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## Bioremediation



Bioremediation refers to any method that uses [microorganisms](#) (microbes) to recycle organic materials and sequester inorganic ions. Under carefully controlled conditions, it can be a practical and cost effective method to remove [hydrocarbons](#) from contaminated surfaces and sub-surfaces. The primary responsibility of microbes is to recycle organic material, but they must be present in sufficient quantities and diversity in order to accomplish this task.

BioAugmentation is the addition of naturally occurring microbes sites. BioStimulation is the modification of sites to enhance the growth of indigenous microbes already present. [OBI specializes in BioAugmentation.](#)

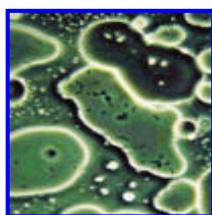
### **Basics and Essential Requirements**

Under optimal conditions, a single microbe can divide every 20 -30 minutes and will live as long as optimal conditions exist. Once these conditions are no longer present, the microbes will die off, be eaten by other microorganisms, or become dormant.

- Needs a food source to be present and available.
- Takes place at the oil / water interface.
- The greater the surface the faster the microbes work.
- Activity is limited by oxygen (a residual level of 1 ppm. or more).
- Inorganic nitrogen, phosphorus, potassium nutrient requirements.
- One microbe can utilize one cell weight of hydrocarbon per hour.
- Is directly related to the number of microbes present.
- Enzymatic process, wherein various enzymes effectively "cutup" the molecule.
- It is transformation instead of transportation.
- The water used to activate microbes can be either fresh or salt water.
- Must exceed 1,000,000 microbes ( $10^6$ )per gram of soil for enhanced bioremediation to proceed.



Other conditions must be taken into account, such as pH, temperature, salinity, type of contaminant, etc.



### **Advantages of BioAugmentation**

- A natural and safe process.
- Cost Effective
- By-products are generally harmless.
- Represents a closure solution for projects.
- Non-disruptive
- Can be performed in-situ on-site, with a low profile.

**To view an example of the microbial degradation process click on the [hydrocarbons](#) page.**

At a time when traditional remediation technologies are proving to be slow and expensive, bioremediation is a popular alternative. BioAugmentation is less expensive than the traditional methods of vacuuming, absorbing, burning, dispersing, or moving contaminated material. This method reduces the response time and length of projects, is cleaner, non-damaging to the environment, and eliminates the 'cradle to grave' liabilities associated with the ownership of hazardous material.

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