

## Biodiesel Fuel at Carleton College

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### **1. Background**

Our loyal band of four formed through a chance glimpse at a common goal. We were originally divided into groups working on differing areas of the campus sustainability initiative for Jen Everett's Environmental Ethics class. Some of us were brainstorming how to raise awareness and some of us were focused on resource consumption when Chris Petit, the 5<sup>th</sup> year Ents intern, mentioned the idea of biodiesel on campus. Although we had only a vague notion of what biodiesel was, where it came from and what it meant for the college, our collective curiosity was immediately piqued. We abandoned our separate goals and decided to work together on bringing biodiesel to Carleton.

Although this project was mandatory as a "public philosophy" aspect of our Environmental Ethics course, we soon began working on it not for a grade but because it was something worth doing and because we believed we were doing the right thing. The group took on a communal energy grounded in the idea that we may see the tangible fruits of our labor before we leave this place. We also felt that we were part of something bigger than ourselves or our group, that we were part of a movement that was working to change the world we live in for the better. With energy and optimism we started our biodiesel project, not knowing where it would take us or how far we would get, but willing to give it our best shot.

## **2. Procedure/Activities**

Initially, our goal for this project was to establish a permanent biodiesel production system on campus by the end of the term. However, after meeting with Richard Strong, the director of facilities, at the beginning of the term it became apparent that establishing such a system was going to be a lengthier and more administratively intense process than we had initially anticipated. Richard Strong suggested that the first step in bringing biodiesel to Carleton would be to write a proposal to Fred Rogers, Vice President and Treasurer of the college, stating the ethical as well as economical arguments for producing biodiesel on campus.

We had little difficulty formulating an ethical argument for biodiesel, but sifting through the economics turned out to be a much more complicated task. The vast majority of time and effort put into creating the proposal went into making phone calls and contacting authorities in order to obtain price quotes for various elements of biodiesel production. For example, Joe Winegardner, who works for Sodexo, was contacted to determine how much money Carleton paid to have waste oil removed. Mary Williams, student work coordinator, quoted the cost of hiring a student to run the machine. A student with the EAC, Jason Lord, was questioned about the possibility of energy credits. Mike Keller, of the Central Valley Co-op, was contacted for price quotes for methanol and a system of pumps and tanks. Conversations with these individuals and many others comprised many hours of frustrating, yet ultimately rewarding, phone conversations aimed at obtaining prices in order to create the cost/expenditures element of the proposal. We also researched biodiesel production on the internet, investigating what other groups thought about the various methods of production in order to determine the most effective set up for Carleton.

Most of the work we divided up and carried out individually, meeting weekly to pool our information and reassess what needed to be done. We found ourselves constantly amending the proposal as we continuously learned more about Carleton's facilities, and discovered more inexpensive places to purchase chemicals. Richard Strong was a tremendous help, and we met with him frequently to confirm that what we were proposing was viable for Carleton's system.

Our term culminated just recently when we met with Fred Rogers to present our proposal. He had a variety of questions about the current state of biodiesel production in Minnesota that he wanted us to research further; however, he was generally supportive of the proposal. With continued work during the next few terms, our goal of biodiesel production on campus may soon be realized.

### **3. Lessons**

Undoubtedly, our group learned an enormous amount about both biodiesel production and the administrative leaps and bounds necessary to implement this kind of production on a public scale, in this case, on Carleton College's campus. We weren't lacking in terms of general information or resources, rather it was the opposite; each of us spent the majority of our time sorting through the literature and various websites pertaining to biodiesel production, in an attempt to consolidate the information and to understand the details of the process so that we might know what needed to be purchased or installed, and how this might be done.

As mentioned previously, we also dedicated a lot of time to making phone calls, sending e-mails, and meeting with various administrative figures on campus. In this respect, we found that implementation of our project was more difficult than expected, and that we were often bogged down by numbers and details. For instance, it took a full week before our

persistent telephone calls, unanswered voicemail messages and e-mails resulted in a reasonable estimate of methanol costs, an additive necessary for biodiesel production from waste vegetable oil. We found that businesspersons at petroleum companies were often reluctant to give us the cost of methanol, and we began to wonder if the reason was not simply that methanol is a volatile liquid, but maybe because producing our own biodiesel would mean that we would not be purchasing it from a petroleum company.

In short, the practical aspect of our research involved estimating how much biodiesel we could produce from the waste vegetable oil on campus, calculating the exact amount of the various additives we would need to purchase in order to produce that much biodiesel, deciding how it should best be stored, where it could be stored, in what vehicles it could be used and in what proportion, what could be done with the fuel when it was not being used in vehicles during the winter months, and most importantly, ensuring that the numbers added up so that production on campus would be economical. Some of our questions could only be answered by the General Manager of Dining Services, others only by the Director of Facilities, and still others only by online forums or instruction manuals, businesspersons or professors. Oftentimes the process seemed overwhelming and intangible; we were forced to reevaluate our short and long term goals periodically to ensure that we remained undiscouraged.

