

**Value Engineering Study Yields Immediate Results for Hanford Plutonium Finishing Plant
– 14429**

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ABSTRACT

The Plutonium Finishing Plant (PFP), located in the 200 West Area of the U.S. Department of Energy's (DOE) Hanford Site, began operations in 1949 and produced plutonium metal during the Cold War. Production was stopped in 1988, the facility was formally shut-down in 1996, and material processing completed in 2004. Currently, the PFP Closure Project is progressing toward Decontamination and Decommission (D&D) closure, with mission complete by September 30, 2016.

Over the past four years, costs and areas of risk have increased while schedule contingency has been significantly reduced. With a fiscal year (FY) 2013 budget shortfall and FY2014 funding anticipated to fall below its baseline, DOE contractor CH2M HILL explored ways to ensure it achieves PFP's mission despite mounting challenges.

CH2M HILL, partnering with the DOE-Richland Operations Office (DOE-RL), formed a multi-disciplinary team to conduct a Value Engineering (VE) study to develop an innovative strategy to complete the safe, compliant, and efficient PFP "Slab-On-Grade" D&D mission by 2016.

INTRODUCTION

PFP, also known as Z-Plant, operated from 1949 to 1989 and represented the final step in the plutonium production effort at Hanford. At this facility, plutonium was processed into solid, hockey-puck sized "buttons" and plutonium oxide powder that could then be safely shipped to the country's weapons production facilities. PFP produced nearly two-thirds of the nation's plutonium stockpile.

In December of 2009, all of the remaining plutonium bearing special nuclear material that had been stored at PFP was successfully stabilized, packaged, and shipped to the Department of Energy's Savannah River Site. Iconic security was removed – metal detectors, vehicle inspection stations, armed guards, and razor wire were all gone. This marked the end of the high security profile long associated with PFP and ushered in a new era for PFP workers: cleaning out, decontaminating, and ultimately removing the PFP complex.

The PFP Closure Project now faces a monumental cleanup challenge to remove the facility and reduce the risks of the hazards within to protect human health and the environment. Demolishing the PFP complex presents several challenges, including working with an outdated critical ventilation system, removing the complex configuration of remaining gloveboxes and equipment, and minimizing the risk of the several kilograms of residual plutonium and americium that remain in the facility.

BACKGROUND

CH2M HILL, the prime contractor for cleanup of the central part of Hanford, is managing the transition of PFP to full-scale cleanup decommissioning and demolition of the plant. Removing PFP is a priority project for CH2M HILL and DOE to reduce environmental risks and surveillance and maintenance costs on Hanford's Central Plateau; extending the PFP project past 2016 could require additional safety upgrades approaching \$10 million in addition to the annual \$50 million surveillance and maintenance costs.

When CH2M HILL started work at PFP in 2008, PFP housed highly complex and contaminated equipment including 232 large enclosures called gloveboxes, 196 pencil-shaped tanks, and more than a mile of highly contaminated vacuum system piping.

In 2009, just a few months into the contract, CH2M HILL received \$1.3 billion from the American Recovery and Reinvestment Act (Recovery Act) to create and save jobs and accelerate cleanup. The work included a focus on PFP to prepare process areas and buildings for demolition, which required training and integrating additional workers into the PFP workforce for the limited 2.5-year duration of the funding.

To date, CH2M HILL has removed more than 85 percent of the PFP gloveboxes and 59 percent of the pencil tank units. The PFP facility is 66 percent deactivated, with more than 36 percent of process piping and 76 percent of process transfer lines dispositioned.

As of 2013, few gloveboxes remain and entire buildings are gone from the footprint. Yet, some of the most contaminated and challenging areas of the facility remain. With less than three years to go, the PFP Closure Project is identifying ways to safely and compliantly advance the schedule to achieve the 2016 milestone. Accomplishing this mission in the midst of fluctuating funding and a changing workforce, compounded by managing a complex culture change, proves to be a major challenge.

Based on this challenge, CH2M HILL and DOE-RL conducted a Value Engineering (VE) study and set forth recommendations and the implementation path forward for the Deactivation, Decommissioning, Decontamination, and Demolition (D4) of PFP to "slab on grade", the state where the buildings and hazards have been removed and only the building slab remains (Figure 1).

