

In-Situ Fenton-Like Oxidation of Volatile Organics: Laboratory, Pilot, and Full-Scale Demonstrations

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Laboratory, pilot, and full-scale experiments were used to evaluate and optimize the ISOTECSM remedial process at a warehousing facility in Union, New Jersey. Based on modified Fenton's oxidative chemistry, the ISOTECSM process uses a proprietary catalytic agent that delays formation of reactive hydroxyl radicals. This allows adequate dispersion of the hydroxyl radicals, which is an oxidizing agent, throughout a contaminant plume. Groundwater at the site was contaminated with high levels of gasoline and waste oil constituents, principally BTEX and MTBE. Bench scale microcosm studies were used to evaluate the appropriate site-specific stoichiometric relationships between catalyst, stabilizers, and oxidizers; the effect of contaminant type and concentration; and the pH optima. Based on results of the laboratory studies, a pilot-scale study was performed at the site. One injection point for catalyst, stabilizers, and oxidant was installed in the contaminated zone at the site, with one hydraulically connected downgradient well used for monitoring. A single treatment of the reagents in the optimal stoichiometry determined from the laboratory study was injected in-situ over a period of three days. A 98.5 percent reduction in volatile organics was observed in the area treated, with the radial extent of treatment estimated to be approximately 20 feet, based on the presence of hydroxyl radicals detected in hydraulically connected areas and at the surface. The full-scale process employed six injection points and three treatment cycles over a three-month period. Subsequent to treatment, contaminant levels were either nondetectable or were reduced to below applicable New Jersey groundwater standards, with regulatory closure on the site achieved in less than one year.

Remediation of groundwater contamination is a chronic environmental problem, primarily due to the complexity associated with a subsurface soil-water matrix. In most cases, contamination exists in both soil and aqueous phases dictated by the corresponding distribution coefficient (K_d) and the octanol water partition coefficient (K_{ow}) (Watts, 1997). Several factors limit