

Groundwater Remediation Case History: Chromium (Cr⁶) Removal to <1ppb ZLD



Award

Purifics built and deployed in 2013 an automated 400gpm Photo-Cat System to remove Hexavalent Chromium (Cr⁶) from ground water at a Superfund Site in Odessa, Texas. The Photo-Cat solution removes Cr⁶ from 440ppb to less than 1ppb in a continuous duty process. The toxic Cr⁶ is converted to the significantly less toxic Trivalent Chromium (Cr³), removed from the water and concentrated into a sludge for disposal / recovery (problem eliminated).

According to EPA Region 6 report of November 2012, "The alternative treatment system will achieve a lower chromium concentration in the treated water at a lower monthly operating cost".

Background

Until recently this contaminated ground water had been treated with conventional Ion Exchange technology to remove Cr⁶ from 440ppb levels to the 50ppb discharge limit. The Ion Exchange process was found to be costly and had significant logistical challenges. In addition, it was not able to cost effectively treat and sustain treatment to the pending standard of <1ppb. Consequently, the EPA sought alternative options.

The Photo-Cat water purification process was successfully piloted in this application. The Photo-Cat pilot was conducted and optimized over a four month period. The Photo-Cat pilot demonstrated sustained and cost effective removal of Cr⁶ to <1ppb. After contract award, Purifics further refined the process to eliminate liquid waste streams. The result of this technology advancement is a fully automated water purification process to recover chromium and other metals, without generating liquid waste streams.

Full Scale Solution



400gpm Photo-Cat Zero Liquid Waste, Hexavalent Chromium Reduction, Removal & Recovery

How it Works

Hexavalent Chromium removal is a new application for the proven Photo-Cat technology. Photo-Cat readily **REDUCES** Cr⁶ to the more desirable and significantly less toxic Cr³. During its reduction, all of the Cr³⁺ adsorbs onto the TiO₂ catalyst of the Photo-Cat and is **REMOVED** with the catalyst.

The chromium laden TiO₂ is then processed and **RECOVERS** the chromium as a highly concentrated wet solid (Cr(OH)₃). The TiO₂ is sent back to the Photo-Cat (i.e. TiO₂ is completely closed loop). The entire process is automated and extremely energy efficient.

Photo-Cat Enhanced Performance

- Cr⁶ is eliminated by being reduced to Cr³
- Cr⁶ reduction is performed Photo-Catalytically
- Energy cost consists of 1.5 kW-hr/m³
- More cost effective than the Ion Exchange process previously employed
- Easily and cost effectively achieves <1ppb treatment of Cr⁶
- Zero liquid waste & chromium recovered

On-Site Pilot Verification



Commercial Application

Photo-Cat is anticipated to be the Best Available Technology for Hexavalent Chromium removal from water.

Consider Photo-Cat for complete Cr⁶ Reduction, Removal and Recovery.

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