United States Environmental Protection Agency

Solid Waste and Emergency Response (OS-110W)

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EPA

# TECH TRENDS

The Applied Technologies Journal for Superfund Removals and Remedial Actions and RCRA Corrective Actions

**SITE Search**

**EPA's SITE Program (Superfund Innovative Technology Evaluation Program) is searching for appropriate sites to evaluate 17 innovative technologies. Check page 2 of this issue of *TECH TRENDS* to see if your site may be a match for one of these technologies.**

**News Flash**

**Watch for a special mailing from EPA's Technology Innovation Office on recent updates and plans for the next round of additions to VISITT (Vendor Information System for Innovative Treatment Technologies). See the graph on this page for a breakdown, by major technology category, of the 231 technologies in VISITT.**

## A Cost-Effective Alternative to Drilling in Arid Soil

VOCs diesel
Cone
Soil

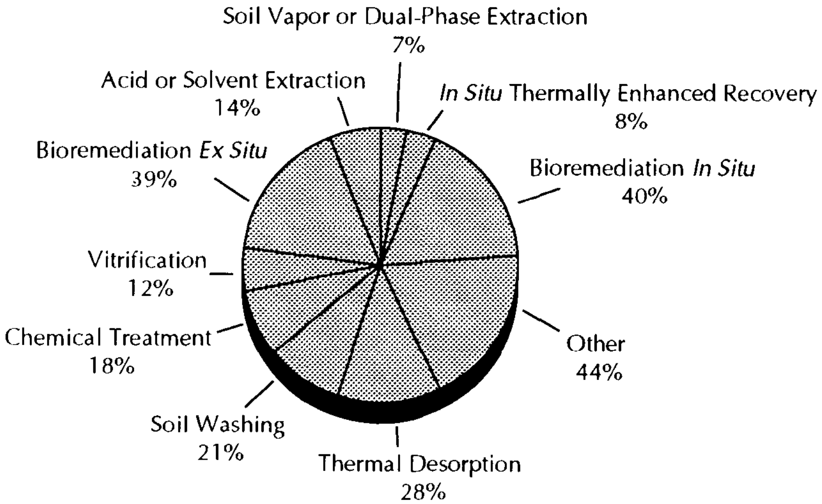
by Bruce Cassem, Westinghouse Hanford Company

The U.S. Department of Energy, through the Argonne National Laboratory, has demonstrated a cone penetrometer technology (CPT) for arid soils at the Hanford Site in Richland, Washington. The CPT is faster than drilling and is a cost-effective alternative. The CPT, which is a 1.75-inch (outside diameter) hollow steel rod, can be pushed hydraulically into the subsurface soils, using the static weight of a CPT truck. Probes such as a soil characterization probe, a volatile organic compound (VOC) monitor, and a radiation scintillator can be used with the cone to collect samples in the hollow rod (1-inch inside diameter). As the probe passes through the soils, data can be sent back to a computer from the characterization and radiation scintillor probes or to VOC monitoring equipment from the VOC probe, which can measure VOC concentrations in relation to depth. Thus, the CPT provides continuous, detailed *in situ* characterization data with real-time data processing. Soil samples can be collected with a specialized CPT soil sampler. Minimal waste is generated from this process. Additionally, permanent monitoring points can be installed.

At Hanford, the CPT has reached depths up to 146 feet, with an overall site average of approximately 65 feet. At Hanford, soil consists of pebbles, boulders, gravel, and fine coarse-grained sand and silt. During the Hanford demonstration, VOC monitoring probes measured a maximum of 1,500 parts per million VOCs and collected a diesel fuel contaminated soil sample. A portion of the diesel fuel plume was delineated. A radiation spectrum was recorded at 18 feet, thus demonstrating the ability of the CPT to record this type of data. A permanent soil gas monitoring well was installed at a depth of 39 feet.

Although the CPT is being further refined, it may be applicable now for environmental characterization work at many sites. For more information, call Bruce Cassem at 509-376-1007.

