

Thermal Soil Remediation of PCE

Remediation beneath a active dry cleaning facility | Case Study

Customer

The Capital Region of Denmark

Location: Odense, DK

Technology

Thermal Conduction (TCH) & Steam injection (SEE)

Keyfacts

Treatment area: 222 m²

Depth of treatment zone: 10 m

Treatment volume: 1.330 m³

Geology: Glacial till

Contaminant: PCE

Remediation target: 5 mg/kg TS

Target temperature: 100 °C

Heating period: 105 days

Number of heater wells: 45

The client's needs

Dense non-aqueous phase liquids (DNAPL) of Tetrachloroethylene (PCE) had migrated through 11 m of clay till into a sandy groundwater aquifer. The aquifer is confined by the low-permeable clay till layer and is remarkably high-yielding.

The contamination was situated beneath a dry cleaning facility which activities had to remain in operation throughout the whole remediation period. The project addressed numerous complexities, including execution in very tight spaces as well as close proximity to urban infrastructure such as gas, sewer and electrical lines.

Calculations had shown that end concentrations of maximum 5 mg PCE/kg were required in order to eliminate the risk for the well field of local municipal water supply.

Since the dry-cleaner building was covering the whole treatment area a large number of level measurements were made in order to document subsidence if any.

Our solution

Besides excavation, heating was considered the only realistic process to effectively reduce the contamination in the tight clay. Moreover a thermal solution was favored in the saturated zone.

Combining two thermal remediation technologies in this project was the optimal way to achieve complete source-zone cleanup of both the clay, using ISTD, and the sandy aquifer, using steam-enhanced extraction (SEE). The groundwater flow in the aquifer was controlled by pumping throughout the project.



45 heater wells were installed in the clay to 10 meters depth. At each heater well an extraction screen was installed to 5 m depth in order to capture the high concentration vapors immediately. The power was turned on in June 2008 with an estimated treatment period of 175 days and a target temperature of 100 °C.

Results

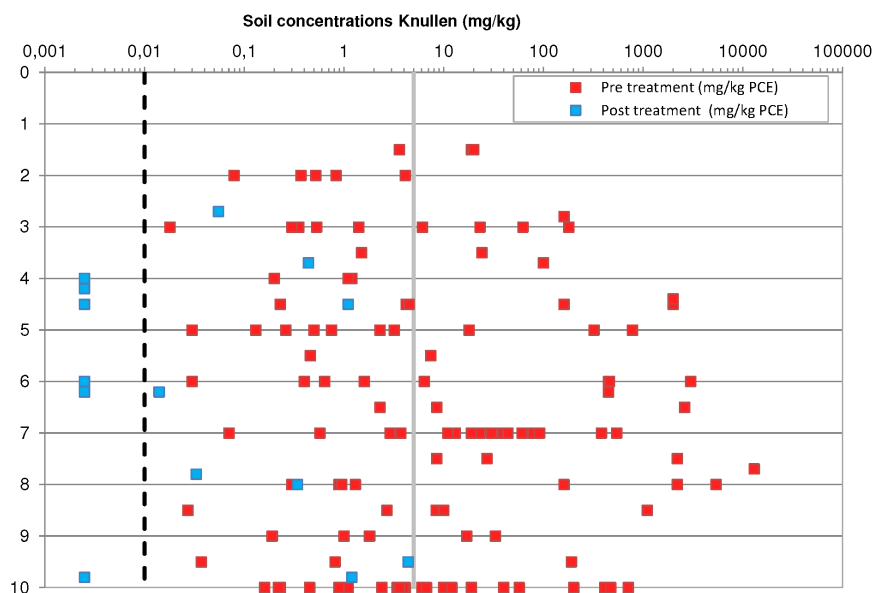
After a treatment period of 105 days 14 soil samples were taken in different depths from 5 borings within the treatment area.

All the soil samples showed concentrations below the remediation target of 5 mg/kg.

- 5 soil samples were below the detection limit
- Average post-treatment concentration: 0.51 mg/kg PCE
- Maximum post-treatment concentration: 4.4 mg/kg (Location where DNAPL were present pre treatment)

3.500 kg of chlorinated solvents were recovered from the clay till layer while 500 kg were removed from the sandy aquifer. Recovery rate then exceeds 99% in both sand and clay layer.

No soil subsidence occurred as a consequence of the heating.



**For further information,
please contact:**

Niels Ploug

Tel: +45 3957 2061

E-mail: nip@kruger.dk

Kruger A/S • Veolia Water Technologies, Denmark

Our website technomaps.veoliawatertechnologies.com/thermalsoilremediation/en/