FS-Fed Biodiesel Production

The Next Generation Sanitation Facility

October 2013

Newsletter

Greetings

Welcome to November. We've reached the team's last full month conducting fieldwork in Kumasi.

In preparation for our exit and the handover to the WSUP-Cranefield team, Bob hosted a site visit for a portion of their team. They are in on-going discussion about transfer of equipment and operating knowledge.

Prior to our departure, Beta Construction will also be returning to the site to remediate the construction deficiencies, i.e. broken gas pipes, insufficient back-fill, inadequate sand filter. He's agreed to start in mid-November and will be done before the end of December.

Technology development highlights: fermentation

Midway through October, the fermentation team stopped feeding the digesters, as consistent loading had become impossible due to worsening weather and road conditions. (You recall the pictures from the last newsletter, I'm sure!) This means that loading and date collection were cut short by a couple of weeks compared to the project timeline set in June.

During the shutdown phase, the team has continued with sampling, mixing and lab work. They hope that by monitoring the change in gas characteristics and behavior once feedstock was cutoff they will gain a better understanding of the system. The team intends to compare these results with the data they collected over the previous nine months to see what meaningful insights they can gain.

Meanwhile, the team is drafting paper outlines to present the data that have been collected over the length of the project. The team has had a few conference calls with advisory board members, students, and researchers to begin the analysis and to decide how best present the research in papers.

If you're curious about how they're logging and tracking date, let me introduce Datao…

Here's a teaser screenshot. See more at: http://fs2bd.datao.us/ (Contact Jay for the login info)

Technology development highlights: fermentation

Over the past few months, the fermentation team has been implementing the online Datao system to seamlessly log data. This past month they've really gotten into it, and have produced results worth sharing!

Using Datao has been an exciting opportunity to use multiple technologies for logging data online. They used mobile phones to log pH and temperature data from all six fermenters. Back in the lab they've been using an iPad to log lab test results. All of these data are synced to Google spreadsheets and pulled automatically to Datao. The result is an online FS2BD dashboard that shows real-time updates of what is happening in the field and/or lab. The dashboard shows the status of each sample and test log. It also shows charts from the test logs, as show on the previous page. The team hopes to use this new display to help communicate data to the technical advisory board for analysis and feedback. While they considered automating certain data points, ultimately, they ran out of time and were not able to implement this step. Perhaps future projects will leverage the potential of wireless sensors that automatically log temperature, pH, at a regular interval and log them online for a more complete visualization of system performance.

Technology development highlights: biodiesel

The biodiesel team has successfully dried enough fecal sludge for a pilot-scale batch of fuel… weighing in at 16.38 kg, just over the 15 kg they need for a batch.

Here's a picture of the final drying scheme: You're looking at small trays made of tin foil, which are loaded with nearly dry FS and ready for the oven.

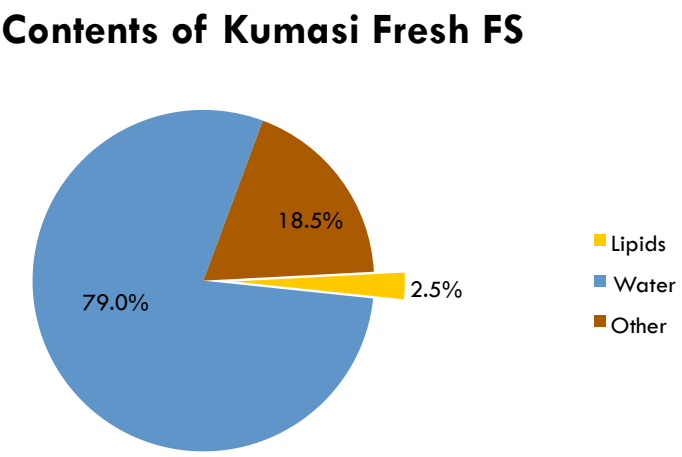
Now the team is preparing to run the biodiesel plant, and expect to do so this week. The only thing standing in their way is a pretty serious leak in the reactor tank. Montale (the tank builder) has been out to the site twice to remedy the situation, but to no avail. Now he's taken one of the legs to his shop for repair… they're hoping for good news soon.

The imperfect biodiesel tank…note the puddle on the floor.

Technology development highlights: biodiesel/Misc.

Because trucks were having difficulty getting to the site and digesters were not able to be fed regularly, BJ's plan to sample and analyze lipid levels from fermentate at the site was tabled after the team's first round of sampling. But never fear! The focus of her particular project has shifted to compiling a thorough literature review of the fate of lipids in anaerobic digestion. Thus far, the literature has shown quite convincing that further digestion of FS would significantly decrease the levels of biodiesel precursors in the feedstock.

As for the other portion of her work, fresh FS samples from Ghanaian colleagues have been processed, and lipids have been extracted and sent to Avanti for further analysis and speciation. Thus far they can report that the Kumasi fresh FS samples are about 80% moisture (the normal level for most poop) and 2.5% lipids. When you break that down into the lipid content of the total solids, 12% of the dry weight of the Kumasi fresh FS samples is lipids. Once they get results back from Avanti, they'll know what kind of lipids can be found in fresh feces, which will give the team a great baseline to compare to the FS they're getting at the site.



That's all for now! The team is working hard to compile all of their findings and data into papers for publication in the peer-reviewed and gray literature. Much appreciation to those on the advisory board who have provided technical feedback thus far!