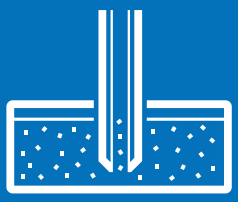
BIOLOGICAL REDUCTIVE DECHLORINATION

Technology for Site Clean-up



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PRINCIPLE

Biological Reductive Dechlorination (BRD) is an effective method for degradation of various types of chlorinated contaminants, mainly widespread chlorinated solvents, such as trichloroethene (TCE), tetrachloroethene (PCE), etc. It is based on an addition of an organic substrate (electron donor) into a groundwater collector to enhance bacterial growth that results in establishing highly reducing conditions. Under such conditions, anaerobic dechlorinating bacteria can perform reductive dechlorination of these chlorinated organic compounds to harmless degradation products - according to the following simplified degradation path:

PCE→ TCE→ cis-DCE → VC → ethene

Various additives, such as whey, lactate, molasses or other commercially available products, can serve as an organic substrate.

DESCRIPTION

The technology consists of proper delivery of an organic substrate into an aquifer. This can be achieved primarily by direct-push application using a hydraulic pump, via permanent application wells or a drainage system. For better spreading of the organic substrate, it is useful to establish a system of circulation wells for controlled groundwater circulation.

Furthermore, this technology can be intensified by delivery of an external heat. There are several methods available including electric heating, solar absorbers, waste heat from various technologies or their combination. Thermally Enhanced Biological Reductive Dechlorination (TEBRD) proved to be a convenient solution for sites where it is necessary to achieve remediation goals within a short time period or to treat aquifers with higher contamination levels.

DEKONTA also offers a wide range of laboratory testing services to evaluate the effectiveness of the BRD technology, including a recommendation of an appropriate organic substrate and its dosing to optimize the remediation system for *in-situ* application.

APPLICATIONS

BRD is a suitable technology for treatment of contaminated groundwater and soils. The typical sites are former (or active) plants, brownfields, and industrial zones affected by leakages of chlorinated solvents.
The biological reductive dechlorination of the highly chlorinated hydrocarbons, such as PCE and TCE, occurs more easily than the dechlorination of chlorinated hydrocarbons that are already reduced, such as DCE and VC. Therefore, it is important to determine, that *Dehalococcoides* or other species capable of complete reduction of PCE or TCE to ethene are present and are of sufficient quantity to ensure the process does not stop at DCE/VC.

High pressure direct push application of whey using drilling rig Geoprobe 7822 dt

Main advantages of the technology:

- Cost-effective solution for sites contaminated by chlorinated solvents
- Easy application and maintenance
- Possibility of intensification by an appropriate heating system
- Generation of harmless products
- Suitable for widespread contamination plumes

Potential limitations

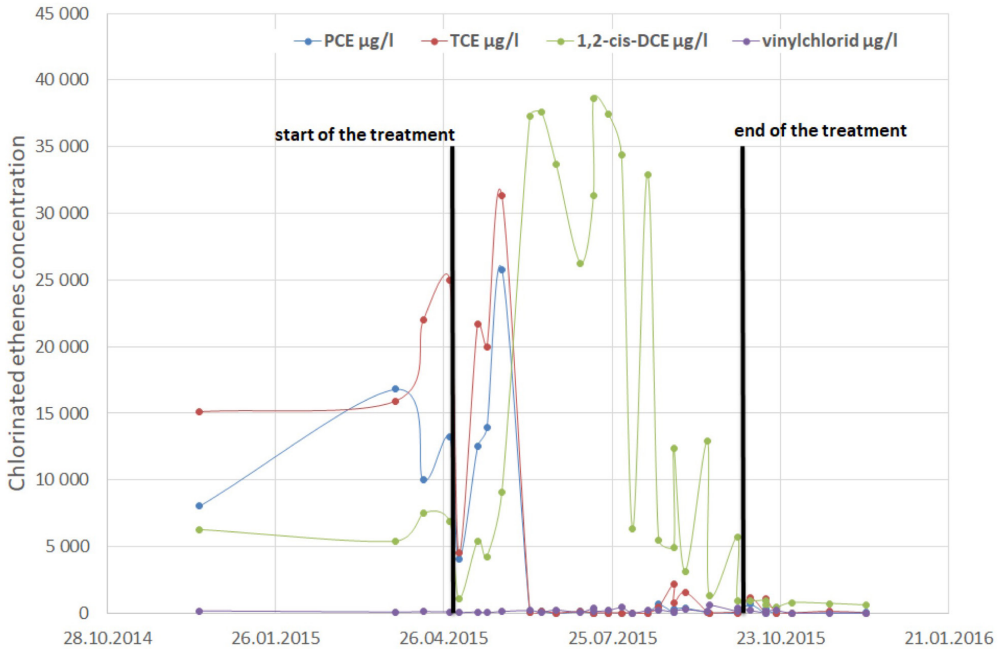
- Low permeability of the saturated zone may negatively affect efficiency of the method
- Remediation by the BRD method usually takes longer time (several years)
- Inappropriate for extremely contaminated source zones
- Some sites are not suitable due to groundwater conditions influencing the full degradation path (incomplete degradation of the initial contamination compounds)

REFERENCES

COMMERCIAL REMEDIATION PROJECT - ZACH TEMELÍN

BRD was one of the technologies used for the site remediation. This former chemical plant was mainly contaminated by chlorinated ethenes. Fresh whey from local dairy plant was stirred with added calcium hydroxide in adapted application tanks. The suspension was injected into the drainage system and application wells. The monitoring of related parameters proved establishing of appropriate reductive conditions in the aquifer.

Results from particular pumped well affected by the whey injections



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