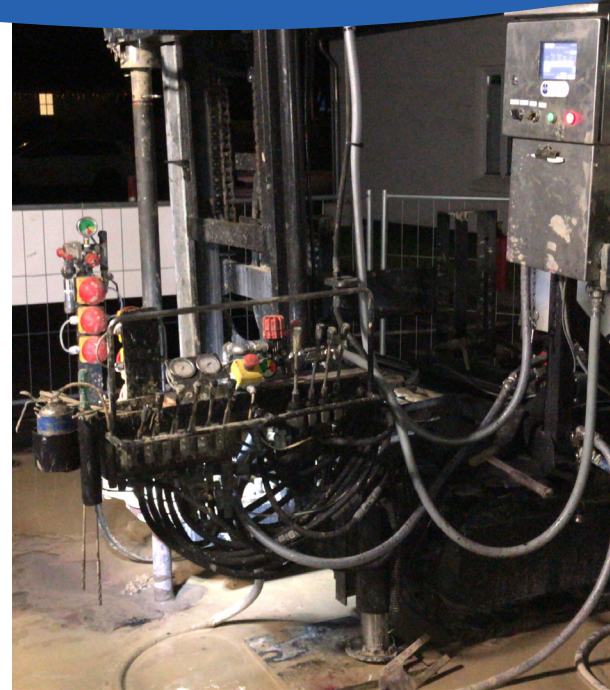


# A permeable reactive barrier of Zero Valent Iron





## Context

In order to test the conditions of injectability and the efficiency of the chemical reduction by the Zero Valent Iron (ZVI) in the treatment of water pollution in chlorinated solvents, the SPIN® technology was used in this pilot to install a permeable reactive barrier (PRB).

The site geology was very heterogeneous, with alternance of sandy layers and clay layers which made the SPIN® technology the best solution of injection to guarantee a continuous and homogeneous injection whatever the permeability of the soil. Indeed, traditional injection techniques cannot perform this work with good results. Firstly, injections with injection screens, will preferentially target the more permeable sand layers. Secondly, regarding Direct Push (DP) technology that cannot inject continuously (only each 0,3 to 1 m soil interval) and with very high probability to create fractures in the clay layers preventing an optimal reaction.

To ensure that the best injection technique was selected for the full-scale project, the pilot was carried out with both techniques: Direct Push vs SPIN® Technology.

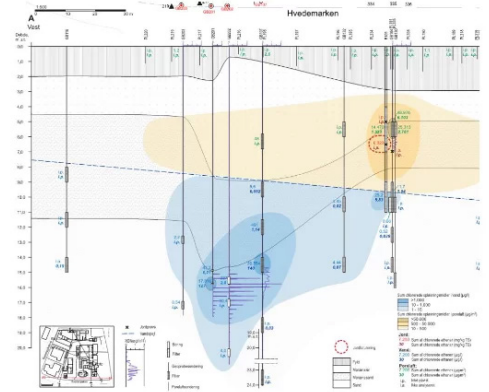
## Reaction

Zero valent iron (ZVI) was used as a reducing agent playing the role of electron acceptors in the reduction chemical reaction. ZVI particles are small enough to remain suspended in water and facilitate injection directly into aquifers at low pressures. A thickener an adjuvant (guar-based liquid) was added to the mixture to ensure and prolong the suspension of the iron in the injected solution and optimize the injectability and guaranty an optimal contact.

## Particularity

For this pilot test, in addition to the significant depths at which the PRB had to be installed, namely between 13.5 and 16.5m-bgl, Injectis succeeded in installing the barrier achieving injections with high dosage of 1550 L/m (whereas most traditional injections reach 200–300 L/m).

During this injection, it was discovered that also in the morene sand layer underneath the gravel layer, there are some stones/gravel which could not be handled with the standard SPIN® injector. To overcome the need for predrilling the injection points and to overcome the problem of getting stuck on stones underneath the gravel layer, the “Gravel-Spin™” injection head has been successfully used to deal with the individual stones in the morene sands underneath the gravel layer and inject the desired volumes homogeneously.



## Results

During the injections of the different type of ZVI and combination of concentrations, the radius of influence (ROI) was observed with an overlap on the observation wells.

The post-intervention monitoring showed the effectiveness of the Spin in setting up the permeable barrier reactive to the ZVI reducing the HCOV concentrations in the dissolved phase.

<b>Location:</b>	Farum, Denmark
<b>Geology:</b>	very heterogeneous: Alternance of Sandy /Clay layers
<b>Pollutant(s):</b>	HCOV
<b>Reaction:</b>	ISCR
<b>Reagent(s):</b>	Zero Valent Iron (ZVI)
<b>Application type:</b>	Permeable Reactive Barrier (PRB)
<b>Surface/length:</b>	15 m
<b>Number of points:</b>	4
<b>Depth interval:</b>	13,5 – 16,5 m-bgl
<b>Dosage:</b>	1550 l/m

# Injectis, your specialist partner for in situ soil remediation

Innovative techniques for cleaning and restoring contaminated soil in its original location.

