Application of Terramend® Reagent through Tilling or Windrows for Enhanced Aerobic Bioremediation of Soils

INTRODUCTION

Terramend® Reagent is used to treat soils impacted with aerobically biodegradable organic compounds, such as petroleum hydrocarbons, PAH's, PCP, and phthalates. Terramend® enhances and promotes natural bioremediation rates by adjusting conditions in the soil matrix to stimulate target compound biodegradation. No microbial inoculation is conducted. The key to the Terramend® aerobic bioremediation approach is the application of proprietary organic soil amendments designed with appropriate nutrient content and nutrient release kinetics. Combined with effective control of soil moisture and aeration protocols these amendments are designed to increase contaminant biodegradation rates.

Terramend® is frequently applied as a land treatment process. Soil and amendment are blended using a rotary tiller, driven by an agricultural tractor, with an effective penetration of 2 feet (0.6 m). Tilling serves to homogenize and aerate the amended soil. A variety of other soil mixing methods have also been successfully applied with Terramend® reagents. Water content is one critical process parameter and is adjusted using agricultural irrigation equipment. A cover (i.e., tarpaulin and/or a greenhouse) may be used to prevent the addition of water from precipitation events and to minimize evaporation at other times.

TREATMENT PROTOCOL OVERVIEW

Treatment is generally conducted as follows, using either a tilling or bio-pile/windrow approach. Evonik will assist our customers in developing a site-specific treatment process work plan when Terramend® will be used on the project.

FOR TILLING OR WINDROWS

1. Apply Terramend® reagent to the soil.
    a. Tilling approach - Incorporate using a deep rotary tiller at least twice, preferably at perpendicular angles to facilitate complete incorporation.
    b. Windrow approach - Incorporate using a heavy-duty windrow turner.
2. Add water to achieve a soil water content equal to 50% to 60% of water holding capacity (WHC).
3. Conduct maintenance tilling/mixing, preferably twice per week, to incorporate oxygen and maintain aerobic conditions in the soil.
4. Assess soil pH and adjust as needed to maintain between 6.0 and 8.0.
5. Determine soil moisture content periodically and add more water as needed to maintain soil water content between 50% and 60% of WHC.
6. Collect representative samples periodically (*ca*. every 30 days) and analyze for targeted contaminant concentrations to verify treatment progress.
7. Continue treatment for the estimated project treatment duration or until remedial goals are achieved.

FOR AERATED BIO-PILES (ELIMINATES OR GREATLY REDUCES MAINTENANCE SOIL MIXING)

1. Apply Terramend® to the soil.
2. Incorporate using an Allu bucket or by mixing very thoroughly with an excavator or loader.
3. Establish constructed bio-piles in accordance with project design requirements. Depending on soil texture, this may include vent piping, blowers, a drip irrigation system, and a variety of process monitors (i.e., moisture, pH, oxygen, carbon dioxide).
4. Apply water to achieve the target moisture content (50% to 60% of the soil's WHC).
5. Assess soil pH and moisture periodically to verify and adjust as needed to maintain soil water content between 50% and 60% WHC and pH between 6.0 and 8.0.
6. Conduct analytical testing to verify treatment progress, approximately every 30 days.
7. Continue treatment for the estimated project treatment duration or until the remedial goals are achieved.

Note: *For site soils with higher petroleum hydrocarbon concentrations (>10,000 mg/kg. treatment protocol may include a second Terramend® addition).*

HEALTH AND SAFETY

Terramend® reagent is safe when handled properly in accordance with instructions for use and the safety data sheet (SDS). The SDS is posted on our web site at: http://www.evonik.com/remediation. When working with Terramend®, the use of standard personal protective equipment, including safety glasses, protective clothing and gloves is recommended.

Additional safety equipment may be required for mechanical and site operations.

Please contact Evonik for additional guidance.

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