Aerobic Granular Sequencing Batch Reactors (GSBRs) ↑

Skills: fluids, fabrication, Process Controller, Mathcad

Big questions to answer

1. How do operational changes to cycles affect performance of GSBRs
2. Can we devise a low-tech way to cycle through different phases: drain, feed, anaerobic phase, then aeration?
3. Can we devise aeration schemes that don't require electricity? Or at least use a small amount (e.g that could be provided by a solar panel)
4. Can the amount of biogas produced by an upstream UASB provide enough methane to power aeration pumps?
5. Can startup be shortened by smart inoculation? e.g. with a wide diversity of sources of bacteria (activated sludge, anaerobic digester fluid, other cultures)
6. Can GSBRs be used effectively to further treat wastewater after a UASB process. How should reactor operation/desgin be different to treat UASB-treated ww
7. Can GSBRs be used to treat blackwater (high strength wastewater)? with UASB pre-treatment.
8. How efficient and stable are GSBRs?
9. (both UASB and GSBR teams): For WW treatment in Honduras: are UASB and GSBR still promising? Which other processes/reactor types make sense? esp for blackwater treatment (corresponding tasks would include researching reports from Honduras about accepted technologies and going through the sswm.info website for WW treatment technologies for Blackwater)
10. (both UASB and GSBR teams): Social and public health questions: IS there a need for WW treatment in Honduras or is the widespread surface disposal of WW not a problem (corresponding tasks would involve researching fecal bacteria data in Honduras and/or prep for doing some fecal bacteria tests on the the trip to Honduras in January)

Tasks and goals

- Construct, startup, maintain and monitor aerobic granular sequencing batch reactors (GSBR)
- Perform nutrient analyses to analyze performance (COD, N, and P)
- Perform tests with modifications to cycle operating variables and monitor performance for C N and P removal. (e.g. adding another anaerobic phase after aerobic but before settling and discharge; or changing aeration rate during aeration)
- Test ability of GSBRs to further treat effluent from UASBs
- Brainstorm ideas for smart, low-tech operational control of GSBRs (e.g. switching on feeding, discharge, aeration without high tech sensors or pumps)
- possibly add harmless *E. coli* and trace survival
- Test how variability in strength of wastewater affects performance
- Possibly analyse granule communities for key microbial groups using DNA techniques

Resources

- Past reports (including the most recent Summer 2015 report by Interns Maria Dias and Mirelly Manica)
- Datafiles from existing reactors
- Literature on GSBRs