The footprint of the RHWF is approximately 190 × 90 ft (58 × 27 m).

HANDS OFF!

New West Valley Facility Cuts Rad Components Down to Size

West Valley's Remote-Handled Waste Facility began radioactive operations in June after the completion of a rigorous testing and readiness program. The facility is being used to process, cut up, segregate, and package highly contaminated, obsolete nuclear process equipment, components, and materials.

By Jim Hurst, Kathy Szlis, and Tom Vero

Today it's an interim storage facility that holds 275 canisters of radioactive high-level waste glass. But in the 1980s, the Chemical Process Cell at the West Valley Demonstration Project (WVDP) was almost vacant, the cell having been decontaminated and emptied of many components: 17 major vessels, 1500 feet of jumpers, and processing equipment weighing up to 20 tons each, among other equipment. This highly contaminated equipment was removed and placed into 22 steel waste boxes for storage because there were no permanent disposal locations or offsite shipping requirements at the time the cell was cleared of debris.

Now a new facility is in operation at the WVDP to cut these and other types of radioactive components down to size and prepare them for transport.

The Remote-Handled Waste Facility (RHWF) recently began radioactive operations (June 2004) after the completion of a rigorous testing and readiness program. The facility is being used to process, cut up, segregate, and package highly contaminated, obsolete nuclear process equipment, components, and materials. To accomplish this, the facility has state-of-the-art bagless waste packaging systems, a high-purity germanium (HPGe) gamma assay system, powered dextrous manipulators, overhead and wall-mounted cranes, and floor conveyors. Operations are further supported by ad-

New York Sen. Charles Schumer toured the RHWF in March 2004 before radioactive operations began.

vanced sensor and control device technologies to maintain safe and efficient operations.

The highly contaminated equipment from the former Chemical Process Cell is not the only material that will be processed through the RHWF, but it has the highest dose. Two of the boxes contain spent nuclear fuel (SNF) dissolvers that have high exposure rates (approximately 107 roentgens per hour) and high contamination levels (greater than 1E+06 disintegrations per minute per 100 square centimeters beta/gamma). The large vessels from the cell will be the last to be processed through the facility. The goal for the RHWF is to process the least contaminated, lowest dose material first, and then the highest contaminated, highest dose material over an approximately four-year period.

The WVDP is a congressionally mandated project that is "demonstrating" cleanup of the nation's only commercial nuclear fuel reprocessing facility, which operated from 1966 to 1972. Since 1981, the U.S. Department of Energy has been in charge of the cleanup effort. West Valley Nuclear Services Co. (WVNSCO), part of Washington Group International Inc., has been the site contractor overseeing daily operations since the WVDP's inception.

A number of contaminated vessels, piping, and equipment have been removed from several areas of the former fuel reprocessing facility during the WVDP's 22-year history. Much of this waste was not fully characterized at the time it was packaged, and the containers do not meet current transportation regulations. This material includes long-shafted pumps used in liquid HLW processing operations; spent resins; water filters; crane components; and hazardous constituents such as lead, mercury, and polychlorinated biphenyls, among others.

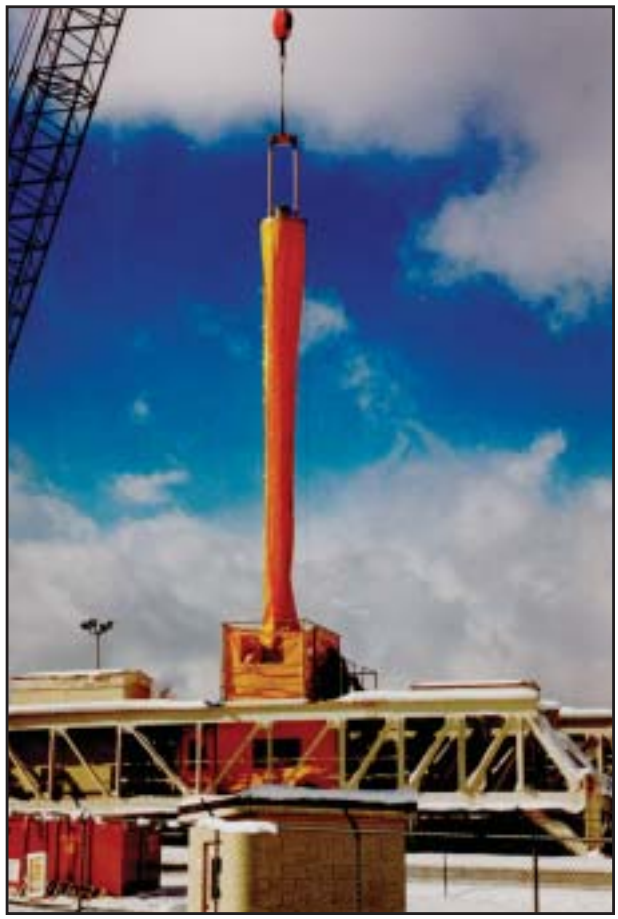
A Unique Facility for Radioactive Operations

The RHWF is a one-of-a-kind operation in the DOE complex because of the wide variety of wastes that will be processed through the facility. While the WVDP comprises only about 200 acres, the wastes contained within it are extremely varied and difficult to process. The new remote facility will handle 13 different waste streams with varying sizes, weights, and contamination levels. The facility may expand its future processing capabilities as well, because it offers designed-in features that allow for expansion.

