HRC-X™
HYDROGEN RELEASE COMPOUND
[eXtended release formula]

HYDROGEN RELEASE COMPOUND (HRC-X™)

[eXtended release formula]

HRC-X is specifically formulated to treat residual DNAPL in groundwater and to provide a long term solution for groundwater contaminant plume control

How it Works

HRC-X is a special formulation of the patented and widely accepted Hydrogen Release Compound (HRC®), which has been successfully applied on hundreds of project sites world-wide for the cost-effective, *in-situ* treatment of groundwater contamination.

HRC-X is a viscous material, composed of glycerol polylactate, which is injected directly into the contaminated subsurface. Once in place, this compound slowly releases lactic acid for periods in excess of 3 years. This source of lactic acid is then metabolized by naturally occurring microbes producing consistent, low-level concentrations of hydrogen. This hydrogen, in turn, is used by microbes to degrade chlorinated solvent-type contaminants through a well understood process known as reductive dechlorination.

HRC-X can be used to degrade a range of contaminants including: degreasing agents (PCE, TCE, TCA and their breakdown products), carbon tetrachloride, chloroform, perchlorate, nitrate, and certain pesticides/herbicides.

Residual DNAPL Treatment

Residual Dense Non-Aqueous Phase Liquids (DNAPL's) are often difficult to find and very costly to treat. Residual DNAPL causes a lingering and unwanted source of groundwater contamination that can represent enormous and unexpected cleanup costs.

HRC-X is a proven solution to this challenging problem. Once injected into the general vicinity of the residual DNAPL, HRC-X goes to work releasing lactic acid and cost effectively producing the desired hydrogen throughout the area. This, in turn, drives the rapid desorption, dissolution, and degradation of the bound residual DNAPL. (Figure 1).

Since HRC-X facilitates a microbial driven process, it can be applied without the need to identify the exact location of the residual DNAPL, avoiding costs associated with detailed site analysis. Additionally, HRC-X does not require stationary equipment, any on-going power supply, piping, long-term operations and maintenance or labor costs. These characteristics alone can significantly reduce the costs of residual DNAPL remediation.

Long Term, Low Cost Plume Control

When long-term plume control is required to halt the migration of groundwater contaminants, HRC-X may be one of the most cost effective alternatives available. In the past, the only alternative in these situations was to cut-off the plume by intercepting the groundwater with very inefficient and costly pump and treat systems, or by disruptive construction of expensive sheet pile barriers and "iron filing walls."

Groundwater remediation professionals now have an effective alternative to offer their clients and to reduce their cost burden, HRC-X. When applied perpendicular to the migrating plume, HRC-X passively releases the hydrogen required to degrade the mobile contaminant flux. The HRC-X material, once installed, continues to release hydrogen, effectively "cutting off" the migrating plume for a period in excess of 3 years, while avoiding the capital costs associated with engineering, construction and O&M intensive systems.

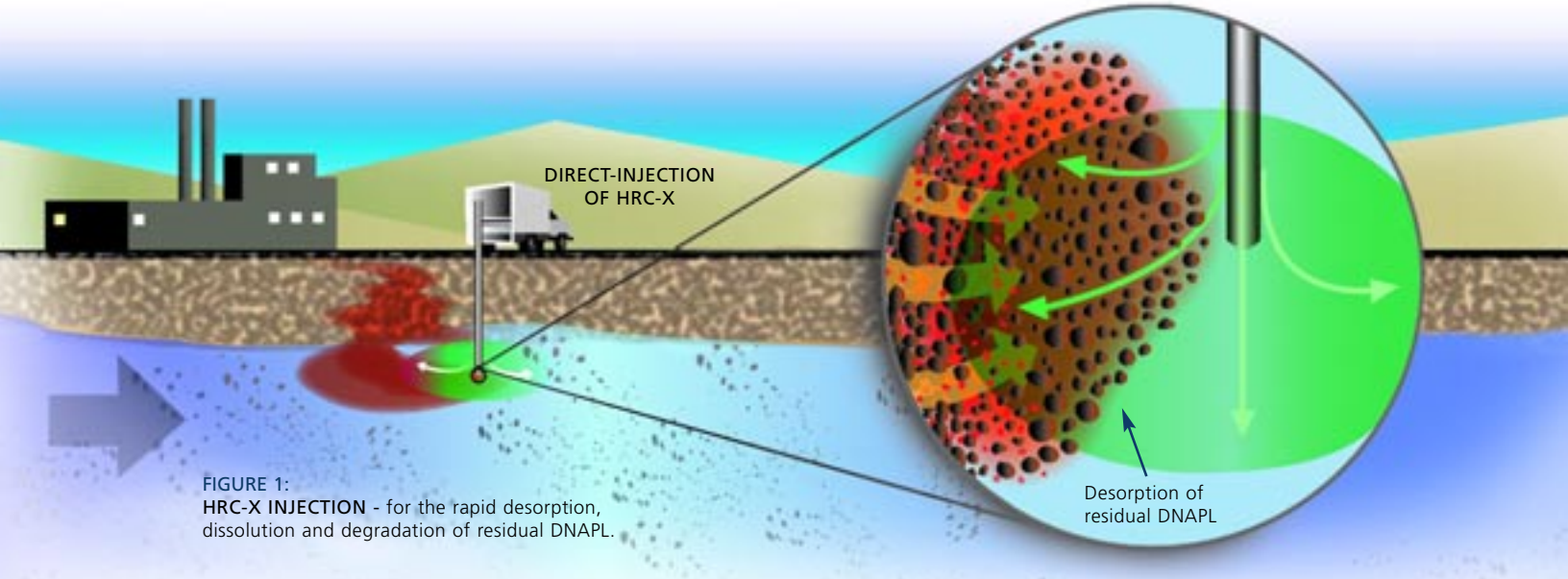

FIGURE 1:
HRC-X INJECTION - for the rapid desorption, dissolution and degradation of residual DNAPL.

