



# ***BIO-MATRIX***

**BLENDED HYDROCARBON  
BACTERIAL CULTURES**

# BIO-MATRIX CULTURES - GENERAL



## Description:

- ❖ **BIO-MATRIX** is a proprietary blend of bacterial cultures specifically designed to rapidly degrade the light-distilled oil fractions, and the heavier fractions of hydrocarbons normally associated with # 4, # 5, and #6 fuel oils including crude oils and coal tars.
- ❖ **BIO-MATRIX** cultures are not genetically engineered. These cultures are naturally occurring, selectively adapted, and tolerant of high contaminant concentrations.

## Features:

- ❖ Inoculates contaminated solids, liquids, and mixes of both, with the chosen blend of **BIO-MATRIX** bacterial culture.
- ❖ Quickly decontaminates soil and groundwater containing hydrocarbons resulting from leaking underground storage tanks, transfer line leaks, and general daily industrial spillage.
- ❖ Eliminates or reduces further environmental damage through biodegradation of the contaminant plumes.
- ❖ Can tolerate petroleum concentrations inhibitory to many indigenous (naturally occurring microbes/bacteria found in-situ) populations.

## Advantages:

- ❖ Eliminates future liability risks associated with offsite disposal.
- ❖ Remediates the site with minimal disruption to the ecology and geographic site location.
- ❖ Remediation technology is the natural and ecologically sound approach toward spill clean ups.

## Benefits:

- ❖ No more disposing or transporting of contaminated mixes, soils, or solids.
- ❖ More cost effective than excavation or incineration.
- ❖ No more timely and costly, applications, licenses, and administrative paper work.
- ❖ No more liability upon completion of bioremediation.
- ❖ Costs are substantially reduced for each and every hydrocarbon spill clean up project.
- ❖ The physical workload is substantially less labor intensive and more easily manageable.

# BIO-MATRIX CULTURES – GENERAL

continued...



## Products:

- ❖ *Bio-Matrix TRC*, a liquid blend **T**otal **R**emediation **C**ulture which includes nutrients.
- ❖ *Bio-Matrix HCR*, a dry powder full range blend **H**ydrocarbon **R**emediation **C**ulture.
- ❖ *Bio-Matrix GRC*, a dry powder specialty blended **G**asoline **R**emediation **C**ulture.
- ❖ *Bio-Matrix DRC*, a dry powder specialty blended **D**iesel **R**emediation **C**ulture.
- ❖ *Bio-Matrix NBA*, a dry powder **N**utritional **B**oost **A**ccelerator for hard to degrade hydrocarbons.
- ❖ *Bio-Matrix NPN*, a dry powder **N**itrogen and **P**hosphorous **N**utrient balancing food source.

## Packaging:

- ❖ **Liquids:** The only liquid product is *Bio-Matrix TRC*. This is packaged as follows:-
  - 5 US Gallon / 13 Litre Plastic Pail - 36 per pallet
  - 55 US Gallon / 142 Litre Plastic Drum - 4 per pallet
  - 250 US Gallon / 648 Litre Plastic Tote - 1 per pallet
- ❖ **Powders:**
  - 25 Lb. / 11.34 Kilo. Fiber Drum (5 Gallon Pail Size) - 36 per pallet
  - 50 Lb. / 22.68 Kilo. Fiber Drum (10 Gallon Pail Size) - 24 per pallet
  - 500 Lb. / 226.8 Kilo. Cubed Box ( 1 pallet, squared) - 1 per pallet

## Disclaimer:

The data herein is based on test information obtained by our contracted US laboratories. These data are believed to be reliable, but do not imply warranty or performance guarantee. We recommend that the user determine performance through laboratory or system testing. We assume no liability or responsibility for patent infringement resulting from the use of this product.

