Remediation of Volatile Organics in Groundwater Using In Situ Carbon (ISC) Injection Technologies: A Comparative Analysis

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Background/Objectives. The application of activated carbon in situ for the remediation of organic contaminants in ground water has gained significant popularity in recent years. There are a variety of commercial products now available, most commonly designed as co-injectates with electron acceptors or other amendments to bind contaminants while stimulating biodegradation processes. Given the relative novelty of these products, there is not much available by way of comparative analysis in the literature to date.

Approach/Activities. Two carbon-based products currently on the market were tested at multiple remediation sites across the United States. The first product incorporates a gypsum-based electron acceptor with facultative microorganisms and nutrients into an injectable slurry that is applied in situ under pressure. The injection method is designed to open preferential channels where impacted ground water can migrate to contact the injectate. Once contact is established, the carbon provides increased surface area for biodegradation, which is facilitated by the added microorganisms, nutrients, and electron acceptors. This product was used on spills at several retail gasoline service station sites in the northeast using focused interval pressure injection.

The second product uses a smaller particle size carbon that can be injected under less pressure and still achieve efficient distribution in the subsurface. Once injected, this formulation serves as a colloidal biomatrix combining microorganisms, nutrients and electron acceptors to facilitate enhanced contaminant biodegradation. Injection is typically completed in liquid form at low pressures using conventional technologies. This product was applied more than a dozen sites coast to coast to address petroleum hydrocarbon and chlorinated solvent impacts mostly using direct push techniques.

Results/Lessons Learned. Results compiled from applications of both carbon-based products at multiple remediation sites will be compared, with lessons learned highlighted. One case study using each product will be detailed focusing on application observations, changes in site chemistry, and overall performance.