## Technologies in VISITT by Major Technology Category




Source: U.S. EPA, VISITT Database, May 1993

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# SITE Search

## EPA SITE Technologies Available for Demonstration

EPA's SITE program currently is searching for appropriate sites to evaluate specific innovative technologies. The information below lists the 17 technologies, their application, and appropriate contacts whom you can contact for more information. The page numbers listed in the application description refer to *the* pages *in The Superfund lnnovative Technology Evaluation Program: Technology Profiles Fifth Edition* (Document No. EPA/540/R-92/077, November 1992), which gives a more complete summary of each of the technologies below, in addition to other SITE program information. If you do not already have this document, it can be ordered from CERI at 513-569-7562.

| Technology | Application | Developer/Contact | SITE Project Manager |
|---|---|---|---|
| AlgaSORB Process | Removes heavy metal ions from aqueous solutions using immobilized gels (pages 44-45) | Bio-Recovery Systems/ Tom Powers (505) 523-0405 | Naomi Barkley (513) 569.7854 |
| Mobile Environmental Treatment System (METS) | Stabilizes/solidifies soils contaminated with organics, heavy metals, and mixed wastes (pages 82-83) | Ensotech/Inderjit Sabherwal (818) 767-2222 | Naomi Barkley (513) 569-7854 |
| Maecite Treatment Process | Solidification/stabilization process that converts leachable lead-contaminated wastes into insoluble mineral crystals (pages 116-l 17) | Maecorp, Inc./Karl Yost or Dhiraj Pai (312) 372-3300 | S. Jackson Hubbard (513) 569-7507 |
| Soil-Cement Mixing Wall (SMW) | *In situ* solidification/stabilization technology (pages 156-l 57) | S. M. W. Seiko/David Yang (510) 783-4105 | S. Jackson Hubbard (513) 569-7507 |
| Sevenson Extraction | Solvent extraction process for removal of organic contaminants from soil (pages 160-l 61) | Terra-Kleen/Alan Cash (405) 728-0001 | Mark Meckes (513) 569.7348 |
| Acid Extraction Treatment System (AETS) | A soil washing process that uses hydrochloric acid to extract contaminants from soils (pages 224-225) | Center for Hazardous Materials Research/Stephen Paff (412) 826-5320 | Kim Lisa Kreiton (513) 569-7328 |
| Batch Steam Distillation and Metal Extraction | Batch steam distillation and metal extraction process for soils contaminated with organics and inorganics (pages 264-265) | IT Corporation/Robert Fox (615) 690-3211 | Ron Lewis (513) 569-7856 |
| Adsorptive Filtration | Adsorptive filtration to remove inorganic contaminants from liquids (pages 300-301) | University of Washington/ Mark Benjamin (206) 543-7645 | Norma Lewis (513) 569-7665 |
| Chemical Treatment . and Ultrafiltration | Process uses chemical pretreatment and ultrafiltration to remove trace concentrations of dissolved metals from wastewater, ground water, and leachate (pages 214-215) | Atomic Energy of Canada, Ltd./ Leo Buckley (613) 584-3311 | John Martin (513) 569-7758 |
| WES-Phix | Heavy metal stablization process that involves adding small quantities of a liquid reagent to be waste material being stabilized (new process-not in Profiles as yet) | Wheelabrator Technologies | Paul de Percin (513) 569-7797 |
| ZenoPV™ | Bioreactor combined with ultrafiltration membrane system (pages 196-l 97) | Zenon Environmental Systems/ Tony Tonelli (416) 639.6320 | Dan Sullivan (908) 32 l-6677 |
| VaporSep Membrane Process | Synthetic polymer membrane separation system to remove organics from gaseous waste streams (pages 270-271) | Membrane Technology and Research, Inc./Hans Wijams or Vicki Simmons (415) 328-2228 | Paul de Percin (513) 569.7797 |
| Fluid Extraction Biological Degradation Process | Three-step process to remediate organic contaminants in soil: fluid extraction, separation, and biological treatment (pages 260-261) | Institute of Gas Technology/ Robert Kelley (312) 949-3809 | Annette Gatchett (513) 569-7697 |
| Two-Zone Plume Interception In Situ Treatment Strategy | *In situ* treatment for anaerobic and aerobic treatment for chlorinated and nonchlorinated organic compounds in saturated soils and ground water (pages 208-209) | ABB Environmental Services, Inc./ Sam Fogel (617) 245.6606 | Ron Lewis (513) 569-7856 |
| Laser-Induced Photochemical Oxidative Destruction | Process photochemically oxidizes organic compounds in wastewater using a chemical oxidant and ultraviolet radiation from an Excimer laser (pages 246-247) | Energy & Environmental Engineering, Inc./James Porter (617) 666.5500 | Ron Lewis (513) 569-7856 |
| Methanotrophic Bioreactor System | *Ex situ* remedial technology for methanotrophic biotreatment of halogenated compounds (pages 222-223) | Biotrol, Inc./Durrel Dobbins (612) 448-6050 | David Smith (303) 293-l 475 |
| GHEA Associates Process | Process applies surfactants and additives to soil washing and wastewater treatment to make treatment and metal contaminants soluble (pages 276-277) | New Jersey Institute of Technology/Itzhak Gottlieb (201) 596.5862 | Annette Gatchett (513) 569-7697 |

