

### Technologies installed to further cleanup along river

Deborah Dunn, *Fluor Hanford*

Technologically advanced equipment is in place for safer, more cost-effective and quicker deactivation of the highly radioactive hot cells in Hanford's 324 Building. The facility is in the 300 Area near the Columbia River, north of the Richland city limits.

The 324 facility was previously used for examining irradiated materials and developing waste-treatment processes. High radiation levels in the 324 Building hot cells prohibit human entry. Visibility is limited, and it's difficult for the 1960s-vintage manipulators and overhead cranes to reach all areas of the highly cluttered cells and reliably perform heavy-duty deactivation tasks.

A variety of remote-control technologies are used from outside the radio-chemical processing cells. The remote technologies are designed to handle heavier loads; use a broader set of cleanup tools; improve access to difficult-or impossible-to-reach spaces; and allow for remote visual inspection, radiological characterization, decontamination, waste handling and size-reduction.

Some of the more recent additions to the 324 Building "toolbox" include a large robotic work platform, a heavy-duty robotic manipulator arm, a crawler that can clean hot-cell floors and the lower areas of walls, a ventilation duct crawler and a rescue tool for size-reduction — a process for cutting apart large, radiologically contaminated equipment to remove it and dispose of it using a minimum of space. The toolbox also includes a 360-degree camera that is most commonly used in the real-estate marketing business. The camera enables virtual viewing in every direction within a given room or set of rooms. Also, a video "borescope" can snake through right-angle bends in process piping as small as a half-inch in diameter.

"The right tools for the job are in place and ready for use," said Tim Veneziano, director of 324/327 Buildings deactivation for the Fluor Hanford Central Plateau Remediation Project. "Cleanup work will not be delayed while we develop additional technological solutions. When the Shielded Materials Facility hot cell D&D is initiated under the upcoming River Corridor Contract, the technologies are ready to go."

#### The ARTISAN arm

A closer look at one remote technology provides insight into the challenges posed by old contaminated buildings and how they can be overcome by new technology.

During Fluor Hanford's earlier 324 Building deactivation activities, workers relied on the manipulators originally installed in 1965 for light-duty research tasks. The baseline manipulators can extend about 10 feet into the interior of a hot cell. The 324 Building's Shielded Materials Facility hot cells are arranged in an "L" shape. These hot cells are typically 16 feet wide and 18 feet tall. The original manipulator arms in those hot cells can hold 100 pounds when positioned vertically, but only 20 to 25 pounds when extended horizontally.



Mike Reid tracks movement of the ARTISAN telerobotic manipulator arm via a remote viewing monitor.

## Technologies installed to further cleanup along river, cont.

Heavy demands during deactivation tasks in other 324 Building hot cells have resulted in frequent breakdowns. Each time a manipulator arm broke, it had to be removed through a 10-inch-diameter port in the 4-foot-thick concrete wall, moved to another portion of the building, decontaminated, repaired and reinstalled. The work-break-repair cycle caused increased radiological exposure precautions for repair workers, and the “down” time increased costs and slowed progress.

In 2000, a technology-transfer program between the Department of Energy Office of Science and Technology and a company called AEA Technology of Pittsburgh resulted in the development of a heavy-duty manipulator arm. The ARTISAN manipulator arm fits through the standard 10-inch-diameter hot-cell ports. Its reach is 11 feet and its payload capacity is more than 10 times that of the original manipulators — up to 220 pounds!

The ARTISAN (a registered trademark of AEA Technology) is hydraulically powered and controlled by a joystick and a touch-screen monitor. The heavy-duty arm has a “teach and repeat” feature to reduce the time necessary to accomplish complex or repetitive maneuvers. It is designed to be more robust than the standard manipulators and is expected to significantly improve the rate of progress in hot cell deactivation. The ARTISAN package also includes a specially designed A-frame support structure for installing the 1,100-pound heavy-duty manipulator into the various hot-cell ports.

### Smooth operator

The ARTISAN arm was recently installed in the hot-cell mock-up training chamber in the 324 Building. Nuclear chemical operators Ron Holman, Deanna Judy, Mitch Marrott, Sam Morris and Mike Reid were trained by AEA representatives the week of March 2. During a training break, operators commented on the smooth operation and ease of fine-motion control offered by the ARTISAN. Supervisor Dewayne Smith noted the biggest difference between the ARTISAN and its predecessors is the use of joystick control.

“AEA Technology is proud to have been selected to provide the ARTISAN robotic system to the 324 facility, based on its proven versatility, heavy-lift capability and its modular design to provide state-of-the-art remote handling technology,” said Eric Clements, Richland general manager for AEA.



**The heavy-duty robotic arm more readily handles the heavy demands of D&D work than the original manipulators installed in the 1960s for waste-treatment process studies.**



**Operator Mitch Marrott practices joystick control of the ARTISAN robotic arm.**