Detailed Task List Spring 2013

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May 8, 2013

Literature Search

Due February 13, 2013 (continue throughout the semester as needed)

- Research other organizations that use filtration in water treatment systems to draw on ideas for our own model-Done!
- Research the difference between depth and surface filtration to help us judge the kind of filtration that occurs with subsurface injection of raw water into the sand filters-Done!
- Create a graphic illustration of the difference between depth and surface filtration to use in symposium presentation-Done!
- Learn about the circumstances that would best suit either a conventional rapid sand filter (RSF) or a SRSF-Done!
- Learn about how surface wash is used in RSFs to clean the sand near the surface and prevent mudballs. Determine if this is relevant or could be applied to the SRSF-Done!
- Research solids loading capacity in depth filtration to understand they physics of how particles accumulate in the filter and how this impacts pressure drop within the filter-Done!
- Review CEE 4540 notes on filtration-Done!

Study the Current System

Due February 27, 2013

- Study the water treatment plants to learn about how the water flows through the systems and what size particles the filtration step will need to capture-Done!

- Take apart and reassemble the sand filter to gain a better understanding of how the water moves through the filter. This will also allow us to see what sizes of particles get captured and where most of them get trapped within the filter. Determine whether positions of particle capture would classify as depth or surface filtration -Done!
- Tour Cornell's water treatment plant to learn about the water treatment process in general. See if we can implement any of those techniques in our sand filters on a smaller and cheaper scale-Not done, but the trip planned did not work out.
- Set up a filtration experiment using process controller to vary and measure a temperature-controlled water source, raw water turbidity, coagulant dose, and monitoring turbidimeters -Done!

Build Experimental Apparatus

Due February 27, 2013

- Design inlet conditions for two sand columns, one similar to RSF and the other similar to SRSF, such that the veloicity of the water entering the sand from the slotted inlet pipe for the SRSF matches the velocity in the RSF-Done!
- Set-up filters with surface inlet and depth inlet in parallel using the same raw water to compare the differences in head loss and particle capture efficiency as functions of time-Done!
- Experiment under different conditions regarding flow rates, raw water turbidity, coagulant dose, run time, etc.-Done!

Measure Performance of Surface and Depth Filters

Due March 27, 2013

- Design a series of tests to understand the performance characteristics of depth and surface filtration. (Increase coagulant dose or decrease filtration velocity as necessary to obtain surface filtration.)-Done!
- Determine in each filter whether surface or depth filtration occurs based on head loss and performance characteristics
- Determine if one design better suits higher or slower flow rates
- Begin to develop a fundamental understanding of what determines the head loss at which filter performance begins to deteriorate for depth filtration

- Determine if there is a direct relationship between coagulant dose and the type of filtration that occurs as well as the performance of such filtration
- All of these tests should be completed by April 26 and we will have the results analyzed and interpreted by May 1. - Done!

Test Possible Modifications

Due April 24, 2013

- -Not going to have enough time to run these additional tests because it requires extensive restructuring of the testing apparatus
- -This would probably be the same as using a higher coagulant dosage, which we are already testing.
- Try using different materials/textures/sizes of sand to trap the particles. Determine if these interfere with backwash-Contingent on time constraints.
- Install a foam filter after the the sand filter to test for an decrease in turbidity -Contingent on time constraints (re-design) of the apparatus.