However, we generally found that members of the administration on campus were helpful, available, supportive, and interested in the prospect of producing biodiesel on campus. Unfortunately, we also got the sense that the administration were doubtful we would see the project through, whether its implementation would become a reality, a sentiment that was, and still is, rather discouraging. It seems that despite high levels of enthusiasm for innovative ideas and the frequency with which ideas are bounced around at institutions like Carleton, talk is

simply talk, and it takes a lot of persistence and willingness to cut through red tape to accomplish one's goals.

In our meeting with Fred Rogers, he mentioned that a friend had spoken to him about using biodiesel to fuel his personal vehicle some 20 or 30 years ago, but that he hadn't taken him seriously at the time. Colleges across Minnesota have already jumped on the biodiesel bandwagon, and are currently producing their very own renewable fuel. We ask ourselves then, if Carleton is such an accomplished liberal arts institution, why is it not at the forefront of such endeavors? Why is Carleton not pursuing sustainability to the same extent as Northland College, or even our neighbor, St. Olaf College? We are concerned that simply submitting a detailed proposal and meeting with the Treasurer of the College is not enough. We have to ensure that our proposal is actually read, approved, and the money for our project allocated. It is discouraging, from an environmental ethics perspective, that so much of our project relied on making the numbers work so that production of biodiesel was cost-effective; ethical and environmental reasons favoring production, though included in our proposal, did not seem weighty enough on their own to persuade the administration that our project was worthwhile.

However, we are ultimately optimistic. It has simply become clear that we must be persistent, we must remain in contact with Fred Rogers, continue our research, establish a dialogue among students, faculty and staff about sustainable projects like biodiesel production, and if all else fails, build a biodiesel processor and begin production ourselves in order to show the administration that we're serious! However, with all of the support we've received thus far, we expect that we'll see results within the next year, and that's certainly encouraging. We have to admit, it feels pretty good to look back and see how much we were able to accomplish in only a number of weeks; if only we didn't have classes...we'd be unstoppable!

#### **4. Recommendations**

Having spent the term investigating the processes and equipment necessary to make biodiesel fuel a cost-effective alternative to regular diesel, we feel that we are well prepared to implement our fuel production efforts as soon as next term. With the cost of other heating alternatives on the rise, it would behoove the College to invest in the required inputs and processing equipment as quickly as possible in order to begin our generation of fuel in time to positively impact this season's heating bill. While our initial goal was the sustainable conversion of our waste vegetable oil into fuel by the end of the school year, we recommend advancing that goal to the end of winter term.

Of course, converting Sodexo's waste oils into fuel will not be sufficient to completely offset the rising cost of natural gas, though it will certainly help. However, the beauty of this project is that it is easily scalable, and the processor we plan to purchase will have considerable excess capacity. In fact, it may be capable of processing roughly seven times the amount of oil generated in our snack bar and dining halls into usable fuel. Therefore, we recommend that as we become more skilled at converting waste oil into fuel we expand the project to take advantage of the waste oils generated by the many businesses of Northfield, who currently must pay to have it hauled away by an outside contractor. For a small increase in expenses representing the additional student labor required to gather the oils and possibly additional storage for the fuel, the College can recoup a much greater portion of its heating costs and reduce our campus emissions of greenhouse gases, possibly enough to qualify for substantial energy credits. We hope that an outreach effort to involve the Northfield community could be feasible as early as the 2007-2008 school year.

Our final long-term goal is to reduce the College's dependence on more expensive conventional diesel fuels to a minimum. Part of this goal will be eliminating the use of traditional diesel for heating purposes, and supplementing our diesel-burning tractors with biodiesel to the greatest extent possible. Admittedly, we are unsure whether it would be feasible to gather enough waste oil from the surrounding area each year to make this possible, or what level of capital would be needed to accommodate production on this level. Nevertheless, we are committed to do as much as we can with the resources presented to us, and to build a successful program that can be passed on to a new generation of students after our graduation. For a wide variety of ethical and economic reasons, we feel that large-scale production of biodiesel fuel is a goal worthy of the College's time and effort, and hope to see it come to fruition in the not-too-distant future.

## **5. Appendices**

Original Proposal-

Carleton's Sustainability Initiative:  
Energy (biodiesel)  
10/18/05

Team Members:  
Jannel Anderson  
Beth Mynar  
Dan Pulver  
Jason Snyder

### Vision Statement:

Carleton, the institution, will find innovative ways of reducing energy consumption and of procuring new sources of energy so that no resources that cannot be renewed are depleted. As a result of this emphasis on sustainability, future generations of Carleton students will not suffer ill consequences due to the choices made by previous generations concerning energy usage.

### Goals:

2005-06 academic year:

- ♦ To produce biodiesel on campus, to fuel maintenance tractors with a blended biodiesel fuel, and to have biodiesel available for heating purposes in the winter.

