

Horizontal Filtration

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In an optimized plant design, we would like to be able to manipulate geometry to reduce the required plan area. The best design would take advantage of placing the filter material in a vertical direction, with water flowing through the filter horizontally. Therefore, it is necessary to determine the filtering capacity of the foam material while in a vertical position, with water flowing through the column horizontally. To do this, we used the same experimental set up, and simply rotated the filter column onto its side.

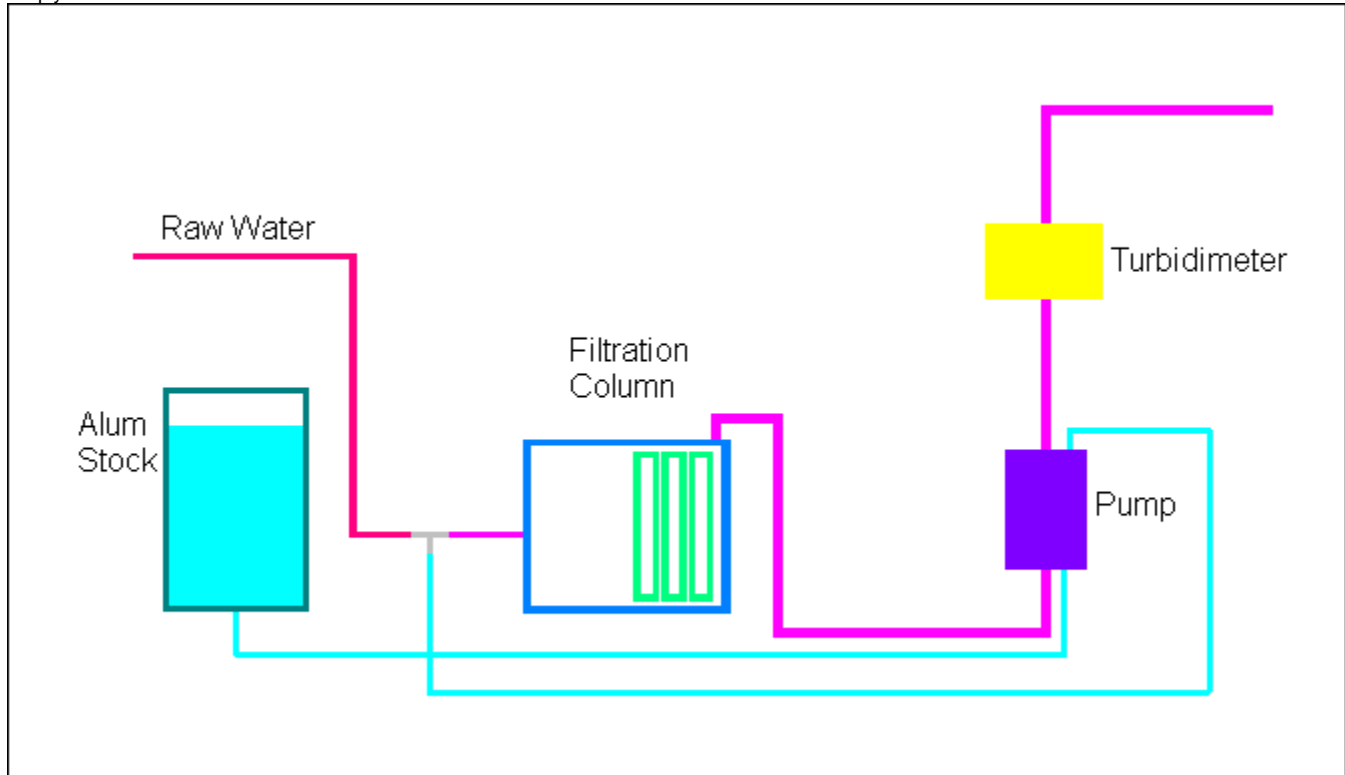


Figure 1: Horizontal Filtration Experimental Setup

Experiment 1

The graphs below indicate that horizontal filtration does not provide optimal performance, as compared to vertical filtration. The horizontal filter only achieves a pC^* of .7 after 20 hours of operation, whereas the vertical filter achieves this after only 3 hours. This is a clear indication that horizontal filtration will not be able to meet the standards of achieving a .9 pC^* within a reasonable timeframe.

