



A Major Oil Company in Hong Kong Remediates Subsurface Hydrocarbon Contamination with MICROBE-LIFT® Technology

Location: Oil Transportation & Transfer Site, Hong Kong

Background: **Ecological Laboratories** has addressed wastewater technology internationally for over ten years. In that time they have remediated a variety of petroleum contaminated sites including oil production ponds in Venezuela for GEBetz, containment ponds in Israel, and sites in the Dominican Republic and throughout Asia. In this case, a major oil company, who chooses to remain anonymous, had detected contaminated soil under a concrete slab at an oil transportation and transfer site. The oil had seeped into the ground to a depth of two meters.

Objective: To avoid further mobilization, it was imperative to remove the oil by the most cost effective, least disruptive technology available. Working with their local agent, Ecological Laboratories developed a remediation plan using **MICROBE-LIFT®** technology.

Because in-situ treatment generally requires support engineering, it is important to first confirm that the hydrocarbon can be degraded by the inoculant and that the site does not contain additional toxicity that would inhibit biological activity. Therefore, a bench top remediation trial was run using a soil bio-slurry inoculated with a **MICROBE-LIFT®** formulation.

This **MICROBE-LIFT®** formulation was applied to a slurry containing contaminated soil in a tank. Dry weight of material was 10-15%, pH 7-9, TPH content at 3-5%. The TPH was not diesel based, but made up of linear hydrocarbon chains between C12 and C20. The boiling point is between 200° and 250° C in the gas chromatographic analysis (C10-C40) giving the following splitting in mg/kg dm:

Hydrocarbon Fraction C10-C40 mg/kg Ds 43,400
Hydrocarbon Fraction C10-C12 mg/kg Ds 875
Hydrocarbon Fraction C12-C16 mg/kg Ds 21,375
Hydrocarbon Fraction C16-C20 mg/kg Ds 6,750
Hydrocarbon Fraction C20-C24 mg/kg Ds 2,475
Hydrocarbon Fraction C24-C28 mg/kg Ds 800
Hydrocarbon Fraction C28-C32 mg/kg Ds 400
Hydrocarbon Fraction C32-C36 mg/kg Ds 460
Hydrocarbon Fraction C36-C40 mg/kg Ds 300

The test tank contained +/- 600 liters in a slurry (+/- 75 kg waste+ 525 kg water). Nitrate was added to assure that proper C:N:P ratio for biological degradation was present. The slurry was re-circulated in order to provide adequate mixing. The initial test was run for 28 days. Each 7 days the slurry was sampled in order to follow the TPH content and the biodegradation.

After three weeks the **MICROBE-LIFT®** formulation had reduced the petroleum by 71%.

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Solution:

MICROBE-LIFT® had readily degraded the contaminating TPH and there was no toxicity present that would prevent a successful remediation. The results of the study are shown below: The in-situ treatment was initiated. After drilling a test hole of two to three meters, a gradient-flow analysis was conducted. Diluted MICROBE-LIFT® was applied through injection holes

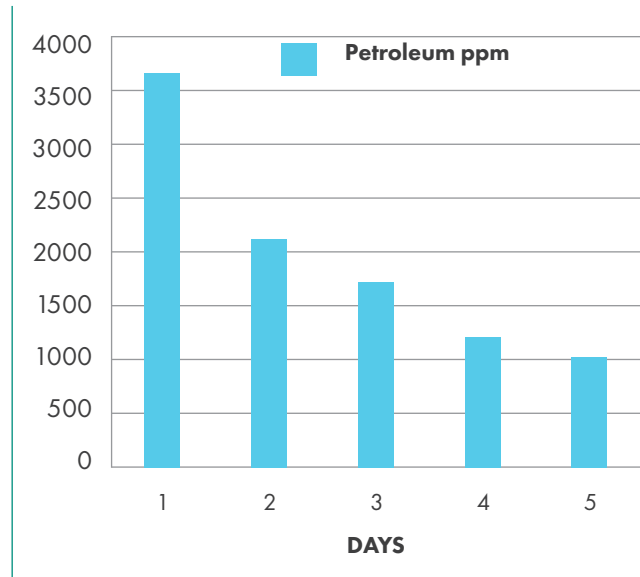


Fig. 1: This graph shows the result of the bench top remediation with an initial concentration of 35-40,000 ppm of hydrocarbons C10 to C40 being reduced by 71% in one week

Results Achieved:

and recycled through extraction holes downgrade to get the same results in the field. The site was successfully remediated. In our experience, all applications for in-situ remediation tend to be site specific depending on other contaminants present and engineering required providing adequate contact, but in general most land treatment plans require the following:

- Inoculation with capable consortium of microbes (pretesting recommended)
- Provision of the necessary nutrients (adjust C:N:P ratio)
- pH and moisture adjustment as necessary
- Assurance of contact between microbes and pollutants:
 1. Land farm surface pollution - work remediation ingredients into soil or
 2. Subsurface soils - provision of an engineered system, often pump and treat, to assure contact
- In some cases, a solubilizing agent such as a lipophilic surfactant may be recommended to increase surface contact.

Effective bioremediation is always the most cost effective solution for elimination of hydrocarbon contamination and it is widely used by industry globally. Ecological Laboratories' MICROBE-LIFT® technology, is a highly effective solution to hydrocarbon pollution when used with proper, site-specific application.

For more information on MICROBE-LIFT® Technology contact

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