



ENGINEERING NEWS

Automated Biodiesel Processor

By Mike Zummo

After almost three years of research, development and testing, the Biodiesel Research project has made a number of great strides in perfecting the process of small-scale biodiesel production. The student research team is currently collecting all of Messiah College's waste vegetable oil, purifying it through a centrifuge, converting the oil into biodiesel and processing all of the waste glycerin through a methanol recovery system. The culmination of all of this work has led to the development of an automated biodiesel processor that creates up to 25 gallons of biodiesel per batch with very minimal user input.

Senior electrical engineering student Philip Martinez '12 has spent the last year and a half working to develop the mechanical, electrical and software components of this new automated processor. Building on the work of several students before him, Martinez has created a functional prototype of a Programmable Logic Controlled (PLC) biodiesel production system. The PLC



Automated biodiesel processor with engraved schematic



Back: Jordan Beckler '10. Front, from left: Philip Martinez '12 and Michael Hahn '12 by the weather containment protecting the 55-gallon waste vegetable oil drum from rainwater.

processor performs all of the necessary reactions, washing, drying and waste removal steps required to make high-quality biodiesel with virtually no required user input along the way. After a user inputs the necessary reaction elements and turns the system on, the system is programmed to perform each step on its own. If that is not impressive enough, Martinez has also designed a number of safety features into the system that will completely shut the processor down in the case of overheating, over pressure, power interruption, heater failure or pump failure.

Continuing in his effort to make the PLC processor both safe and user friendly, Martinez spent many hours learning to use Solid Works to create a process schematic that he then engraved on the control panel using a CNC mill. This schematic allows the user to approach the system at any

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Chair's Corner



This fall, some interesting people are showing up in the Engineering Department. When Dr. Gray looks out over the Introduction to Engineering class this year, he sees 74 new engineering students (about 18% female). Most of these eager faces are new to Messiah; students tell us that they came here

because they wanted to study at a school with a Christian world view and because of the strength of the program. Some are existing Messiah students changing to engineering from majors as diverse as biology, psychology and Spanish. While computer, electrical and mechanical concentrations attract the majority of these new students, a sizable and growing number tell us that they intend to choose one of our newer concentrations in biomedical or environmental engineering. At the end of September, we will host another group of interest-

ing people: the accreditation review team from ABET. Every six years, the department conducts a self-study and hosts a visit team as a part of the continuing accreditation process. The self-study has been conducted and the report has been submitted. Now it's time to meet with the review team. We enjoy interesting people. You are welcome to stop by anytime.

—Randy Fish, professor of electrical engineering

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point and know exactly where it is in the processing cycle. Through a series of indicator and warning lights, even a relatively untrained operator can follow the schematic to determine exactly what the system is doing and if there are any problems. While the system is completely automated, each component does have a manual override switch that allows the user to take complete control if necessary.

Currently, the PLC processor is being tested to optimize system set points and to bring to light any problems in the control system. Over the course of the next two semesters, Martinez will be rigorously testing the system to continue to perfect its processing ability and safety. Though it is still in the development stage, this processor has successfully produced a number of batches of high-quality biodiesel.

“Since the fall of 2010, engineering students have been collecting and processing all of the waste vegetable oil generated by Messiah College dining facilities into biodiesel. The goal of the automated processor is to reduce the time and labor required to convert this oil into biodiesel.”

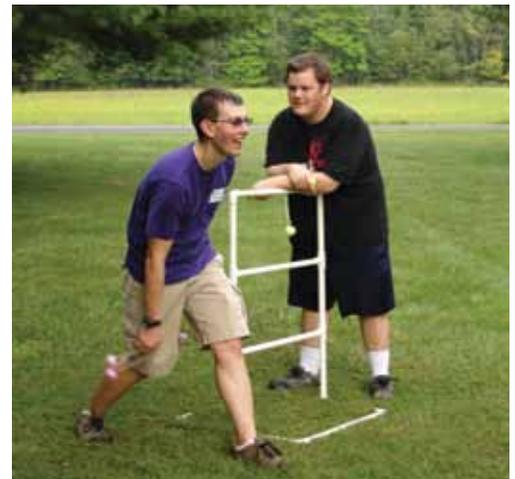


Engineering Student Philip Martinez '12 works on the automated biodiesel processor control panel.

First-year engineering students' picnic is HUGE success!

By Carl Erikson

More than 60 students, faculty, staff and families attended the first-year engineering students' picnic held at Professor Erikson's farm over Labor Day weekend. A total of 39 first-year engineering students were welcomed by the engineering faculty and staff. Twenty-seven of those students (a new record!) rode up on a hay wagon from the Falcon Hut, while others found another ride or walked up N. Grantham Road. Activities included water and "land" volleyball, badminton, Frisbee and horse-shoes, as well as talking with professors and staff, up close and personal. The delicious food included hamburgers, hot dogs, fruit salads, pasta salad, vegetable trays and dips, chips and other snacks, watermelon, all kinds of soda and lemonade. A large decorated sheet cake (with blue and white and orange balloons) welcoming the students served as the main dessert. The weather was great, and all who attended enjoyed the event.



