Used frying oil to power MIT shuttles

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An MIT shuttle bus drives down Vassar Street. Photo - Patrick Gillooly

(PhysOrg.com) -- If you catch a whiff of french fries this fall when an MIT shuttle rolls past, it won't be a coincidence. Part of the fuel in its tank may have come out of a kitchen deep fryer just a few weeks earlier.

The student group biodiesel@MIT, formed three years ago, has been working diligently — and often in an uphill effort — to secure the space, equipment, and safety approvals to begin turning leftover cooking oil into fuel that can be blended with regular diesel fuel to help power MIT's fleet of shuttles. That long effort finally came to fruition in August when the group succeeded in making its first batch, 30 gallons of slightly cloudy, golden-colored fuel. Earlier this month, they finished a second batch.

Before the fuel can actually be poured into the tank of a shuttle bus, though, it has to be tested under standards set by ASTM International (originally known as the American Society for Testing and Materials), an independent safety standards and testing organization, to assure that it's free of contaminants and has the correct "flash point" for ignition. "If it passes that," says biodiesel@MIT vice president Kyle Gilpin, a graduate student in EECS, "then we will pass it off to facilities to use in their equipment." The test results are expected next week.

This initial batches, cooked up by Gilpin and undergraduate student Natasha Jensen, might go into lawn mowing equipment, but later this fall the system should be ready to start adding 20 percent biodiesel to the fuel supply for the campus shuttles. The fuel will be made from used oil collected initially from the Student Center, and eventually from all of MIT's dining facilities. When the system is in full swing, producing about one 55-gallon drum of biodiesel per week, it should be a win-win for the Institute: It will save up to 20 percent of fuel costs (the amount of biodiesel that's blended in), since the raw material is free and the labor is donated. At the same time, it will save on the disposal cost and environmental impact of dumping the used cooking oil. And it will even make the exhaust fumes smell better.

There's no new technology involved here. The equipment used to process the used oil — which involves first filtering and then mixing it with methanol and a catalyst - was assembled by Al Landano of MBP Bioenergy, a North Conway, N.H.-based company, assisted by MBP shareholder Jim Proulx on the engineering, design, and construction, and was installed at MIT over the last few months. But as the students actually operate the equipment over the coming months and years, learning to adjust the system as they go along, they may well figure out some methods that could help improve biodiesel manufacturing in general, Gilpin suggests.

The biodiesel@MIT group was formed in 2006, and has been working ever since to draw up detailed plans and get the system installed and running. Two students who have since graduated, Matt Zedler '07 and Joe Roy-Mayhew '08, originated the project, and the group is currently led by Sara Barnowski ’10.

Finding a place

The hardest part turned out to be finding an appropriate place on campus to install the facility, given the safety issues associated with producing flammable fuel and using some toxic chemicals. Niamh Kelly of MIT's Environment, Health and Safety Office has been working closely with the group to help them get the system installed and running in Building NW14.

Gilpin has been an avid advocate for biodiesel. Last summer he made a carefully planned coast-to-coast trip in his diesel engine VW sedan, using 100 percent biodiesel the whole way. Because suppliers are hard to find in some parts of the country, that often meant having to haul along cans of the stuff in his car. "It was a challenge, but well worth it," he says.

The students hope to study "how to best go about producing the fuel, how to produce it most efficiently, and how best to handle the waste," which can include some toxic materials, he says. "There are a lot of process variations that can be tried."

Eventually, the biodiesel@MIT group, which during the academic year has about eight to 10 active members, would like to increase production by collecting oil from local restaurants. "There's no reason it couldn't be" collected from such sources, Gilpin says, although the drums of used oil tend to be "big, heavy and kind of messy."

The costs of installing the equipment were covered by a $25,000 first prize the group won in 2006 in a competition run by GE and mtvU, called the Ecomagination Challenge. The Campus Sustainability Fund has also provided support by paying students under the UROP program to work on the project, and the MIT Energy Initiative has also pledged support. The operating costs of the system are relatively small, Gilpin says, mainly for the purchase of the methanol additive. The system "will definitely pay for itself," he says.

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