# **BIO-MATRIX TRC** (TOTAL REMEDIATION CULTURE)



**Liquid Culture: Models *TRC-0050; TRC-55D; & TRC-250T***

## **Specifications:**

Cell count.....7.6 billion per US gallon,  
..... 28.77 billion per litre.  
pH.....10.4 – 10.7  
Percent Volatile.....Nil  
Solubility in Water.....99%  
Boiling Point.....> 220 Deg. F / 100 Deg. C.  
Flash Point.....Non Flammable  
(Method ASTM D – 93)  
Appearance.....Cream to White Liquid  
Odor..... Floral Perfume

## **Product Description:**

**BIO-MATRIX TRC** is a proprietary blend of bacterial spores, concentrated biodegradable surfactants, and biostimulating agents for use as a total remediator for combined hard surface cleaning with bioremediation properties and also includes the nutrients required for accelerated remediation. The product effectively removes surface stains from spilled petroleum products on concrete, asphalt, machinery, vehicles, rock and soil, and inoculates the contaminants with bacterial cells. **BIO-MATRIX TRC** shortens clean-up time, increases contaminant bio-availability, and initiated biodegradation.

## **Benefits:**

- ❖ Inoculates contaminant materials with bacteria.
- ❖ Cleans surfaces of oil spills and stains.
- ❖ Contains no petroleum distillates or solvents.
- ❖ Contains essential microbial nutrients.
- ❖ Enhances biodegradation above and below ground surface when used as recommended.
- ❖ Economically attractive and ecologically sound.
- ❖ No more digging, transporting, or disposing of contaminated materials is required.

## **Dosage:**

- ❖ Application rate is generally between 1 gallon/25 ft<sup>2</sup> or 1 litre/0.6135 m<sup>2</sup> and 1 gallon/50 ft<sup>2</sup> or 1 litre/1.227 m<sup>2</sup>, based on the surface and the contaminant.



# **BIO-MATRIX TRC** (TOTAL REMEDIATION CULTURE), continued...

## **Coverage:**

**BIO-MATRIX TRC** may be used neat or diluted. In the concentrated form 1 US gallon will cover 80 square feet.

Concentrated	- heavy aged oil stains
1:3	- tool clean-up,
1:5	- parts cleaning,
1:10	- fresh oil stains,
1:25	- general cleaning

## **Hard Surface Cleaning:**

Dampen the contaminated surface with water, apply BIO-MATRIX and allow it to work for 20 – 30 minutes, then brush and rinse with water. Keep the work site damp with water during treatment and repeat if necessary.

## **Porous Surface ( soils) Cleaning:**

Scrape surface, dampen with water, and apply product. Scrape the surface again and rinse with water. To further accelerate biodegradation of the petroleum products, follow with either **BIO-MATRIX NutroBoost** or **Nitro-pH** bioremediation accelerators.

## **Cleaning Note:**

Even when applying concentrated **BIO-MATRIX TRC** to surfaces they must first be dampened and be kept damp throughout the application period as the **BIO-MATRIX TRC** cultures require moisture to become activated and work as they should. Even when contaminated hard surfaces are rinsed off the contaminants flushed off with the rinse will be inoculated with the **BIO-MATRIX TRC**. The microbes will continue to bioremediate these contaminants, wherever they are as long as nutrients and oxygen is available, until such time as complete bioremediation has occurred.

## **Recommended Application Equipment:**

**BIO-MATRIX TRC** will clean petroleum-based materials from nearly all surfaces regardless of the application method. Pre-test new equipment finishes by applying to a small area first.

# **BIO-MATRIX HRC** (HYDROCARBON REMEDIATION CULTURE).



**Dry Culture: Models *HRC-6X2S*; *HRC-050D*; & *HRC-500C*.**

## **Specifications:**

Bacterial Count.....85.05 billion per oz. / 1.3608 trillion per lb.  
3 billion per gram / 3trillion per kilo.  
Odor.....Yeast-like  
Moisture Content.....15%

## **Studies & Performance:**

In the example shown below, the rate of oxygen consumption was measured as an indicator of bacterial growth on No. 6 fuel oil. The **BIO-MATRIX HRC** (hydrocarbon remediation culture) began consuming oxygen immediately, and as a result achieved an average TPH (Total Petroleum Hydrocarbon) reduction rate 31% higher than nutrient-stimulated indigenous cultures. After only 25 days, the **BIO-MATRIX HRC** cultures reduced the target contaminant concentration by 86%, as compared to 59% when only nutrients were added.

