Plant to Power
Successful Inaugural Program at Sparta High School

The time finally arrived to try out the Plant to Power Bioreactor at a local school. Mehgan Castle, FFA Advisor, and Aaron Byrne, Chemistry and Physics teacher, enthusiastically agreed to a 3-week biofuel training program sponsored by the Randolph County Farm Bureau and Gateway FS. Ms. Castle had been collecting oil from high school cafeteria since the beginning of the school year for the project. Charles Schupbach, Plant to Power chairman, and Ryan Ford, Manager of the Randolph County Farm Bureau, arrived early on Monday, September 28 to begin the biofuel experiment with students from the agriculture, chemistry, and physics classes.

The custom built bioreactor was rolled into the Ag workshop, where it would stay for the next three weeks. Charles and Ryan carefully explained the process of converting used cooking oil into biodiesel. They also expanded upon the biofuels industry, recycling, climate change legislation, and agriculture. During the first day, the collected oil was transferred to a 55-gallon drum where it was heated to 140 degrees by a drum heater. Once heated 30 gallons of oil was pumped into a recirculation tank, where 7.5 gallon of Methyl oxide was mixed into the oil. The oil recirculated for 2 hours while being reheated to 140 degrees by an inline heater. When the two hour span was complete, the mixture was then pumped to a washing tank to sit for 12+ hours.

On Tuesday, the students evaluated the change that occurred in the washing tank. A visible line appeared near the 7½ gallon mark. A dark substance formed on the bottom of the tank. Through a process called transestrification glycerin is formed. The glycerin was drained out of the tank leaving behind methyl ester (biodiesel). The glycerin can be used for a number of things including parts cleaner, soap, and fuel for fires or wood burning stoves.

Charles began Wednesday by hooking up 2 water hoses to the bioreactor. One hose would supply a fresh source of water for washing the biodiesel; the other would be used as a drain hose for waste water. The water was turned on and ran through a meter into a misting system on top of the tank. Water was slowly misted over the biodiesel at a rate of 5 gallons per hour. The washing took place for 12 hours until 60 gallons of water had run through the biodiesel.

Thursday, Mehgan turned off the water before class started. Ryan and Charles drained off the excess water leaving behind the clean biodiesel. They reviewed the entire process with the students before beginning the final process of bubbling. A small amount of air is pumped into the biodiesel to evaporate any leftover water or methanol. Again this process continued overnight and concluded the next morning.

Friday was a day to celebrate a week of hard work and success. The bubbler was turned off and 100% biodiesel remained. The product was an orangey/yellow color with 100% visibility. A couple of small jars were filled to commemorate their first batch of biodiesel. The class reviewed the process carefully because they would be on their own for the rest of the experiment.

The classes took over the project for the next two weeks. They followed a step by step instructional sheet and examined their notes from the 1st week. Ms. Castle would read each step and the students would put on their safety gear and complete the tasks. Both weeks the students were very successful at producing their own biodiesel.

For the maiden voyage of the Plant to Power biodiesel bioreactor, the entire 3 week program was a huge success. Everything went exactly to plan, without any problems. Richard Tanner, Charles Schupbach, and David Gramenz's hard work and dedication to this project finally has begun to pay off. They have spent numerous hours in planning, construction, experimenting, and designing the bioreactor. Several changes and adjustments have improved the usability of the device.

Special thanks go out to Gateway FS, Randolph County Farm Bureau, Byrd's Body Shop, Regional Superintendant of School Office, and Red Bud FFA Alumni for their generous support and contributions to the project.

The next episode of Plant to Power will be at the Regional Teachers Workshop in Red Bud on November 3rd and then onto Red Bud high school for another 3 week program.