



CASE STUDY: TREATMENT OF SHALLOW SOIL CONTAMINATION USING HIGH pH ACTIVATION OF SODIUM PERSULFATE INDUSTRIAL SITE, ILLINOIS

INTRODUCTION

In 2008, JAG Consulting Group implemented an in-situ chemical oxidation (ISCO) application at an active industrial site in Illinois to treat the shallow soil contaminated with PCE, TCE, methylene chloride, toluene, and xylenes.



Use of sodium hydroxide (caustic) provided the high pH activation of sodium persulfate. High pH activation was selected as the optimal ISCO technology because of its treatment effectiveness on both chlorinated and petroleum hydrocarbons, the rapid cleanup timeframe, and its relative low cost application.

DESIGN OF FIELD INJECTION PARAMETERS

Prior to the field injections, JAG Consulting performed a soil buffering test in the laboratory in order to determine the amount of sodium hydroxide needed to raise the pH of the soil to above 10.5 pH units and maintain it for 2 weeks.

Because chemical oxidation requires an aqueous media, an infiltration gallery was constructed to slowly percolate water into the shallow soil (1 to 15 ft) to create saturated soil conditions. The full scale field injection consisted of 12 injection wells located in two Treatment Areas. Due to the low permeability silts and clays, each injection well had an estimated radius of influence of 10 feet.

Approximately 4,700 gallons of sodium hydroxide (25%) and 11,500 pounds of sodium persulfate were injected into the wells.

FIELD AND ANALYTICAL RESULTS

The following results were achieved in this ISCO project:

- Analytical sampling results indicate that PCE, TCE, methylene chloride, xylenes, and toluene levels were generally reduced from 88% to 99% within 6 months following treatment.
- The ISCO injections attained the soil cleanup criteria established by the State of Illinois EPA and “No Further Action” was granted for Area #1 and Area #2 in 2009.

Boring No.	Constituent	Initial Concentration (ug/kg)	After ISCO Concentration (ug/kg)	Percent Reduction
SB-17	PCE	160,000	180	99.9%
	TCE	5,900	10	99.8%
	Methylene Chloride	360	1	99.7%
	Xylenes	1,200	82	93.2%
	Toluene	52,000	1,400	97.3%
SB-20	PCE	220,000	1,900	99.1%
	TCE	4,500	280	93.8%
	Methylene Chloride	620	10	98.4%
	Xylenes	1,900	10	99.5%
	Toluene	1,900	10	99.5%
SB-8	PCE	1,700,000	190,000	88.8%
	TCE	16,000	4,200	73.8%
	Methylene Chloride	5,900	10	99.8%
	Xylenes	220,000	7,000	96.8%
	Toluene	200,000	22,000	89.0%

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