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Yining Dai's Individual Contribution Page

Fall 2013 Semester Contributions

Team: Laminar Tube Flocculator

The Laminar Tube Flocculator group hopes that through our research with AquaClara this Fall semester, we will be able to gain an understanding of what final dimensions of the flocculator will allow for both spectator visibility and the steady growth of flocs. We also hope to create a "control" laminar flocculator that we will be able to compare our experimentation to so that we will be able to determine the most suitable dimensions for the water treatment plant. This semester we will also be researching ways to build more flocculators through different material and fabrication methods as well as adjusting the flocculator lengths so that they will not be longer than necessary.

The experiments that we are conducting on the flocculator include testing different clamp sizes attached to the middle of the flocculator and testing the credibility of Karen Swetland's theory that at a certain point, there is no need to for flocs to continue growing in size since shear force will prevent small colloidal matter from being collected by large flocs. From our experiments conducted this semester, we can conclude that the 4 mm and 5 mm clamps do not disprove or support Karen Swetland's Floc Breakup Theory. The 4 mm clamp did not improve flocculation performance. The t-test conducted on the 4 mm clamp data showed that there was a significant difference in residual turbidity from the 4 mm clamp results compared to the base case. However, it was a significant increase, so the 4 mm clamp caused a significant increase in residual turbidity which disproves the Floc Breakup Theory.

Our team has conducted four tests to create a "base case" to compare our experiments to. The first test resulted in a graph that had data points bouncing up and down. The starting turbidity at the beginning of the experiment was 70 NTU, which is strange because at that point coagulant has not been added in yet so the turbidity of the effluent water should be higher.

My contributions to the Laminar Tube Flocculator team include the writing of the Detailed Task List, the Research Paper, participating in the Base case testing, coming up with what experiments to conduct this semester, the reading of Ian Tse, Professor Lion, and Professor Monroe's papers on flocculation, speaking at symposiums presenting our work this semester, and adding input during problem solving for when the flocculator runs into an issue.

Spring 2014 Semester Contributions

Semester Goals

The Laminar Tube Flocculator Team hopes to finish the installation of the Settled Water Turbidity (SWaT) measurement system and run experiments similar to the ones we completed last semester. With the new turbidimeter system, there should be less flocculations in our data points. Therefore, clearer correlations can be drawn from the experimental data and conclusions regarding Karen Swetland's Floc Breakup Theory can be finalized.

Results

My contributions to the Laminar Tube Flocculator team include assisting in the design and implementation of the new SWaT system, researching and running tests on the new apparatus, participating in the writing of our research paper using the program Lyx, and giving public presentations of our research to the AquaClara advisers and fellow project team members.

The results for our research semester are that no concrete conclusions could be made towards the Floc Breakup theory because the new turbidimeter system still needs a lot of work and there are still many things we do not completely understand about SWaT. The research this semester has shown us that there are still improvements that need to be made to SWaT. Unfortunately, all the tests we have run so far are proving SWaT to be a worse residual turbidity measurement system than FReTA was. The NTU readings using SWaT were significantly higher than the NTU readings for FReTA at the same PACI dosage concentrations. Nonetheless, SWaT has been incorporated into the Laminar Tube Flocculator apparatus and Process Controller has been updated to the correct states.

Fall 2014 Semester Contributions

Semester Goals

The Laminar Tube Flocculator Team hopes to build off of the Summer 2014 Research Team's work on testing Floc Breakup Theory and make a final conclusion as to whether or not breaking up flocs in the midst of the flocculation process improves flocculator performance. Goals for this semester include running experiments using varying PACI dosages and finding an optimal PACI dosage that results in the best flocculation performance. Hopefully by the end of the semester, clearer correlations can be drawn from the experimental data and conclusions regarding Karen Swetland's Floc Breakup Theory can be finalized.

Results