

Bioventing

Nature has an amazing way of repairing itself. For example, an overcrowded forest littered with dead trees becomes a prime candidate for a forest fire. When lightning ignites the fire, the old trees are wiped out and a new generation begins.

For years, scientists have tried to devise methods of repairing decades of damage to the environment. Ironically, they have discovered nature, not technology, may be the best solution to some of Earth's environmental woes.

Bioremediation, is one such success story. Researchers have harnessed the appetite of billions of microorganisms to help clean up petroleum spills around Hill AFB. The technique, takes advantage of natural processes that break down complex chemicals, like diesel fuel or jet fuel, into its simpler compounds.

Microorganisms found naturally in the soil "eat" the petroleum molecules, transforming them into harmless compounds—carbon dioxide and water. Without any human interference or

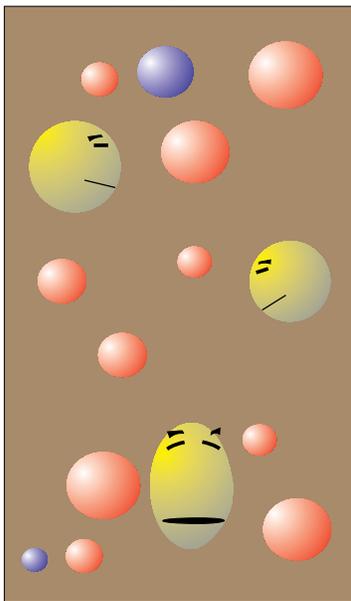
assistance the microorganisms or *bugs*, as they are called, would eventually break down all the petroleum molecules.

But this process is very slow. While the bacteria find the petroleum delicious, their appetites are dependent on the amount of oxygen available to them. Chemically speaking, the reaction that occurs inside the bacteria requires oxygen to break down the petroleum molecules. Underground oxygen does not exist in large quantities nor does it replenish very quickly, so the bugs use what is available to them. When they run out of air, they quit eating the petroleum.

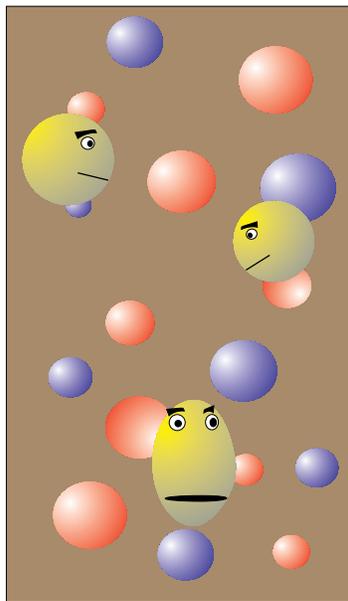
To speed up the process, scientists are lending the bugs a hand by providing them air. A blower attached to a well forces air into the soil. The air provides the bugs the precious oxygen they need to break down the contaminants more quickly and efficiently. This enhancement is known as bioventing.

Bioventing has several attractive characteristics. Depending

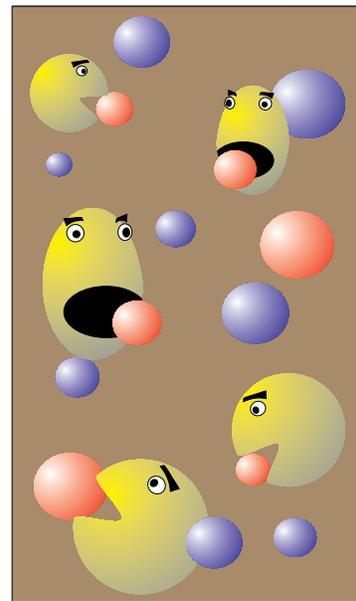
Oxygen is the key to bioventing



Before bioventing, not much oxygen is in the soil. The bugs are there, but not very active.

