tlm44

Individual Contribution

Fall 2008 Semester Contributions

During the Fall 2008 semester I have worked on the Dissolved Air Flotation of Flocs Team. This group is a subsection of the Research Team. I am the only member of this sub team so all of the work done on the project was my work. The first thing I did was consult with the Cornell students in Honduras to get a better understanding of the problem. Once I had a relatively good grasp on the situation I began performing literature searches to find out information on other situations that have had an issue with particles floating to the surface in a system. Unfortunately I was not able to find very much pertinent information during those searches. I have since made another attempt to locate papers on research performed to explore the process and causes of floc rising to the surface of the water in the tank and found some useful documents which I am still reviewing. After the original unsuccessful literature searches a conversation with Paul McClaskey brought up the idea of using an air-water separator. These apparatuses are used for water heaters that have a similar issue with particles rising in the tank. After further research I decided that this was not a practical solution for the AguaClara water treatment plants. My next course of action was to consult with my professor of Physical and Chemical water properties, Prof Gosset, about the current issue. He made several suggestions as to the cause of infusion of gas into the floc particles:
1) That the Alum was causing the water to become too acidic thus subsequently causing CO2 bubbles to form in the water. The solution to this problem would be the simple addition of a basic chemical. However, after Tamar and John took pH readings on the influent and effluent (Plant Entrance Tank: pH = 6.77, Plant Exit Tank: pH = 6.50) it became apparent that this was not the case in Tamara.
2) A significant temperature difference between the influent and the effluent could also increase the amount of air in the water but Tamara does not appear to have that problem.

The current idea is to focus on getting the gas out of the water rather than just the cause of the problem. Aeration is used in the laboratory to remove gases from the water being used in air sensitive systems but it originally seemed impractical to use aeration in a full scale treatment plant where there is no electricity. However, after consultations with Prof Gosset and Prof Monroe Weber-Shirk, the use of aeration appears to be a viable option. Instead of using an air pump, a small hole in one of the influent pipes that have free falling water could cause a vacuum that would infuse the water with small air bubbles. Aeration works by increasing the rate of gas transfer using the greater surface area/volume ratio of small bubbles. The faster the gas can be taken out of the water, the shorter amount of contact time between the water and the open air needed to allow all of the gas bubbles to rise to the surface. I am currently looking into using Henry's Law and orifice relationships to calculate the number and size of holes needed in the pipe to sufficiently aerate the water in the grit chamber.

Spring 2009 Mid-Semester Contributions

During the Spring 2009 semester I have been the team leader of the Dissolved Air Flotation of Flocs Team. This semester the Floating Floc team broke into two sub-sub teams: Floating Floc Aeration Method and the Floating Floc Fluidized Bed Method. I am working with the aeration group which is focused on the use of aeration of the water in the grit chamber to reduce the dissolved oxygen (DO) content of the water. Thus far I have worked hard to solve the problems we have encountered in the design and operation of the mini grit chamber/entrance pipe and at this point Tanya and I have come very close to solving all of the problems (hopefully). The experiments we have performed have not had the results that we had hoped for, but it is possible that problem actually lies in the testing DO probe being under different pressures rather than the concept in general.

While the set up was being constructed I did literature searches and wrote one of the summaries & annotated bibliographies. I have also worked hard to stay on top of my team and make sure all the assignments get finished, including individual assignments.

In the second half of the Spring semester the aeration team was disbanded and Tanya and I have joined the Sand Filter team. The aeration method was deemed a "successful failure" because we successfully determined that using aeration to decrease the DO in the water did not work fast enough. The entire experiment had many complications, some of which we were not able to resolve like the issue with the DO probe on how its readings were inconsistent, possibly due to the alternating positive and negative pressure. Tanya and I tried for a while to get this experiment to properly simulate the pipe leading into the grit chamber and the entrance into the tank but after a lot of work it was decided that we were headed down a dead end road. It is possible that the method would work in real life and to really work this experiment had to be done in full scale which is impractical. This experiment was abandoned in favor of putting more man power behind the sand filter method which shows promise.

As part of the Sand Filter team I have helped modify the experimental apparatus to include "Bob" which is our bubble chamber we used to aerate the water in the Aeration Group's experiments. I have also been involved in the experiments and the group think to fix all of our problems. I have let Haley take more of the lead now since she knows more about the current experiment since it was her sub team. We hope to have real data soon.

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There are no pages at the moment.