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A Citizen's Guide To Air Sparging

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Technology Fact Sheet

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What Is Air Sparging?

Air sparging is an innovative treatment technology that injects air into the **saturated zone** (that part of the subsurface that is soaked with ground water) to remove hazardous contaminants. The air is injected below the contaminated area forming bubbles that rise and carry trapped and dissolved contaminants into the **unsaturated zone** (that part of the subsurface located above the ground water). Through a subsequent treatment technology, soil vapor extraction, the contaminants can be removed and treated as necessary. (See at right a brief discussion on "What Is Soil Vapor Extraction?") Since air sparging effectively moves the contaminants upward into the unsaturated zone, this technology is typically used in conjunction with soil vapor extraction.

What Is Soil Vapor Extraction?

Soil vapor extraction is an **effective treatment technology** that can be used to treat volatile organic compounds (VOCs) in the **unsaturated zone**. This technology uses a vacuum to draw air through **underground wells** to vaporize the VOCs found in the soil. When soil vapor extraction is used alone, it has **limited effectiveness** in treating contaminants that exist in the **saturated zone**.

How Does It Work?

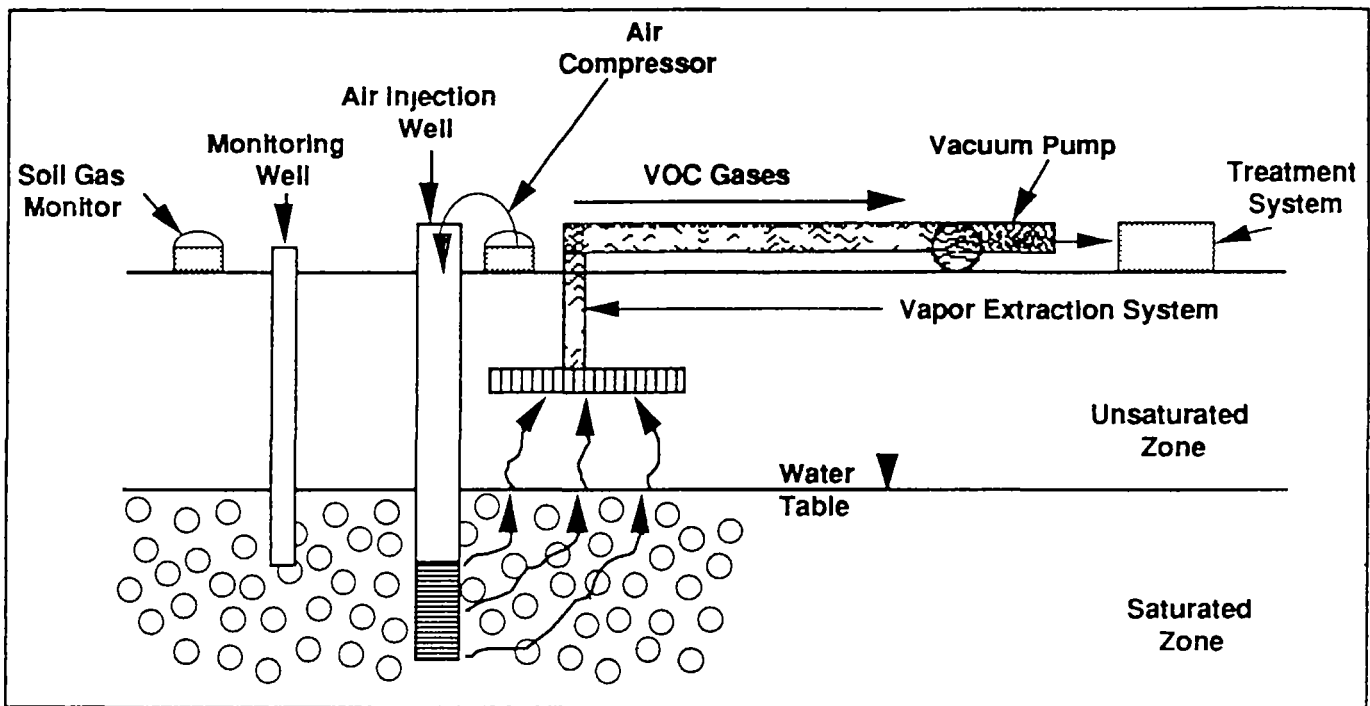
Figure 1 on the following page provides a schematic diagram of the air sparging process. The process begins by installing air injection wells into the ground water below the contaminants. The number of wells installed at a site is determined by the size of

