Treatment of groundwater by means of electric current

Experimental study of the properties of electric current for complete degradation of chlorinated solvents in groundwater

Underlying problems

Denmark has previously made widespread use of chlorinated solvents in dry-cleaning facilities, in the metal-processing industry and elsewhere. Careless handling of the chlorinated solvents, including waste or leaks in for example sewers, has resulted in pollution of soil and groundwater. The chlorinated solvents are toxic and certain types of chlorinated solvents are also carcinogenic. Today, the polluted groundwater is pumped up from the underground and purified to prevent the pollution from spreading to the aquifers. If a drinking water well contains chlorinated solvents, it is necessary to close the well. The groundwater pump-and-treat system is a lengthy and costly method, however.

Solution

This project studies a method for remediation of chlorinated solvent-polluted groundwater by means of an electric current. Practically, this is done by making drillings in the ground for installation of electrodes, whose electric current will then affect the aquifers. The electric current will create chemical compounds, which are able to chemically decompose the chlorinated solvents and also assist in the biodegradation. The method will first be studied and optimized in a laboratory and then tested in a natural environment.

The project

The project is part of a business PhD, which is carried out jointly by the consulting engineering company COWI A/S and the Technical University of Denmark, DTU Civil Engineering. It is a three-year research process starting in mid-January 2016. The candidate is Bente Højlund Hansen supervised by Lone Tolstrup Karlby and Rasmus Jakobsen from COWI, while Lisbeth M. Ottosen supervises on behalf of the Department of Civil Engineering. In addition, a reference group is attached to the project consisting of experts from the US Army, Geosyntec Consultants, DTU Nanotech, Kjul & Co. and the Capital Region of Denmark. The lab tests will be carried out at DTU Civil Engineering and at the Capital Region of Denmark's test site in Skovlunde. During the full-scale tests, the Capital Region of Denmark will also make a test site available. The project has been rendered possible by support from Innovation Fund Denmark, COWIfonden and the Capital Region of Denmark.

Implications for future use

Both the Danish regions and private landowners demand an efficient, low-cost and sustainable method for remediation of groundwater. At the moment, the Capital Region of Denmark alone has 67 treatment facilities, which it wishes to replace by a solution similar to the one proposed by this project. The same applies to the remaining regions in

Denmark. Furthermore, there is also a global demand for this solution, for example from North America.