



Sawyer PointOne™ Filters

- Gravity-fed point-of-use filter
- Hollow fiber membrane (0.1 µm pores)
- Shown to reduce diarrheal disease by 78% over 12 weeks.
- New filters have been shown to meet EPA recommendations of at least 6 log removal of bacteria.
- A properly maintained filter should last >20 years in the field



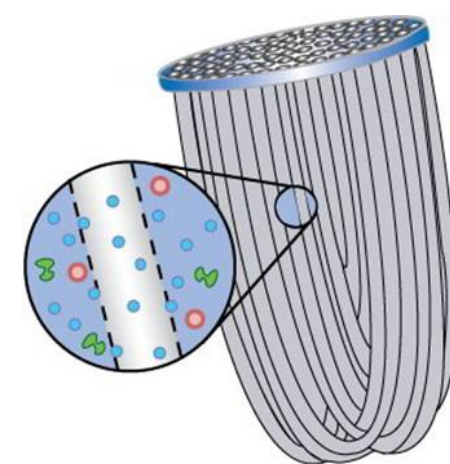
Specifications

A primarily self sustaining system that is able to cycle water continuously through the Sawyer PointONE™ filters to test longevity and useful life of filters. System should also allow for removal of filters for various testing purposes.

Goals

• To assess the long term performance of Sawyer PointONE™ hollow fiber membrane filters in bacteria removal. We do this by stressing the filters by cycling water constantly through them.

• To regularly assess if the filters have passed bacteria removal testing, according to EPA standards of at least 6 log reduction (99.9999% removal).



Bacteria Removal Test Results

• As of summer of 2017, the filters had each filtered over 40,000 gallons of water.

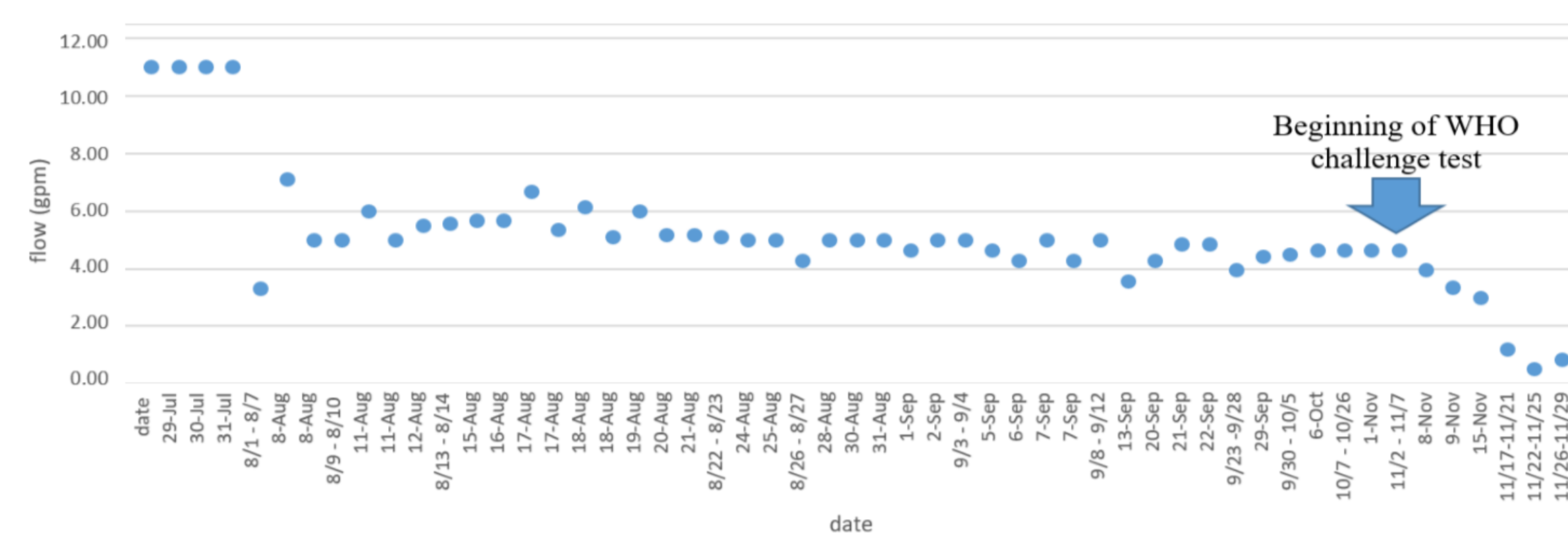
• This is about 25 years of average household filter use.

• After 40,000 gallons, the filters were tested, and **all 24 filters exceeded 7-log removal of e. coli**, meeting EPA standards.

• There was no breakthrough of bacteria in any of the filters.