Pictured clockwise from top left: Professor David Gray, Zach Fletcher '15 and Jon Myer '15; Zach Fletcher '15 and Jon Myer '15; Katie Howell '15 with Professor Harold Underwood; and Marcus Upton '15 and Ben Asper '15.

Zambia Trip by Jaime Gerhart '12



Jaime Gerhart '12 dismantles the oxygen concentrator prior to repair.

A mentor of mine once told me that you don't come back from Africa the same. To be honest, this advice was lost among a million other thoughts as I began my three-day journey across the Atlantic Ocean. My goal was to reach Macha Mission Hospital in south-central Zambia. With my other team member, Tim Houck '12, our goal was to determine the reasons for failure of some of their oxygen concentrators which supply oxygen to patients in need (much like oxygen tanks) and restore them as best we could to working order. My luggage was full of notes, documents and testing equipment along with old T-shirts and knee-length skirts. I had everything

I thought I would ever need. However, I quickly realized the one thing I was truly lacking: the right mindset. I was going to Zambia to give them something, to fix something that was broken that I knew how to fix. In my mind, it was that simple. What I never imagined was what the people of Macha were going to give to me. While I may have taught them technical skills, the Zambians taught me more than I could have ever expected.

On the technical side, Tim and I successfully accomplished our mission to diagnose the problems with the concentrators. They were failing due to the poor air quality running through them. We were

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ENGINEERING NEWS • FALL 2011 OUR MISSION

The mission of Messiah College is to educate men and women toward maturity of intellect, character and Christian faith in preparation for lives of service, leadership and reconciliation in church and society. Graduates of the engineering program will therefore be technically competent and broadly educated, prepared for interdisciplinary work in the global workplace. The character and conduct of Messiah engineering graduates will be consistent with Christian faith commitments. We accomplish this mission through engineering instruction and experiences, an education in the liberal arts tradition and mentoring relationships with students.

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able to show the maintenance workers how to diagnose and replace the bad parts. We left them with a manual outlining all the information we gave them. We also had parts shipped to them from DeVilbiss Healthcare in anticipation that they will repair the machines to working order.

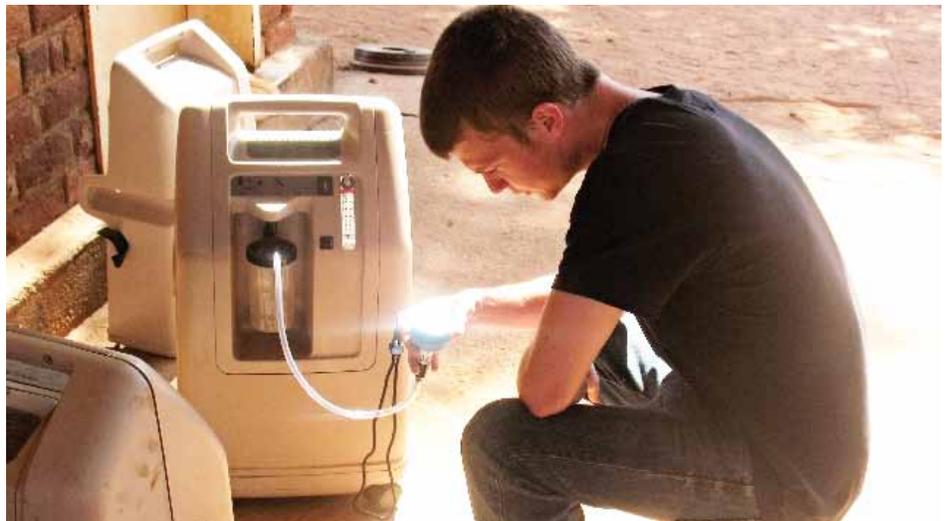
The people of Zambia may not have much material wealth, but they are rich in so many other ways.

While I am more than ecstatic that we were able to give something to the Zambians, the lessons I learned from them will remain with me. These lessons spanned from the value of simplicity and true faith to the importance of cultivating and valuing relationships more than material things. The people of Zambia may not have much material wealth, but they are rich in so many other ways. They are rich in relationships: their interactions with those around them are more important than any agenda or schedule they might have. They

are rich in faith: they know that everything they have comes straight from the hands of God, and they worship Him purely and wholeheartedly. Lastly, they are rich in wisdom: they know what truly matters in life, and their minds are not clouded with superficial ambitions or desires.

My life has and forever will be altered by the people I met and the lessons I

learned in Zambia. God worked in my life in a way that I would never have expected, and I pray that my future endeavors reflect those lessons and experiences. I hope that the Zambians can benefit from our trip with better medical equipment and more knowledge, but I know that I can thank them for the wisdom, love and renewed faith that I have gained.



Tim Houck '12 tests the oxygen content of the output of the concentrator.