

Organochloride Soil Remediation by Biostimulation via Intercalation of Aerobic and Anaerobic Environments

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Background/Objectives. The objective of the following finalized full-scale work was to remediate the organochloride contaminated site from 178 mg/kg to a value < 1 mg/kg according to the local regulation, using the in situ biostimulation technology. The site has about 3800 ft² and the contaminants were in the non-saturated zone of the soil, 3.3 ft below ground level. The soil composition was mainly sandy with a total OCC (organochloride compounds) concentration of 178 mg/kg, divided in 72% hexachlorobenzene, 13% hexachlorobutadiene, 9% pentachlorobenzene, 5% 1,2,3,5-tetrachlorobenzene and 1% of another OCC formulas.

Approach/Activities. The site was divided in three virtual cells. All of the samplings were conducted at the same manner: One composite sample was generated from each cell; each cell was composed by eight to nine sampling points.

After a baseline measure, the treatment started in June/2014 with the addition of organic substrate stemming from chicken manure. The organic matter dry base in soil supposed to be kept above 12%. That's why we added organic matter (organic substrate) twice and mixed well with the contaminated soil, so the microorganisms would have the optimum metabolic rates.

The monitoring plan had a 6-month periodicity and the collected samples were analyzed for OCC (GC/MS) and physical-chemical parameters (ORP, pH, organic matter, ashes, and moisture). During the treatment, the area was submitted to intercalated environments: aerobic and anaerobic. Changing the consortia active group and the metabolism of the facultative microorganism for as studied in laboratory. This process was needed had a good yield and kinetic in OCC bioremediation. In practice in rainy seasons the place would be covered by a tarpaulin to keep it aerobic, or without it to keep anaerobic. In dry seasons water would be placed until it reached field capacity above 100% for anaerobic conditions or no water would be added to keep it aerobic. Soil drying has always occurred naturally.

Results/Lessons Learned. After 1151 days of treatment (August 2017) the soil was considered remediated for the reaching concentrations of total OCC of 0.64 mg/kg, where 0.35 mg/kg of hexachlorobenzene, 0.28 mg/kg of pentachlorobenzene and 0.01 mg/kg of 1,2,3,5-tetrachlorobenzene. The final objective was accomplished and the site area had the rehabilitation certificate requested.