BACAd - Bioaugmentation with optimized in-situ culture propagation

***J. Gemoets*[1], *Q. Simons*[1], *B. Boonen*[2]**

1 VITO, Boeretang 200, B2400-Mol, Belgium; johan.gemoets@vito.be, Tel. +32-14-335777
2 RSK Benelux, Ontginningstraat 22, B-3530 Houthalen-Helchteren, Belgium

A metal processing site has a groundwater contamination with chloro-ethenes that has migrated 1 km. The groundwater has a high seepage velocity and is acidic. Laboratory tests have shown that enhanced natural attenuation by addition of a substrate induces partial dechlorination of PCE which stalls at DCE. The objective of the EU-LIFE+ sponsored project BACAd is to demonstrate that bioaugmentation can be achieved on full-scale in a cost efficient way by optimizing propagation of injected cultures.

Five microbial cultures and two electron donors have been screened with a laboratory microcosm test. The two best cultures were used for execution of two push-pull pilot tests. Each test was done with a specific culture and electron donor. Laboratory column tests were performed with these cultures and site materials to evaluate and optimize their migration in the soil. The culture that performs the best in the push-pull and column tests was injected on a larger scale to perform a pilot test with 4 injection wells. At the same time, a similar field test is being performed in an adjacent area with injection of groundwater from another site where complete dechlorination of PCE has occurred. Afterwards, the remediation has been scaled up-scaled to a reactive zone with 40 injection wells that covers the entire plume width. Full-scale bioaugmentation with transfers of the microbial population from the initial pilot test remediation areas to the reactive zone is scheduled in fall 2013. By doing this, the costs for the production and injection of the microbial culture may be decreased, improving remediation efficiency. The in-situ propagation of microbial cultures is monitored with QPCR and DGGE-analyses.

Laboratory microcosms have demonstrated complete dechlorination following bio-augmentation in the presence of the electron donors *Nutrolase* (a residue from potatoe processing) and glycerol. The column tests confirmed the need for bio-augmentation and the dechlorination capabilities of the two cultures that were used in the field. They have demonstrated the mobility of the cultures in aquifer material of the site. The two push-pull test with cultures grown on *Nutrolase* and glycerol induced complete dechlorination in the field. Acidic groundwater conditions have slowed the process and required neutralization. Glycerol has proved to a better substrate than *Nutrolase*. The culture grown on *Nutrolase* was contaminated by pathogenic bacteria, which was caused by the substrate. The in-situ evolution of the pathogens has been monitored. The first small scale pilot test with injection of glycerol and a microbial culture has achieved complete dechlorination in the injection wells following bio-augmentation. The migration of the culture to the downgradient monitoring wells is currently being monitored. Full dechlorination has not been achieved yet in the injection wells of the second small-scale test in which groundwater from another site was injected. The installation of the full-scale reactive zone will be presented.

Platform presentation