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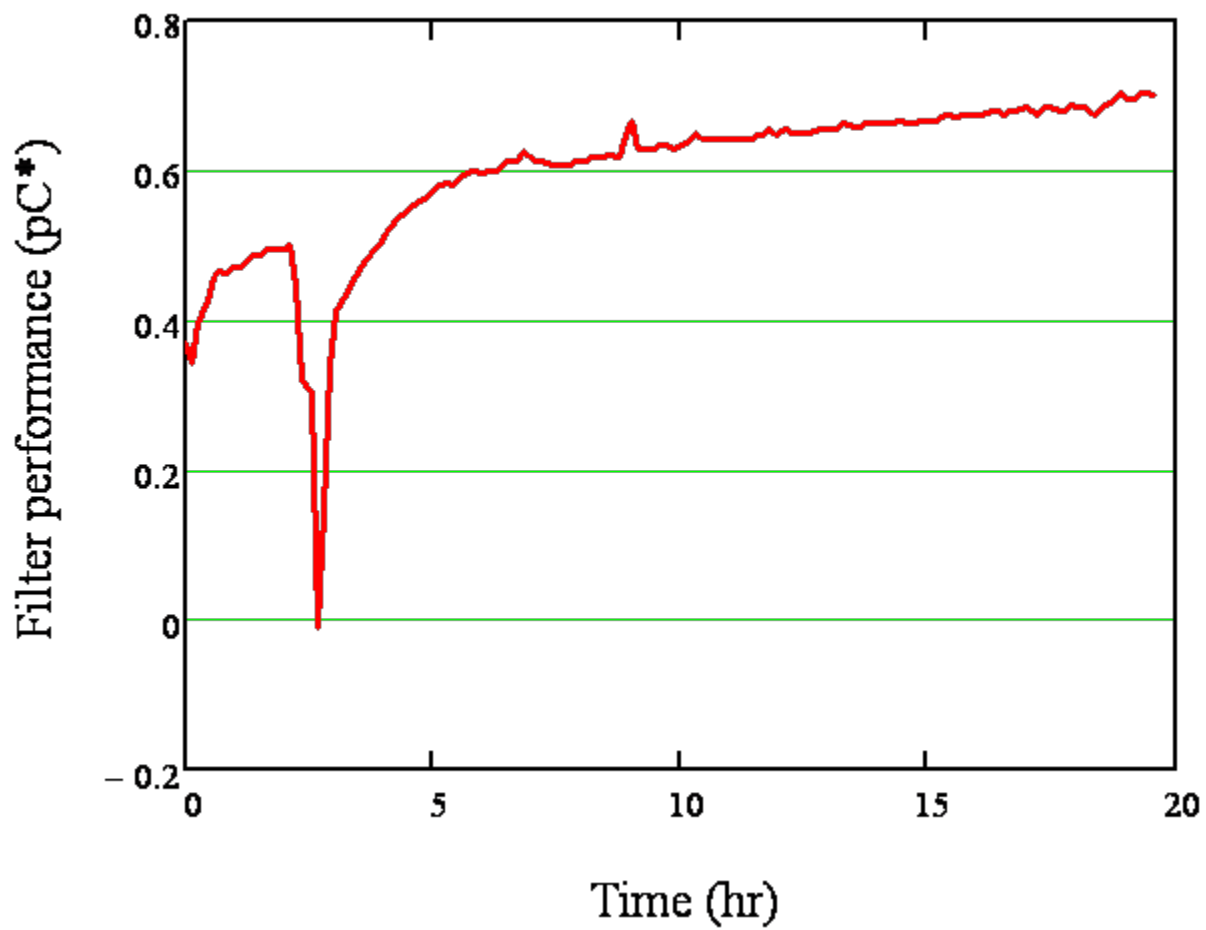