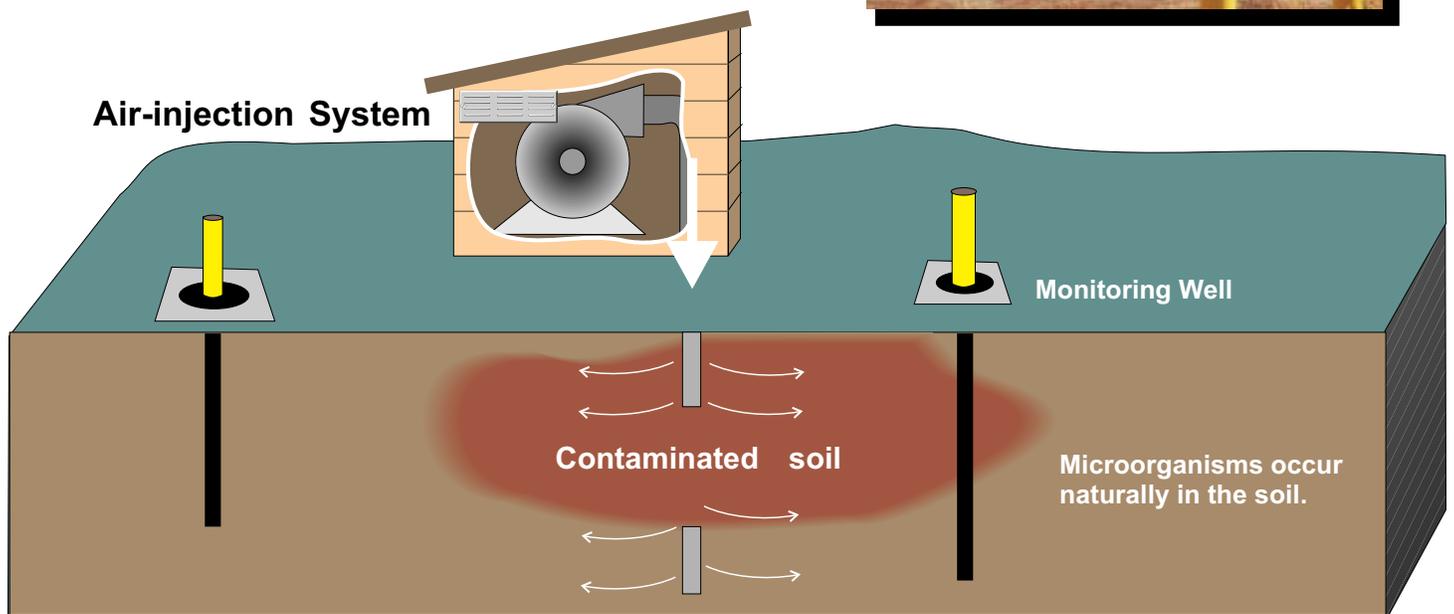


Bioventing adds oxygen to the the soil. This boosts the bugs' activity level...



...and they begin breaking down the fuel molecules.

Typical Bioventing System



on the site conditions and amount of contamination present, it can be an extremely cost-effective cleanup method. Using bioventing, a typical leaking tank site can be cleaned up for about half of what it would cost to excavate and dispose of the contaminated soil. Better still, the whole operation occurs without any contaminated soil leaving the site.

Bioventing has already been successfully used at Hill and other bases to clean up fuel spills and leaks. Most of the currently operating bioventing locations are at old leaking underground storage tank sites. Hill's UST program includes removing old tanks and cleaning up any remaining soil contamination. If only a small amount of soil is contaminated, it is usually excavated and disposed of in accordance with regulatory guidelines. However, larger volumes of contaminated soil will be left in place and cleaned up using bioventing.

Installing a bioventing system at one of these UST sites is very easy. Once the tank is removed, perforated piping is laid into the excavation. Once the pipe is laid, the excavated soil is replaced into the hole. The piping is then attached to a blower system and bioventing begins. When deeper contamination is found, vertical wells are installed and air is pumped into the well.

While not a solution for all contaminated sites, bioventing and bioremediation can be used at other sites of petroleum contamination. For example, most gas stations store their fuel in underground tanks. Many stations, especially older or abandoned stations, have had leaking tanks or spills. Bioventing can be used to clean up many of these sites cheaply and effectively and without further damage to the environment.