

Catherine Hanna's Individual Contribution Page

Summer 2010 Contributions

This past summer, I worked with the Foam Filtration Team in order to determine the feasibility of implementing a foam filtration unit into AquaClara's small-scale water treatment plant.

I worked with four other group members to conduct research on foam filtration. We ran multiple experiments using different parameters (pore per inch count, raw water approach velocity, foam depth, alum coating, etc.) in order to determine the optimal parameters for maximum performance and least effluent turbidity. After realizing that not much work has been completed on studying the effects of foam filtration, we decided also to write a thorough research paper on our findings. Essentially we discovered that foam filtration units are not appropriate for use at a large scale. But rather, sand filtration may work best with AquaClara's water treatment plant. Hence, we have decided to begin focusing our efforts on foam filtration as a point-of-use system.

Fall 2010 Contributions

I spent this semester working with the Foam Filtration Team once again. This time, we focused our efforts on designing a point-of-use foam filtration unit.

My part consisted of designing the middle of the unit, the foam filtration body itself. The design focused on a unit that utilized a polyvinyl chloride (pvc) pipe with a diameter that varied based on the needed volume of filtered water. Foam was to be supported at the bottom of the filter column by a screen. Additionally, one orifice would be drilled into the top and bottom of the column to let water enter and exit the filtration unit respectively. The orifices were designed so that the flow through the filter would be constant (meaning that the inlet flow would be equivalent to the exit flow). After leaving the column, the filtered water would then be chlorinated and sent to a distribution tank.

I also created a MathCAD file that allowed the user to input values for approach velocity, number of people getting water from the filter, and average volume of water consumed by one person per day. With these values, the program calculated the necessary diameter of the filter and the required diameter of the inlet and exit orifices. Another file was created to determine the total head loss through our filtration system, given specific dimensions and number of elbows.

After combining and constantly revising my and my teammates designs (filtration unit, chlorination doser, and holding tanks), our group managed to finalize a schematic for this unit, submit a financial aid proposal to EPA's P3 competition, and run experiments to determine our unit's effectiveness as a point-of-use system. Toward the end of the semester, we also began looking into filtration effects of layering foam with different pore sizes.

Spring 2011 Contributions

I worked with AquaClara's Foam Filtration Team once again, where my priorities for the semester were focused on design and fabrication efforts versus research. We continued to design the point-of-use foam filtration system, but instead focused more on the specific details of the system by calculating all necessary dimensions for each individual component. The goal was to determine and finalize all dimensions and components in order to build a sample system to test physically and obtain concrete results. However, due to time constraints, fabrication efforts will have to be completed another semester.

Along with the "point-of-use" tasks, we also attempted to finish writing a paper (regarding foam as a filtration media) that was started during the Summer of 2010. After much revision, the paper is almost complete and will soon be submitted for publication.