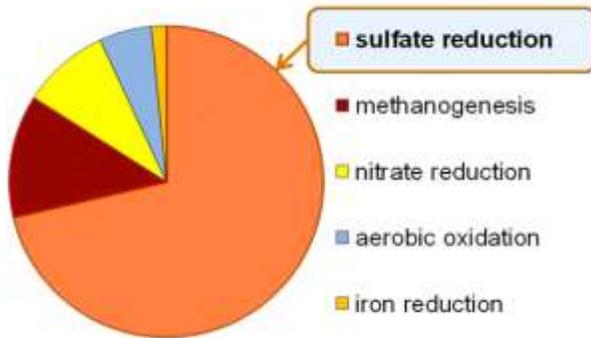


Nutrisulfate™

Enhanced aerobic bioremediation technologies such as the **iSOC®** gas inFusion technology or the use of oxygen releasing compounds such as **TersOx™** are commonly used to accelerate naturally occurring in situ bioremediation of petroleum hydrocarbons, and fuel oxygenates such as MTBE and TBA, by indigenous microorganisms in the subsurface. However, these indigenous microorganisms do not function well in the high contaminant concentrations of the source area. Moreover, the oxygen technologies have to overcome the anaerobic conditions of the source area and often the presence of iron.

Significance of Sulfate

Sulfate reduction is the predominant electron accepting process for the degradation of hydrocarbons



Sulfate reduction and methanogenesis is the dominate natural degradation processes at most sites; and therefore, adding oxygen to the anaerobic portion of the plume may be disadvantageous.

Nutrisulfate™ (U.S. Patent No. 7,138,060) stimulates biodegradation by providing a soluble, readily available electron acceptor solution. In the presence of elevated sulfate, anaerobic groundwater bacteria use BTEX, MTBE and other petroleum hydrocarbons for carbon and energy while mineralizing the hydrocarbons to carbon dioxide and water. Sulfate addition enhances natural conditions and reduces the carbon footprint when compared to conventional remediation.

Nutrisulfate™ is a high sulfate metabolic supplement designed to enhance the kinetics and efficiency of microbial systems specifically related to bioremediation of BTEX, MTBE, TBA and other petroleum hydrocarbons. The increase in kinetics and efficiency decreases the remediation time and reduces the amount of substrate / amendment required.

Sulfate Enhanced Bioremediation



Benefits of Nutrisulfate™

- Demonstrated effectiveness on BTEX, MTBE, and TBA
- No adverse effects
- Clean, low-cost, non-disruptive application (e.g., direct-push, wells and excavations)
- Aqueous solution for easy injection and distribution
- Increases pH
- Nutrient-enhanced for anaerobic bacteria
- Enhances abiotic bioremediation
- Increases bioremediation kinetics
- Decreases remediation time
- Reduces the amount of substrate required
- Remedy will be faster, better and cheaper
- Green sustainable chemistry

Increases activity, abundance, and fecundity of anaerobic heterotrophic bacteria



Characterization (Specific Constituents)

Parameter	<i>Nutrisulfate™</i>
Total Carbon*	1.2%
Total Nitrogen (N)*	0.09%
Carbon/Nitrogen ratio (C/N)*	13.1
Total Kjeldahl Nitrogen (TKN)*	652 mg/L
Chemical Oxygen Demand (COD)*	29,575 mg/L
Total Phosphorus*	218 ppm
Sulfate*	127,250 mg/L
Other Constituents	
Modified Culture Media	Oligosaccharides; Peptides
Yeast Cells	Proteins; Amino Acids; Peptides; Vitamins; Minerals; Proteinates; Nucleic Acids; Beta-Glucans; Lysine; Leucine
Extracellular Metabolites	Peptides; Organic Acids; Oligosaccharides; Nucleotides; Amino Acids; Esters; Alcohols

*Approximate Value

Packaging Options

- 55-gallon poly drums
- 275-gallon IBC totes
- Bulk tankers

Offers Cost Savings

Our *Nutrisulfate™* technology has the potential to offer significant cost savings to the groundwater remediation industry. The passive nature of *Nutrisulfate™* eliminates the large capital and operations/maintenance costs associated with active engineered systems. *Nutrisulfate™* offers a lower cost alternative to time consuming drawn out natural attenuation strategies.



Innovative Sustainable Green Technologies

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