During field applications **BIO-MATRIX HRC** cultures have proven to be just as effective, having reached the desired endpoints in just seven months. (See below figure).

# **BIO-MATRIX HRC** (HYDROGEN REMEDIATION CULTURE) ,continued....



## **Optimum Conditions For Use:**

pH.....6.0-8.5 (6.8-7.4 optimum)  
Temperature.....40 – 100 Degrees F. / 4.4 – 37.7 Degrees C.  
Dissolved Oxygen.....>2.0/1(1.0mg/1 minimum)  
Nutrients.....N- available as approx. 5% of the **BIO-MATRIX** culture.  
.P- available as approx. 1% of the **BIO-MATRIX** culture.

- ❖ N-Nitrogen
- ❖ P- Phosphorous in form of phosphate

## **The *BIO-MATRIX HRC* 2 Lb. Sock:**

Used ideally in areas where contaminated run-offs are in a controlled or manageable environment whereby the contaminants passing through the sock become inoculated with the **BIO-MATRIX HRC** cultures and will continue to bioremediate these contaminants, wherever they are as long as nutrients and oxygen are present, until such time as complete bioremediation has occurred.

## **Storage & Handling:**

Storage.....Store in dry, cool place  
Handling.....Avoid excessive inhalation. Wash hands thoroughly with warm soapy water after handling.

## **Nutrient requirements:**

For best results, we suggest you inquire about the Spill-Sorb **BIO-MATRIX NutroBoost** and **Nitro-pH Nutrient** product line for your nutrient and micronutrient needs. Each blend is carefully formulated to optimize microbial degradation and achieve desired end points in a minimum timeframe.



**Dry Culture: Models *GRC-050D and GRC-500C*.**

## **DESCRIPTION:**

**BIO-MATRIX GRC** is a synergistic blend of selectively adapted bacteria developed specifically for the rapid degradation of the major components of gasoline. The product is particularly effective on the benzene, toluene, and xylene chain fractions within the gasoline/petrol range. These compounds have been determined to be persistent in the environment.

## **BENEFITS:**

- ❖ Quickly decontaminated soil and groundwater containing gasoline resulting from underground storage tanks, transfer line leaks and spills.
- ❖ Rapid decontamination minimizes or eliminates further environmental damage through biodegradation of contaminant plume.
- ❖ Can tolerate gasoline concentrations inhibitory to many indigenous bacterial populations.

## **LAB STUDIES AND PERFORMANCE:**

The graphs below demonstrate reduction of gasoline and some oils of its main components.

### **Dosage:**

As a general rule the dosing will be between 0.5 pounds ( or gallons ) per cubic yard / 0.25 kg per cubic meter to 0.75 pounds ( or gallons ) per cubic yard / 0.38 kg per cubic meter. Spill-Sorb recommends using Bio-Matrix GRC on those soils and waters in which the contaminant of concern consists primarily of light end petroleum distillates.

# **BIO-MATRIX GRC** (GASOLINE REMEDIATION CULTURE)



**Dry Culture: Models *GRC-050D and GRC-500C*.**

## **DESCRIPTION:**

*BIO-MATRIX GRC* is a synergistic blend of selectively adapted bacteria developed specifically for the rapid degradation of the major components of gasoline. The product is particularly effective on the benzene, toluene, and xylene chain fractions within the gasoline/petrol range. These compounds have been determined to be persistent in the environment.

