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Public Reading Room
U. S. Department of Energy

AMWTP

Advanced Mixed Waste Treatment Project

What's The Problem?

Accumulation of radioactive waste began in the 1940s with the race to build the world's first nuclear weapon. Over the next four decades, the nuclear weapons complex evolved to meet Cold War demands for tens of thousands of atomic warheads. Like most manufacturing processes, these defense activities generated waste. The Rocky Flats Plant in Colorado shipped defense waste to the Idaho National Engineering and Environmental Laboratory (INEEL). While a lot of this waste looks familiar—rags, clothing, tools, plastic containers—it is contaminated with ***transuranic*** *radioactive elements (mostly plutonium), as well as non-radioactive hazardous constituents. Called mixed waste, these byproducts of our nuclear defense must be treated to stabilize them for safe disposal, and some must be permanently isolated to protect people and the environment.*

Where We Are Today

In 1970, INEEL began placing waste from Rocky Flats on adjoining, above-ground asphalt pads at the Transuranic Storage Area (TSA) at the Radioactive Waste Management Complex. Waste containers—including steel drums, steel boxes, and plywood boxes—were stacked on the pads and topped with plywood, followed by a layer of polyethylene sheeting, and finally by a protective layer of soil. The soil forms an earthen berm up to 3 feet thick on top and up to 16 feet thick around the sides. Eventually, the earthen berm was enclosed within the Transuranic Storage Area Retrieval Enclosure, a metal structure built to protect the environment during waste retrieval. The Type-II modules (buildings approved for storing mixed waste) were recently built to house containers retrieved from the berm. The Type-II modules also received waste from other buildings used for storage at TSA in the past, but that no longer meet waste storage requirements.

DOE has always considered storage at TSA temporary. In fact, many of the waste containers at TSA were built to last for only 20 years and are starting to deteriorate, posing a potential threat to the Snake River Plain aquifer. Laws, regulations, and agreements—such as the **Federal Facility Compliance Act Consent Order** and a 1995 court-ordered **Settlement Agreement** among DOE, the State of Idaho, and the Navy—require DOE to treat and dispose of its mixed waste. But no existing facility can safely provide the range of treatments needed to accommodate the highly varied, **alpha low-level** and transuranic mixed wastes types stored at TSA and render them safe for disposal.

The AMWTP Mission

The Advanced Mixed Waste Treatment Project (AMWTP) will help the Department of Energy (DOE) meet its commitment to safely dispose of at least 65,000 cubic meters of **legacy** mixed waste now in temporary storage at the TSA. To be disposed, mixed waste must meet the requirements of at least two laws. The hazardous component is subject to the requirements of the Resource Conservation and

Words You Should Know

Alpha Low-Level Waste:

Low-level waste that contains alpha-emitting radionuclides with an atomic number greater than 92 and half-lives greater than 20 years, at concentrations between 10 and 100 nanocuries per gram.

Alpha Radiation:

Relatively low-energy radiation that cannot penetrate clothing or the outer layer of skin. If contaminated material is inhaled or eaten, alpha radiation may cause tissue damage inside the body. Alpha-emitting waste generally requires containment and confinement.

Characterization:

Examining or testing a waste to determine its physical, chemical, and radiological composition and properties.

Consent Order:

An order issued by the Idaho Department of Health and Welfare to implement the Site Treatment Plan written under the Federal Facilities Compliance Act.

Federal Facility Compliance Act:

The Federal Facilities Act amends the Resource Conservation Recovery Act (the law that defines requirements for the management of hazardous waste) and requires DOE to develop treatment capacity and technologies for treating mixed waste.

Legacy Wastes:

Defense wastes generated during the Cold War that require treatment/disposal.

Low-Level Waste:

Low-level waste is a very broad category, often defined by what it is not: it is not uranium mill tailings, transuranic waste, high-level waste, or spent nuclear fuel.

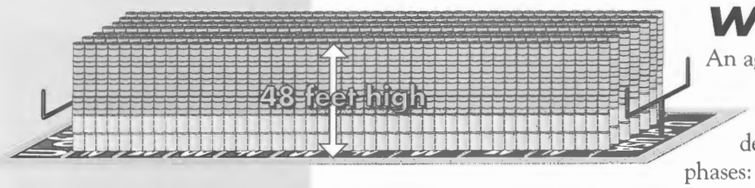
Nanocuries Per Gram:

A curie is a unit of measurement of radioactive decay—3.7 x 10^{10} disintegrations/second, to be exact—and a nanocurie is one billionth of that. Waste with an activity greater than 100 nanocuries per gram is transuranic, less than 10 nanocuries per gram is low-level waste, and between 10 and 100 nanocuries per gram is alpha low-level waste. As a point of reference, a commonly used residential smoke detector contains 1,000 nanocuries of Americium-241.

