

THE ENRETECH-1 APPLICATION PROTOCOL FOR SOIL REMEDIATION:

Based on an average soil TPH contaminant concentration of about 1,000 – 40,000 ppm, Enretech-1 should be applied using the following protocol:

Ex-Situ:

1. Excavate a given amount of contaminated soil and place in an LDPE lined storage area on-site. The liner should be covered with a thin layer of straw or sand as an depth indicator to help prevent puncturing of the liner during mixing. Mix the soil as thoroughly as possible to eliminate ‘hot spots’ and ideally create a homogeneous mixture. The soil should be positioned in rows or piles such that it is easily accessed by earthmoving equipment and so the soil does not exceed 1m in depth, if possible.
2. Apply 1-2 bags of Enretech-1 (10 kg bags) for each cubic metre of contaminated soil. Dampen the soil during the tilling procedure to reduce dusting and promote migration of hydrocarbon particles into the absorbent. Mix in the Enretech-1 as thoroughly as possible.
3. Simple regular tilling will provide sufficient oxygen. Initially, tilling should be undertaken weekly to ensure even distribution of the soil, contaminants and Enretech-1. However, weekly tilling is not recommended beyond 27 days. After 1 month, the tilling interval is normally two weeks to monthly, depending on the expected time frames for remediation.
4. The minimum soil moisture content necessary for biodegradation to occur depends on the soil type, but should cycle between 30 and 80% of field capacity. Fluctuations in soil water content accelerate biodegradation. As soil moisture content is not readily measurable in the field without expensive equipment, soil tension can be used as a guide. The easiest way to qualitatively assess if the soil contains sufficient moisture is to press a handful of soil into a clod. If the soil does not stick to your fingers and the clod is not significantly darker on the inside than on the outside, irrigation is required. Soil moisture should be assessed every third day for deciding when to irrigate. Do not overwater as this may result in oil-contaminated water leaving the remediation site.
5. Generally, the warmer the temperature, the faster the reactions with cellular activity (and biodegradation) roughly doubling every 10 °C. The optimum soil temperature is reported to be around 28°C, however, note that bacterial growth and degradation rates drop off dramatically below about 15°C.
6. Check the soil pH (the lab doing the soil sampling can do this). Most bacteria grow best in a relatively narrow range around neutrality (pH 6-8). Die off typically occurs below pH of 4 and above a pH of 9.5. If the soil pH is outside this range it can easily be brought back to the desired range.

In-Situ:

1. Apply 1-2 bags of Enretech-1 (10 kg bags) for each cubic metre of contaminated soil, and till into the soil as thoroughly as possible. Where areas of higher contamination are visible, increase the amount of Enretech-1 applied accordingly. Dampen the soil during the tilling procedure to reduce dusting and promote migration of hydrocarbon particles into the absorbent.
2. Do not till Enretech-1 into soil deeper than 1 metre as it then becomes difficult to till the soil/Enretech mixture completely and oxygen may become limiting, affecting the remediation rate. If the soil contamination is deeper than 1 metre, then a partial or total ex-situ application may be necessary.
3. Follow the same steps as described in items #3-6 above.