

# **EPIZYM<sup>®</sup>-HC**

## **Microbial Ecosystem for Hydrocarbon Digestion**

### **PRODUCT DESCRIPTION**

EPIZYM-HC Microbial Inoculant is a unique multi-component formulation which promotes the biodegradation of crude oil and petroleum products in contaminated soil and fresh or salt water under aerobic conditions.

EPIZYM-HC contains natural microorganisms that possess broad-spectrum oxidizing activity that biodegrades aromatic, paraffinic or asphaltic crudes to carbon dioxide, water and microbial cells. The microorganisms in EPIZYM-HC also metabolize chemical intermediates such as organic acids, alcohols, aldehydes, ketones and esters produced from biodegradation of crude oil.

The system of products used in conjunction with EPIZYM-HC is designed to emulsify, disperse and solubilize crude oil or refined petroleum products, converting these materials through microbial and enzyme action into non-polluting end products. Efficient action is dependent on the establishment of a definitive relationship between:

- Salt tolerant EPIZYM EMULSIFIER, which efficiently disperses hydrocarbons in fresh or seawater and which wets oil contaminated soil to facilitate microbial contact.
- Specialized hydrocarbon metabolizing microorganisms in EPIZYM-HC that function in fresh or seawater, or in soil.
- Nutrients in EPIZYM NUTRIPAK that are necessary for microbial growth.

EPIZYM-HC Inoculant is a formulated microbial ecosystem with added stabilizers and growth stimulants. The microbes derive from natural sources and are grown-up under high quality control conditions to prevent contamination by hazardous microorganisms. These natural microbes are non-pathogenic. The EPIZYM-HC microbes are grown on a naturally derived carbohydrate base that gives the product its general, granular appearance. They are grown to as high a concentration as possible so that EPIZYM-HC provides users with the most effective product possible. EPIZYM-HC contains greater than 4.4 trillion aerobic and facultative anaerobic microorganisms per kg (2 trillion/pound). While these organisms are microscopic, they - along with the enzymes they secrete - are powerful, living “engines” that love to consume waste.

### **COMPANION PRODUCTS**

EPIZYM NUTRIPAK products are a blend of aqueous and oil soluble nitrogen compounds, essential minerals and auxiliary growth stimulants which maximize the microbial growth and petroleum biodegradation capability of EPIZYM-HC. Four NUTRIPAK grades are available:

- NUTRIPAK LIQUID with 14% nitrogen is the most convenient to use.
- NUTRIPAK LT granular with 32% nitrogen is the most concentrated and has a slow release feature for land farming.
- NUTRIPAK LTS granular with 30% nitrogen is a fast dissolving version of the LT.

- NUTRIPAK SW granular with 18% nitrogen is an oleophilic nutrient designed for oil spills on water.

EPIZYM EMULSIFIER is a mixture of ecologically acceptable, biodegradable emulsifiers which promotes emulsification and intimate surface contact between the crude oil or petroleum contaminants and the water phase containing the microbes and nutrients.

## MODE OF ACTION

EPIZYM-HC Inoculant uses microbial degradation to breakdown contaminating hydrocarbons, enzymatically converting them under aerobic conditions into carbon dioxide, water and microbial cells. The time required is dependent on:

- temperature
- nutrient availability.
- oxygen

Within specified limits, the efficiency of the microbes and enzymes of EPIZYM-HC varies the greatest with temperature. Typically, the biodegradation of crude petroleum doubles with each 10°C (18°F) rise in temperature between 10° - 40°C (50° - 104°F).

## APPLICATION SUGGESTIONS

### EPIZYM-HC HYDRATION

EPIZYM-HC Inoculant is supplied as a dehydrated powder and must be re-hydrated with warm water (not hot) for approximately half an hour before use. Mix one part EPIZYM-HC with 10 parts water. Upon completion of hydration, mix the activated microbial culture with EPIZYM NUTRIPAK and EPIZYM EMULSIFIER as noted in the following.

