SOLUTIONS

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Looking in a new direction

Engineers, operators deploy 2 visual inspection systems in AP-107 refractory

WRPS is really starting to get to the bottom of things when it comes to learning more about Hanford's double-shell tanks (DSTs).

For the first time ever, a team made up of WRPS engineers and highly skilled members of the WRPS Ultrasonic Testing/Camera Operations crew deployed two visual inspection platforms through the refractory air slots of Tank AP-107.

Both inspection platforms – one designed and constructed by subcontractors Veolia and Inuktun, and the other by subcontractor Adaptive Energy – navigated the full radius of the 8-inch-thick refractory to the center of the primary tank. The refractory, which sits between the primary tank and secondary liner, has a pattern of 2.5 inch slots for cooling of the primary tank and to direct any leakage into the annulus.

"We're thrilled with the results. The inspections revealed that the tank bottom and refractory pad appear to be in excellent condition with no signs of significant degradation or leakage," said Jason Gunter, a WRPS Tank and Pipeline Integrity (TAPI) engineer.

For several years, Gunter and his colleagues have been committed to gaining a better understanding of existing and emerging tank integrity issues. One of the greatest needs has been to find a technology to visually inspect the bottom of primary tanks. Deploying the two crawler systems was the culmination of extensive research, collaboration with experts in robotics and nondestructive examination, and testing of different tools and technologies.

"It's extremely rewarding for so many people associated with the effort," Gunter said." Developing and implementing the tools to visually inspect the underbelly of primary tanks will help us achieve our ultimate goal to support extended service lives of the double-shell tanks."

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Members of the UT/Camera Operations team, from left to right, Cameron Buckenberger, Scott Morris, Joaquin Garcia, John Hebert and Bo Peake, during the successful deployment of the Veolia/Inuktun primary tank bottom visual inspection system.

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Both the Veolia/Inuktun and Adaptive Energy systems feature "marsupial" crawlers (think mother robots carrying and releasing smaller robotic inspection devices). The larger, mother crawler enters the carbon steel tank through a riser, clings to the primary tank wall with magnets, travels along the sidewall, and launches the smaller inspection tools into the air slots.

The Veolia/Inuktun crawler lines up with air slot entrances at the base of the primary tank to send a microcrawler into the refractory pad. The microcrawler carries two visual inspection cameras (front and rear) with integrated lighting, a temperature sensor and a radiation sensor.

The Adaptive Energy system is carried by Hanford's existing Ultrasonic Testing (UT) crawler fleet used for regular tank inspections. The system features a new cable push/pull attachment that guides and pushes a pan/tilt camera via its rigid tether through the air slots.

The WRPS UT/Camera team trained to operate the Veolia/Inuktun system, while the Adaptive Energy system is run by personnel from subcontractor ITIVS, which is contracted to operate WRPS' existing crawler platform.

Cameron Buckenberger, who supervises UT/Camera Operations, said his team was impressed with both inspection systems.

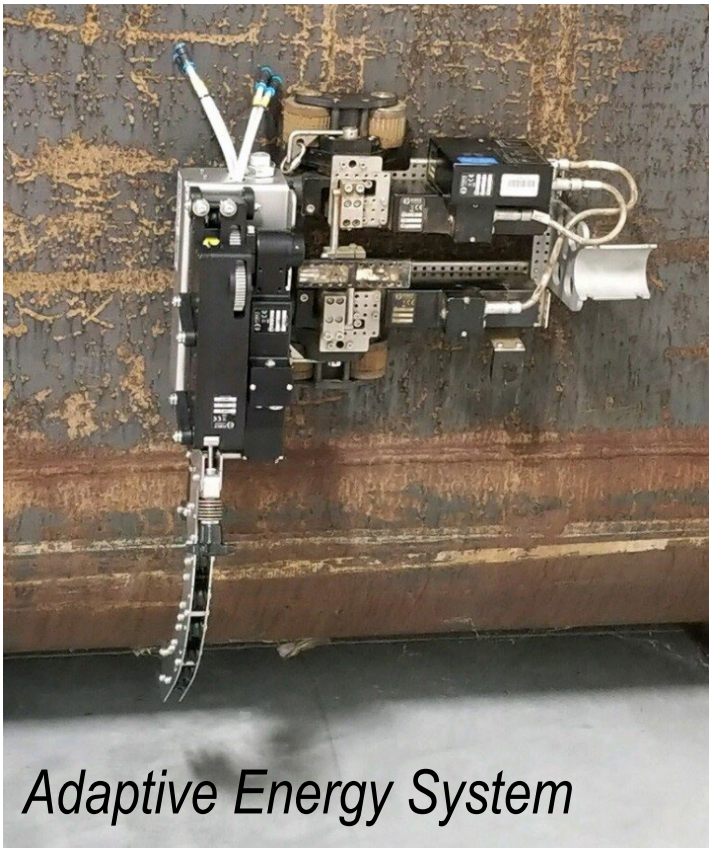
"It was great to work with cutting-edge technology," he said. "Both systems performed well. We had a few issues with the Inuktun crawler, but we saw its capabilities and we can make some adjustments. The Adaptive Energy system was fantastic. Of course, we have a lot of experience working with ITIVS, so running the crawler was second nature. Overall, we're excited about both systems."