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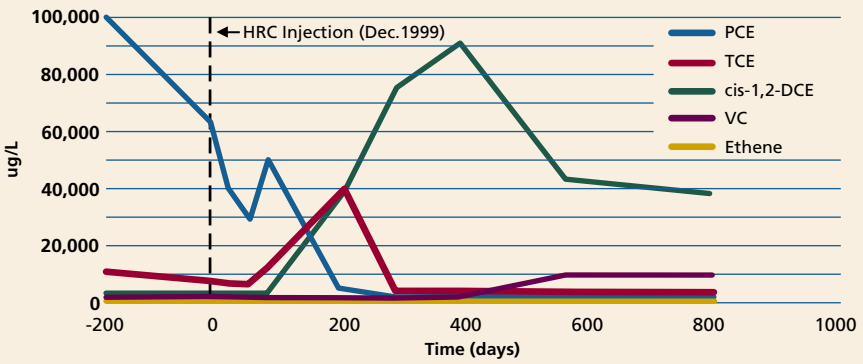
REGENESIS
Leaders in Accelerated Natural Attenuation

Effective DNAPL Source Zone Treatment

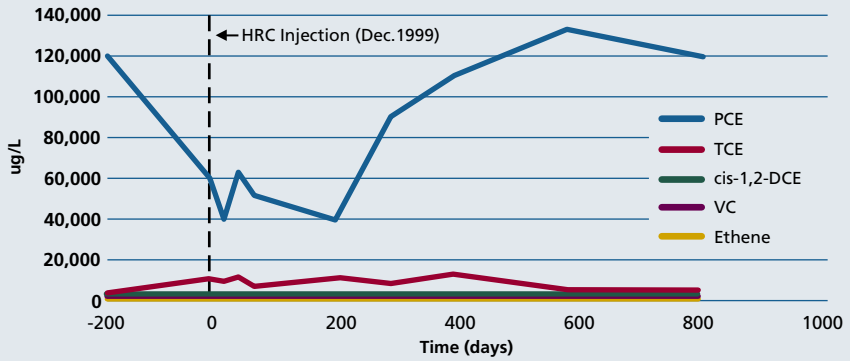
At a dry cleaner site managed by the Oregon Department of Environmental Quality, PCE concentrations in groundwater reached 100,000 ug/L – indicating the presence of residual DNAPL in the area. At the site, approximately 700 lbs of HRC-X material was injected through 5 direct-injection points. The application was situated in the general residual DNAPL area monitored by well JEMW-4. The results clearly indicate that HRC-X stimulated the rapid, *in-situ,* desorption and degradation of PCE and its resulting intermediate compounds (Figure 2).

Figure 2: Monitoring Well (JEMW-4) within HRC-X Treated DNAPL Area



In the control well, JEMW-5, located within the residual DNAPL area but not affected by HRC-X, PCE concentrations in groundwater remained high over the treatment period, (from 60,000 ug/L to 120,000 ug/L) (Figure 3). The results from JEMW-4 indicate that HRC-X continued to degrade an influx of PCE starting at day 200 and peaking at day 600 (Figure 4), while maintaining its longevity out to 800 days.

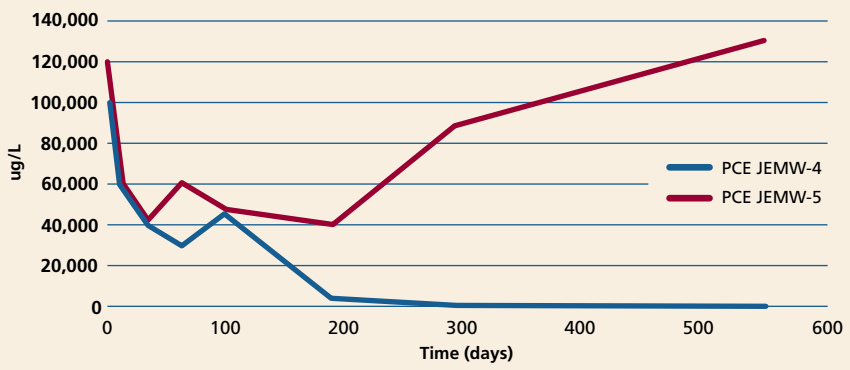
Figure 3: Monitoring Well (JEMW-5) outside of HRC-X Treated DNAPL Area



The total cost of HRC-X used to treat the residual DNAPL area was $20,000. The product was applied by simply injecting the material into the aquifer using direct-push technology. No expensive on-site equipment, operations, maintenance, or wells were required.

HRC-X is a proven technology used to rapidly and cost effectively treat residual DNAPL source areas. For a site design and cost estimate please contact Regenesis directly. Regenesis technical support services are provided free of charge.

Figure 4: PCE Concentration Graph
Comparing Monitoring Wells JEMW-4 and JEMW-5



1011 Calle Sombra / San Clemente / California 92673-6244 / Tel: 949/366-8000 / Fax: 949/366-8090 / www.regenesis.com