

REDUCTIVE DECHLORINATION COMBINED WITH THE ZERO VALENT IRON APPLICATION



PRINCIPLE

A method of biological reductive dechlorination combined with zero valent iron (ZVI) application was approved as an effective and inexpensive method for decontamination of recalcitrant pollutants as halogenated organic compounds i.e. lindane (hexachlorocyclohexane - HCH), DDT (dichlorodiphenyltrichloroethane) and other persistent organic pollutants (POPs).

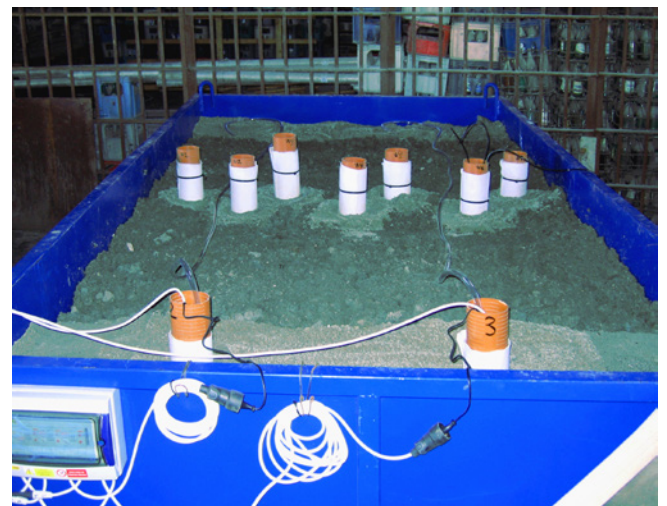
The developed technology involves the alternating application of processes of chemical reduction (which is achieved by mixing the iron powder into the contaminated matrix) and biological reductive dechlorination using a suitable organic substrate (beet molasses, whey, etc.). Providing the optimum operating parameters (humidity, temperature, air supply etc.) in both alternating phases of decontamination process is necessary for a successful decontamination.

TECHNOLOGY APPLICABILITY

Combined technology of biological reductive dechlorination with the chemical reduction by using the ZVI is suitable for decontamination of soil and groundwater polluted with the halogenated organic compounds, including the persistent organic pollutants (i.e. HCH and DDT). It is possible to apply the mentioned technology in situ, as well as ex situ.

DESCRIPTION

Podmínkou úspěšné dekontaminace je zajištění optimálních provozních parametrů (vlhkost, teplota, přístup vzduchu atd.) v obou střídajících se fázích dekontaminačního procesu. Při nízkém redoxním potenciálu a v přítomnosti dodaného organického uhlíku dochází k reaktivní dehalogenaci chlorovaných látek, které mohou být degradovány kompletně, ale ve většině případů vznikají meziproducty, které jsou následně rozkládány přirozenou mikroflórou v aerobní fázi.



Containers filled with contaminated soil

Main advantages of the technology

- Highly effective even when used for decontamination of material containing hard-degradable halogenated organic compounds (including POPs)
- Relatively low investment and operational costs
- Possible to use even for the sites with high concentration of contaminants

Potential limitations

- Time consuming method (months)
- When applying the method ex situ, it is necessary to irrigate the treated soil sufficiently
- Space requirements when applying the method on site

Services and products

- Laboratory and half-scale tests of decontamination by biological reductive dechlorination combined with ZVI application
- Remediation design for the objective method
- Remediation system installation, operation and monitoring
- Rent of the appropriate equipment and supply of organic substrates and ZVI needed for processing the method
- Monitoring and supervision of the remediation projects

Data for system design

- Character of the contaminated material
- Level and type of contamination
- Availability of the organic substrate
- Required target limits for remediation
- Deadlines for the site remediation

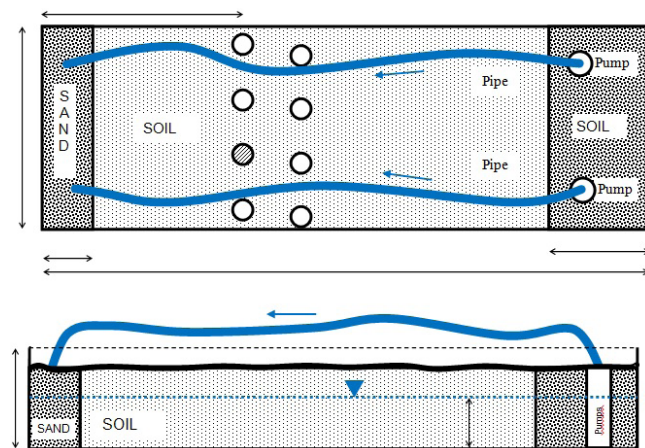


REFERENCE PROJECT

For the demonstration project the soils from two different sites in Romania were used for ex situ application of biological reductive dechlorination combined with ZVI application. The first site was an area of a giant chemical plant SC OLTCHIM SA. The second site was a chemical dump at Turda.

The soil from both chosen sites was contaminated with lindane, DDE and DDD. During the phase of biological reductive dechlorination, the beet molasses was used as an organic substrate; the powder iron was used in the chemical reduction phase. The decontamination process took about 8 months.

Reached decontamination efficiency was 90% for HCH and 99.9% for DDE and DDD.



Reagent infiltration scheme

