

Evaluation of Ceraflow-50 as a Filtration Media for Hexavalent Chromium Treatment

Project Description

Pilot testing was conducted to evaluate the relative performance of 4 filter media, including Ceraflow-50, as part of a reduction coagulation filtration (RCF) treatment process for the removal of hexavalent chromium (Cr(VI)) from groundwater. This evaluation was conducted at multiple well sites for a water utility in California.

The RCF process achieves Cr(VI) removal by reduction to the less soluble trivalent chromium (Cr(III)) using a reductant – i.e., ferrous iron, coagulation, followed by filtration of the chromium laden particulate. Following the reduction step, any remaining ferrous iron is oxidized to ferric hydroxide via aeration or chlorine addition, and then filtered, removing the chromium particles. RCF for Cr(VI) removal is akin to arsenic removal with coagulation filtration with the exception of the reduction step and the use of ferrous, rather than ferric iron as a coagulant.

This investigation compared the efficacy of four different filter media designs for use in the RCF process (See Table 1). For the impacted utility, significant capital cost savings

could be realized by reduction of (1) the requisite filter area, and (2) instantaneous back wash volume. In this instance the backwash volume was important as the utility could discharge backwash waste to sewer, however the existing sewer capacity is limited and therefore either costly sewer main improvements or on-site equalization would be required. If Ceraflow-50 were effective, the filter area could be reduced by as much as 50% and the instantaneous backwash volume by 75% when compared to a traditional dual media design.

Pilot Test Results

Total Chromium Removal:

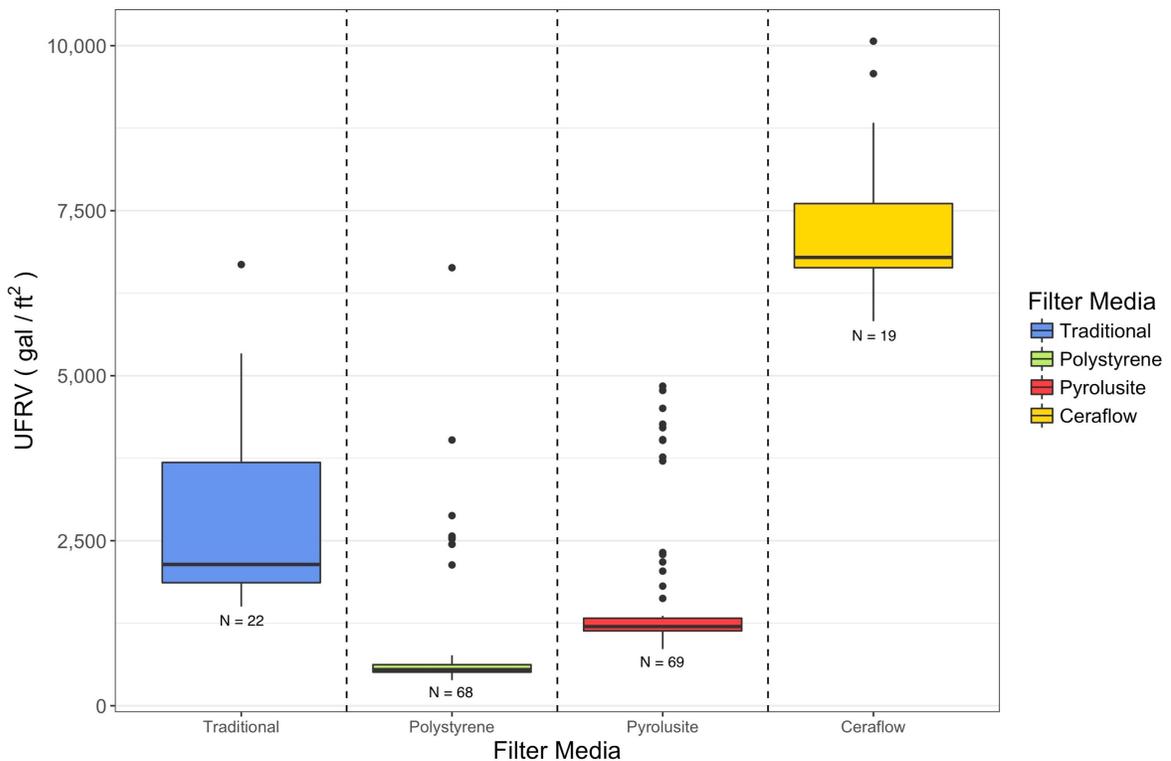
With all four media designs, with optimal ferrous doses and contact times, filtered water total chromium targets of 4 µg/L could be reliably achieved.

Table 1 Media designs pilot tested

Media	Ceraflow	Traditional	Pyrolusite	Polystyrene
Media Design	30"	18" anthracite 12" sand	30"	30"
HLR (gpm/ft ²)	8-10	5	8	5
BWLR (gpm/ft ²)	10	20	28	3.5

HLR: Hydraulic Loading Rate
 BWLR: Backwash Loading Rate

Figure 1 Comparison of UFRV with a 1 mg/L-Fe coagulant dose



Filter Media Performance:

The Ceraflow-50 media performed comparably to the other media designs tested but exhibited median unit filter run volumes (UFRV) nearly three times greater than the traditional dual media design which was the second best performing media with respect to UFRV, as shown in Figure 1.

Conclusions:

Based on the findings of the pilot testing:

- **Ceraflow-50 was recommended for full-scale implementation for each of the wells tested, or a combined capacity of nearly 6,000 gpm.**
- The use of Ceraflow at these sites results in decreased filter area and eliminates the needs for on-site equalization and sewer upgrades.

- With these two factors combined, the use of **Ceraflow-50 is estimated to reduce the total project cost by more than \$5M, or nearly 30% of the original engineers cost estimate.**

Contact Information:

If you would like more information regarding Ceraflow-50, or its application in a RCF treatment process for Cr(VI) removal, please contact:

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