

CASE STUDY

ISTD remediation of PCE

Skuldelev, Denmark

KRÜGER



Key facts

Contaminant:	PCE
Treatment area:	250 m ²
Treatment volume:	1180 m ³
Depth of treatment zone:	7.5 m
Geology:	Clay, sand and peat
Location:	Smaller residential area

For further information:

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Challenge

A massive contamination of Tetra-chloroethylene (PCE) was found in a sandy aquifer. Before ISTD treatment 1.2 m³ of free phase PCE was removed directly from the aquifer by simple pumping.

The contaminated aquifer was based on top of a low permeable clay layer. And a considerably risk occurred that pools of PCE were left there and that contamination was absorbed in the clay.

According to this the situation required that both the high-permeable aquifer and the low permeable clay layer were treated.

Earlier tests had shown that effective groundwater control was needed to prevent cooling of the area if heated by ISTD.

Part of the hotspot area was placed beneath a small pond and very close to both residential houses and to a transformer producing company.

Solution

Based on results from an ISTD pilot test in the hot spot area a decision was made regarding groundwater control. To be sure to prevent problems with incoming water a pile sheet were driven 8 m below ground surface around the whole treatment area.

53 heater wells were installed to 7-9 meters depth. By creating a hot floor in the clay layer complete removal of DNAPL was ensured. A vapor cap of high-porous concrete covered the whole treatment area. The vapor cap was constructed in three levels to compensate for the considerable topographic differences in the area.

Now having the treatment area enclosed by pile sheets the aquifer was emptied by pumping.



The power was turned on in September 2008 with an estimated treatment period of 112 days and a target temperature of 100 °C.



ISTD
remediation
Skuldelev

 **VEOLIA**
WATER

Solutions & Technologies

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Key facts

Number of heater wells: 53

Target temperature: 100 °C

Remediation target: 5-10 mg/kg TS

Heating period: 73 days

Avg. end concentration: 0.02 mg/kg PCE

Client: Capital Region of Denmark

Consultant: NIRAS

Contractor: Krüger A/S

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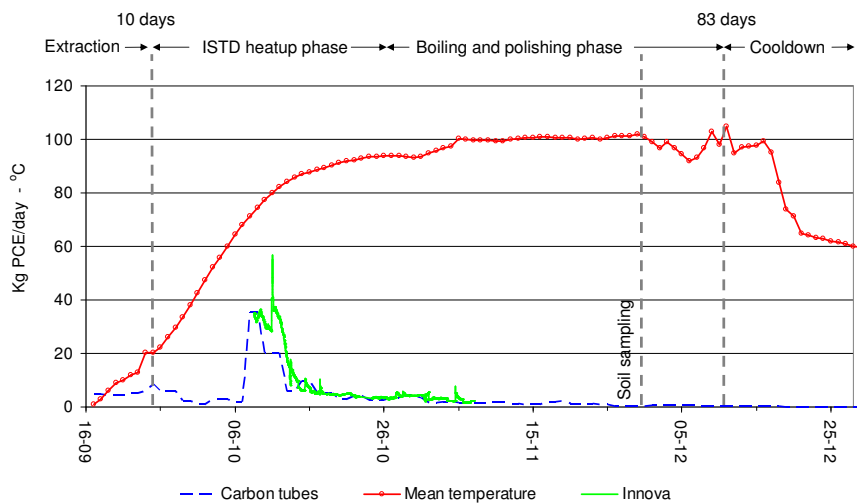
Results

After a treatment period of 90 days 40 soil samples were taken. The samples were taken in different depths from 8 borings within the treatment area.

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

- 30 samples were below detection limit
- Average concentration: 0.02 mg/kg PCE
- Maximum concentration: 0.77 mg/kg PCE

The ISTD treatment was finished before the end of 2008.



Energy balance	
Volume, total	1.180 m ³
Power input	300-360 kW
Total energy	567.070 kWh
Total energy/m ³	506 kWh/m ³
Energy extracted	208.459 kWh
Average temperature within TTZ	100 °C