# Low Temperature Thermal Process for Pesticides and Other Organic Compounds

Pesticides VOCs SVOCs
Thermal Desorption
Soils

by Paul de Percin, Risk Reduction Engineering Laboratory

The Low Temperature Thermal Aeration (LTTA™) process was developed by Canonie Environmental Services, Inc. (Canonie), as a high-capacity thermal treatment system for soils. The LTTA™ process has remediated contaminated soils at six sites, including three Superfund sites. The Superfund lnnovative Technology Evaluation (SITE) program evaluated the technology in September 1992 as part of ongoing remediation of a pesticide-contaminated site in western Arizona. The LTTA™ process can remove organochlorine pesticides (OCP), organophosphorous pesticides (OPP), volatile organic compounds (VOC), semivolatile organic compounds (SVOC) and total petroleum hydrocarbons (TPH) from soils, sediments and sludges. Full-scale operations have been used to remove OCPs such as toxaphene and dichlorodiphenyltrichloroethane (DDT) and its metabolites; OPPs such as ethyl parathion and methyl parathion; VOCs such as benzene, toluene, tetrachloroethene (PCE), trichloroethene (TCE), and dichloroethene (DCE); and SVOCs such as acenaphthene, chrysene, naphthalene, and pyrene.

The LTTA™ process thermally desorbs organic contaminants from soils by heating the soils up to 800 F in a materials dryer. The main components of the process are: (1) a materials dryer, (2) a pug mill, (3) two cyclonic separators, (4) a baghouse, (5) a wet Venturi scrubber, (6) a liquid-phase granular activated carbon (GAC) column, and (7) two vapor-phase GAC beds. When required, the LTTA™ system includes a particulate filter for the scrubber liquor.

At the SITE evaluation in Arizona, the LTTATM process met the specified cleanup criteria for the site. The maximum allowable pesticide concentrations in the treated soil were 3.52 milligrams per kilogram (mg/kg) of DDT family compounds and 1.09 mg/kg of toxaphene. Prior to treatment, the soil contaminant concentrations were: toxaphene-1540 parts per million (ppm); DDT-321 ppm; dichlorodiphenyldichloroethane (DDD)-206 ppm; dichlorodiphenyldichloroethene (DDE)-48 ppm; as well as other pesticides, such as endrin, endrin aldehyde, dieldrin, endosulfan 1, and endosulfan II. Removal efficiencies were: >99.83% for toxaphene; 99.97% for 4,4 -DDT; >99.97% for 4,4 -DDD; 90.26% for 4.4-DDE; >99.85% for endrin; 97.43% for endrin aldehyde; 99.27% for dieldrin; >99.98% for endosulfan I; and >99.34% for endosulfan II. The LTTA™ process does not appear to have generated dioxins or furans as products of incomplete combustion or thermal transformation.

The LTTA™ process is best suited for dry granular soils. However, soils containing silt and clay also have been successfully treated, and sludges are potentially treatable by the LTTA™ process.

For more information, call Paul de Percin at EPA s Risk Reduction Engineering Laboratory at 513-569-7797.

