Biodiesel@MIT

Making grease good

Matt Zedler

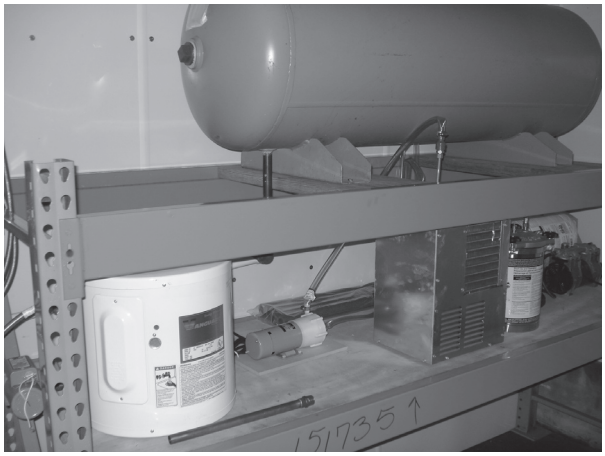
While much of the energy research done at MIT is theoretical in nature, there is a need for hands-on, small-scale experiments to educate future leaders about different energy systems. These on-campus demonstrations can serve as living laboratories for students, faculty, and community members to learn how wind power works, the best way to integrate a solar photovoltaic system into a household, or easy office efficiency improvements. One student group, Biodiesel@MIT, is pushing the development of a campus-wide biodiesel system to serve this educational purpose while also "closing the loop" by turning a waste stream of used vegetable oil (UVO) into a usable resource stream of pure biodiesel fuel.

Biodiesel@MIT was established out of an Independent Activities Period (IAP) project that investigated the feasibility of such a system on campus. Joseph Roy-Mayhew (Chemical Engineering, 2008) and a few other students determined that the amount of UVO produced in on-campus dining locations, such as the Student Center and dormitory dining halls, totaled approximately 5,000 gallons annually. This UVO can be converted into biodiesel using methanol and potassium hydroxide, producing an equal amount of the bio-based fuel, along with a small amount of glycerol. This pure biodiesel could be blended in a 20% mix with petro-diesel, producing a blended fuel (B20) that could be used in the diesel-powered Tech Shuttles on campus. Discussions with Peter Cooper (MIT Facilities), Steve Lanou (Lab for Energy & Environment), and Ward Ganger (MIT Dining) ensued, but several technical questions remained unanswered by the end of IAP.

In the fall of 2006, Roy-Mayhew met with others who were interested in biodiesel as a solution for MIT's campus sustainability to resurrect the idea. At the initial meeting, over forty students, administrators, and community members were present, suggesting a strong interest in the project. Roy-Mayhew and Matt Zedler (Mechanical Engineering, 2007) evolved the group into a weekly meeting focused on developing a proposal presenting the technical feasibility of the biodiesel system to the MIT administration and community. Biodiesel@MIT quickly achieved recognition from students, administrators, and environmental groups. Over the past year, the group was selected as the winner of the $25,000 GE / mtvU Ecocollege Challenge (www.ecocollegechallenge.com) for its proposal and presentations of a solar-powered biodiesel station, and has been widely publicized around the MIT campus.

There are several innovative aspects with regards to the implementation of the biodiesel system on MIT's campus. First, biodiesel would be produced from UVO using a commercial processor. Though it would be cheaper and relatively easy to build a processor here on campus, the usage of the fuel product in Tech Shuttles mandates certification. Using a commercial processor will guarantee certification and ensure the fuel can be properly utilized. Second, the biodiesel system would be run as a student corporation, saving MIT money while recycling waste resources. Currently, MIT vendors pay $1.10 per gallon for disposal of the UVO; Biodiesel@MIT would collect the UVO for a lower price of $0.90 using student employees who would be properly trained. This income, combined with the savings from eliminating nearly 5,000 gallons of petro-diesel annually, would allow Biodiesel@MIT to pay back the estimated $15,000 initial capital in just under five years. This payback period could be shortened if the

amount of biodiesel produced annually is increased. An important point is that having paid student employees ensures the sustainability of the project. Finally, the biodiesel system has high potential to serve as an educational resource, considering there are faculty across several different departments who have expressed interest in this project. The system could serve as a practical example for Chemical Engineering lab courses, a resource for people conducting research on biodiesel, and even as a showcase of student innovation for the local community. Implementing this biodiesel system on campus will lower carbon dioxide emissions, reduce fuel costs, educate the public, and allow MIT to be an example in local and national biofuels communities.



Recycling UVO at MIT into a blended biodiesel fuel can serve as a prime example of MIT "walking the talk" in regards to energy. If funding can be secured and the location can be set, expect to see a biodiesel processor operating on campus by the summer of 2007. Biodiesel@MIT has the support of MIT Facilities, Parking & Transportation, Dining, Environmental Health & Safety, and the Lab for Energy and the Environment.

With funding secured, the only remaining challenges are setting the locations, installing the processor, and fleshing out operational details. Biodiesel@MIT currently has around ten to fifteen active student members, including undergraduates and graduate students in several di fferent engineering departments and the Sloan School, but is always looking for new members. For more information about the project, current status, and a copy of the full proposal, please visit the Biodiesel@MIT web site (web.mit.edu/mit_energy/programs/campusenergy/biodiesel)