EHC®

The Original Injectable ISCR Reagent for Groundwater Applications

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Reductive dechlorination of solvents in groundwater and source zones using controlled release carbon with ZVI.

About EHC®

EHC is a patented combination of controlled-release, integrated carbon and zero valent iron (ZVI) used for stimulating *in situ* chemical reduction (ISCR™) of otherwise persistent organic compounds in groundwater. Variations of these materials have been used to treat over 6,000,000 tons of soil/sediment and hundreds of sites with groundwater impacted by recalcitrant compounds.

How It Works:

EHC yields redox potential (Eh) in the -500 to -650 mV range. This Eh is significantly lower than that achieved when using either organic materials (simple hydrogen-releasing compounds, lactate, molasses, and sugars) or reduced metal alone. Eh potentials in this range facilitate the timely and effective removal of normally recalcitrant chlorinated organics (e.g., CT, PCE) and other persistent compounds (e.g., pesticides) without the formation of potentially problematic intermediates, such as DCE/VC from the anaerobic degradation of PCE/TCE or CF/DCM from the anaerobic degradation of CT.

Reasons to Choose EHC:

1. Comparison of Commercially Available *In Situ* Groundwater Treatment Products

PRODUCT	CARBON	ZVI	NUTRIENTS	BUFFERING	LONGEVITY (MONTHS)	COST (US$/lb)
ISCR™ EHC®	Yes	Yes	Yes	Yes	12 - >60	$2.50
Lactate-based hrc's	Yes	No	No	No	6 - >12	$5.0-8.0
Iron	No	Yes	No	No	80 – 120+	$0.2-0.5
Molasses	Yes	No	Yes	No	1 – 2	$0.2-1.0
Vegetable Oil	Yes	No	No	No	12 - >60	$0.5-0.7
Chitin	Yes	No	Yes	No	6 – 24	$2.0–3.0

Client Testimonial: Alabama Superfund Site

"ISCR technology from Adventus was the EPA approved remedy for both soil and groundwater treatments at our Alabama Superfund Site. The EHC application for chlorinated solvents and pesticides in groundwater has shown to be an effective, long-lasting solution. Following one series of injections, groundwater performance standards have been attained for chlorinated ethenes and ethanes. Pesticide concentrations are approaching their performance standards. The EHC technology was selected after other injectable products had failed to meet performance standards".

— *Superfund Site Program Manager*

"THE EHC APPLICATION FOR CHLORINATED SOLVENTS AND PESTICIDES IN GROUNDWATER HAS SHOWN TO BE AN EFFECTIVE, LONG-LASTING SOLUTION."

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Treatment Mechanisms:

Following placement of EHC into the saturated zone, a number of physical, chemical, and microbiological processes combine to create strong reducing conditions that stimulate dechlorination of organic solvents and other recalcitrant organics (e.g., perchlorate). The organic component of EHC (fibrous organic material) is nutrient rich, hydrophilic, and has high surface area; thus, it is an ideal support for growth of bacteria in the groundwater environment. As they grow on EHC particle surfaces, indigenous heterotrophic bacteria consume dissolved oxygen and thereby reduce the redox potential in groundwater. In addition, as the bacteria grow on the organic particles they ferment carbon and release a variety of volatile fatty acids (acetic, propionic, butyric), which diffuse from the site of fermentation into the groundwater plume and serve as electron donors for other bacteria including dehalogenators and halorespiring species. Finally, the small ZVI particles (i.e., <100 μm) provide substantial reactive surface area that mediates direct chemical dechlorination and an additional drop in the redox potential of the groundwater. These physical, chemical, and biological processes combine to create an environment that stimulates chemical and microbiological dechlorination of solvents. Redox potentials as low as –600 mV are observed in groundwater after EHC addition.

EHC has an estimated lifetime of 5 years in the subsurface, which makes it ideal for placement into permeable reactive barriers (PRBs). The first full-scale EHC PRB has been operating for over four years now and continuously supports >90% CVOC removal under flow-through conditions. EHC is also commonly employed for source area/hot-spot treatment and the product longevity will then serve to prevent rebound from desorption over time. Designs with multiple PRBs have been employed for complete plume treatment and are particularly advantageous for large plumes at sites with a higher groundwater velocity. EHC is effective on a wide range of concentrations and has successfully been applied at a site with starting TCE concentrations >600 mg/L.

Installation: EHC and can be placed into the saturated zones in a variety of ways including direct push injections, hydraulic and pneumatic fracturing, and direct soil mixing. EHC is completely non-hazardous and safe to handle. Common applications include Plume Wide Remediation as well as Plume Cut-Off / Barrier Remediation.

EHC a Cost-Effective Remediation Strategy:

By accelerating natural attenuation using EHC, *in-situ* treatment of aquifer contamination can result in an efficient, simple, cost-effective alternative to traditional technologies. With low capital costs, no operation and maintenance expenses, minimal site disturbance and proven effectiveness, this product can inexpensively restore water quality and property values at contaminated sites.

NEXT STEPS:

Contact us to obtain a free Conceptual Design & Site Remediation Proposal.

Adventus Group – info[at]AdventusGroup[dot]com or visit us at http://www.AdventusGroup.com.

Internet Seminars and on-site presentations in your offices can be easily arranged.

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