

SIUC Green Fund Final Report

Name of person(s) completing report: Blaine Heisner

Department: Automotive Technology

Contact Phone and email address: (618)453-9138

Faculty Advisor (if applicable): N/A

Project Title: *Repurposing SIUC Generated Waste Motor Oil (WMO) into Diesel Fuel*

Project ID #: 17SP107

Award Date: April 27, 2017

Completion Award: \$4904.00 from Green Fund (\$2000 additional from Auto. Tech)

Total Funds Used: Of the total funds of \$6904 (\$4904 from Green Fund and \$2000 from Automotive Technology) we have spent \$6330.50 and have \$573.50 remaining for future testing, etc...

1. Please provide a write up of your project/project experience.
2. Please provide a summary of your results (environmental, social, and/or economic) including quantifiable data as appropriate (ex. # of individuals reached, lbs. diverted from landfill, energy saved, etc.).
3. Summarize how your project promoted the Green Fee/Sustainability on campus including, but not limited to, flyers created, screenshots of website, signage, etc. Please include website links, if applicable.
4. Is there anything you would do differently if you were to do a similar project in the future? If so, please describe.
5. Please attach a minimum of 5 digital images –these will be images used to promote interest in sustainability projects on campus. These can be photos of the progress of the project or the completed project.
6. Optional: Do you have any suggestions for the SIU Sustainability Council to improve the Green Fund Award Process?

Project Write-up

In the Spring Semester of 2017, after we had received notification of our Green Fund Award, we were then able to order our equipment and supplies necessary to assemble our processor. As we had already been aware of the project, we cordoned off a containment area in our fleet storage building and had an epoxy coating applied to the floor. We also outlined the containment area with hazard tape. We had purchased an oil transfer pump from Utah Biodiesel Supply to remove oil from satellite containers and to pump oil into the main collection vessels. Though the processor had not yet been built, we had started to collect and store used motor oil from the Automotive Department and from Flight Services.

We purchased pallet racks, spill pallets, and decking to assemble the processor scaffold. The centrifuge necessary to filter the oil was purchased from Utah Biodiesel Supply. We upgraded to a booster cone and inline heater to assist the process. Two cone bottom plastic tanks were purchased to act as the blender and mixing vessels. They have unique vertical stands to enable proper orientation on the scaffold. A small mixing pump, iron pipe, fittings, sealant, valves, etc... were used to complete the

processing unit. We were able to order most of the components to start assembling the processor and building the scaffold area to prepare for processing the oil in the Fall Semester of 2017.

During the Fall Semester, we had continued the process of collecting used motor oil from the SIUC Automotive Department and Flight Services. Students in AUT-480 Alternative Fueled Vehicles and AUT-475 Special Projects classes became involved with the theory, collection, research, and assembly of the project. At this time, the process of building the processor and scaffold was well underway. Though we had not started processing any used motor oil, we had collected well over 500 gallons of oil by the end of the Fall Semester of 2017.

On November 4th 2017, the project was presented at the SIUC ASA Multidisciplinary Research Symposium. The presentation was given to an audience by Professor Blaine Heisner, and students Dustin Nance and Tyler Frascone. The presentation was well received and the proceedings were published in the OpenSIUC forum at the following link:

<http://opensiuc.lib.siu.edu/asars/2017/abstractpresentation/6/>

During the Spring Semester of 2018, completion of the processor and scaffold was complete. The centrifuge was tested and used to filter all previously collected used motor oil. Testing was performed to determine desired viscosity and cleanliness of the final product. A sample of the centrifuged oil was sent to Blackstone Labs for testing and was determined to require additional filtering processes. Research was expended and a plan to further thin the used motor oil with lighter petroleum fractions was made. Multiple batches of fuel were made to test the performance characteristics in live vehicles. At this time, the project is in the testing phase and over 100 gallons of motor oil based fuel have been successfully utilized in live vehicles. As of yet no University vehicles have been fueled with our product, but we are very close to this step. The project has collected well over 900 gallons of used motor oil from the University, individual students, and faculty, providing a responsible option to recycle this oil and keep it out of the environment. Additionally, at \$0.85 per gallon in disposal fees, the project has saved approximately \$765 in disposal fees.

From this point forward, we are continuing to collect used motor oil from SIUC Automotive Technology. We have discontinued collecting oil from Flight Services due to the discovery of very high levels of lead in their oil. Blackstone Labs concurred with our suspicion this level of lead is consistent with the use of leaded fuel in reciprocating aviation engines. We may still utilize agreements with SIUC Travel Services to participate in our project and collect additional oil from them as the project grows. We plan to continue to enable students and faculty to drop off used motor oil from personal use as a method of recycling their oil. We will continue to test the performance characteristics of the fuel in live vehicles, then transition the usage into University vehicles. This transition will increase cost savings to the University in not only reduced disposal fees, but reduced fuel costs as well. SIUC Farms were contacted in regards to using the manufactured fuel and they have agreed to take 55 gallons of fuel to use in their agriculture equipment. As soon as we have completed our performance testing, we will provide our fuel the Farms for this purpose. We hope to encourage additional streams of usage for our fuel within the University, provided all testing is positive. We foresee continued successful collaboration between departments/segments of SIUC with our project for many years.

