

Ground Water, Surface Water, and Leachate

Deep Well Injection

Introduction:

Deep well injection is a liquid waste removal process. This option uses injection wells to put treated or untreated liquid waste into geological formations that have no possibility of permitting the movement of contaminants into possible potable water aquifers.

Description:

A standard injection well contains concentric pipes, which go several thousand feet down from the surface into greatly saline, permeable injection zones that are restricted vertically by impermeable strata. The outermost pipe extends below the foundation of any underground sources of drinking water (USDW) and is cemented back to the surface to avoid contamination. Inside the surface casing is a long string casing that extends to the injection zone. This casing is filled with cement back to the surface in order to close off the injected waste from the formations above the injection zone back to the surface. The casing provides a seal between the wastes in the injection zone and the upper formations. The waste is injected through the injection tubing inside the long string casing either through holes in the string or in the open hole beneath the bottom of the string. The space between the string casing and the injection tube is called the annulus, and is packed with an inert, pressurised fluid, and sealed at the bottom by a removable packer inhibiting injected wastewater from backing up into the annulus.

Applicability:

Target contaminant groups are VOCs, SVOCs, fuels, explosives, and pesticides. Nonetheless, existing permitted deep well injection facilities are restricted to a narrow range of wastes.

Limitations:

- Injection will not be used for hazardous waste disposal in areas where seismic activity may occur.
- Injected wastes should be well matched with the mechanical components of the injection well system and the natural formation water.
- Elevated concentrations of suspended solids (usually >2 mg/l) can lead to plugging of the injection interval.
- Corrosive media may react with the injection well components, with injection zone formation, or with confining strata with unwanted results. Wastes should be neutralised.
- High iron concentrations could result in fouling when environmental conditions change the valence state and convert soluble to insoluble species.
- Organic carbon may act as an energy source for indigenous or injected bacteria resulting in quick population growth and ensuing fouling.
- Waste streams containing organic contaminants higher than their solubility limits may necessitate pre-treatment prior to injection into a well.
- Site assessment and aquifer characterisation are essential to establish suitability of a site for wastewater injection.
- Assessments must be completed before receiving approval from the regulating authority.

Data Needs:

Routine data are required.

Performance Data:

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Injection wells have been used for the removal of industrial and hazardous wastes since the 1950s, so equipment and method are promptly available and well known. In spite of this the use of them is under very strict regulatory control.

Cost:

Not currently known.