



Tessenderlo, December, 2010

Newsletter LIFE+ project 'LVM-BIOcells' | 1

"Using Hydrogeobiocells (HGBcells) for the in-situ biological treatment of CAH contaminated groundwater in areas with low hydraulic gradients."

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The LIFE+ project

General project description

At the LVM site a groundwater contamination with chlorinated aliphatic hydrocarbons (CAHs) is present. These compounds are very difficult to remediate because of their physical and chemical characteristics. In most cases traditional remediation techniques are often inadequate, time-consuming and expensive.

Anaerobic dechlorination by soil micro-organisms is a promising remediation approach for CAH contamination, if conditions are favourable or can be engineered to become favourable. The Laboratory of Microbial Ecology and Technology of the University of Ghent has carried out research which resulted in the isolation of '*Desulfitobacterium dichloroelimans strain DCA-1*'. This bacterial strain is unique and can biodegrade 12DCA to ethene without the formation of toxic intermediate products. Based on this bacterium, Avecom developed a multispecies dechlorinating culture that degrades 12DCA as well as other CAHs.

In order to be successful, in situ remediation techniques always require sufficient groundwater velocities. At the LVM site, groundwater velocities are very low. The research unit Groundwater Modelling of the Department of Geology and Soil Science (University of Ghent) has developed a technique of hydrogeobiocells (HGBcells), which increases the groundwater flow velocity by a specific pumping and injection scheme and where no treatment of the contaminated groundwater is necessary.

The project's objective is to demonstrate the applicability of a remediation technique using HGBcells for the bioremediation of groundwater contaminated with CAHs for a site characterized by low natural groundwater flow velocities. In addition, its purpose is to develop an anaerobic bioreactor for the growth of bacteria on large scale at the LVM-site. This bacteria can subsequently be injected in the HGBcells.



Project organisation

The project will be carried out in different phases. In a first phase, the first HGBcell will be installed and operated in an area with CAH concentrations which allow the use of biostimulation (addition of carbon source). Next, the results of the first HGBcell will be used to calibrate the existing groundwater model. The calibrated groundwater model will then be used to adjust (if necessary) the dimension of the HGBcell and to determine locations for the other HGBcells. Consequently, HGBcells using biostimulation will be installed in other areas with comparable CAH concentrations.

Together with the upscaling of the first HGBcell, the growth of the dechlorinating bacterial culture will be scaled up. Afterwards a HGB cell will be installed and operated using bioaugmentation (addition of carbon source and bacteria) in an area where higher CAH concentrations are present.

Parallel with the third phase, the development of an anaerobic bioreactor will be initiated for the growth of the bacterial culture on a large scale at the site of LVM. These bacteria will be used for the further application of bioaugmentation.

Project partners

- **LVM NV** is part of Tessenderlo Group and produces monovinylchloride (MVC), a raw material used for the production of polyvinylchloride (PVC).
- **RSK Benelux bvba & ESA** are part of the RSK Group. RSK Benelux and ESA bvba are specialized in providing innovative solutions for complex soil and groundwater problems.
- **AVECOM NV** is a spin-off of the Ghent University. Avecom is the expert in steering and optimizing of microbial processes for waste water treatment, anaerobic digestion, soil remediation and biotech-production.



Activities 2010

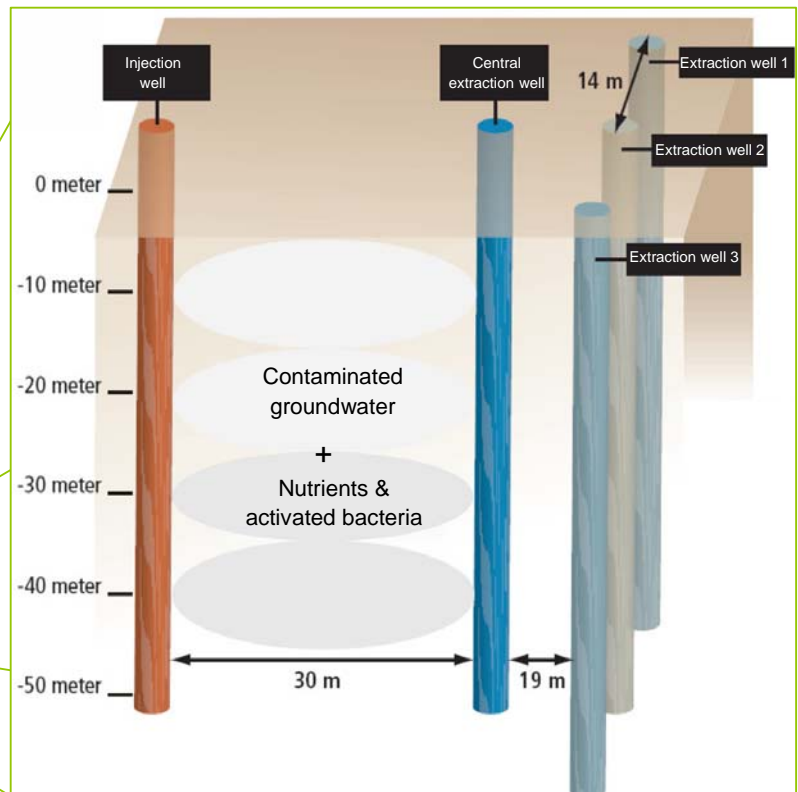
Kick-off

The kick-off meeting of the LIFE+ project was held on 22/01/2010 in the offices of coordinating beneficiary LVM in Tessenderlo. It was followed by a press conference to inform the press on the LIFE+ project. Following this press meeting, articles were published in several news papers and in a specialised magazine.

Prior to the kick-off meeting, a notice board was installed at the premises of LVM in Tessenderlo.

HGBcell

The set-up of the first HGBcell is indicated on this figure.



Groundwater will be extracted from 3 extraction wells. This water is collected and after nutrients are added, the water will be injected in the injection well. At the same time, groundwater is extracted from the central extraction well at the same flow rate as the water is injected in the injection well. This installation is developed to create a cloud of nutrients between the injection well and the 3 extraction wells. The extracted water from the central extraction well will be redistributed over injection wells of a hydraulic barrier.

During 2010, the installation and operation of the first HGBcell using biostimulation was prepared. Subcontractors were selected for the installation of injection wells, extraction wells and monitoring wells and for the installation of piping. In august, all the extraction, injection and monitoring wells were installed at the site (see photos on the next page).



Photo 1



Photo 2

In the second half of 2010, detailed engineering for the operation of the HGBcell was carried out (flow measurement control, measurements for guaranteeing anaerobic circumstances,...).

Planned activities 2011

Necessary piping will be installed in January and February 2011. Consequently, the HGBcell should be operational by the end of February 2011. The working of the HGBcell will be monitored by using fixed measuring devices (flow control measurements, divers, ...) and by chemical analysis (reduction in CAH concentrations).

Based on the results of the operation of the first HGBcell, the existing groundwater model will be adjusted so that it becomes more accurate, faster and user friendly.

Also the working and concept of the HGB cell will be evaluated and optimized based on the results of the updated groundwatermodel.

In January 2011, the growing of the bacterial culture will be started up as a preparation for the second phase of the project, i.e. HGBcells using bio-augmentation.

More information

More information can be found on the project website: www.lvm-biocells.be