection Agency National Center for Environmental Research recognized the students’ pioneering work with a grant through their P3 Award Program: A National Student Design Competition for Sustainability Focusing on People, Prosperity, and the Planet. The EPA stated the project was unique, promoted the use of alternative fuels and clearly demonstrated the need for this work.

The idea of using the trap grease from restaurants has been around for a while, according to **Mac Haas**, an environmental engineering student who is part of the Drexel team. “We are looking into how we can clean this trap grease and ultimately use a waste product as biofuel. Currently, it costs to dispose of this waste. If our idea works, we will find a cost-effective, environmentally friendly solution for all involved,” he said.

Biodiesel is a cleaner-burning, renewable fuel for diesel engines derived from vegetable oil instead of petroleum. Current domestic biodiesel production uses virgin vegetable oil, usually derived from soybeans. Used restaurant fryer oil or “yellow grease” is also an excellent source of biodiesel feedstock, however there is already a robust market for it as an animal feed additive. Trap grease, the grease that goes down the drain in a restaurant, is an abundant and underutilized source for biodiesel feedstock. An estimated one million gallons of trap grease are disposed of each month in the Philadelphia area.

Under the guidance of advisor **Dr. Nicholas Cernansky**, Frederic O. Hess Chair professor of combustion, the students developed specifications for trap grease to be used as a feedstock for biodiesel. Next, they designed and tested a process that would upgrade the trap grease to meet those specifications. Once the grease is upgraded, it will go through additional steps to be transformed into renewable heating oil and diesel.

Philadelphia Fry-o-Diesel is constructing a production facility in northeast Philadelphia which includes the student’s pretreatment system design. Their project is partially funded through a grant through from the Pennsylvania Department of Environmental Protection.

What is trap grease?

Trap grease is the grease that goes down the drain in a restaurant and is collected in a “grease trap.” Trap grease is a true waste product; restaurants and grease collectors pay for its disposal. Traps are pumped out regularly by a grease hauler and brought to a wastewater treatment plant for dehydration and incineration. Unfortunately, many grease traps are not properly serviced and maintained, and the trap grease winds up in the region’s wastewater system, leading to expensive blockages. Trap grease contains significant amounts of water and other solids, as well as grease. Through the processes of dehydration and filtration, the grease can be separated out and used as a feedstock to produce biofuels in the same way that yellow grease and virgin oils are used. According to Fry-o-Diesel, trap grease contains 134,280 BTUs of energy per gallon, equivalent to other more common biodiesel feedstocks.

Can anyone use biodiesel?

One hundred percent biodiesel or B100 has been demonstrated as a viable fuel for diesel engines, and it is frequently blended in varying proportions with petroleum diesel. Both B100 and biodiesel blends deliver a reduction in tailpipe emissions including particulates, carbon monoxide and unburned hydrocarbons. The use of biodiesel also reduces the consumption of petroleum. According to the student engineering team, a blended fuel of 20 percent biodiesel and 80 percent petroleum diesel (B20) is a popular alternative fuel that is used without any modification to diesel engines.