The RHWF is the fourth facility at the WVDP in which operations are performed remotely because of the contaminated material involved. From 1996 to 2002 the Vitrification Facility was used to remotely process liquid HLW into glass. This process was the reason the former Chemical Process Cell was refurbished and now holds the canisters of solidified waste. WVDP operators are also performing remote operations in the two Head End Cells, which were formerly used to shear spent SNF and store it before chemical dissolution.

Preparing for Startup

Before radioactive operations began, WVNSCO conducted a rigorous line management self-assessment of facility operations. The review confirmed the readiness of personnel, equipment, programs, and procedures to operate the facility. The assessment also verified processing capability for two unusually challenging containers: vent filters in cement and HLW pumps from the WVDP Waste Tank Farm. Successful completion of the self-assessment



Waste pumps that were removed from HLW tanks will be size-reduced and packaged in the remote facility.

A mock box of waste is placed on the facility's roller system during testing operations.

was a prerequisite for the WVNSCO Operational Readiness Review (ORR). A DOE ORR followed the review completed by WVNSCO.

The scope of the WVNSCO and DOE ORRs included readiness of the facility/equipment, personnel, and systems to process the target waste streams. The review focus was on management systems, operations, procedures, safety systems, and training. After the conclusion of both ORRs, the DOE approved radioactive RHWF startup.

As the ORRs were being completed, each system of the RHWF was tested individually through functional testing, then through three integrated nonradioactive campaigns that allowed operators to receive "hands-on" experience with the "hands-off" system.

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WVNSCO developed its own operator training program based on lessons learned from Vitrification Facility and Head End Cells operations. Facility managers with a training requirements checklist, similar to a qualification card, laid out the operations that would be performed in the facility and trained operators using a combination of classroom training, briefings, and on-the-job training. To the WVDP's advantage, many of the operators assigned to the RHWF are already seasoned personnel who have worked in other WVDP facilities. They are skilled in the use of robotics and are knowledgeable about the safety aspects of working in this kind of facility. Additional training was required, however, for the operators to become proficient in the specific RHWF operations.

Continuing training programs will be conducted on a two-year cycle and will include comprehensive written examinations, operational evaluations, oral qualification boards, or a combination of these as applicable to the position. Certain job positions may require one or more final activities, which operators must pass to be allowed to work unsupervised. Drills are conducted to maintain personnel proficiency and improve response time to abnormal or accident situations, in accordance with operations team building and training.

WVNSCO also developed an extensive program for facility standard operating procedures that included tabletop reviews and walkdowns with the operators to ensure safe and efficient operability of the remote systems. The procedures provide detailed instruction on operating much of the facility: utilities, cranes, shield doors, ventilation system, decontamination system, wastewater collection and transfer system, powered roller system, waste packaging, sample system, programmable logic controller system, camera system, lead shielding tracking, alarms, and waste campaign planning.

What Goes In Comes Out Ready for Transport

Approximately 75 000 ft^3 (2124 m^3) of waste will be processed through the RHWF. The main process flow is through a central corridor of three connected rooms: the receiving area, the buffer cell, and the heavily shielded work cell. These rooms are built with 30-inch-thick reinforced concrete walls for shielding and are separated from each other by heavy, movable doors. Packaged waste materials exit the work cell through the waste packaging area to the load-out truck bay. Other support areas of the facility include maintenance rooms, sampling stations, operating areas, and an attached office area. Overall, the footprint of the facility is about 190 × 90 ft (58 × 27 m).

After processing, the bulk of the waste is expected to be classified as low-level waste, contact-handled transuranic (TRU) waste, remote-handled TRU, and small amounts of mixed LLW.

The process works like this: Waste containers are delivered to the RHWF receiving area by a 50 000-pound-capacity shielded forklift designed specifically for this operation. The containers are transferred to the buffer cell using a powered roller system. The containers are

Photos on Left: Top: *This 50 000-lb-capacity fork truck was specially designed to transport heavy waste boxes for processing through the RHWF.*
Center: *The powered roller system is used to move waste boxes and drums through the facility.*
Bottom: *The crane system is integral to moving large components in the RHWF.*

transferred to the work cell using a powered roller system.

