



BADECO

Coordination:

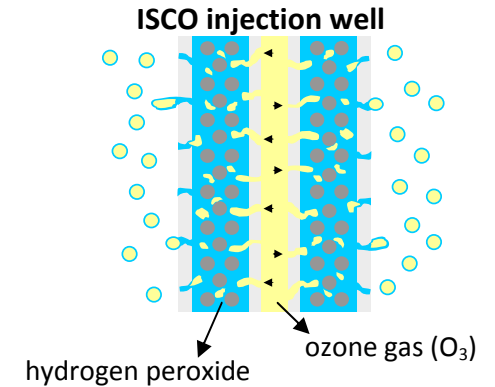
Vopak Chemical Terminals Belgium NV (Antwerp, Belgium), is a tank terminal operator, specializing in the storage and handling of liquid and gaseous chemical and oil products and part of the Vopak Group.

Partners:

RSK Benelux bvba (Willebroek, Belgium) is specialized in providing innovative solutions for complex soil and groundwater problems and part of the RSK Group.

Badeco bvba (Vorselaar, Belgium) is an expert in health and safety, specialized in the management of safety aspects related to environmental remediation projects.

EU – LIFE+ Project



Using ISCO with perozone® for the remediation of a cocktail of organic contaminants at an EX-rated industrial site in operation (VOPAK-EXPERO3)

www.vopak-ExperO3.be

VOPAK-EXPERO3 is a soil remediation project realized with a contribution of the LIFE financial instrument of the European Community (agreement number LIFE 09ENV/B/000407). The project has started on 01/09/2010. The expected end date is 31/08/2015.

Description

At the site of Vopak Terminal ACS a historical soil and groundwater contamination with chlorinated aliphatic hydrocarbons, BTEX and petroleum hydrocarbons is present. Given their different physical and chemical characteristics, the soil and groundwater remediation is very challenging. Using traditional remediation techniques, a succession of several techniques would be required, resulting in a time-consuming process, with a non-guaranteed chance of success. In Situ Chemical Oxidation (ISCO) using Perozone® (ozone and hydrogen peroxide) offers a promising alternative for the simultaneous remediation of a cocktail of organic contaminants. With this technique Perozone® is injected in the groundwater. Perozone® is a highly reactive, non selective chemical which is capable of turning all types of recalcitrant compounds into harmless products.

The release of chemicals with dangerous properties such as Perozone® in the environment however raises major concerns with respect to health and safety on petrochemical (EX-rated) sites. For that reason the development of a specific and extensive health and safety plan is required to determine the necessary safety measures during the remediation activities. Another point of interest is the effect that Perozone may have on the corrosion of the underground infrastructures. This LIFE project focuses on an innovative remediation technology and addresses the above mentioned points of interests and risks: cost effectiveness, safety, corrosion, soil behaviour and efficiency of the technique, residual concentrations etc...

Project Organization

In the early stage of the project, a health and safety plan was drafted, based on the assessment of the specific risks that could be expected on the site. Thereafter a pilot test was undertaken in order to investigate the feasibility of the technique and to gather information in order to design the full scale remediation. Based on the results of the pilot test, the health and safety plan was evaluated and the final health and safety measures were defined. This resulted in a specific and extensive health and safety plan for the full scale remediation.

The remediation concept consists of an in situ remediation using ISCO with Perozone®. Since the soil investigations had revealed a source zone with highly elevated concentrations of contaminants in the topsoil (including the presence of pure product), it was opted to treat this source area by excavation outside the tank farm and Multiple Phase Extraction (MPE) inside the tank farm prior to the ISCO. The objective of the excavation and MPE is to eliminate the pure product in order to reduce the costs of the in situ remediation by Perozone®.

The heavily contaminated topsoil in the source area was excavated in December 2012. Special health and safety measures were taken to avoid contact with the highly volatile chemicals set free during the excavation. The underground piping, injection wells and extraction wells for the ISCO and MPE have been installed from October 2012 until February 2013. The full-scale in situ remediation started in March 2013.

Demonstration

The project's objective is to demonstrate the Perozone-technology as an overall efficient soil remediation technique, suitable for treating heavily contaminated sites within operational petrochemical industries. Specific focus is put on managing risks (such as explosion and exposure to chemicals). Comparison with alternative approaches will be made on time-, cost- and energy-efficiency.

The main targets of the project are:

1. Demonstrate the applicability of ISCO with perozone® for the remediation of complex soil and groundwater pollution containing multiple contaminants;
2. Demonstrate that it is feasible to use ISCO on EX-rated sites, provided that adequate safety measures are taken;
3. Demonstrate the cost and energy efficiency of the remediation technique;
4. Demonstrate the environmental benefits of the remediation technique compared to traditional remediation techniques (lower energy and water consumption and carbon emissions);
5. Disseminate the acquired knowledge.

If the project succeeds, it will show that ISCO by Perozone® offers a technically and economically feasible solution for soil and groundwater remediation on chemical plants or tank storage facilities that are fully operational and hence pose great risks toward safety. The technology then could readily be transferred to other industrial sites in Europe with similar environmental problems.