

Remediation of a Historic Chrome Residue Stockpile Site to Below Remedial Goals

Site Overview

Soil was contaminated by the historic stockpiling of chromium slag at this former chromate manufacturing facility site in Yunnan Province China. The primary contaminants of concern were hexavalent chromium (Cr (VI)), along other heavy metals including lead and cadmium. The project had a stringent remedial goal (RG) of <1 mg/kg for Cr (VI).

The total area of this site encompassed 18,992 m² with a total volume of 50,655 m³ of soil, Cr (VI) concentrations at the site exceeded 1,000 mg/kg with some locations as high as 6,000 mg/kg. A stringent RG for the site was established at 0.91 mg/kg of Cr (VI) in soil (analyzed by standard alkaline digestion method), in order for the site to remain as industrial use after remediation.



Figure 1. Former chromate chemical production site

Treatability Study

An initial laboratory treatability test was conducted to evaluate and confirm the optimal MetaFix reagent formulation and dosage rate. A dosage of 2.5% w/w was used on a representative soil sample from the site. A greater than three orders of magnitude decrease of Cr (VI) concentrations in soil was achieved, meeting the strict remedial goal (Figure 2). Furthermore, both acid (SPLP) (Table 1) and water leaching concentration (Table 2) of chromium and other coexisting heavy metals were significantly reduced. MetaFix did not have a noticeable negative impact on the physical and biological properties of the soil (Figure 3).

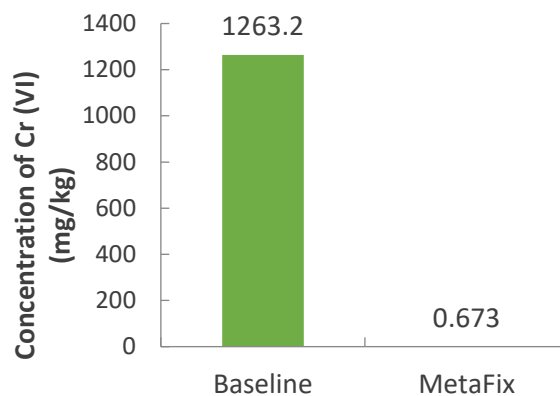


Figure 2. Cr (VI) stabilization of soils with MetaFix Reagent



Table 1: SPLP leaching (HJ/T299-2007) concentrations of heavy metals of concern pre and post stabilization

	Cr (VI)	Total Cr	Pb	As	Cd	Zn	Hg
Pre-treatment	106	108	2.55	0.005	0.18	0.012	0.001
Post-treatment	0.067	0.16	0.295	ND	0.011	0.005	ND
Hazardous waste leaching toxicity standards (GB5085.3-2007)	5	15	5	5	1	100	0.1

Table 2: Water leaching (GB5086.1-1997) concentrations of heavy metals of concern pre and post stabilization

	Cr (VI)	Total Cr	Pb	As	Cd	Zn	Hg
Pre-treatment	108	115	2.58	0.009	0.2	0.019	0.005
Post-treatment	0.011	0.482	0.222	ND	0.008	0.005	ND
Wastewater discharge standards (GB8978-1996)	0.5	1.5	1.0	0.5	0.1	-	0.05



Figure 3. Based on the analysis of the soil and leachate no negative impacts on the physical and biological properties were observed.



Field Application

The full-scale MetaFix application showed comparable stabilization performance to the lab test. The project remedial goal was achieved and the site passed the final regulatory inspection.



Figure 4. Full scale treatment process

Summary

MetaFix demonstrated outstanding stabilization effectiveness for Cr at this highly contaminated site. MetaFix provides a very competitive solution to heavily contaminated chromium sites due to its low dosage rate and excellent stabilization effects under natural subsurface conditions.

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