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Marlana's Individual Contribution Page

Summer 2012 Contributions

During the summer of 2012, I worked on creating an LFOM orifice template to be used on-site in facilitating precise drilling of orifices during LFOM fabrication. The rendering of the template in AutoCAD is automated with input parameters of plant flow rate and head loss in the LFOM. Significant work was done on the template by the end of the summer, and it was later completed by other members of the design team. In addition, preliminary work began on generating a scale for the LFOM, Chemical Dose Controller, and Calibration Column with a general algorithm that input parameters such as scale range, scale length, tick length, font size, and scale orientation.

Spring 2013 Contributions

This semester, I worked on the Sedimentation Tank Hydraulics Team. We made a lot of great progress during the semester that included (1) changing the bottom geometry of the sedimentation tank, (2) switching to using PACl and finding the optimum dosage (5 mg/L), (3) exploring the relationship between energy dissipation rate in the jet diffuser and floc blanket performance, and (4) learning about the influence of floc hopper depth on sludge consolidation. We also ran a dye test to better understand the flow of water and colloids through the floc blanket (videos of this dye test can be found on the AguaClara YouTube channel). We found that even at high energy dissipation rates (130 mW/kg), there was improvement in performance over blankets created with lower energy dissipation rates. In addition, we discovered that compression settling occurs in the floc hopper, contrary to our hypothesis that only zone settling was occurring. The dye test showed that while there is evidence showing a slightly preferential flow path through the blanket, the blanket does become uniform and models a PFR as fluid moves through the upper portions. It was a semester filled with lots of hard work and late nights in the lab, but the significance of our findings made it worth all the while.

Fall 2014 Contributions

During the Fall 2014 semester, I worked with the Foam Filtration team, focusing our efforts in learning about the parameters related to backwashing the filter. A new apparatus, the 4" Pipe Small Scale Filter, was designed and constructed to hydraulically model the full scale filter. While we were unable to perform our first experiment on the filter during the fall, in Spring 2015, the foam filter team will attempt to determine an empirical relationship between backwash pore velocity and the percent mass removal of the particles from the foam during the cleaning cycle. Accomplishments for Fall 2014 include: (1) designs for improving the chemical dosing and flow measurement mechanism, (2) a redesigned lever arm with a rigid connection to the base of the filter for support, and (3) confirmation through mass spectrometry that chemicals are leaching from the foam; however it is unclear what chemicals are leaching and their effect on human health. Throughout the semester, the team communicated bi-weekly with AguaClara Engineer, Walker Grimshaw, and traded ideas on filter design as Walker and the Cornell team prepared to build a full-scale filter at the pilot site in Honduras: El Carpintero.

Spring 2015 Contributions

After a trip to Honduras during the January intersession, I returned to the foam filtration team with a new sense of motivation and passion for this work. With the Spring 2015 semester came a trip to The Expo in Washington, DC, to compete for the EPA P3 Phase II award with the Foam Filtration team. The primary task for the first half of the semester was to prepare the best presentation to win $75,000 for foam filtration research. This included constructing a small-scale model to effectively show the backwash mechanism, a large scientific poster explaining the technology, and a 10-minute presentation to two sets of judges. Efforts in the second half of the semester were focused on experimentation with the 4" Small Scale Filter to try to determine the relationship between pore velocity and cleaning efficiency of the backwash method. Findings from this semester are documented in the Spring 2015 Final Report.