Recovery Act. Unless legally exempted, hazardous waste must meet Resource Conservation and Recovery Act land disposal restrictions to be disposed at a hazardous waste landfill.

DOE regulates the radioactive part of the waste under the authority of the Atomic Energy Act. Material with an activity below 100 **nanocuries per gram** can be disposed as **low-level** mixed waste at a hazardous waste facility; that above 100 nanocuries per gram can be sent to DOE's **Waste Isolation Pilot Plant (WIPP)**—as long as it meets WIPP's **waste acceptance criteria**. The goal of the AMWTP is to reduce the overall waste volume by 65%, treat to land disposal restrictions standards (even though WIPP is exempt from land disposal restrictions), and concentrate transuranic contaminants to above 100 nanocuries per gram so this waste can be disposed at WIPP.

The right treatment for a given waste type depends on variables, such as its physical and chemical nature or its radioactive and hazardous characteristics. For example, treatment that works for a metal tool would probably not be very effective on paper or a drum of oily sludge. The group of technologies selected for the AMWTP will accommodate almost 100% of the mixed waste at the TSA. In order to meet commitments for moving waste out of Idaho, the facility will be designed to operate around the clock, 365 days/year, from 2003 through 2015.



How Much is 65,000 Cubic Meters?

If you stacked the waste at TSA evenly between the end zones of a football field, you would have a pile almost 48 feet tall—about as tall as a four-story building. The yellow barrels illustrate how much waste would be left after treatment (65% volume reduction).

(Drawing not to scale.)

Where We're Headed

An aggressive schedule is necessary to meet the deadlines established by the Settlement Agreement for building and operating the AMWTP. Those deadlines were used to divide the project into three phases:

- Phase I (Jan 20, 1997 to April 1, 1999) Obtain all permits and approvals needed to start construction
- Phase II (May 1, 1999 - December 31, 2002) Facility construction
- Phase III (March 31, 2003 - 2015) Facility operations. Scheduled to begin on or before the date established in the Settlement Agreement. The facility will be designed to treat the baseline 65,000 cubic meters waste at TSA, plus up to 20,000 cubic meters of optional waste during Phase III. After Phase III, the facility can be used to treat additional waste or will be decommissioned.

Challenges

- Before 1973, detailed records for waste weren't required, and we don't know for certain what is in some containers. **Characterization** of the TSA mixed wastes is an important part of the AMWTP.
- Some waste may also contain mercury or materials regulated under the Toxic Substances Control Act, such as polychlorinated biphenyls and asbestos, requiring special treatment.
- It is likely that some waste containers have ruptured, and the surrounding soil may need to be handled as mixed waste.
- Although containers shield **alpha radiation**, transuranic waste can damage health if inhaled or ingested. The facility design must anticipate—and mitigate—accidents that could cause air-borne contamination.

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For More Information on the AMWTP Please Call

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Settlement Agreement:

A court-ordered agreement among the State of Idaho, DOE, and the Navy. Under the Settlement Agreement, DOE must ship out the transuranic waste stored at TSA by a target date of the year 2015 and no later than 2018. According to the Agreement, after January 1, 2003, a running average of no fewer than 2,000 cubic meters per year will be shipped out of Idaho.

Transuranic Waste:

Waste that contains alpha-emitting radionuclides with an atomic number greater than 92 and half-lives greater than 20 years, at concentrations greater than 100 nanocuries per gram.

Waste Acceptance Criteria:

The standards a waste must meet to be accepted at a facility for treatment, storage, or disposal. Waste will have to meet AMWTP waste acceptance criteria before being treated. Treated waste will have to meet waste acceptance criteria for WIPP.

Waste Isolation Pilot Plant (WIPP):

Developed by DOE as a geologic disposal facility near Carlsbad, New Mexico for defense transuranic waste. The disposal area is 2,150 feet (almost half a mile) underground in excavated, natural salt formations. WIPP could begin waste disposal as early as May, 1998.