Jim Castleberry, the project manager, said the communication between the engineers, UT operators and subcontractors was critical to the project's success.

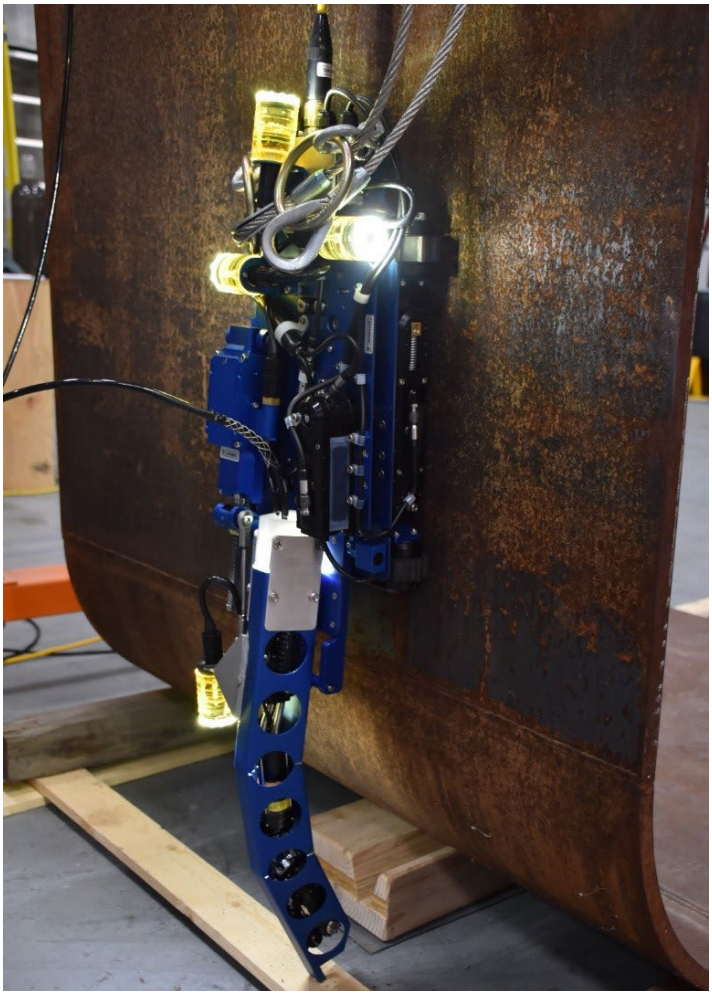
"This is a great example of what can be achieved through teamwork," Castleberry said. "It was great to see everybody involved in the project pull together and come up with solutions to one of the biggest challenges we face in the tank farms. Their work helps us achieve our mission of safely and efficiently managing tank waste, protecting the environment and, most important, keeping workers safe."

Still, there is plenty of work to be done. Gunter said the maiden voyages of both visual inspection systems is only the start.

"We're thrilled that both crawler systems were highly successful, and we're eager to advance these platforms and develop additional sensors that will help us learn more about any defects or degradation of the tank steel through volumetric examination, much like we currently do for the tank walls," he said.



Adaptive Energy System



Veolia/Inuktun system