PROGRESS AT THE HANFORD VITRIFICATION PLANT
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KEY PROCESS EQUIPMENT INSTALLED IN LOW-ACTIVITY WASTE VITRIFICATION FACILITY

In July, crews at the Low-Activity Waste (LAW) Vitrification Facility installed two large mixing vessels, which are key to the vitrification process. The installation is significant because mixing ensures a quality glass product.

Fabricated by Dynamic Air in St. Paul, Minn., each vessel is approximately 15 feet long, 11 feet wide, 8 feet tall and weighs approximately 45,000 pounds (more than 22 tons). They will be used to mix dry glass-forming materials, such as borosilicate and sucrose, before the materials are added to the low-activity liquid waste. Once added, the liquid mixture will be poured into two melters, which will heat it to 2,100 degrees Fahrenheit, then transferred into stainless steel containers for permanent storage.

OVERVIEW

Currently, 53 million gallons of radioactive and chemical waste are stored in 177 underground tanks on the Hanford Site in southeastern Washington state. A dangerous legacy from the World War II and Cold War eras, an estimated one million gallons have already leaked from at least 67 tanks, threatening the nearby Columbia River and the residents of surrounding communities.

To address this challenge, the U.S. Department of Energy contracted Bechtel National, Inc., to design and build the world's largest radioactive waste treatment plant. The Hanford Waste Treatment and Immobilization Plant (WTP), also known as the "Vit Plant," will use vitrification to immobilize most of Hanford's dangerous waste. Vitrification involves blending the waste with molten glass, heating it to high temperatures, then pouring it into stainless steel canisters. In this glass form, the waste is stable and impervious to the environment, and its radioactivity will dissipate over hundreds to thousands of years.

WTP spans 65 acres and includes four nuclear facilities -- Pretreatment, Low-Activity Waste Vitrification, High-Level Waste Vitrification and an Analytical Laboratory -- as well as operations and maintenance buildings, utilities and office space.

Approximately 3,000 people are employed by Bechtel National, Inc. and its subcontractors. Construction of the WTP began in 2002. The plant will be operational in 2019.

Installed in the north end of the facility at the 68-foot elevation, each vessel was lowered through a hatch, not much larger than the vessels themselves, using a crane. A crew of approximately 20 craft employees, engineers and safety personnel worked together, making sure the vessels were precisely placed on the waiting support frames before they were bolted down.

The LAW Facility is currently more than 60 percent complete. When operational, the LAW Facility, one of four main nuclear facilities at WTP, will process low-activity waste that is transferred via underground pipes from the Pretreatment Facility. It will produce 30 tons of glass daily and is approximately the size of one and a half football fields and seven stories high.

COMPLEX HIGH-LEVEL WASTE VITRIFICATION FACILITY DOOR LINER PLACEMENT COMPLETED

Last month, crews lifted a massive door liner into place in the High-Level Waste (HLW) Vitrification Facility. Placing the liner supported completion of the filter cave, which is one of the most complex areas in the HLW Facility. The liner, which is approximately 30 feet long and 11 feet tall, must be installed for construction to continue above and around it.

The liner was fabricated by Premier Technology Inc., in Blackfoot, Idaho. It comprises a steel liner, four inches thick and weighing approximately 56,000 pounds, as well as approximately 25,000 pounds of installed rebar and another 8,000 pounds of support materials. The total weight is approximately 85,000 pounds (more than 42 tons), the equivalent of nearly 18 half-ton-capacity pickup trucks. Ironworkers had been working to install the rebar and rig the liner since late April.

The assembly will hold two shield doors to the HLW filter cave, one that will move vertically and one that will move horizontally. When operational, the filter cave will be used to remotely handle contaminated air filters and will be inaccessible by humans. The shield doors will provide access to an adjacent maintenance room.

When operational, the HLW Facility, one of four main nuclear facilities at WTP, will process high-level waste that is transferred via underground pipes from the Pretreatment Facility. The waste will be mixed with glass-forming materials in two 90-ton melters, heated to 2,100 degrees Fahrenheit and poured into stainless steel canisters. When complete, the HLW Facility will be one football field long, three football fields wide and six stories high.

PRETREATMENT FACILITY CONCRETE DRAWINGS ISSUED

This spring, the Pretreatment (PT) Facility reached a major milestone when construction drawings were issued for the facility's concrete walls that rise from the 56-foot to the 77-foot elevation. This was the largest concrete design release for the PT facility since full construction resumed in 2007. Construction was curtailed on the PT Facility and the High-Level Waste (HLW) Vitrification Facility in 2005 to address and finalize seismic design criteria.

With the release of these drawings, construction crews are able to place the concrete walls that will reach up to the 77-foot elevation. These walls provide structural support, as well as shielding necessary for worker safety. When complete, the PT Facility’s concrete walls will reach a total of 109 feet; steel columns and roof trusses will extend beyond the walls to an overall building height of 120 feet.

The PT Facility is the largest of the four major nuclear facilities that compose the WTP. It is approximately one and a half football fields long, and 12 stories high.

HIGH-LEVEL WASTE VITRIFICATION FACILITY CASK-HANDLING BOGIE TESTS COMPLETED

Last month, factory-acceptance tests were successfully completed on the High-Level Waste (HLW) Vitrification Facility’s cask-handling bogie. When the WTP is operational, the bogie, which is a trolley-like mechanism, will be used to safely transport canisters filled with vitrified high-level waste. It was manufactured and tested by Mid-Columbia Engineering in Richland, Wash.

Completing the factory-acceptance tests proves the equipment's safety and functionality, such as ensuring the bogie can stop within 1/8 of an inch of a required position. It will be the final piece of equipment used to transport the stainless steel high-level waste canisters within the facility.

Approximately 13.5 feet tall, 9 feet wide and 12 feet deep, the bogie is mounted on wheels and driven by an on-board motor. It will transport a shielded stainless steel cask designed to protect the high-level waste canisters. Initially traveling to the lidding station, where the cask lid will be removed, it will then continue to a position beneath the export cave hatch, where it will receive a filled high-level waste canister. The bogie will then return to the lidding station, where the lid will be replaced. Finally, the cask will be removed, exported from the HLW Facility, and the process repeated.

To test the system, the bogie was run along a set of rails and stopped and positioned at various locations. In addition, the cask shield lid was removed and replaced, and a glass-filled canister was loaded into it. Non-radioactive glass, comparable in weight to that expected in the high-level waste canisters, was used.

WTP QUICK FACTS

- WTP construction is nearly 50 percent complete.
- It is the largest nuclear construction project in the United States today.
- It is the first nuclear facility to be built in the United States in decades, requiring a re-establishment of the nuclear supply chain.
- It requires a total of 262,000 cubic yards of concrete, more than 4 million feet of electrical cable and 901,000 feet of piping.

ADDITIONAL INFORMATION

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