

Hexavalent Chromium Treatment Technologies

Process validation of ion exchange - nanofiltration and stannous reduction - filtration of hexavalent chromium water sources

**Research Bulletin
Science and Technology
Program**
9085

Treatment options for chromium were identified and evaluated to be viable from an engineering perspective, which would allow for full-scale buildout of either process.

Mission Issue

Each treatment process considered was deemed viable. Depending on site resources, waste disposal options and potable water source location the most cost effective treatment process could be considered. This research is beneficial to the two locations where it was tested in addition to any water source containing chromium.

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Problem

Hexavalent chromium is present in many groundwater aquifers used as drinking water sources and may be naturally occurring or due to anthropogenic sources. Many drinking water utilities will be impacted by anticipated maximum contaminant levels in California being lowered below the current federal standard. If a nationwide regulation is implemented, thousands of entry points in public water systems would require additional treatment at a cost of \$0.5-\$5.1 billion per year.

Solution

Reclamation sought to extensively test and validate the most cost effective technologies to remove hexavalent chromium from potable water sources. Ion exchange was coupled with nanofiltration to separate the brine waste into a reusable and waste fraction, minimizing wasted regenerant and waste volume. The ion exchange waste is hazardous and requires special handling and disposal. Stannous reduction was coupled with filtration to form a waste fraction that could be discharged to a sewer connection.



Optimization of ion exchange regeneration in TSC Reclamation facilities using different concentrations of regenerants.

“Results from testing technologies that treat hexavalent chromium will be used as validation to design and build similar processes at full-scale treatment locations in the most cost effective manner possible’.”

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More Information

<https://www.usbr.gov/research/projects/detail.cfm?id=9085>

<https://www.usbr.gov/research/projects/researcher.cfm?id=2779>

Application and Results

Research studies were conducted at Joshua Basin, California and Norman, Oklahoma. It was determined that both ion exchange – nanofiltration or stannous reduction - filtration could be applied at the test locations. Each treatment process had engineering.

Future Plans

In total, twenty (20) commercially available coating systems and three experimental were also tested side-by-side for comparison including thermoplastic and thermoset materials. Each system was subjected to a series of accelerated weathering laboratory and durability tests. While no single coating system matched the performance in every test, several promising candidates emerged, and additional laboratory and field tests are recommended.



TSC Reclamation testing of stannous – chromium filtration in Norman, Oklahoma.