

Low Level and Mixed Low Level Waste Treatment Technology Identification

U.S. Department of Energy Environmental Management Office of Waste Management

The mission of the U.S. Department of Energy (DOE) Office of Environmental Management (EM) is to complete the safe cleanup of the environmental legacy brought about from five decades of nuclear weapons development and government-sponsored nuclear energy research.



To support DOE-EM in its mission, the Office of Waste Management (EM-30):

- Performs program management functions to identify and advance strategies to plan and optimize EM waste management projects and processes.
- Identifies and implements strategies and technical practices that improve the performance, costs and schedule and reduce the technical risk of EM projects.
- Supports implementation of EM waste and materials disposition activities and provides the complex-wide integration of operational disposition activities.
- Ensures safe and efficient packaging and transportation systems necessary to achieve waste and materials disposition EM-wide.

Objective

Develop concise information describing current and historical United States (U.S.) commercial low-level waste (LLW) and mixed low-level waste (MLLW) treatment capabilities to support exchanges on U.S. and international treatment capabilities, with a particular focus on technologies to address orphan (challenging) waste streams that lack a disposition path.

Historical Companies & Their Technologies

The 1996 report "Review of Private Sector and Department of Energy Treatment, Storage, and Disposal Capabilities for Low-Level and Mixed Low-Level Waste" summarized the current and near-term private sector vendor capability for the treatment, storage, and disposal of low-level and mixed low-level waste in 1996. The table shows the information currently available regarding each of those private sector vendors.

Vendor	Current Website	Notes about Services and Past Technologies
ADCO Services, Inc.	www.adcoservices.com	Radioactive waste disposal and hazardous waste disposal has been ADCO Services' line of business since 1965. One of the United States' oldest waste technology companies for radioactive and hazardous wastes such as self-immunized resin, radioactive and/or hazardous sludge, radioactive animal carcasses, biological, chemical, and/or toxic, radioactive sources, waste devices, dry active waste, mixed waste, and hazardous waste disposal for industrial settings, places of research, and medical fields. Additionally, ADCO Services developed specialized services in NRC manufacturing / paperwork preparation, preparation of hazardous waste manifests (manifests), decontamination and decommissioning, emergency response assignments, health physics services, training programs, and sealed source (gauge and device) decontamination, removal, and disposal, as well as proper handling and treatment of naturally occurring radioactive materials such as Thorium, Uranium (Uranium compounds), and Radium. ADCO will accept low-level radioactive waste in any type of U.S.D.O.T. approved package from cardboard boxes, "excepted packages", up to and including 55-gallon drums. This includes fiber drums of any size, pails, metal drums ranging from 10-119 gallons, paper sacks, even polybags, (with advance notification).
ADTCHS Corporation	-	-
Advanced Recovery Systems, Inc.	-	-
Affix, Ltd.	-	-
ALARON Corporation	http://www.alaron.com/na/enr/alaron/alaron.htm	Vendor's portfolio of services provided to the nuclear industry includes: <ul style="list-style-type: none"> • Asset Recovery - Decommissioning services to allow for the reuse of assets • Contingency Planning - Nuclear Service Level 1 surface preparation and coating services • Low-Level Radioactive Waste - Dry active waste processing • Licensed Facility Access - Work under Vendor's Radioactive Materials License • Machine Shop - Nuclear licensed machining equipment • Metal & Large Components - Process and decontaminate over sized contaminated components • Motor & Pump Refurbishment - Repair and refurbishment services for small and large motors • Source Recovery - Sealed source recovery and recycling for radioactive applications • Contaminated Asset Storage - Interim and remote monitored and inspected storage • Transportation - Transportation services for radioactive materials, including truck and rail access • Lead Blankets - A case study on the decontamination and recycling of lead blankets

42 companies existed in 1996 to treat either LLW or MLLW

24 companies continue to exist today in 2013

11 companies have treatment capabilities on site

Waste Information Management System (WIMS) indicates DOE sites are forecasting to ship waste to 5



Results

All the surveys were collected and the data was compiled onto two matrices.