## **BENEFITS:**

- ❖ Quickly decontaminated soil and groundwater containing gasoline resulting from underground storage tanks, transfer line leaks and spills.
- ❖ Rapid decontamination minimizes or eliminates further environmental damage through biodegradation of contaminant plume.
- ❖ Can tolerate gasoline concentrations inhibitory to many indigenous bacterial populations.

## **LAB STUDIES AND PERFORMANCE:**

The graphs below demonstrate reduction of gasoline and some oils of its main components.

### **Dosage:**

As a general rule the dosing will be between 0.5 pounds ( or gallons ) per cubic yard / 0.25 kg per cubic meter to 0.75 pounds ( or gallons ) per cubic yard / 0.38 kg per cubic meter. Spill-Sorb recommends using Bio-Matrix GRC on those soils and waters in which the contaminant of concern consists primarily of light end petroleum distillates.



## **BIO-MATRIX GRC** (GASOLINE REMEDIATION CULTURE), continued.....

### **SPECIFICATIONS:**

- ❖ Bacteria Count.....141.75 billion per. oz. / 2.268 trillion per lb.  
.....5 billion per gram / 5 trillion per kilo.
- ❖ Odor.....Yeast – Like
- ❖ Moisture Content.....15%

### **OPTIMUM CONDITIONS FOR USE:**

- ❖ pH.....6.0-8.5 (6.8-7.4 optimum)
- ❖ Temperature.....40 – 100 Deg. F (65 – 85 Deg. F optimum)  
.....4.4 – 37.7 Deg. C (18.3 – 29.4 Deg. C optimum)
- ❖ Dissolved Oxygen.....>2.0 mg/l (1.0 mg/l minimum)
- ❖ Nutrients (N & P).....>1.0mg/l Ammonium Nitrogen  
.....>0.5mg/l Ortho Phosphate
- ❖ Heavy Metals.....<20.0mg/l

### **STORAGE AND HANDLING:**

- ❖ Storage.....Store in dry, cool place
- ❖ Handling.....Avoid excessive inhalation. Wash hands thoroughly with warm soapy water after handling.

### **NUTRITIONAL REQUIREMENTS:**

For best results we suggest you inquire about the Spill-Sorb **Bio-Matrix** NutroBoost and Nitro-pH Nutrient product line for your nutrient and micronutrient bioremediation accelerator needs. Each blend is carefully formulated to optimise microbial degradation and achieve the desired end points in a minimum timeframe.



# **BIO-MATRIX DRC** (DIESEL REMEDIATION CULTURE)

**Dry Culture, Models: DRC-050D & DRC-500C.**

## **DESCRIPTION:**

**BIO-MATRIX DRC** is a proprietary blend of bacterial cultures selectively adapted specifically for the rapid degradation of the major components of diesel. The product is particularly effective on benzene, toluene, xylene, naphthalene, methyl naphthalene, anthracene and C 10 to C 17.

**BIO-MATRIX DRC** has demonstrated to be highly prolific and efficient in the degradation of diesel spills.

## **BENEFITS:**

- ❖ Quickly decontaminated soil and groundwater containing diesel resulting from leaking underground storage tanks, transfer line leaks and spills.
- ❖ Eliminates or reduces further environmental damage through biodegradation of contaminated plume.

## **FEATURES:**

- ❖ Rapidly degrades all major organic components of diesel.
- ❖ Can tolerate diesel concentrations inhibitory to many indigenous populations.

## **STUDIES AND PERFORMANCES:**

The figures on the following page demonstrates **BIO-MATRIX DRC** 's ability to reduce contaminant concentration in above ground and below ground treatment cells. In the example on the left **BIO-MATRIX DRC** destroyed 95% of the contaminants in a period of three months. In the example on the right 81% of the target contaminant was degraded in nine months. In both cases, nutrient levels, oxygen supply and other conditions critical to optimum bacterial growth were monitored and adjusted as needed.