Figure 2: Horizontal Filtration Experiment pC^* vs Time

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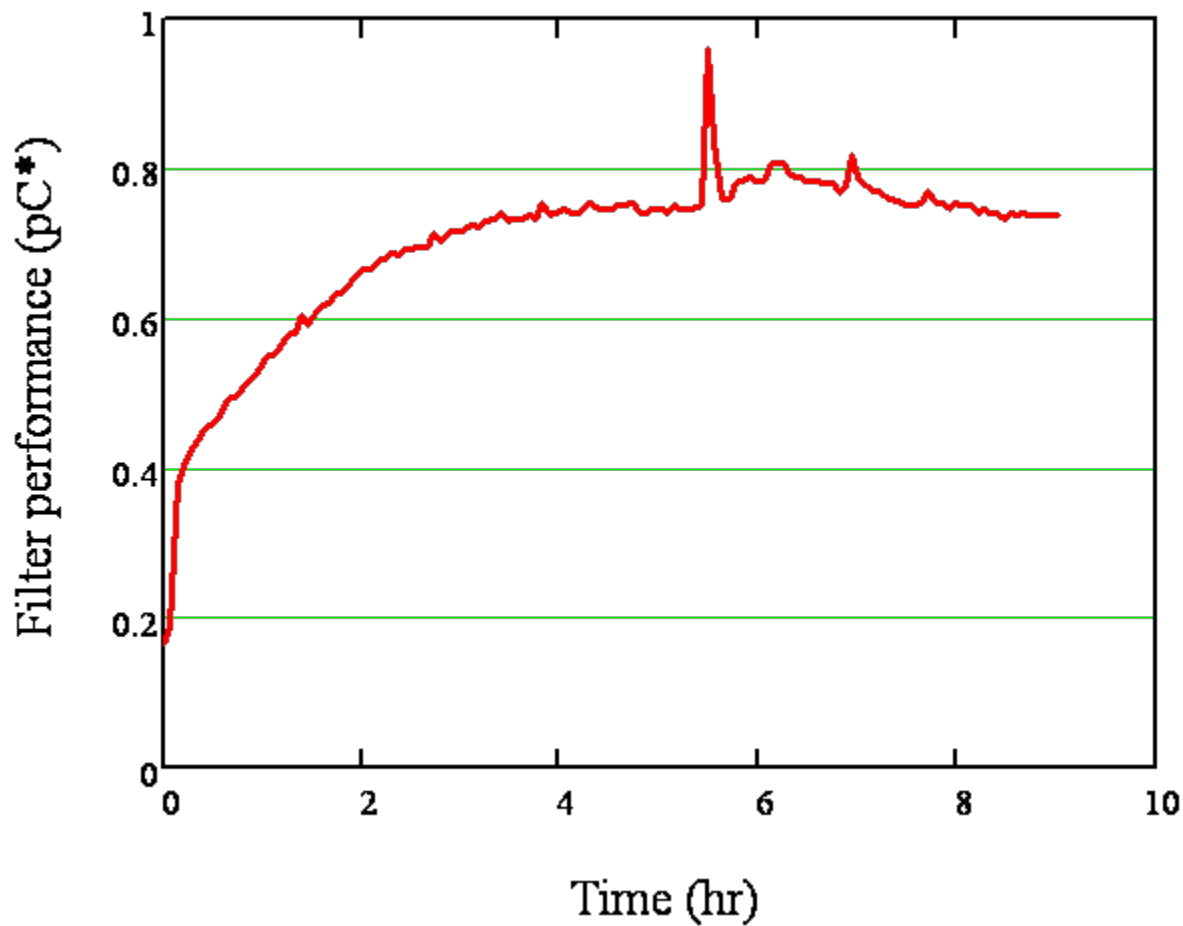


Figure 3: Vertical Filtration Experiment pC* vs Time

Experiment 2

In this experiment, we first primed the filter by running 5 NTU water through the filter placed in a vertical arrangement for 22 hours, after which the filter column was carefully rotated 90 degrees onto its side, with the effluent water being drawn from the vertically highest elevation at the end of the filter. The experiment was then run for another 22 hours. Figures 4 and 5 clearly indicate that after the column was rotated, there was a significant decrease in the trend of increased performance with time. After rotation of the column, it was visually obvious that a turbidity gradient developed over the depth of the filter, with very turbid water going through the filter at the bottom, and cleaner water going through the top. This gradient is likely contributing to the decrease in performance, as compared to vertical filtration tests after comparable time intervals, shown in Figure 6.

