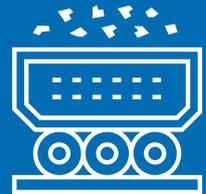


BIOREMEDIATION OF CONTAMINATED SITES

An Eco-friendly Solution for Contaminated Sites



Services & technologies
for a better environment

PRINCIPLE

Bioremediation is a technology that uses microorganisms for the removal of organic contaminants in:

- soil,
- sediments,
- water,
- waste,
- other contaminated materials (like construction debris and stones, sludge).

The contaminants are converted into harmless compounds.

Since 1992, Dekonta has got a know-how and a state-of-the-art equipment to treat high

concentrations of petroleum hydrocarbons in contaminated soils successfully.

Generally, the bioremediation process duration depends on several factors:

1. The pollution nature (TPH, PAH, BTEX);
2. Heavy fraction content and toxicity;
3. Type of soil and contaminant sorption;
4. Bioavailability;
5. Target limits / final use;
6. The bioremediation process can be performed in two ways: *ex situ* or *in situ* (treatment of non-saturated zone).



DESCRIPTION

Bioremediation is a natural process taking place spontaneously at contaminated sites. Nevertheless, the process without external interference is slow for several reasons, especially:

- Low background amounts of natural microflora which can decompose the present pollutants;
- Very limited solubility of the present pollutants;

- Inhomogeneous pollutant distribution;
- Oxygen deficit;
- Deficit of mineral nutrients;
- Insufficient humidity of soil.

The bioremediation goal is to accelerate biological processes in soil by implementing the appropriate technological operations (soil aeration, moistening, homogenization, etc.).

The *ex situ* bioremediation plant comprises the following facilities and equipment:

1. Treatment plate (equipped with an impermeable liner, circumferential barriers, drainage system and a leachate collection sump)
2. Biotechnological facility (biotechnological laboratory, bioreactors, etc.)
3. Soil aeration equipment (excavators, front loaders, etc.)
4. Equipment for application of liquid solutions on contaminated soil (pumps, pipelines, etc.)
5. Auxiliary equipment and installations (power and water supply, fencing, sanitary facilities, etc.)

DEKONTAM®

DEKONTA developed several bacterial suspensions DEKONTAM® for enhancement of the bioremediation process.

These solutions contain bacterial strains with high biodegradation potential and are:

- Non-toxic;
- Non-pathogenic;
- Non-GMO;
- Suitable for treatment of soil, sludge, groundwater, and waste water;
- Approved by relevant authorities.

IN SITU BIOREMEDIATION

In special cases (e.g. if the soil cannot be excavated), the *in situ* non-saturated zone treatment is designed. Injection wells or direct push techniques are used for the necessary soil inoculation and enrichment with mineral

nutrients. A bioventing system can be employed to ensure sufficient aeration. The overall process of bioremediation is monitored. The *in situ* treatment takes usually longer time, but it is less expensive.

Main advantages of the technology:

- ✓ Lower costs than chemical/physical methods;
- ✓ Contaminants are usually converted into harmless products (like carbon dioxide and water) and not transferred to a different environmental media;
- ✓ The method implementation is relatively easy, it often allows a continued site use;
- ✓ Ability to clean-up sites showing the concentration of Total Petroleum Hydrocarbons (TPH) up to 100 000 mg/kg in dry matter.

REFERENCES

BIOREMEDIATION OF CONTAMINATED SOIL IN BEER SHEVA RAILWAY STATION, ISRAEL

Client: NEGEV ECOLOGY – Agricultural Cooperative Society Ltd.

Project goals: Elaboration of a project designing a biotreatment platform, treatment of contaminated soil using *ex situ* bioremediation, application of the bacterial solution BIOTECH, soil sampling and analyses

Treatment technology: *Ex situ* bioremediation

Total quantity of the treated material: 3,200 t

Initial contamination: 20,000 mg/kg TPH

Target limit: 5,000 mg/kg achieved in 4 months



BIOREMEDIATION OF SOIL CONTAMINATED WITH PETROLEUM HYDROCARBONS IN VOJNIĆ, CROATIA

Client: C.I.A.K. d.o.o., Zagreb, Croatia

Project goals: Design, construction and delivery of technology for hazardous waste treatment, hazardous waste treatment using *ex situ* bioremediation

Pollution source: Leakage of petroleum hydrocarbons from a storage of petrol stations

Target limit: 500 mg/kg TPH

Total quantity of the treated material: so far more than 20,000 tons



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