# **BIO-MATRIX DRC** (DIESEL REMEDIATION CULTURE), continued.....



**Dosage:** As a general rule the dosing will be between 0.3 pounds ( or gallons ) per cubic yard / 0.15 kg per cubic meter, to 0.75 ponds ( or gallons ) per cubic yard / 0.38 kg per cubic meter. Spill-Sorb recommends using Bio-Matrix DRC on those soils and waters in which the contaminant of concern consists primarily of heavy end petroleum distillates.

## **SPECIFICATIONS:**

- ❖ Bacteria Count.....3 billion/gram
- ❖ Odor.....Yeast – Like
- ❖ Moisture Content.....15%

## **OPTIMUM CONDITIONS FOR USE:**

- ❖ pH.....6.0-8.5 (6.8-7.4 optimum)
- ❖ Temperature.....40 – 100 Deg. F (65 – 85 Deg. F optimum)  
.....4.4 – 37.7 Deg. C (18.3 – 29.4 Deg. C optimum)
- ❖ Dissolved Oxygen.....>2.0 mg/l (1.0mg/l minimum)
- ❖ Nutrients (N & P).....>1.0mg/l Ammonium Nitrogen  
.....>0.5mg/l Ortho Phosphate
- ❖ Heavy Metals..... <20.0mg/l

## **STORAGE AND HANDLING:**

- ❖ Storage.....Store in dry, cool place
- ❖ Handling.....Avoid excessive inhalation. Wash hands thoroughly with warm soapy water after handling.

## **NUTRIENT REQUIREMENTS:**

- ❖ For best results we suggest you inquire about Spill-Sorb’s **BIO-MATRIX NBA and NPN** accelerator product line for your nutrient and micro-nutrient needs. Each blend is carefully formulated to optimize microbial degradation and achieve desired end points in a minimum timeframe.

# **BIO-MATRIX NPN** (NITROGEN & PHOSPHORUS NUTRIENT)



Critical to establishing and maintaining the activity of the bacteria in the site soil is the control of the inorganic nutrients required by the bacteria for the cellular metabolism. Bacteria require both nitrogen (N) and phosphorus (P) in order to carry out cellular functions. Nitrogen is required by the organism for microbial wall components, nucleic acids and proteins. Nitrogen makes up nearly 15% of the molecular composition of a bacterial cell, any limitation on the nitrogen seriously impacts the metabolic functions of the organisms. Bacteria utilize only that nitrogen, which is in the ammonia (NH<sub>4</sub>) form, N in other forms, cannot be incorporated into the organisms organelles. Instead, improperly monitored, other N sources may lead to field and laboratory results which mislead the practitioner of bioremediation into believing that the inorganic N level is satisfactory. Inorganic N sources will be required in the bioremediation program at the site, the sources have been carefully chosen to facilitate the remedial process and to maintain the levels of N in the NH<sub>4</sub> form.

Phosphorus, in the form of inorganic phosphates, is used by the microorganisms in the synthesis of phospholipids and nucleic acids. Phosphorus is also essential for the energy transfer reaction of ATP. The enzymes that hydrolyze the phosphates ester ~e present in nearly all organisms. In P limiting environments the metabolism of microorganisms decreases sharply, reducing their capacity to utilize the hydrocarbons in the soil as an organic carbon source. Inorganic phosphorus sources shall be applied with the nitrogen sources in order to stimulate and maintain the remediation project.

Micronutrients are also required for microbial growth. These micronutrients include potassium, iron, sulfur, magnesium, calcium, and sodium. In Spill-Sorb's experience these trace elements are present in nearly all soils, and due to the small amount required for microbial metabolism, further addition of these compounds at the site will not be required. However, should the monitoring program indicate that the degradation rates have changed significantly, micronutrients should be examined as a potential rate limiting variable.

**Bio-Matrix NPN** is a slow release nutrient, used in the earlier stages of a soil remediation.

**Dosage :** 12.5 pounds/kilos per 100 pounds/kilos of organic carbon to be degraded.