METHOD

A multidisciplinary team, including CH2M HILL Project and D4 Managers, Project Integration, Project Controls, Engineering, Operations, Safety Basis, Radiological, Environmental, and Waste & Fuels Management Project personnel, and several project and program members from DOE-RL, conducted the VE study from April 16-17, 2013 in Richland, Washington. The team's specific objectives were to reduce mortgage costs, optimize site resources, improve mission strategy, and optimize cost and schedule effectiveness.

The outcome of the study were recommendations and actions that required a phased implementation plan over five months, with several short-term actions to accelerate D4 progress while re-sequencing work and maintaining the commitment on high-hazard risk reduction work. These recommendations included:

- Change with the end in mind
- Change the skyline/change the culture
- Focusing on increasing productivity

- Five stand-alone actions



Figure 1: The Plutonium Finishing Plant in 2013 (left) and the projected footprint in 2016 (right).

DISCUSSION

Beginning in May 2013, CH2M HILL began to implement these VE study recommendations and realized benefits. After only three months of implementation, the PFP Project management began to see results. Productivity increased significantly and the project's safety record improved. As shown in Figure 2, productivity in some areas has improved by more than 50 percent. CH2M HILL management anticipates that PFP will meet its goal of "slab on grade" by 2016, and lessons learned from this project can be shared across the DOE complex on similarly complex and hazardous D4 projects.

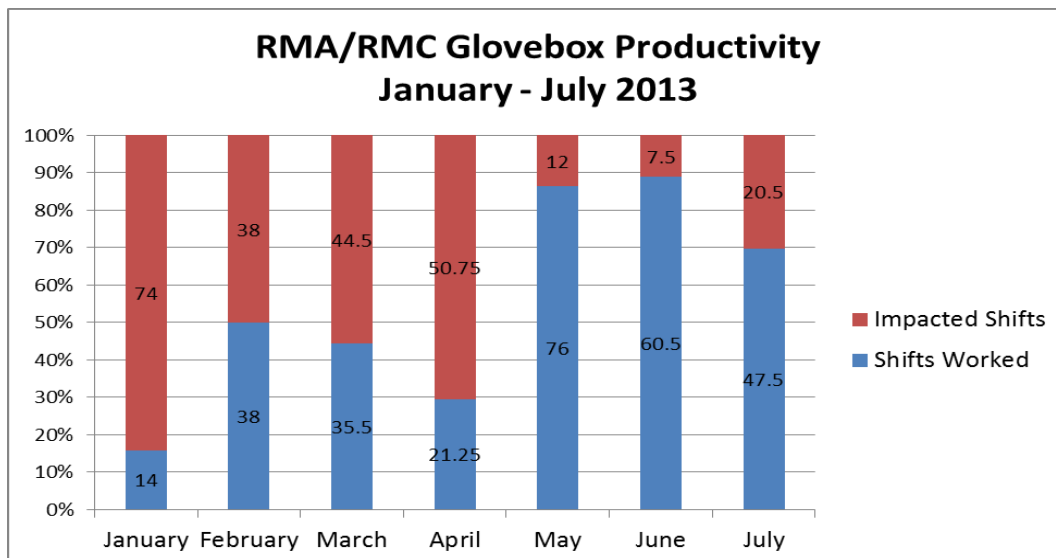


Figure 2. The above chart shows that glovebox removal productivity improved by an average of 50 percent during May, June and July.

Change with the End in Mind

PFP management initiated several strategies to advance from an operations mode to a D4 closure mode. The leadership team placed D&D work crews on multiple high-hazard removal tasks and embedded the crews with surveillance and maintenance teams. The multi-function crews worked on entire rooms, going after source contaminant materials, dismantling equipment and process piping, and bringing the room to a cold and dark condition before moving to the next location. This holistic approach allowed for collaborative and goal-oriented participation on PFP efforts, while maintaining safety.

The team is reducing dependence on aging systems and moving to temporary systems that achieve the same safety functions. For example, costly, large, legacy vacuum air systems in facilities slated for demolition are being replaced with more cost-effective, energy efficient portable systems. This allows for reuse of the new portable systems in other facilities being prepared for demolition. The team is also combining fire alarm tests and cancelling preventative maintenance activities for equipment and buildings waiting for demolition.