U.S. Treatment Technologies vs. U.S. Waste Categories

Technology	LLW	MLLW	HLW	TRU	Other
Incineration					
Landfill					
Storage					
Reprocessing					
Other					

U.S. Treatment Technologies vs. Nation X Waste Categories

Technology	Nation X
Incineration	
Landfill	
Storage	
Reprocessing	
Other	

The 1st matrix correlates U.S. treatment technologies to U.S. waste streams.

The 2nd matrix is for the purpose of collaboration with international nations. Nations would be able to provide their waste streams and the treatment facilities can indicate what treatment technology capabilities they have. This particular matrix was completed for a specific nation.

Summary of Treatment Technologies

Technology	Summary of Description	Applicability	Advantages	Disadvantages	Stage of development
Incineration	Incineration is a process of destroying waste by burning it at high temperatures. It is a common method for treating hazardous waste. The process involves the use of a furnace or incinerator to burn the waste at temperatures ranging from 1,000 to 2,000 degrees Fahrenheit. The resulting ash is then disposed of in a landfill.	Incineration is applicable to a wide range of waste types, including hazardous waste, municipal solid waste, and industrial waste. It is particularly effective for treating waste that is highly flammable or contains toxic substances.	Incineration offers several advantages, including the ability to destroy a wide range of waste types, the production of energy from the waste, and the reduction of waste volume. It is also a well-established technology with a long history of use.	Disadvantages of incineration include the potential for air pollution, the need for specialized equipment and facilities, and the cost of the process. Additionally, the ash produced from incineration must be properly managed and disposed of.	Incineration is a mature technology that has been used for many decades. It is currently being used by a wide range of industries and governments around the world.

Details of each available technology was collected

- Summary description
- Advantages
- Applicability
- Disadvantages
- Specific example of applicability
- Stage of development

U.S. Vendors and their Treatment Technologies

Vendor	Technology
ADCO Services, Inc.	Incineration
ADTCHS Corporation	Landfill
Advanced Recovery Systems, Inc.	Storage
Affix, Ltd.	Reprocessing
ALARON Corporation	Other

A table identified supplier information; it indicated which technologies were available from each vendor.

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Waste Categories

Using the DOE Waste Treatability Group Guidance report, six waste categories were identified.

1. Liquids / Slurries
2. Solids
3. Soil / Gravel
4. Debris Waste
5. Lab Packs
6. Special Waste Forms

Waste Category	Description	International Waste Stream within U.S. Category
Liquids / Aqueous Liquids / Slurries / Organic Liquids	Wastes that are liquids, including slurries. Slurries are defined as liquids with a total suspended solids (TSS) content of 21% and <10%. Only liquids and slurries packaged in bulk, free form (e.g., drums, tanks) are included in this category. Liquids and slurries containing less than 1% total organic carbon (TOC). This waste is further evaluated per the criteria of Waterborne (Acidic, Basic, Neutral, Cytotoxic) and Aqueous Slurries (Acidic, Basic, Neutral, Cytotoxic). This category includes liquids and slurries containing 21% TOC. This waste is further evaluated per the criteria of Aqueous Organic Liquids (Aqueous Hologrammed, Aqueous (Neologrammed) and Pure Organic Liquids (Hologrammed Neologrammed).	Aqueous liquids including bottles • Contaminated bulk oil • Material contaminated with oil • Treated Oil

The descriptions go into further detail of what specific waste would be included in each category. Based on the descriptions provided by the international nation for their waste categories, the table also lists the international category titles that would fall into the U.S. categories.

Present Technologies

Surveys were sent out to the 5 private sector vendors to gather specific details on available technologies.

1. Perma-Fix Environmental Services, Inc.
2. EnergySolutions
3. Studsvik, Inc.
4. Waste Control Specialists LLC
5. Philotechnics

A list of the U.S. waste categories and international waste categories were provided. The vendor marked off which waste categories they would have the means to treat on site.

Waste Category	Perma-Fix	EnergySolutions	Studsvik	Waste Control Specialists	Philotechnics
Liquids / Aqueous Liquids / Slurries / Organic Liquids					
Solids					
Soil / Gravel					
Debris Waste					
Lab Packs					
Special Waste Forms					