

Bioremediation Technology for oily sludge treatment

Environment-friendly and low-cost biotechnologies for Oily Sludge Remediation

Management of oily sludge is one of the major problems being faced by refiners worldwide. Oily sludge is hazardous waste which causes enormous environmental pollution.

IndianOil R&D has developed environment-friendly and low-cost bio-technologies for oily sludge remediation. This technology provides an environment-friendly solution for disposal of oily sludge generated in refineries, pipelines and marketing locations during crude oil /product storage and transportation.

The technology has two formats and both have been widely applied in commercial scale successfully.

- i. Land-farming based bioremediation: Bioremediation of sludge is carried out after mixing it with soil.
- ii. Confined Bioreactor bioremediation: Bioremediation of sludge carried is out in separate bioreactor in aqueous media.

The land-forming based bioremediation technology combines bio-augmentation and bio-stimulation strategies for environmentally safe and cost-effective disposal of various types of oily sludge, hydrocarbon waste and treatment of oil contaminated soil. It uses a selective aerobic microbial blend of potential isolates that are specifically adapted to degrade various types of hydrocarbons in soil and water. The microorganisms break down or degrade, hazardous substances into non-toxic substances such as carbon dioxide and water. IndianOil R&D also has a proprietary nutrient recipe (microbe adjuvant) to hasten the break-down of hydrocarbon contaminants. The technology needs only watering and tilling intermittently once the bacteria are dosed, and no other inputs required. It takes approx. 3-6 months for complete bioremediation of hydrocarbon waste loaded at 10- 15%.



Salient Features

- Uses "natural isolates" - Not genetically modified".
- Safe to handle, no disease causing organisms.
- Has excellent capability to degrade wide range of hydrocarbon contaminants like saturated and unsaturated alkanes, mono and polycyclic aromatic hydrocarbons (PAHs) including organosulphur compounds
- High salt tolerance

The bioremediation technology has been recommended by CPCB, a statutory organization in India for safe disposal of oily sludge. This technology has also been widely recognized with several technology awards.

Commercial Experience

- This technology has been effectively employed over the last two decades for:
 - ⦿ Disposal of oily sludge generated in oil refineries for crude oil tank bottom sludge, pipeline installations and marketing installations for product storage tank sludge.
 - ⦿ Treatment of drill cuttings and oil spills at oil exploration sites
 - ⦿ Treatment of oil spills on land
 - ⦿ Oil contaminated soil/site restoration
- It has also been implemented for disposal of tar ball during Mumbai Oil Spill, Paradip oil spill and Chennai Oil spill.
- Deployed by ADNOC for bioremediation of 200 tons oil sludge from drill cutting industry.

Confined Bioremediation (CBR) technology

This is a bio-reactor based ex-situ technique for treatment of oily sludge and oil-contaminated soil with a total treatment time of 3-4 weeks. This technology is IPR-protected. In this, an aqueous slurry is created by combining soil, sediment or sludge with water and other additives. The slurry is mixed to keep solids suspended and microorganisms in contact with the soil contaminants. Upon completion of the process, the slurry is de-watered and the treated soil is disposed off.

This can be operated as a batch-semi-continuous and continuous in an aerobic, anaerobic or mixed process.



Major Benefits

- Sludge is treated in aqueous suspension, typically 10 to 30% w/v under controlled environmental conditions by providing optimized bacteria, nutrients, continuous aeration and agitation.
- This leads to several process advantages:
 - Increased mass transfer rates and increased contact microorganisms/pollutant/nutrients;
 - Increased rates of pollutant biodegradation compared to in-situ bioremediation or to ad-situ solid phase biotreatment
 - Shorter treatment times
 - Control and optimization of several environmental parameters such as temperature, pH, etc.; increased pollutant desorption and availability through the addition of surfactants and solvents

Commercial Experience

- Successfully implemented at a commercial scale in IndianOil refineries located at Panipat, Gujarat, Bongaigaon, Barauni, Guwahati, etc.



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