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Project Summary

Assessment of International Technologies for Superfund Applications — Technology Identification and Selection

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Technologies being developed or applied for remediation of hazardous waste sites in countries other than the United States were identified. An assessment was made of the applicability of each of the technologies to Superfund sites. Of the 83 technologies screened, 12 were selected as being sufficiently promising that follow up was warranted. Of these, two are thermal treatment techniques, eight are physical/chemical or electrolytically-driven technologies and two are biological treatment systems.

This Project Summary was developed by EPA's Risk Reduction Engineering Laboratory, Cincinnati, OH, to announce key findings of the research project that is fully documented in a separate report of the same title (see Project Report ordering information at back).

Introduction

The objective of the assessment was to identify technologies that are being evaluated or are in use in countries in Europe, Asia, and North America, excluding the United States, which could be utilized for hazardous waste site remediation within the United States. The approach focused on the location, acquisition, and interpretation of existing data, and studies and related documentation for remedial technologies. Data were obtained through a comprehensive literature survey and telephone interviews with personnel associated with agencies, industries, vendors, research groups, and others involved in the development and marketing of technologies. Emphasis was placed on technologies that have been developed or applied in Europe, Japan and Canada.

Findings

As a result of the investigation, 83 technologies have been identified that may be applicable to Superfund site remediation activity. Factors considered in assessing the applicability of each technology were:

- Function—purpose of the technology and its applicability;
- Description—flow schematic, discussion of theoretical operating principles and design features;
- Performance—demonstrated performance of the process for clean-up of uncontrolled hazardous waste sites;
- Limitations—physical or chemical characteristics that limit the applicability of the technology;
- Economics—the capital, operating, and maintenance costs; and
- Status—current development status, availability, and research plans.

These characteristics were used to select technologies for follow up. Each technology was described in a fact sheet that summarized available information. An example fact sheet is presented in Table 1.

The screening of the technologies resulted in selecting 12 that were recommended for further study, along with 10 additional that may warrant further study.

Table 1. *International Technology Fact Sheet*

Process: Onsite Soil Cleaning Using the "Oil Crep System"
Type of Treatment: Physical/Chemical
Country: Federal Republic of Germany
Institution/Contact: Dipl.-Ing. Peterson
AEG Shiffbau
BREMER Vulcan
TBSG Industrie Anlage

Function: Removal of oil (containing CB/Halogen) from soil using a mobile cleaning system that washes out oil, forming a separable emulsion allowing recycling of the water phase.

Description: System is a basic washing procedure but uses the product CREP (Cleaning, Recycling, Environmental Protection), which forms a separable emulsion with water and, therefore, allows the recycling of the water layer. CREP itself is not toxic, contains no aromatics, is not a dispersion agent, leaves the basic structure of the pollutant oil, and has the "Environment Friendly" seal of the German environmental agency.

The system operates on the basic principle of adsorption and cold water washing with high pressure to create a separable emulsion. This allows skimming of the oil layer and after clarification, return of clean wastewater to the wastewater system without special treatment. Heavy metals are removed as hydroxides. Process steps include centrifuge, oil removal, pH adjustment, detoxification through oxidation or reduction, heavy metal precipitation, water clarification, and neutralization through ion exchange.

Performance: Pilot plant was successfully operated, and in 1985, a 20-ft mobile container unit was built. This unit has been in use with success since then. Bremen University has conducted independent tests on one site and found that sand contaminated with 14,000 ppm oil was reduced to 190 ppm, which is well below the 300 ppm level for reuse of sand in the FRG. Efficiency was 98.7%.

Limitations: Soil must be conditioned to reduce particle size to 60 mm.

Economics: Exact data not available, but considered a proven system.

Status: System is now in use in Europe. Efficiency is high. Extensive test data is available (GCMS runs, etc.).

Recommendations: Further evaluation and comparison with U.S. techniques.

Reference: Brown, Margaret. Correspondence of October 19, 1987.

Technologies not considered further include:

1. those that are applicable to only a small percentage of Superfund wastes,
2. those similar to conventional techniques in use in the United States, and
3. experimental technologies that are not well developed.

Among the 12 most promising technologies, 2 are thermal treatment techniques, 8 are physical/chemical or electrolytically-driven technologies, and 2 are biological treatment systems. Twelve additional technologies are already being studied under the NATO/CCMS Pilot Study program.

Hazardous Waste Management

Hazardous waste management in countries throughout Europe, Asia, and North America (excluding the United States) is an evolving practice that involves continually developing policies and regulatory approaches to the problems posed by hazardous waste production and disposal. Most foreign countries have developed a wide variety of technologies for dealing with hazardous waste problems, in addition to sponsoring significant research and development efforts in the field.

The European approach to hazardous waste management is one of decentralization, whereby individual countries or provinces most often assume the responsibility for the collection and disposal of hazardous wastes produced in their locality. While implementation of hazardous waste management systems is often a local responsibility, most countries do have a National Environmental Protection Agency that creates the environmental policy for the country and develops the regulatory framework for meeting the goals of that policy.

Decentralization seems to allow for greater dissemination of information, a well as the development of organize collection and transport systems de signed to meet the unique needs of eac locality. However, problems do arise ot of the lack of uniformity of environmenta regulation and policy enforcemer throughout the country, in addition to th lack of local facilities available for prope waste disposal. Some European cour tries including the Netherlands, Sweder Austria, Denmark, and Norway hav constructed centralized incineration faci ities and landfills that accept waste from all over the country, in response t the shortage of local facilities.

A common practice of countrie lacking proper disposal facilities of thei own is the exporting of hazardou wastes to neighboring countries, primar ily in the Federal Republic of Germany Other uncommon waste disposal prac tices seen in Europe and Japan ar codisposal of hazardous wastes witl municipal wastes and disposal at sea.

The high costs of disposal ofte incurred by local municipalities an extrepreneurs, along with the lack o proper disposal facilities, tends to resul in numerous incidence of illegal dump ing throughout Europe. This is especiall true in the more populated an politically-reactive developing countrie where enforcement poses unique diffi culties. This, and the fact tha environmental regulations are only a recent phenomenon, give rise to the contemporary issue of what to do with old, abandoned, contaminated waste sites, known or suspected to exist in large quantities throughout these countries.

Most foreign countries are only beginning to catalogue their abandonec sites with no country surveyed yet hav ing a regulatory mechanism for the remediation of such sites as sophisticated as the United States' Comprehensive Environmental Response Compensation and Liabilities Act (CERCLA). The Canadian Council of Resource and Environmental Ministers (CCREM), however, is currently working on establishing a "national contingency fund" to respond to the problem of abandoned sites in Canada. Most central governments are responding to the problem of abandoned hazardous waste sites by directing nationwide studies and providing subsidies to local communities for remediation efforts. However, it is likely in the near future that in most European communities, the restoration of aban-

doned hazardous waste sites will continue to be a local affair.

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The complete report, entitled "Assessment of International Technologies for Superfund Applications—Technology Identification and Selection," (Order No. PB 89-205 959/AS; Cost: $28.95, subject to change) will be available only from:

National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
Telephone: 703-487-4650

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