

BS Geokinetics ApS

Specialized Company for remediation of polluted soil and groundwater.

Kærgård Klitplantage.

Test remediation of polluted groundwater from Grindstedværkets deponi, with ElectroChemical GeoOxidation.



Fig. 1: reaktor with CO₂ stripping, and circulation pump.



Fig. 2: Converter (grey), reactor, CO₂ bottle, on trailer: tank, stripping reactor and filter.

Background: The contamination in Kærgård Klitplantage are coming from the former Grindstedværket A/S, there in the period from 1956 – 1973, after permission from authorities, was depositing their wastewater from the production in the factory of vitamins and medicine which have lead to a major Contamination of the groundwater.

As a part of making a clean up strategy, has B.S. Geoteknik ApS in cooperation with RGS 90 A/S performed a test with cleaning of pumped off groundwater.

Test material:

The 27. of marts 2006 RGS 90 A/S pumped off 600 liter water from well B 108, filter3 in the border of the dunes in Kærgård Klitplantage. Well and filter was advised from Laila Nielsen from COWI.

The test:

The test was performed in our lab facility in Odense, in the days after receiving the pumped off water, with an mobile geoelectrical test unit.

We was not informed of the specific content of pollutants, except barbiturate, in the water, so we included both our main technologies: Carbon Dioxide Stripping (CVS) and Electrochemical GeoOxidation (ECGO) together with flotation og filtering. The unit is built as a reactor, where the water by flotation passes through simultaneously with



injection of a small amount of CO₂ and adding of Hydrogenperoxide. The power is coming from special built AC/DC converters, developed for the technology.

During the 36 hour test the power consumption was 12 kWh, 500 liter CO₂ and 1 liter Hydrogen peroxide.

Before start up there was taken 0 samples in Red-cap-bottles. During the test there was taken samples every third hour. Additional we ongoing was measuring for pH and eH, pH stabilized around neutral and an oxidized eH.

Results: All samples were after finishing the test analyzed by AnalyCen for BTEX, TPH, phenol, chlorinated solvents, barbiturates and sulfonamides. The best results was reached for BTEX, chlorinated solvents and phenol with effects of more than 90 % reduction, while TPH was reduced with approx. 80 %. Results are shown in the scheme below and in the graph.

		baseline	24 hours	reduction [%]
Benzene	µg/l	4400	70	98
Toluene	µg/l	5000	99	98
Ethylbenzene	µg/l	7,9	0,88	89
M-Xylene	µg/l	31	1,4	95
O-Xylene	µg/l	110	5,4	95
C6H6-C10	µg/l	11000	340	97
>C10-C25	µg/l	1000	210	79
Total TPH	µg/l	12000	540	96
phenol	µg/l	1700	140	92
2 Methylphenol	µg/l	2,4	0	100
2,4 Dimethylphenol	µg/l	3,1	0	100
2,5 Dimethylphenol	µg/l	3,8	0,49	87
2,6 Dimethylphenol	µg/l	2,6	0,47	82
3 Methylphenol	µg/l	4,3	0	100
3,4 Dimethylphenol	µg/l	62	2	97
3,5 Dimethylphenol	µg/l	78	0,37	100
4 Methylphenol	µg/l	34	0,58	98
Amobarbital	µg/l	1200	600	50
Barbital	µg/l	2100	1700	19
Butabarbital	µg/l	260	190	27
Pentobarbital	µg/l	570	340	40
Secobarbital	µg/l	3	4	-33
Dapson	µg/l	0	0,002	
Sulfaguanidine	mg/l	4,2	4,6	-10
Sulfanilamid	mg/l	48	25	48



Sulfanilsyre	mg/l	200	96	52
Sulphadiazin	mg/l	8,5	0,046	99
Sulphamerazin	mg/l	0,22	0,003	99
Sulphamethazin	mg/l	14	0,9	94
Sulphamethiazol	mg/l	0,91	0,08	91
Sulphathiazol	mg/l	3,9	0,011	100
Tetrachlorethylene	µg/l	160	2,9	98
Trichlorethylene	µg/l	1200	21	98

Cleaning effect in % by 24 hours treatment.

