

# 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/design 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](http://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 GSBs