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EPA A Citizen's Guide To How Innovative Treatment Technologies Are Being Successfully Applied At Superfund Sites

Technology Innovation Office — **Technology Fact Sheet**

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What Are Innovative Treatment Technologies?

Treatment technologies are processes applied to the treatment of hazardous waste or contaminated materials, such as soils, sludges, sediments and debris, 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.

Innovative treatment technologies have been used successfully at some contaminated waste sites around the country. They are used as an alternative to merely containing the hazardous substances on site or in a hazardous waste landfill that is designed and operated under the Federal Resource Conservation Recovery Act (RCRA) regulations. Today, treatment technologies are being tailored to deal with specific hazardous

Do They Work At Every Site?

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

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Successful Application of Innovative Treatment Technologies Profile

- **Innovative treatment technologies have been used successfully to clean-up contaminated sites.**
- **Their selection at Superfund sites has increased steadily, from 26 percent in 1987 to 58 percent in 1990.**
- **The appropriate technologies for each hazardous waste site are selected based on the specific characteristics of the site.**

Table 1
Descriptions Of Some Innovative Treatment Technologies

Bioremediation: uses microorganisms, such as bacteria, to break down organic contaminants into harmless substances.
Solvent Extraction: separates hazardous organic contaminants from oily-type wastes, soils, sludges, and sediments, reducing the volume of hazardous waste that must be treated.
In Situ Soil Flushing: an in situ (in place) process that floods contaminated soils in the subsurface with a washing solution to flush out the contaminants.
Soil Washing: uses water or a washing solution and mechanical processes to scrub excavated soils and remove hazardous contaminants.
Thermal Desorption: heats soil at relatively low temperatures to vaporize contaminants with low boiling points. Vaporized contaminants are then captured and can be removed for further treatment or destruction.
Glycolate Dehalogenation: uses a chemical reagent (a substance used to react with and change another substance) to change the structure of certain contaminants, thereby rendering them less hazardous.
Air Sparging: injects air into the saturated zone (that part of the subsurface that is soaked with ground water) to remove hazardous contaminants.

contaminants. (See EPA's *A Citizen's Guide to Innovative Treatment Technologies for Contaminated Soils, Sludges, Sediments and Debris* for further information on innovative treatment technologies).

Table 1 above lists some innovative treatment technologies and contains a brief description of each.

Why Does EPA Use These Technologies?

When Superfund began cleaning up contaminated waste sites ten years ago, land disposal technologies were the common method to dispose of hazardous waste. As concerns for safety of the environment increased, EPA worked to design safer landfills and passed new restrictions on landfill disposal. Simultaneously, the Superfund Amendments and Reauthorization Act (SARA) was passed, which directs EPA to carry out research, development and demonstration of innovative treatment technologies and to emphasize selection or application of innovative treatment technologies in site clean-up. EPA believes that, whenever possible, innovative treatment technologies should be routinely considered as an option in addition to the established remedies of land disposal, incineration, and solidification/stabilization.

Innovative treatment technologies may offer:

- Permanent solutions to hazardous waste problems
- The potential for more effective performance
- The potential for lower cost solutions
- The potential for a better and more efficient clean-up than established technologies
- Possible greater community acceptance.

For these reasons, EPA encourages the use of innovative treatment technologies.

Where Have These Technologies Been Successfully Applied?

Records of Decision (RODs) chronicle for public information EPA's selection of the most appropriate clean-up actions for a Superfund site. These RODs indicate that, since the enactment of SARA in 1986, EPA's use of innovative treatment

technologies has increased steadily. At Superfund sites where treatment was employed as a component of the clean-up, selection of innovative treatment technologies increased from 26 percent in fiscal year (FY) (October - September) 1987 to 40 percent in FY 1988 to 51 percent in FY 1989, and to 58 percent in FY 1990. To determine the overall success of these technologies, EPA needs to obtain more cost and performance data in a variety of operating conditions. Listed below are descriptions of three sites where different innovative treatment technologies have been successfully applied:

Wide Beach Development

Wide Beach Development is a 55-acre suburban development of 60 homes located approximately 35 miles south of Buffalo, New York. At this site, **chemical treatment** was used to treat 40,000 tons of soil contaminated with polychlorinated biphenyls (PCBs). These 40,000 tons consisted of the top 18 inches of soil on a mile and a half of roads. The contaminated soil was dug up and placed in a mobile treatment unit that was brought onto the site. The contaminated soil was heated and treated with chemicals to destroy the PCBs.