Air Sparging Profile

- Extends the effectiveness of soil vapor extraction to include contaminants that exist in ground water
- Allows hazardous wastes to be treated on site
- Provides an oxygen source which may stimulate bioremediation of some contaminants

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Figure 1
Cross Section Of An Air Sparging/Vapor Extraction System



the contaminated area and by various geological and engineering considerations

One or more air compressors are used to force air down the injection well and out through a screened opening causing bubbles to form. The bubbles move upward and outward. The bubbles dislodge trapped contaminants, vaporize dissolved contaminants, and carry them up to the unsaturated zone.

As the volatile organic compound (VOC) vapors reach the unsaturated zone, they are pulled into vapor extraction wells that are screened in this zone. The air sparging treatment process is designed and operated in conjunction with the soil vapor extraction system to ensure VOCs are properly removed to the surface for treatment.

The performance of air sparging is monitored in two ways. The first measures the contaminants that are emitted by the vapor extraction system to ensure the VOCs are properly captured and treated. The second method involves installing monitoring wells and surface monitors within and around the contaminated area to determine if

additional collection and treatment processes are needed. These two monitoring systems are operated simultaneously.

Air sparging provides an oxygen source which may stimulate bioremediation of some contaminants. Bioremediation is an innovative treatment technology that uses microorganisms such as bacteria to break down organic contaminants into harmless substances.

Why Consider Air Sparging?

There are several advantages to using air sparging as a treatment method. Air sparging

- Extends the effectiveness of soil vapor extraction to include volatile contaminants that exist in the saturated zone.

- Allows hazardous wastes to be treated on site.

- Can potentially provide a quick and effective means of ground water clean up for VOCs.

Will Air Sparging Work At Every Site?

All waste types and site conditions are not similar. Each site must be individually investigated and tested. Engineering and scientific judgement must be used to determine if a technology is appropriate for a site.

Air sparging is only useful at sites that contain soils and other characteristics that can be effectively treated by soil vapor extraction. In addition, for air sparging to be successful, soils in the saturated zones must allow the injected air to readily escape into the ground water. Coarse grained soils such as sand and gravel particles allow greater movement than fine grained soils such as silt and clay. Air sparging therefore will work fastest at sites where there are coarse grained soils. The most common contaminants treated by this technology are VOCs such as trichloroethane, trichloroethylene, benzene, toluene, ethylbenzene, and xylene.

Where Is Air Sparging Being Used?

Air sparging was first used as a remediation technology in Germany in 1985 to enhance the clean up of ground water contaminated with

chlorinated solvents. Currently, air sparging is widely practiced at hazardous waste sites throughout Europe. In the United States, air sparging has been used on a limited basis at Superfund sites. It has been used most often to treat underground gasoline tank spills.

What is An Innovative Treatment Technology?

Treatment technologies are processes applied to the treatment of hazardous waste or contaminated materials to permanently alter their condition through chemical, biological, or physical means. Technologies that have been tested, selected, or used for treatment of hazardous waste or contaminated materials but lack well documented cost and performance data under a variety of operating conditions are called *Innovative treatment technologies*.

For More Information

EPA prepared this fact sheet to provide basic information on air sparging. Additional technical reports and articles are listed below. The first document can be obtained by telephone or written request to:

Center for Environmental Research Information
26 West Martin Luther King Drive
Cincinnati, OH 45268
(513) 569-7562

The others may be available through your local library. There may be a charge for the EPA document.

The Superfund Innovative Technology Evaluation Program, Technology Profiles, EPA/540/5-91/008

Groundwater Monitoring Review, Application of In Situ Air Sparging as an Innovative Soils and Groundwater Remediation Technology, Spring 1992, Article by Michael C. Marley

The Hazardous Waste Consultant, Air Sparging Improves Effectiveness of Soil Vapor Extraction Systems, March/April 1991

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