mm2674

Mason Minot's Individual Contribution Page

Fall 2015 Contributions

UASB Group Member

Semester Goals:

To assess three UASBs for leaks and ensure each vessel is air-tight.

To establish a protocol for efficient methane measurement and capture.

To inoculate and begin operation of 2 UASBs for stress testing and experimentation. (Oxygen/Wastewater Strength StressTesting)

To inoculate a third UASB to couple with a GSBR unit from the GSBR group to characterize coupled wastewater treatment.

Mid-Semester Progress:

Obtained granules from wastewater treatment plant in Syracuse, NY.

Testing reactors 2.3, 2.4, and 2.5 for leaks using bubble test.

Both solenoid and pinch valves were tested for airtightness using pressure sensors and process controller.

Assembled reactors 2.3, 2.4, and 2.5 in parallel setups using only air and water to identify leak sources and quantify leak rates. All reactors have recirculating water at 6 mL/min and recirculating air at 25 mL/min.

Process Controller was used to setup an off-gas routine: when air accumulates in the head unit such that the pressure sensor detects a difference of 7 cm H20, Process Controller opens a solenoid valve attached to the gas chamber to release the head pressure.

Currently running "retention tests" in which the gas chambers are filled with air and left overnight. A change in pressure or water level indicates a leak. By recording the change in pressure over time, we will calculate the volumetric flow rate of air loss within the reactor head units.

Final semester progress:

Reactor piping and instrumentation assembled and reactors inoculated. The biomass granules were fed synthetic waste water and produced biogas for two weeks before being disassembled. COD removal and methane production were measured and the reactors treated influential COD up to 85%. Next semester the reactors will be used to test the effects of oxygen stress on anaerobic cultures.

Spring 2016 Contributions

Initial Goals:

Build smaller UASB reactors for new lab space with hydraulic retention time of 4 hrs and upflow velocity of 0.05 mm/s.

Currently have 1 reactor assembled. Will begin testing air-tightness and quantifying any air leaks. Afterwards, will inoculate reactor while building another 1-3 additional reactors.

Mid-Semester Progress:
Two reactors have been fabricated and biomass granules obtained. We plan on building an additional two reactors and hopefully inoculating them and operating the systems as continuous processes.

Final semester Progress:

A total of four UASB reactors have been fabricated this semester. It is the hope of the group that 2 reactors can be used as controls and 2 reactors can be used as experimental variants in the future. The new reactors are improvements on the old reactors due to the newly applied union in the reactor body that makes them easy to disassemble, the reduced number of inlet/outlet ports to minimize opportunities for gas leakage, and their size makes them easy to operate and safely mount on the lab bench. The reactors, however, require frequent maintenance. The outlet lines in the basement lab require that all fluid be pumped out and the team does was unable to access any additional pumps; as a solution, the team used effluent holding tanks that had to be emptied daily. The influent water was also placed in sizable tanks that needed to be refilled daily. In the future, making the system more continuous could greatly increase its user-friendliness.