

MICROBE MULTIPLIER

(FOR ALL TYPES OF BIOREMEDIATION)

MICROBE MULTIPLIER PETRO

A water-soluble concentrated humate nutrient (not a fertilizer) in liquid form that stimulates a very rapid growth of the naturally occurring microorganisms to accommodate their hydrocarbon contaminated environment. By exponentially increasing their population, the consumption of the hydrocarbons is proportionally increased, causing natural bioremediation to continue at an accelerated rate until either the food supply is exhausted, and there is a depletion of oxygen and/or the temperature of the soil falls below 2° C. When the hydrocarbon food supply is exhausted, the microorganisms die, leaving only naturally occurring fatty acids and carbon dioxide.

MICROBE MULTIPLIER SODI

A liquid that creates the proper environment for an ion exchange that buffers salt, and prohibits osmotic action normally associated with sodium chloride contamination. Restoration of the ecological balance allows revegetation of fields, pastures or industrial sites. The amount of **MICROBE MULTIPLIER SODI** required is dependent upon the area to be remediated and the levels of sodium chlorides present in the soil.

Since remediation begins immediately upon application of **MICROBE MULTIPLIER SODI**, most sites are restored within days, which allow seeding or planting to follow without significant loss of growing season. Obviously, the time of the year will determine what can be planted. Experience has also shown that abused soil can benefit from application of fertilizer as a prelude to restoration of the vegetation. Following remediation, any crop applicable to the growing season may be grown.

MICROBE MULTIPLIER AGRI

A concentrated liquid form of organic matter, which enables man to accelerate many natural earth processes. Nature uses decaying organic matter to provide a source of nitrogen to the soil, energy for microorganisms and chelating agents for micronutrients. The addition of organic matter to the soil improves soil structure by increasing tilth, friability, and aeration, thereby increasing moisture retention and improving drainage. Components of organic matter act as a plant growth hormone and increase trace elements uptake. **MICROBE MULTIPLIER AGRI** accelerates these natural processes, and through soil improvements, produces healthier plants.

FREQUENT QUESTIONS

Q. Does **MICROBE MULTIPLIER** have EPA approval?

A. YES- EPA has approved use of this technology.

Q. Does **MICROBE MULTIPLIER** work in clay and other heavy soils?

A. YES-An ion exchange occurs that improves the permeability, aeration, and water retention of the clay and heavy soils, thereby allowing the natural microbial activity to be further enhanced.

Q. Doesn't bioremediation take a long time?

A. NO-**MICROBE MULTIPLIER** will usually take between 30-70 days to effect a remediation (see case histories included).

Q. What kind of "bugs" do you use?

A. **MICROBE MULTIPLIER** does not use laboratory (foreign) microbes. **MICROBE MULTIPLIER** stimulates naturally occurring, resident microbes found on site.

Q. What do the "bugs" leave when they finish the remediation?

A. The "by-products" are, H₂O (water) carbon dioxide, and fatty acids.

Q. Is your technology harmful to the environment?

A. NO-**MICROBE MULTIPLIER** is "non-toxic" and totally "organic". It is naturally occurring in nature.

Q. Can **MICROBE MULTIPLIER** affect salt/brine (chloride) contamination?

A. YES-**MICROBE MULTIPLIER SODI** is a liquid that creates the proper environment for an ion exchange that buffers salt and prohibits the osmotic action normally associated with sodium chloride contamination. Restoration of the ecological balance allows revegetation of agricultural, petroleum, and other environments.

Q. How can you bioremediate a site with high/low pH values?

A. **MICROBE MULTIPLIER** is a neutral. Our technology causes the site pH to move to neutral, thereby promoting a proper environment for microbial activity.

Q. What can you do when contamination is under a building or other structure?

A. Our technology allows us to bioremediate "IN-SITU" without disrupting commercial activity. This eliminates "dig and haul" or other disruptive methods.

Q. How expensive is **MICROBE MULTIPLIER**?

A. Our technology is very cost effective. Clients are experiencing a cost reduction of 20%-40% when compared with alternative methods.

