

# Taking the Natural Route for VOC Abatement and Waste Treatment

Finding a safe way to eliminate volatile organic compounds (VOCs) is an important environmental and industrial concern. VOCs are present in oil-contaminated soils and in wastewaters associated with the plastic, food, timber, paint, livestock, and pharmaceutical industries. High levels of VOC can pose health hazards, increase costs of waste treatment and cleanup, or simply create bad odors. However, it is possible to significantly reduce these problems by using bioremediation to naturally and more efficiently accelerate the degradation of VOCs.

Since 1996, Bionetix International has been providing bioaugmentation products that degrade target waste substances through natural biological processes. These natural products contain non-pathogenic microorganisms that target and degrade specific pollutants. In the process of neutralizing or destroying contaminants, the microorganisms receive energy and carbon that help them grow and reproduce. They release harmless  $\text{CO}_2$  and water into the environment as a byproduct. While helpful microorganisms naturally occur in various soil and waste treatment environments, the introduction of additional microorganisms and nutrients accelerates the natural degradation process. It is useful in a variety of common industrial and even residential situations.

## Soil Bioremediation

Soil contamination is a widespread problem caused by leaks or spills during hydrocarbon production, transportation, storage, or use. VOCs contained in oil or gas spills include BTEX (benzene, toluene, ethyl benzene, xylene), which pollutes the environment and is potentially harmful to human health. Fortunately, hydrocarbon contaminants such as BTEX are susceptible to natural microbial activity and have shown a positive response to bioremediation.

In one case, soil contaminant concentration dropped dramatically when Bionetix International's Spill Kit, which includes two products: BCP 35S and BIOSURF, was tested on polluted soil from oil fields in Europe. The soil was carried by truck to landfills. Initially, the soil had a 2000-3000 mg/kg concentration of crude oil. This dropped to <200 mg/kg after the contaminated soil was treated for three to five months with the two products. The main function of

BCP 35S was to introduce a high concentration of microorganisms into the soil. BIOSURF acted as a dispersant and stimulant, giving the hydrocarbon greater bioavailability to the microorganisms and providing nutrients for accelerated biodegradation.

Soil bioremediation can be performed in situ or ex situ, although it is often performed off-site (ex situ) if contamination is high and soil can be excavated. Ex situ treatment allows soil to be spread out on a liner that can collect the runoff waste. The product is sprayed in solution on top of the soil once a week for three weeks, and the soil is periodically tilled to allow aeration for enhanced bioremediation.

In situ (onsite) bioremediation is often more convenient and less costly. In situ bioremediation was performed at a residential property in Quebec, Canada. Wells were constructed throughout the area at 0.5 meters apart and three meters deep. The Spill Kit was applied during five months from June to October. Concentration of  $\text{C}_{10}\text{-C}_{50}$ , PAH, and BTEX was monitored during summer. At the beginning, concentration of these hydrocarbons was above acceptable limits. After the application, concentration of all monitored substances, including benzene, toluene, ethylbenzene and xylenes, was at the acceptable level or below detection limit.



### Oil Spill:

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## Wastewater Treatment

A similar bioremediation product is useful for the biodegradation of hydrocarbons in a marine or wastewater environment. BCP35M contains specially selected microorganisms that produce bacterial surfactants. These surfactants help break hydrocarbons into smaller droplets that are more easily degraded by special microorganisms in the product. BCP35M is suited to seawater and wastewater environments because it contains microorganisms that have greater resistance to organic inhibitors present in high salt content waters.

Phenols in wastewater result from processes such as steel coking, coal conversion, petroleum cracking, and manufacturing of plastic resins and pharmaceuticals. Presence of this VOC in a plant's wastewater can result in toxic shocks, poor removal efficiencies, disrupted flocculation, or general plant upsets. Bioaugmentation with Bionetix's BCP95 helps reverse these problems by naturally degrading phenol. BCP95 also works on various halogen-substituted aromatics such as bromo- and chloro-phenols and can be applied to cumene, catechol, and cresol (aromatics related to phenol).

Another common VOC problem is the presence of bad odors in wastewaters. For example, organic loading from vegetable waste contained in lagoons at a vegetable processing plant in Ontario caused such strong odors that employees and the community started to complain. The addition of BCP60 (which biodegrades organic material comprised of proteins, fats, carbs, and select hydrocarbons) and STIMULUS (which supplies nutrient stimulants) caused the odor to disappear within two days of treatment. It remained so for the rest of the summer and fall treatment period.

Municipal sludge is another source of strong odors. Application of the specialized microorganisms of BCP50, stimulated by the nutrients of STIMULUS, causes these organic materials to biodegrade, in turn reducing odors and sludge and improving effluent.

Septic systems are another excellent candidate for bioaugmentation. In addition to normal waste buildup challenges, these tanks can be troubled by VOCs from consumer product flame retardants, solvents, and some cleaning products poured down the drain. Bionetix biologicals tackle these contaminants and also reduce problems with septic tank sludge, odors, and the toxic shock that comes from strong chemicals.

## Accelerated Bioremediation Techniques

Bioaugmentation can be used in conjunction with bioventing, biopiles, landfarming, bioreactors, and composting for accelerated biore-

mediation. The biological activity of bioremediation products has the potential to make contaminants desorb more quickly from solids so they are easier to extract with a pump-and-treat system. Properties



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like these make Bionetix biologicals well suited to composting situations. Microorganisms and nutrients in BCP85 accelerate composting and break organic waste down more quickly into liquid materials, stabilizing the humus, reducing odor, and improving the quality of the final fertilization product. Even in the case of manure, BCP80 can be thrown into the pile to accelerate digestion, reduce odors, and ultimately lower maintenance and drainage costs of the manure pit.

## Conclusion

The presence of VOC is a persistent problem for contaminated soil, industrial wastewater, and other waste applications. Bioaugmentation provides a natural way to solve many VOC problems by allowing non-pathogenic microorganisms to neutralize or remove the substances.

For more information, visit [www.bionetix-international.com](http://www.bionetix-international.com)  
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