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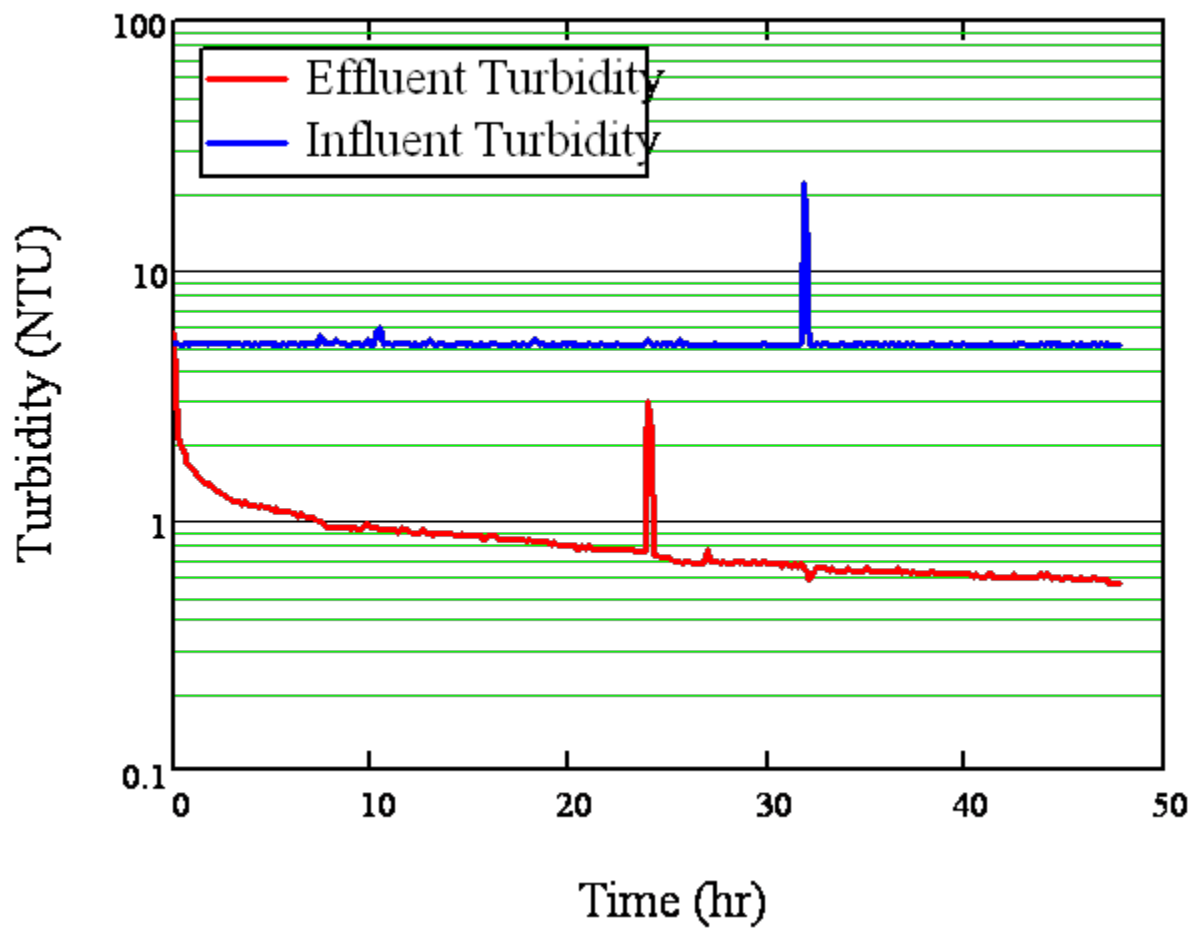


Figure 4: Turbidity vs Time for Vertically Primed Horizontal Filtration Note: Column Rotated to Horizontal Filtration at 24 hours