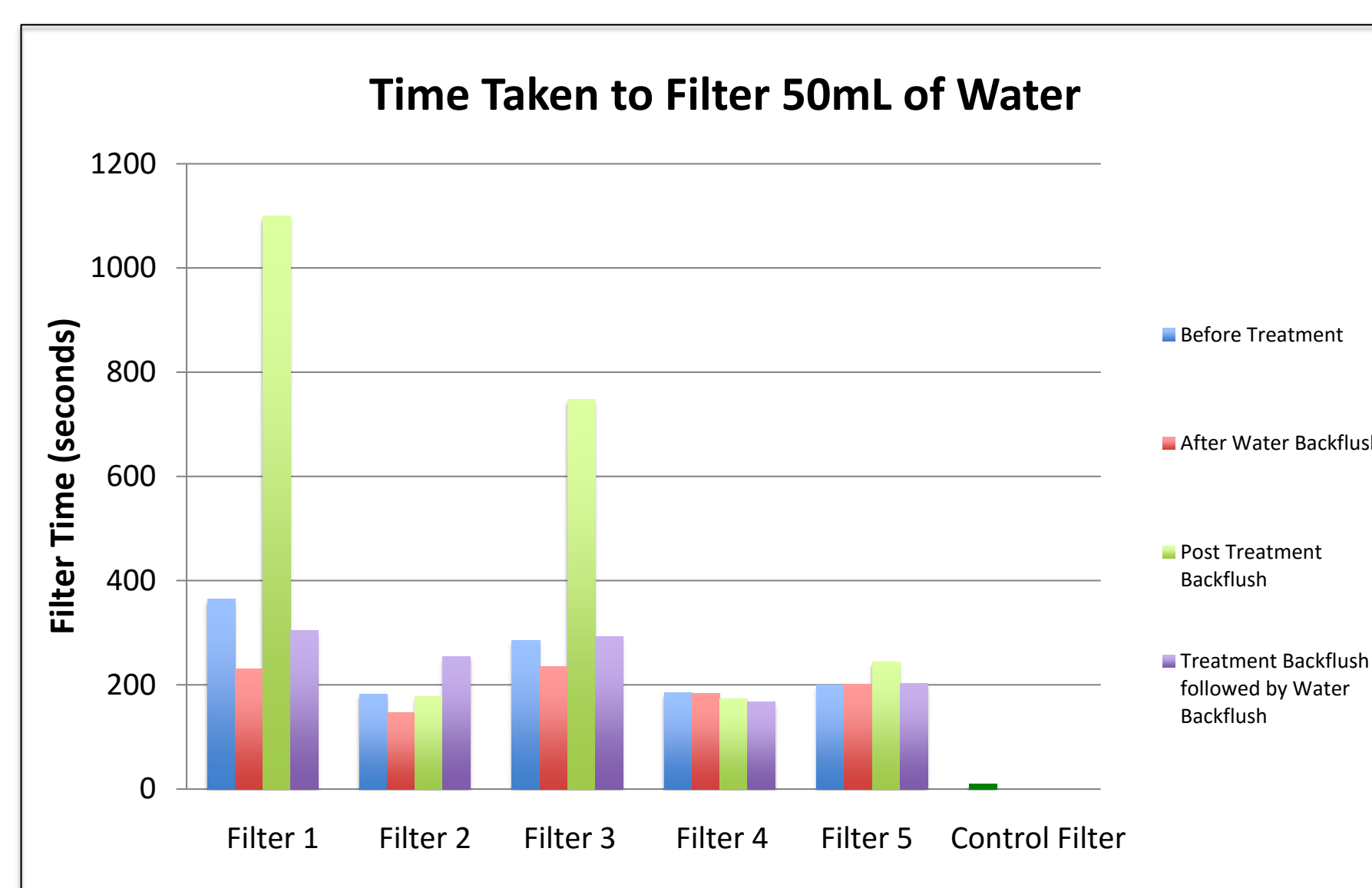
Flow Rate

• A major issue that we have encountered is a weak flow through the system.



Flow Rate Testing

- Over the course of the filter testing flow rates in each of the 24 filters has dropped significantly below the 1 liter per minute mark.
- We tested 5 cleaning solutions in 5 filters to see if the filters could be reconciled or if they were at the end of their useful life.
- Filter 1- Bleach
- Filter 2- Soap and water
- Filter 3- Vinegar
- Filter 4- NaOH
- Filter 5- Vinegar and NaOH