Fall 2005:

- ♦ To establish the infrastructure necessary to produce biodiesel on campus (i.e. submit a detailed proposal to Vice President and Treasurer Fred Rogers, purchase machinery and additional supplies, and oversee the process).
- ♦ To publicize the accrument of biodiesel-producing equipment and the college's capacity to create and use renewable energy.

In order to ensure that our project becomes a part of an ongoing process, and that our long-term goals are reached, we aim to establish biodiesel production as a student-job, part of the on-campus, work-study program. The student may also be supervised by current employees of the facilities department. In addition, we plan to enlist the help of New Student Week coordinators and various student organizations to promote awareness about biodiesel production on campus. Eventually, we aspire to produce biodiesel on a larger scale by incorporating local restaurants and using their waste vegetable oil. This type of cooperation would benefit both the college and the local community, and we believe would help to demonstrate the positive impacts of sustainable activities.

### Process:

Research Process:

Each individual will gather information regarding the specifics of biodiesel production (including necessary materials and systems, safety hazards, and additional problems or concerns associated with the process), as well as considers ways of ensuring successful implementation under present constraints. We will then meet, compare our research, discuss what should be further researched and the next steps to be taken, and divide the work up among ourselves.

Communication Process:

We will be in contact with Richard Strong, Director of Facilities Management and Planning, and Joe Winegardner, General Manager of Dining Services, as well as with John Deere Tractor (as this is the brand of tractor Carleton maintenance employs). We plan to draft a proposal concerning the economic feasibility and environmental impact of biodiesel production on campus and to submit this proposal to Vice President and Treasurer of the college, Fred Rogers.

Physical Process:

First, with the aid of Richard Strong, we plan to purchase a mini-processor kit so that we can produce biodiesel samples to test in the maintenance tractors and to use as physical proof of our success. If our proposal to Fred Rogers goes through, we then plan to have a permanent

biodiesel-producing machine installed in a facilities building. Initially, we will likely be in charge of, or will at least oversee, transport of waste oil from the dining halls and snack bar to the facilities building and its subsequent conversion to biodiesel.

**Reporting Process:**

We will document the entire process using photographs (i.e. photos of our biodiesel samples, installation of the machinery, fueling of tractors, etc.) and put together a Powerpoint presentation that we may present to the class, and further, at an environmental forum on campus. We might also create a poster bearing a number of photos and a description of the process of producing biodiesel that we could display and/or table with in Sayles Hill Campus Center. We will also ensure that the event is publicized in a student newspaper and the Noon News Bulletin.

**Ethical Issues:**

It is possible that our involvement with Sodexo Food Services, if not articulated properly, could add to the already existing tensions between Sodexo and the student body. However, we believe that proper communication and celebration of our successes (including the role Sodexo played in the realization of these successes) will mitigate problems associated with the process and tensions between both parties.

**Contact List-**

**General Information-US National Biodiesel Board**

<http://www.biodiesel.org>

**From the Fryer to the Fuel Tank by Joshua Tickell**

[www.veggievan.org](http://www.veggievan.org)

**Collaborative Biodiesel Tutorial**

<http://www.biodieselcommunity.org/>

**EPA report "A Comprehensive Analysis of Biodiesel Impacts on Exhaust Emissions"**

[www.epa.gov/otag/models/biodsl.htm](http://www.epa.gov/otag/models/biodsl.htm)

**Biodiesel Cold Weather Blending Study**

[http://www.biodiesel.org/resources/reportsdatabase/reports/gen/20050728\\_Gen-354.pdf](http://www.biodiesel.org/resources/reportsdatabase/reports/gen/20050728_Gen-354.pdf)

**Instructions for Construction of Biodiesel Processor**

[http://journeytoforever.org/biodiesel\\_processor.html](http://journeytoforever.org/biodiesel_processor.html)

<http://www.biodieselcommunity.org/appleseedprocessor/>

**Middlebury College Project BioBus**

[www.projectbiobus.com](http://www.projectbiobus.com)

**Carleton College Students Tour the Country in Biodiesel-Fueled Chevy Suburban**

<http://www.acad.carleton.edu/curricular/GEOL/sagas/Bioburban/Bioburban1.html>

**Fuel Meister Biodiesel Processor**

<http://www.fuelmeister.com/products/fuelmeister.asp>

Storage Tank and Fuel Pump Supplier  
Central Valley Co-op  
1500 South Highway 3  
Northfield, Minnesota 55057  
1-800-584-6689

Lye Supplier  
Chemistry Store.com  
[http://candleandsoap.about.com/gi/dynamic/offsite.htm?zi=1/XJ&sdn=candleandsoap&zu=http%3A%2F%2Fwww.chemistrystore.com%2FSodium\\_Hydroxide.htm](http://candleandsoap.about.com/gi/dynamic/offsite.htm?zi=1/XJ&sdn=candleandsoap&zu=http%3A%2F%2Fwww.chemistrystore.com%2FSodium_Hydroxide.htm)

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Straightline Performance  
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