Summary of Results

The major goal of the project, to repurpose a waste product into a useable commodity, has been successfully accomplished. We were able to divert in excess of 900 gallons of used motor oil into our process. At a disposal cost of approximately \$0.85 per gallon, we have saved over \$765 in waste disposal fees.

At this time, we have not yet utilized our fuel in any University vehicles, due to the fact we are still testing the fuel. However, we will be fueling multiple University vehicles before the end of the 2018 Spring Semester. Once this occurs, the fuel cost savings will be realized at approximately \$2.50 per gallon. We have an agreement with the University Farms to use 55 gallons of fuel this semester, and this will save approximately \$137.50.

We have used over 100 gallons of fuel in live vehicles in our current testing phase. This has saved over \$250 in fuel costs, just not to the University. The fact that our fuel has been utilized has however reduced the need to extract and refine petroleum. Albeit a small amount, every bit counts.

This project has directly involved three students in the project and generated a combined 9 total credit hours for the University. This WMO project has been included in the AUT-480 course for 2 semesters now and has involved over 40 students with over 120 total credit hours. These students are able to participate directly and perform research to further the goals of the project.

We have already presented our research in a peer reviewed venue (ASA Multidisciplinary Research Symposium) and had our proceedings published in OpenSIUC. Individuals across the globe could locate and see our project from this venue.

The project is collecting data to define the project and express the results on a continuing basis. The plan is to produce research articles/presentations in peer reviewed venues to further the University's research agenda. We expect our project to grow as our process becomes more refined and possibly expand into additional grants and research opportunities.

This project will continue to attract students interested in the AUT-475 Special Projects course as well as AUT-480 Alternative Fueled Vehicles course. We will continue to collect and process oil to save both disposal and fuel costs. Every gallon of fuel used additionally reduces the global carbon footprint.

Promotion of Project

To promote our project within SIUC, we have posted the Green Fund markers on our processing equipment. As we have many open house events, potential student tours, and industry partners who are shown the project, all involved are made aware of the Green Fund and the Sustainability aspect of the project.

We have presented our project at the 2017 ASA Multidisciplinary Research Symposium which was held at the TEC on November 4th, 2017. We were able to showcase our involvement with the Green Fund not only through the presentation, but as the proceedings of the event were published on OpenSIUC, we are now able to have a global venue where anyone with a web browser could potentially locate and learn about the project. A weblink to the proceedings including the project abstract and a PowerPoint document is as follows: <http://opensiuc.lib.siu.edu/asars/2017/abstractpresentation/6/>

We have contacted Graydon Blair of Utah Biodiesel who has a blog showcasing various projects utilizing equipment purchased from their company. This site would be visited by organizations seeking equipment to start similar projects including WMO, Waste Vegetable Oils, Biodiesel, etc... We hope to receive approval to provide photos and a writeup of the project to post on the Utah Biodiesel blog.

In addition, many conversations have been had by students and myself to interested members of the community. No fewer than 3 individuals, including myself, are currently utilizing the fuel in their personal vehicles. It is always fun to tell people what we are up to and spurs many questions and subsequent conversations about our methods and opportunity afforded by the SIUC Sustainability Council.

As the project continues to grow, we expect to generate more awareness and involvement with students and the community. We all feel that we are in the initial stages of our project.

Doing things differently

I don't know if I would do anything different if we were to do another project except have a better understanding of the process next time. I certainly will investigate the Green Fund award if we have another opportunity. I feel this is an immeasurably valuable experience for the instructors, students, community, and the University.

Photos

Please see attached documents

Suggestions

I think the process of applying and receiving information from the Council and Green Fund is very good. The meetings we attended were well received, the process was straightforward, and I do not really have any suggestions to improve the process at this time. Anyone interested in applying for the Green Fund awards should be able to figure it out.

However, in the interest of promoting the project and including students, a course may be able to be created where students, through the Sustainability Council, could enroll and visit the projects, take photos, create a blog, create presentations, etc... Call it "Modern Sustainability Efforts" or something. In our department, we have an AUT-475 Special Projects course where students can get experience in these type of activities. As a matter of fact, I have 3 students enrolled in this course who are directly involved in this project. This would generate additional credit hours for the University.

I don't know under which school or college they would be able to enroll under, but it is just a thought.



