Challenges Foam Filter Fall 2010

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Summary

Past research has demonstrated that foam filtration is an effective form of turbidity removal. However, given the manual labor required for its operation, it is best when implemented at a smaller scale than AguaClara currently operates at. The viable scale of implementation would fall between municipal scale, and point of use. This could be a great for use in schools, apartment or office buildings, or even small towns. There are two immediate goals: prepare this project for submission as a EPA P3 Phase 1 Design for point of use system and complete the paper that was begun Summer 2010. This novel target area could open new windows (or faucets) to the spread of AguaClara!

Immediate Challenges

Determine the head loss through a clean filter

Install an attenuator with a flow control valve, where the head loss through the valve is significant, so that the revolutions of the pump will not affect the readings of the pressure sensor since the pressure difference due the pump revolutions will be small in comparison to the pressure in the attenuator. We may also achieve constant head utilizing elevation.

Determine the head loss over time and the measured head loss that causes compression

Design a system similar to before where pulsations caused by the peristaltic pump do not affect the pressure sensor results. Such a value is necessary and a high priority so that we can establish when the foam compresses so that perhaps we can recommend cleaning before this happens and so there is a value in the paper we submit. We cannot submit the paper until we have a good understanding of the range and pressure that causes compression.

Determine the range of influent turbidities under which the filter will perform under US EPA Standards of 0.3 NTU

This will be important if this filter should be marketed as a stand-alone treatment option. Can this material effectively filter 100 NTU water? 10 NTU? We should know the bounds of the design.

Determine the effect on run time and effluent turbidity if a layered porosity filter is used instead of a single porosity.

Past experiments have shown that the majority of clay particles are trapped in the uppermost layers of the foam material. We may be able to achieve more uniform particle removal over the depth of the filter media by layering porosities throughout the depth (say 3 inches of 60ppi, followed by 7 inches of 90 ppi). Achieving a more uniform clay distribution over the depth of the filter will likely result in longer experimental runtimes, which means the filter might require less frequent maintenance and cleaning.

Design a foam filter unit for implementation

The design will need to incorporate:

- A filter unit that maintains a tight seal with all edges of foam
    - Must determine desired filter properties from previous research
        - Depth (dependant on porosity)
        - Porosity (even start 30 ppi (pores per inch) perhaps layer 60, then 90)
        - Approach Velocity (3-6mm/s)
- A holding reservoir for incoming dirty water
    - Must incorporate a flow control to regulate the height of water above the filter and the flow rate through the filter
- A holding reservoir for clean effluent from filter
    - A chlorine dose controller
    - It may be necessary to work with the chemical dose controller (CDC) team for help and ideas on accomplishing a simple, effective dosing with a material that does not deteriorate significantly when exposed to chlorine.