

Soil Bioremediation

Hydrocarbon Management



Creating Integrated Solutions
Since 1888

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What is Bioremediation?

- EPA defines as “a process that uses micro organisms to transform harmful substances to nontoxic compounds”.
- Microorganisms are the mechanism that transforms the chemicals, largely into CO₂ and H₂O.

Pros

- “Natural”, ecologically sound process.
- Target compounds are destroyed not diluted or volatilized.
- Less expensive than alternative methods.
- Clean up can be performed in place without transporting waste.

Cons

- Slower than chemical destruction or offsite removal.
- Not all compounds can be biologically degraded.
- In some cases, by-products may be toxic or cannot be further degraded.

Contamination Parameters

- 3 to 4% TPH (Total Petroleum Hydrocarbons) loads at 20 degrees C * can be reduced by 60-70% in 60 days, 80-90% in 90 days.
- Hydrocarbons weights ranging through C-7 to C-28.
- Soil moisture levels between 30-50%.
- Neutral pH (6-8).

Cost Analysis

- On-site (In-situ) is lowest cost/ton but uses more product (\$20/ton).
- Off-site soil remediation plants charge \$20-\$40/ton.
- Thermal remediation ranges from \$60 -\$300/ton.
- Target cost for “bugs” is between \$10 -\$15/ton.

Microbiology

What can be Bioremediated?

- Petroleum Hydrocarbons - such as crude oil, diesel, gasoline, hydraulic fluids.
- Some chlorinated compounds - such as PCP, chloroform, chlorobenzene.
- Polynuclear aromatic hydrocarbons - such as creosote or weathered fuels.
- Alkanes and alkenes-saturated hydrocarbons.
- BTEX
- Phenolics

Control Parameters

- Soil moisture
- Soil temperature
- Soil pH
- Macronutrients
 - Ammonia nitrogen
 - Ortho phosphate
- Micronutrients
 - Trace metals
 - Inorganic salts
- Soil type
- Concentration and depth of contamination
- Oxygen availability
- Microbial populations
 - Total
 - Specific
- Site management

Dosage Rates

- ShopWorks Biozyme at an average of 500 ml/ton. Apply 24 hours in advance (diluted) to surface area.
- Augment P-21 at 225 to 450 grams/ton (1/2-1lb) average.

Application Guidelines

Shopworks Biozyme

- Apply 24 hours in advance to surface area.
- Dilute with enough water to accomplish this based on application equipment.
- Use spray equipment suitable to the surface area. – Remember desired soil moisture levels of 30-50%.

Augment P-21

- Dissolve in an appropriate amount of water to apply over surface area based on your application equipment.
- Thoroughly wet the soil with the mixture remembering your desired soil moisture levels of 30-50%.
- Backhoe/Rototill/Cultivate/Turn or Aerate the soil as often as possible, (based on your available equipment).
- Lower dosage re-applications will increase your remediation rates.

Consult your local distributor specialist of RML for additional information and recommendations.