CASE HISTORIES

EAST TEXAS OIL FIELD – CRUDE OIL SPILL

DATE	LAB #	TPH READING, ppm
09/13/91	E-1657	54,426.0
09/23/91	E-2274	9,895.2
10/14/91	E-3355	13.7

SOUTH TEXAS OIL FIELD – DRILLING MUD PITS

DATE	LAB #	TPH READING, ppm
09/30/91	E-2689	847.0
10/11/91	E-3360	.06

COMPRESSOR SITE HOUSTON, TEXAS

DATE	LAB #	TPH READING, ppm
07/12/91	SP-2	9,200.0
08/09/91	5A-EF	188.4
09/09/91	7-EF	33.0

MATAGORDA COUNTY, TEXAS DIESEL SPILL

DATE	LAB #	TPH READING, ppm
08/19/91	E-1063	7,301.6
08/29/91	E-1066	1,782.7
09/17/91	E-1656	854.0
10/22/91	E-3354	16.3

MICROBE MULTIPLIER

APPLICATION BRIEF

SUMMARY

Unleaded gasoline and diesel fuel contaminated soil in the vicinity of underground storage tanks at a retail service station site was moved to the surface for remediation by evaporation. Approximately 1/3 of the soil was treated with **Microbe Multiplier**. After 50 days the average TPH of the treated soil was remediated to almost one fourth of the untreated soil.

CONTAMINATION

Approximately 340 cubic yards of soil was found to be contaminated with unleaded gasoline and diesel fuel in the vicinity of the underground storage tanks at a retail service station near the metropolitan area of Houston, Texas. One unleaded gasoline tank had been recently overfilled causing contamination of soil between two tanks. The diesel contamination was due to a minor fuel leak. A report from an independent testing laboratory showed a high level of 494 ppm TPH in the hottest sample with an average of 38 ppm TPH throughout the contaminated soil.

METHOD OF REMEDIATION

A plan of remedial action for this site was submitted to and approved by the Texas Water Commission to move the contaminated soil to the surface and allow the sun and wind to degrade the contaminants to a level that would permit the soil to be returned to the excavation.

Heavy-duty visqueen was placed on a cleaned driveway area and approximately 340 cubic yards of contaminated soil was moved to the surface and placed on the visqueen. The extra visqueen was pulled up around the sides and ends of the contaminated soil and imported clean soil was bermed around the contaminated soil to form containment. The visqueen was then pulled down and anchored over the clean soil forming a barrier of liner between the clean and contaminated soils. The bermed area was approximately 30'x50' with the soil stacked 6' high.

30 days after the bermed soil was in place the decision was made to treat approximately 1/3 of the soil with **Microbe Multiplier**. **The Microbe Multiplier** was diluted 1 part concentrate to 10 parts of water to make 31 gallons of solution. One application of solution was sprayed over the surface of the designated treated area. An independent laboratory took samples 50 days after treatment of the untreated and treated soil.

RESULTS OF REMEDIATION

Remediation by **Microbe Multiplier** was 4 to 5 times more effective after 50 days than the results of normal evaporation of the untreated area. Average TPH soil at the beginning of remediation was 385 ppm. There was minor precipitation on the contaminated soil that totaled 1 7/8"

The following table lists the TPH levels on day 50 after treatment. Figure 1 illustrates the location of the samples.

LAB SAMPLE NUMBER	SAMPLE DEPTH	TPH W/ MICROBE MULTIPLIER	TPH UNTREATED
#1	1.0	82.1	
#2	1.0	24.2	
#3	1.0	23.4	
#4	1.0		127.9
#5	1.0		112.7
#6	1.0		232.0
#7	2.5		145.3
#8*	3.5		39.7
#9	3.5		123.5

*Sample #8 was under sample #3

SAMPLE LOCATIONS

The soil was bermed for 30 days prior to the decision to add **Microbe Multiplier**, therefore, day 50 after treatment with **Microbe Multiplier** was approximately 80 days since the soil was bermed. The sample reflects the heterogeneous disbursement of the hydrocarbon contamination.

CONCLUSION

One treatment of the soil with **Microbe Multiplier** accelerated the expansion of the microorganism population in the soil sufficiently to accelerate the natural bioremediation process almost 400%.

Since the **Microbe Multiplier** solution could have been injected into the contaminated soil in situ, the remediation process could have been completed at a fraction of the cost.