### CONTAMINATED SOIL TREATMENT

To treat hydrocarbon contaminated soils in a land-farming or bio-pile process:

- Calculate the total volume of contaminated soils to be treated.
- The amount of EPIZYM-HC Inoculant needed for the treatment is :
  - 0.4 kg EPIZYM-HC per 1m<sup>3</sup> of soil or
  - 0.7 lb. EPIZYM-HC per 1yd<sup>3</sup> of soil
- Determine the average Total Petroleum Hydrocarbon (TPH) in the soil, which represents "C".
- The amount of NUTRIPAK needed for the treatment is determined by the nitrogen (N) requirement following the recommended ratio of C:N:P = 100:10:1. The phosphorous (P) requirement is already balanced in the NUTRIPAK formulation. Therefore, the amount of nitrogen needed is calculated as follows:

$$\begin{aligned} \text{Nitrogen Requirement (kg)} &= (1/10) \times (\% \text{ TPH in soil}) \times (\text{m}^3 \text{ of soil}) \times (1800 \text{ kg/m}^3) \\ \text{Nitrogen Requirement (lb.)} &= (1/10) \times (\% \text{ TPH in soil}) \times (\text{yd}^3 \text{ of soil}) \times (3034 \text{ lb./yd}^3) \end{aligned}$$

- The type of NUTRIPAK used is determined by the engineering design. Either LIQUID, LT or LTS are suggested for soil applications. The NUTRIPAK requirement is calculated as follows:

$$\text{NUTRIPAK Required} = (\text{Nitrogen required}) \times (100) / (\% \text{ nitrogen in NUTRIPAK})$$

- For this type of treatment, the amount of EPIZYM EMULSIFIER should be the same as the amount of EPIZYM-HC Inoculant used.
- Spray the mixture over the contaminated soil.
- Till or plow the treated soil thoroughly to increase the rate of biodegradation.
- If necessary, spray the treated soil with fresh water every other day to keep the soil moist. Re-plow the treated soil at 72 hour intervals to accelerate the biodegradation and resulting removal of soil contaminants.

### **OPEN WATER OIL SPILL**

To treat salt or fresh water contaminated with crude oil and petroleum products:

- Determine how much weight of oil has been spilled in the area (in kg or lb.). The amount of EPIZYM-HC needed for the treatment will be:

$$\text{Weight of EPIZYM-HC} = (\text{Weight of Oil}) / (40)$$

- The amount of EPIZYM EMULSIFIER needed for the treatment will be twice as much as the amount of EPIZYM-HC.
- The amount of NUTRIPAK SW needed for the treatment is determined following the recommended ratio: C:N:P = 100:10:1. The "C" represents the amount of oil, and the N represents the amount of nitrogen needed from the NUTRIPAK SW.
- Spray the above mixture over the entire area using boats with flying booms or helicopters fitted with spray booms.

### **BIOREMEDIATION OF CONTAMINATED SOILS AND GROUNDWATER IN SITU**

For this type of treatment, it is recommended that the EPIZYM-HC be filtered after the hydration to remove the carrier, which could plug the formation. The filtrate, containing the EPIZYM-HC microorganisms, then can be injected along with NUTRIPAK LIQUID nutrient and EPIZYM EMULSIFIER through the injection wells on the site to be treated.

EPIZYM product treatment rates should follow the contaminated soil rate suggestions.

**PACKAGING:** EPIZYM-HC, NUTRIPAK LT, NUTRIPAK LTS, and NUTRIPAK SW are supplied in 40 kilogram (88 pound), net weight polyethylene lined fiber drums. EPIZYM EMULSIFIER and NUTRIPAK LIQUID are supplied in 190 liter (50 US gallon) polyethylene drums.

**PRODUCT STORAGE:** Biological products are unlike inert chemical products. They require special treatment during storage and handling. Therefore, for EPIZYM-HC,

- \* Do not store continuously at temperatures above 40°C (104°F).
- \* Store out of direct sunlight in a well-ventilated area.
- \* Keep products dry until ready to hydrate.
- \* Do not mix with any materials not recommended by Epicore, especially biocides and harsh chemicals.

**SAFETY:** EPIZYM-HC utilizes natural microorganisms which are harmless to humans, plants and animals so it is non-toxic. Users are advised to consult Material Safety Data Sheets for further information and guidance.

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**IMPORTANT NOTICE TO PURCHASER:**

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