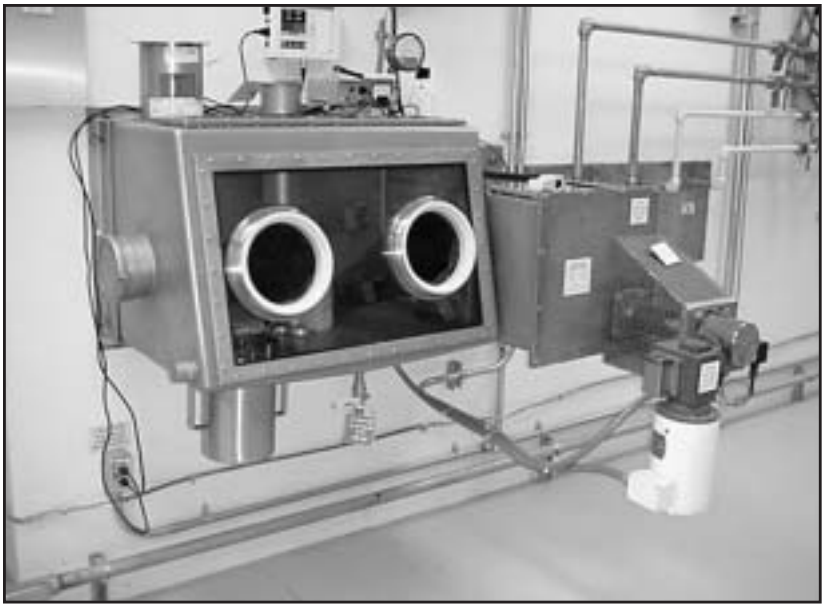
Waste container processing is performed in the work cell. This process includes opening the container; visually inspecting its internals; sampling, dewatering, segregating, and size-reducing large components using saws on power manipulators; nondestructive assaying; and packaging. Waste items that are ready for repackaging are placed in either drum or box liners in the work cell. Full liners are removed from the work cell, packaged in 55-gallon TRU drums or B-25 (carbon-steel) waste boxes, sent through the waste packaging area, surveyed for release in a survey and spot decontamination area, and removed from the facility through the loadout area.

Application of Industry Technologies—With a Twist

Two industry technologies have been adapted for use in this facility: a far-field, gamma assay system and a bagless transfer system for both drums and waste boxes.

The far-field gamma assay system is used in the work cell to look at energies of the different radioactive isotopes in the waste material. The assay system being used at the WVDP offers more features than those used elsewhere in the industry. Coupled with a multichannel software system, multi-element attenuator assembly, and a computer system, a HPGe detector measures the activity of such isotopes as ^{137}Cs, ^{241}Am, ^{154}Eu, and others. At high exposure levels, the attenuators can be used to adjust dead time to an acceptable level and enable analysis of the debris within established detection parameters. The isotopic information is used in conjunction with process knowledge and previous analytical data, where available, to estimate the transuranic content of the waste material in nanocuries per gram. Based on this estimation, the waste is placed in

The waste packaging system allows for bagless transfer of wastes from boxes and drums through these ports, shown during testing.



This glovebox will allow operators to safely handle samples of material from waste boxes being processed through the facility.

the appropriate container for TRU or low-level waste and then removed from the RHWF via the waste packaging and loadout areas. An in-situ object counting system provides nondestructive assay of a container before it leaves the facility.

The bagless transfer system allows for the insertion of steel liners of waste into 55-gal drums and B-25 waste boxes. The WVDP is the first application of the system using boxes. The liners confine the waste before the material is transferred to the shipping containers. Secondary lids also help to prevent contamination spread after the liners are transferred into the drums or boxes and minimize contamination in the waste packaging area during the loadout process. This type of system has been used elsewhere for 55-gal drums but only at the WVDP for B-25 waste boxes.

The 55-gal-drum transfer system consists of a shield cover, drum transfer port (2 ft in diameter), drum port door (equipped with electromagnets to allow removal and placement of a secondary lid), and drum transfer cart equipped with a lifting table. The B-25 waste box transfer system is housed inside the box shield cover and consists of a port opening, box port door, lifting table, transport cart, and turntable to allow radiation surveys of all four sides of the B-25 box. Incoming waste containers are opened in the work cell, and the contents are removed, surveyed, sorted, or segmented and then loaded into the steel liners. The liners are then placed into either the 55-gal drum or B-25 box.

It All Takes Teamwork

The project team responsible for daily operations of the RHWF includes a radiological technician, a process support engineer, a shift supervisor, and approximately six operators who report to the operations manager. System Engineering support is also provided for remote facility operations. A separate Plant Systems Operations team, which oversees general operations, maintenance, and engineering for the entire WVDP site, provides essential services such as heating, ventilation, and electrical services, among others.

Initial processing in the facility is being conducted on a one-shift, four-day operation. The facility is expected to run 24-7 by the end of 2004, when the third of the 13 waste streams is scheduled to be processed.

Future of Remote Waste Processing

Other DOE sites have identified the need to perform many of the functions of the RHWF. Savannah River, Oak Ridge, Hanford, and Idaho sites all have retired nuclear processing facilities with large inventories of obsolete, inactive, and highly contaminated piping, tanks, and nuclear process equipment. These wastes will likely require handling and packaging and disposal. Just like the West Valley "Demonstration" Project itself, the RHWF will "demonstrate" the use of remote handling and packaging technologies, setting the standard for similar facilities to operate in the future. ■

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Operators practice manipulating a reach rod during testing operations to take smear samples of boxes and drums in the waste packaging area.