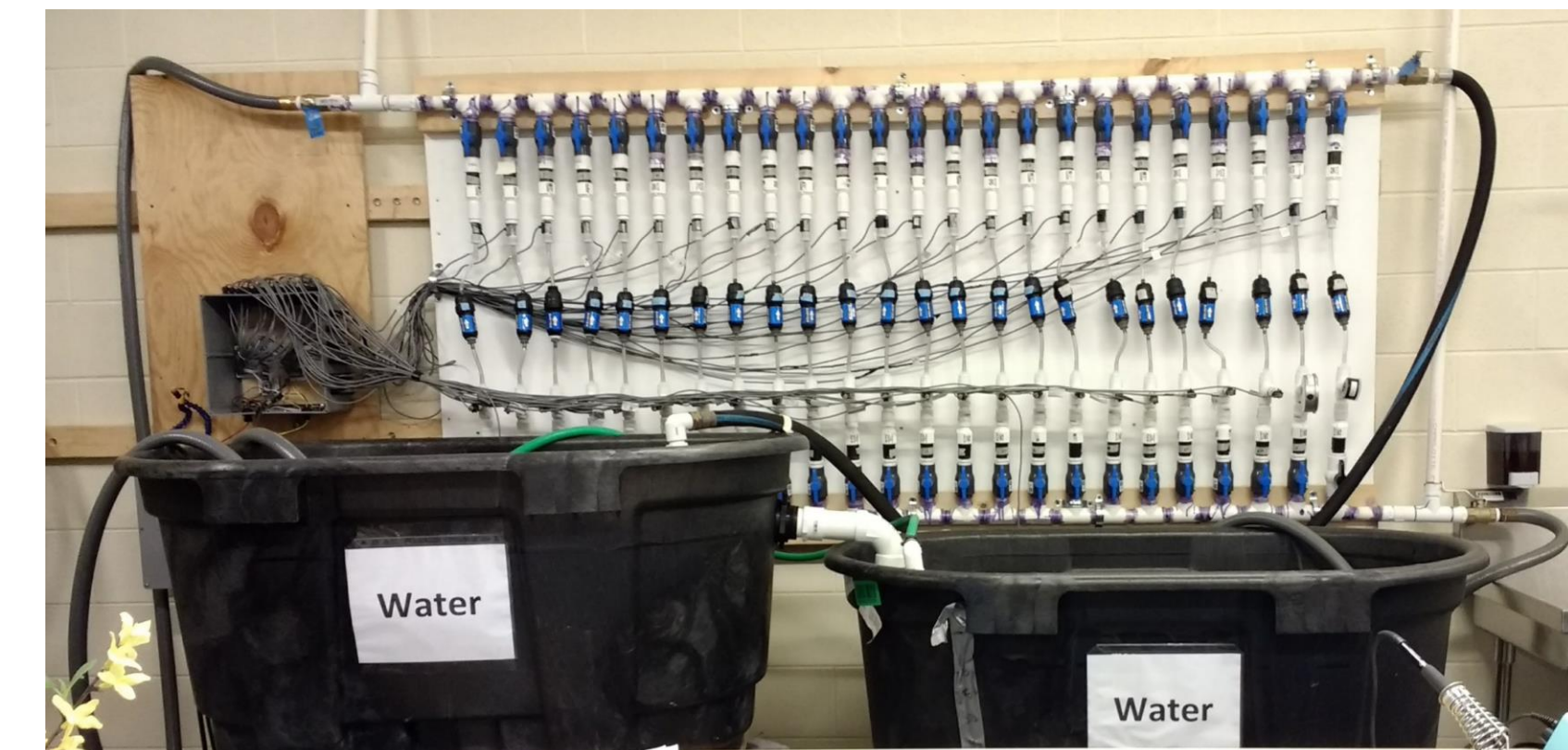
- Post cleaning: NaOH was the only solution to improve the flow rate
- However, the flow rate was no where near to returning to 1 liter per minute

Moving Forward

- Deliver data to Sawyer, replace 24 filters with new ones, start lifetime testing over.

System Design and Layout

- Water is pumped from the right tank, up through the 24 filters, and into the left tank. When the water level reaches a specified point in the left tank it overflows back into the right tank.
- The water passes through two sensors. The first measures pressure, which is restricted to 10 psi before it reaches the filters. And the second measures flow. Both are recorded on a SIM card stored next to the system.
- The tanks are raised up on blocks to be at a more even level to the filters. This is done to prevent air locks in the system.
- Each 30 minutes, the system engages in back flush to clean out the filters as specified by sawyer. This process is regulated to about 15psi back flush.
- Each tank is equipped with a float sensor that shuts of the system if the water in the lower tank gets too high or the water in the higher tank gets too low.



Spring 2018 Observations and Troubleshooting

Mystery dust was observed flowing through the system. In the presence of the unknown precipitate we stopped the system in hopes to find the source of the material. In an effort to clean the system we performed three tests.

- Hardness testing
- Filter testing
- System cycling (without filters)

The four possible sources of the dust are hardness, filter degradation, system degradation, pump degradation. After cycling water through the system and filters separately and concluding the dust wasn't hardness we knew the dust was rust, paint flecks, residue from the WHO challenge test water, and degradation of the pumps.

Conclusions

- The precipitate is collecting in and coming from the pumps
- Bought new pumps

Acknowledgements

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