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McKenzie Hubert’s Individual Contributions

Spring 2013 Contributions

As a member of the StaRS Filter Theory research team, I compared the differences between subsurface injection of raw water into sand filter and conventional down flow filter designs in which water enters through the top of sand bed. Our goal was to determine if there were any significant advantages between the two designs in terms of head loss through the filter or particle capture efficiency. We began the semester by conducting a literature search of what is already known about "depth" and "surface" filtration and what factors caused one over the other to occur. While we were able to find some information about these terms, we were unable to find much information about subsurface water injection in filters. We then created an experimental apparatus which allowed us to directly compare the two types of filters side-by-side using the same influent water. I became familiar with using programs such as Process Controller, Excel, MathCAD, and Lyx throughout the semester as we collected and analyzed the data recorded by the pressure sensors and turbidimeters used in our experiments.

By varying parameters such as coagulant dosage, filter velocity, and influent turbidity, we found that there was little difference between effluent turbidities of the two filters. We also observed that head loss in both filters increased linearly over time, although the surface filter's head loss increased at a faster rate than the subsurface filter. Another key difference between the two was the formation of flocs in the filter. We found that the surface filter needed to be manually scraped clean or "surface washed" with a high velocity jet of water to remove all of the flocs on the surface of the filter. The subsurface filter did not show signs of large floc accumulation and we were able to backwash successfully by pumping water through the bottom of the filter to fluidize the bed. These conclusions apply to the SRSF in that we do not believe that it should not require surface washing or manual cleaning, and the head loss does not increase as quickly as a typical RSF, which means that it can operate for longer periods in between backwash cycles, and less force will be required to fluidize the bed during backwash.