

Soil, Sediment, Bedrock and Sludge

Chemical Reduction/Oxidation

Introduction:

Reduction/oxidation chemically alters hazardous contaminants less toxic compounds that are typically more stable, less mobile and inert. Oxidising agents that are commonly utilised include ozone, hydrogen peroxide, chlorine, and chlorine dioxide.

Description:

Redox reactions entail the transfer of electrons from one compound to another. Particularly, one reactant is oxidised (loses electrons) and one is reduced (gains electrons). The duration of time required for chemical reduction/oxidation is short to medium term.

Applicability:

The target contaminant group for chemical redox is specifically inorganics. The technology may be employed against non-halogenated VOCs and SVOCs, fuel hydrocarbons, and pesticides but is thought to be less effective.

Limitations:

- Incomplete oxidation or the formation of intermediate contaminants could occur depending upon the contaminants and oxidizing agents that are used.
- The process is not known to be cost-effective for high contaminant concentrations because of the requirement for large amounts of oxidizing agent.
- Oil and grease in the media must be minimised to optimise the efficiency of the process.

Data Needs:

Treatability tests should identify parameters such as alkaline metals and humus content in the soils; if there is the presence of multiple phases; and whether or not the total organic halides could affect the processing time and cost.

Performance Data:

Chemical redox is a full-scale and well-known technology used for the treatment of drinking and wastewater, and is a typically a treatment choice for cyanide (oxidation) and chromium (reduction of Cr (VI) to Cr (III) prior to precipitation) wastes. Enhanced systems are being used with a greater frequency for the treatment of hazardous contaminants in soil.

Cost:

Estimated costs range from £ 120 to £ 450 per cubic meter.