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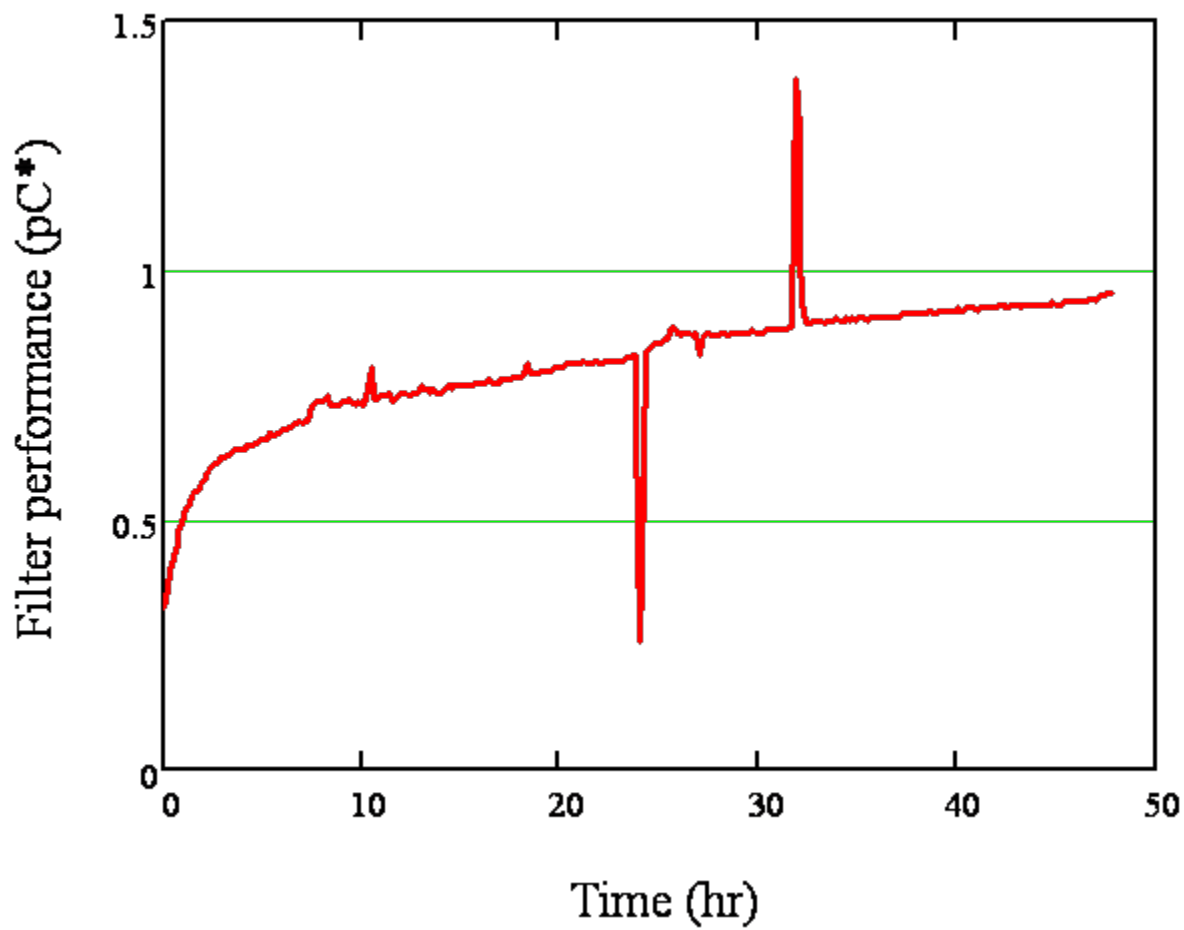


Figure 5: pC^* vs Time for Vertically Primed Horizontal Filtration Note: Column Rotated to Horizontal Filtration at 24 hours

_Figure 6: pC^* vs Time for Vertical Filtration, under same conditions as test of Horizontal Filtration:
3 inches of 90 ppi foam, 1.5 mg/L alum dose, 100m/day_