# New for the Bookshelf

## Hot Water Oil Recovery

The EPA's Robert S. Kerr Environmental Research Laboratory has conducted laboratory experiments that demonstrate that the use of hot water will increase the recovery of oils from sands over that which can be recovered using a waterflood at ambient temperatures. The experiments showed that enhanced oil recovery can be achieved under conditions which resemble field conditions. Although there are still many areas where further research is needed, the use of hot water displacements can be extended to field demonstration trials or, as an intermediate step, to the testing of contaminated field cores in the laboratory.

Hot water displacements should be considered where there is a free immiscible phase present that is viscous and essentially nonvolatile. Hot water and steam displacements have significant advantages over some other remediation techniques which are being researched currently in that they do not require the addition of new potential contaminants to the subsurface. Additional recovery from fine materials may be possible by using hydrofracturing in conjunction with the application of hot water. Hot water displacements cannot remove all the oily contaminants, and the residual oil left behind will often require additional treatment. However, using hot water displacement as a first step in remediation can greatly reduce the contamination level, leaving behind a residual oil that may be amenable to processes such as bioremediation.

A copy of the study, *Laboratory Study on the Use of Hot Water to Recover Light Oily Wastesfrom Sands,* by E. L. Davis and B. K. Lien (Document No. EPA/600/R-93/021), can be ordered from EPA s Center for Research Information (CERI) at 513-569-7562.

## Remediation Technologies Screening Matrix

To encourage further development and use of innovative technologies for site remediation, EPA and the U.S. Air

(see **Bookshelf** *page 4)*

***(Bookshelf** from page 3)*

Force have published a *Remediation Technologies Screening Matrix and Reference Guide* (Document No. EPA/542/B-93/005). This document is intended to help Federal site managers identify potentially applicable technologies for more detailed assessment and evaluation prior to remedy selection.

The publication summarizes the strengths and limitations of 48 innovative and conventional technologies for the remediation of soils, sediments, and sludges; ground water; and air emissions/off-gases. The list of technologies includes *in situ* and *ex situ* biological, thermal, and physical/chemical processes. It includes not only treatment technologies, but also processes designed to be used primarily for containment, waste separation, and enhanced recovery.

The document contains: (1) a copy of the matrix evaluating the 48 technologies; (2) definitions for each of the technologies and processes evaluated; (3) definitions for each of the 13 factors i.e., cost, performance, technical, developmental, and institutional-used to evaluate the technologies; (4) a technology-by-technology discussion of the contaminant groups treated, with supplemental information as needed to explain each rating on the matrix and factors that could limit the suitability and effectiveness of the technology; (5) a list of reference materials, including field demonstration reports and case studies, that site project managers may wish to consult for more detailed information about various technologies; and (6) examples of contaminants included in each contaminant group used in the matrix.

The document can be ordered from U.S. EPA/NCEPI by fax at 513-891-6685 or by mail at P.0. Box 42419, Cincinnati, Oh 45242-0419. Remember to refer to Document No. EPA/542/B-93/005.

## Literature Survey of Innovative Technologies

As part of its effort to improve awareness of the technical literature concerning innovative technologies, EPA has published *the Literature Survey of Innovative Techologies for Hazardous* Waste *Site Remediation* 1987-1991 (Document No. EPA/542/B-92/004). The bibliography was developed by searching the extensive resources of commercial databases and software. Each citation contains the article or document title, journal or publication title, author, corporate source or publisher, conference name, and ordering information, where available.

The citations are organized into the following categories: survey reports; conference reports; *in situ* vitrification; soil washing/soil flushing; solvent extraction; thermal desorption; chemical dechlorination; soil vapor extraction; bioventing; biological slurry phase; biological solid phase; biological land treatment; *in situ* biological treatment; general biological treatment; general biological treatment; and *in* situ ground water treatment.

Although the search was primarily focused on remediation of sites with contamination from hazardous waste, references for petroleum contaminated sites were also retained. The bibliography does not include the following subjects: waste streams or BDAT; fate and transport, unless explicitly related to tratment; oil spill cleanup other than underground storage tank sites; and above ground water treatment.

The document can be ordered from U.S. EPA/NCEPI by fax at 513-891-6685 or by mail at P.O. Box 42419, Cincinnati, OH 45242-0419. Remember to refer to Document No. EPA/542/B-92/004.

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