PROGRESS AT THE HANFORD VITRIFICATION PLANT

A publication for the Hanford Waste Treatment Plant Project August 2010

ANALYTICAL LABORATORY FINISHES MECHANICAL SYSTEMS DESIGN

Engineers recently completed the mechanical systems design for the Analytical Laboratory (Lab), one of the five major nuclear facilities that compose the Vit Plant, bringing the facility another step closer to startup activities in 2013.

When operational, the Lab will be a unique facility that will annually process 10,000 samples, taken and analyzed from throughout the vitrification process, to ensure a high-quality glass product and strong process controls. Analysis will also confirm the glass meets all regulatory requirements and standards.

This is the first of the Vit Plant facilities to complete the mechanical systems design, and marks a nine-year effort to design a series of complex systems and components.

The milestone was met when the last piping & instrument diagram (P&ID), and associated calculations, were confirmed. Approximately 70 P&IDs compose the facility's mechanical system design, and each P&ID is supported by more than 20 detailed calculations. P&IDs are relatively high-level diagrams of an entire mechanical system, including all the required piping, valves, coils and pumps. The diagrams lay out the system, identify system components and specify part and equipment sizes. Supporting calculations call out pressure, flow and temperature requirements. Other engineering disciplines then use the data from the P&IDs as the basis for their more-specific designs.

OVERVIEW

Starting in the 1940s, the Hanford Site, located in southeastern Washington state, was the largest of three defense production sites in the U.S. Over the span of 40 years, it was used to produce 64 metric tons of plutonium, helping bring an end to World War II and playing a major role in military defense efforts during the Cold War. However, as a result, 53 million gallons of radioactive and chemical wastes are now stored in 177 underground tanks on the Hanford Site.

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 Tank Waste Treatment and Immobilization Plant (WTP), also known as the "Vit Plant," will use vitrification to immobilize most of Hanford's dangerous tank 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 will be 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.

More than 3,400 people are employed by Bechtel National, Inc. and its subcontractors. Construction of the WTP began in 2001. The plant will be operational in 2019.

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LOW-ACTIVITY WASTE VITRIFICATION FACILITY BEGINS COMPLICATED COOLING PANEL INSTALLATIONS

This summer, crews began a series of complicated cooling panel installations in the Low-Activity Waste Vitrification (LAW) Facility. The panels are being installed in the area of the facility where the 2,100-degree-Fahrenheit waste-glass mixture, the final product of the vitrification process, will be poured into stainless steel containers for permanent storage.

The panels will absorb the extreme heat emitted from the mixture, helping to keep the pour area of the facility at approximately 150 degrees Fahrenheit. This temperature allows the containers to cool enough to be transported out of the facility and maintains the integrity of both the equipment and surrounding concrete.

The cooling panels are specially treated to absorb the massive amounts of heat and must be handled with extreme care. The natural oils from human hands, for example, can compromise the special treatment coating. Therefore, the panels are covered in a polyurethane protective layer, which will later be removed, and workers must wear white cotton gloves during the installation process.

The panels are also quite thin, less than three-quarters of an inch thick, and range in sizes, from 4 feet wide and 16 feet long, to the same width and just a few feet long. To keep them from bending or folding and to aid workers in maneuvering, the panels are fitted on custom-built installation frames.

Further adding to the complexity, the area has limited access and already contains equipment that workers must maneuver around. A small temporary bridge crane is used to move the panels around installed equipment and within the tight area, where some clearances, above or below the panels, are less than an inch.

A total of sixty panels, which cover 2,900 total square feet, will be installed and are expected to be complete early in 2011. Once the panels are installed, workers will connect piping that will transport chilled water to the panels (water will move through the panels as part of the cooling process). These are the final steps in completing the pour area of the LAW Facility.

HIGH-LEVEL WASTE VITRIFICATION FACILITY FINISHES SETTING SERIES OF MASSIVE SHIELD DOORS

Recently, crews finished setting the last of four massive shield doors in its High-Level Waste (HLW) Vitrification Facility. The first was set this spring. These four doors are located in a key area of the facility and are crucial to advancing construction, beginning with laying the 23-foot elevation concrete floors above them.

Each shield door measures 8 inches thick, 15-feet tall and 18-feet wide. Two of the doors weigh 50 tons, and two weigh 14 tons. The doors were set in the melter area, with the heavier doors closest to the melters. When operational, the HLW Facility will use two identical 90-ton melters to heat the high-level waste and glass-former mixture to 2,100 degrees Fahrenheit. The molten glass will then be poured into stainless steel canisters for permanent storage.

Each melter is designed for a five-year lifespan. At the end of a melter's lifespan, it will be encased in a protective container, removed and replaced. This will be safely accomplished using a sophisticated, remotely operated rail-and-airlock system, which will ensure radiation is contained and workers are protected.

The system includes six airlock shield doors, three for each melter. The doors will open and close sequentially, when the transfer is taking place. The protective container and doors will both move using rails. When the melter is safely encased in the protective container, it will be moved out of the facility for permanent storage.

Two additional doors, which will sit outside the 23-foot elevation floors, will be installed in early 2011.

WTP QUICK FACTS

- WTP construction is 56 percent complete.
- Engineering is approximately 81 percent complete.
- Nearly 55 percent of equipment and materials have been purchased.
- 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, 37,000 tons of steel and more than 900,000 feet of piping.

ADDITIONAL INFORMATION

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