Pit Viper works in 'hot' areas to protect workers

CH2M HILL Hanford Group is cleaning and upgrading some of the most radioactive areas in Hanford's tank farms using the Pit Viper — a robotic arm attached to a backhoe.

The Pit Viper is sleeved to prevent contamination when performing work in tank-farm pits. The backhoe portion of the Pit Viper remains outside the containment tent surrounding the open pit.

The Pit Viper is being used to make upgrades to pits that provide access to the tanks. These pits are made of concrete and contain valves, piping connections, pumps and other tank waste transfer equipment. CHG personnel plan to upgrade 32 of these pits in preparation for transferring waste out of Hanford's tanks to a planned vitrification plant for treatment.

Protecting workers

Work in these pits requires human skill and dexterity, but the job has to be performed in what is often a highly radioactive and contaminated environment. The hydraulic Pit Viper arm has a reach of 8 feet and can be remotely manipulated in the pits to perform a variety of tasks that would otherwise be done by workers with tools on long poles.

"Using the Pit Viper allows us to protect our workers by significantly reducing the potential for radioactive dose," said Rick Raymond, CHG's vice president of Projects. "This means upgrades to the process pits can be done more efficiently, putting us that much closer to retrieving the tank waste for treatment at the planned vitrification plant."

Versatile arm

The Pit Viper's first job in the Hanford tank farms was at single-shell Tank C-104, making preparations to the tank's heel pit for the installation of waste retrieval equipment. The Pit Viper sliced through a deteriorated piece of foam using a water knife, which directs a stream of water at 3,000 pounds per square inch.

Other jobs performed included removal of debris from the pit floor, scraping clean a patch on the pit wall, and spraying fixative within the pit. These jobs will be analyzed to help determine the range of the Pit Viper's capability to perform Hanford's tank-farm work more safely and efficiently.

The Pit Viper operator sits at a control console located in a trailer outside the tank-farm fence line. Five video monitoring screens give multiple views as the operator manipulates the robotic arm, which reaches through a containment tent and into the pit.

The operator can choose to pick up and use a variety of tools such as brooms, spray nozzles, pincers and knives. A rack located inside the pit holds the tools, each of which is fitted with a T-handle for ease of pick-up. Many of these tools are the same as found at local hardware stores. Tools that are inexpensive and difficult to decontaminate are disposed of after the job.

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Developed through teamwork

The Pit Viper concept was developed when CHG recognized a need for ways to do complex work in the pits with less personnel exposure and greater efficiency. The Department of Energy’s Tanks Focus Area and Robotics Crosscutting Program provided a team of technology developers from Pacific Northwest National Laboratory, Oak Ridge National Laboratory and Numatec Hanford Company to work hand-in-hand with CHG from the initiation of the project through the first use of the system at Tank C-104.

“The Pit Viper is a great success,” said Joe Cruz, Retrieval Program engineer for DOE’s Office of River Protection. “This is a direct result of technology developers, engineers and craftspeople combining efforts to develop a system that helps protect workers, speed the pace of work in the field and save money. I am very proud of the team and their partnership.”

Robotics staff members of Pacific Northwest National Laboratory operated the Pit Viper for this job. In the future, tank-farm employees or subcontractors will go through six to eight weeks of training before taking the helm in the control trailer. ✦