The benefits of using this innovative technology, as opposed to using an established technology, such as incineration or land disposal, are significant. The PCBs in the soil were destroyed and, since the contaminated soil was treated on site, the community surrounding the Wide Beach development was protected from any potential transportation problems.

Verona Well Field

At the Verona Well Field, approximately 1/2 mile northeast of Battle Creek, Michigan, **vacuum extraction** is being used to treat soil contaminated with chlorinated solvents. Extraction wells were installed directly into the contaminated soil, which allowed the contaminants to be transferred into an air stream. The air stream was then treated to remove and destroy the contaminants through either **carbon adsorption** or **vapor incineration,** depending upon various economic and engineering considerations at the site. When **carbon adsorption** was used, the air stream was passed through carbon filters to collect the contaminants, which were then incinerated. When **vapor incineration** was used, the air stream was forced into a treatment vessel where it was incinerated.

Vacuum extraction and concurrent treatment have been effective in destroying 90,000 pounds of contaminants. This is equivalent to 450 fifty-five gallon barrels. The contaminants were removed without disturbing the soil and, most importantly, without exposing the community to additional risks. A hazardous waste manager at the site remarked that, "at the Verona well field site, the vacuum extraction process has proven to be safe and effective for both the community and the environment."

Cannon Engineering Corporation

Thermal desorption was used at the Cannon Engineering Corporation site in Plymouth, Massachusetts to treat soil contaminated with volatile organic compounds and semivolatile organic compounds. Thermal desorption uses heat to physically separate the soil from the contaminants, which then require further treatment. At this site, thermal desorption was applied ex situ, which means the contaminated soil was excavated prior to treatment. This technology can also be applied using an in situ technique, which means keeping the soil in place. This technology used a direct heating method that resulted in heating the contaminated soil at relatively low temperatures (200-1000°F), allowing the contaminants to vaporize and separate from the soil. The evaporated contaminants and dust particles were confined in an air stream, which was treated to meet applicable local, State, and Federal standards. (Direct heating is one of four extraction methods that can be used with thermal desorption.)

Thermal desorption effectively treated 871 cubic yards (11,330 tons) of contaminated soil at the Cannon Engineering site, which is comparable to 670 truck loads of soil. The process began in May 1990 and was completed five months later in October 1990. With this technology, cleanup goals for the site were not only met, but exceeded. In addition, the property was restored so that, once again, it can be put to commercial or industrial use.

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How Is EPA Encouraging The Use Of Innovative Treatment Technologies?

The mission of EPA's Technology Innovation Office (TIO) is to increase the government's and industry's application of innovative treatment technologies to contaminated waste sites. The Superfund Innovative Technology Evaluation (SITE) program sponsors field studies to obtain the information needed about an innovative treatment technology's effectiveness under varying conditions. The SITE program and TIO share the resulting information with Federal agencies, States, consulting engineering firms, responsible parties, technology developers, and the investment community.

For More Information

Additional information regarding the use of innovative treatment technologies can be obtained by contacting the Technology Innovation Office (TIO) at (703) 308-8800 or writing to:

U.S. Environmental Protection Agency
Technology Innovation Office
401 M Street, S.W. (OS-110W)
Washington, DC 20460

Among the documents available from TIO is the Innovative Treatment Technologies: Semiannual Status Report, September 1991, EPA/154012-91/001.

TIO has also produced a series of ten Citizen's Guides, including this one, on topics relating to innovative technologies. The others are on the topics of:

Innovative Treatment Technologies for Contaminated Soils, Sludges, Sediments and Debris, EPA/542/F-92/001
Soil Washing, EPA/542/F-92/003
Solvent Extraction, EPA/542/F-92/004
Glycolate Dehalogenation, EPA/542/F-92/005
Thermal Desorption, EPA/542/F-92/006
In Situ Soil Flushing, EPA/542/F-92/007
Bioventing, EPA/542/F-92/008
Using Indigenous and Exogenous Microorganisms in Bioremediation, EPA/542/F-92/009
Air Sparging, EPA/542/F-92/010

Copies of these fact sheets are available by calling (513) 569-7562 or writing to:

Center for Environmental Research Information
26 West Martin Luther King Drive
Cincinnati, OH 45268

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