The End in Mind approach maximizes the use of innovative, alternate methods to immobilize and remove waste, which was realized when a team of PFP workers visited the DOE Advanced Mixed Waste Treatment Plant (AMWTP) site in Idaho to observe equipment that would assist in entering highly contaminated areas. This visit was a prime example of sharing experiences across the DOE complex and worker involvement. It resulted in the adoption of the use of MSA PremAire supplied-breathing air (SBA) system and a Level-B protective suit to enter highly radioactive and chemically contaminated areas, including areas with airborne radioactivity. This allows for increased productivity in the complex removal and size reduction of highly contaminated components throughout the facility while maintaining worker safety.

The PFP Project evaluated several other performance-improvement initiatives, such as glovebox foaming, which could significantly improve schedule performance in removing the remaining gloveboxes. Foaming entails filling the gloveboxes with a low-expansion pressure product that expands to fill voids and lock contamination in place. The benefits of using this method are to safely and efficiently prepare large pieces of contaminated equipment for removal and disposal with reduced worker handling and in less time. PFP plans to begin foaming gloveboxes by June 2014.

Other actions identified to transition to a closure mode include characterizing equipment and gloveboxes to surgically remove or leave in place. The PFP team will leave low-level waste process piping and gloveboxes in place for demolition. This is anticipated to reduce worker handling associated with size reducing, or cutting up, and removing the large pieces of equipment from the complex confines of the building. Worker handling is anticipated to be reduced by approximately 30 percent.

Change the Skyline/Change the Culture

Over the last two decades, PFP workers ushered what was once a high-security plutonium production complex into a non-operating contaminated plant slated to be taken to “slab on grade” by 2016. Now, the workforce is facing a major change in the skyline: they will witness the elimination of the buildings many have come to know as a home away from home. The VE study recommends changing the skyline to signal the change from operations to D&D and help transition the culture.

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Personnel still reside in the buildings planned for demolition, with monitoring systems, shift operations, shops, and command centers in place. Relocating employees allows for the establishing of a demolition zone with a designated debris load-out area and access/egress points for people, equipment, tooling, and removal routes. This will also allow for dedicated haul roads, demolition and removal of staged materials, trailers, and buildings. It also is intended to relocate the safety system monitoring functions, outside of the site boundary.

As of November 2013, the PFP Project evacuated and eliminated eight mobile office trailers that were turned over to another site contractor. In addition, nine facilities were emptied and prepared for demolition which is anticipated to begin at the beginning of calendar year 2014. Many of the personnel who previously occupied those facilities relocated into one large mobile office trailer that was set aside as “D&D Central”. This centralized location for D&D crews was established to cultivate greater teamwork, improve communications across crews and allow for more efficient allocation of resources. This move was symbolic of the culture change that is occurring throughout the project.

Incidentally, the new home to the D&D crews was a previous home to the project’s senior management team and support staff that moved into less comfortable accommodations. The switch was initially met with resistance from the D&D crews but was later seen as a morale boost.

Focusing on Increasing Productivity

During PFP operations, work packages were needed for virtually every task. Many of the procedures that dictate prescriptive work steps were still in effect even with the change to a D4 mission. The VE recommendation calls for more streamlined D4 work packages with consistent safety and oversight but fewer required approvals and clearly established control points on a system versus prescriptive scope. The goal is to standardize repetitive work packages into single system packages with contingencies. Development is focused on the consistent expertise, bounding hazard analysis, skill-based instruction and staffing levels for pre-emptive work.

After completing a thorough evaluation of PFP procedures and work packages, the PFP team retired procedures that are no longer applicable and streamlined cumbersome work packages. The changes to procedures and work packages were approached with a focus on maintaining safety and eliminating redundancy and unnecessary steps and approvals. The volume of some work packages was reduced by up to 50 percent, eliminating redundancy and steps that skilled staff members have received training to perform. These efficiencies yielded reduced procedural non-compliances and paperwork-related field work stoppages. This allows for greater efficiency and productivity in conducting day to day work.

Five Stand-Alone Actions

The VE team defined five actions in addition to the three major recommendations. Collectively these actions established a Risk Evaluation Board (REB). The REB consists of CH2M HILL and DOE-RL senior managers participating in a collaborative process for managing risk. The Board also fosters timely resolution of improvements and constraints to successful project delivery.

The REB has identified several process improvements and efficiencies, including glovebox foaming and modifications to the HEPA filtration systems to allow for better air flow.

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Another action identified was to explore alternate work schedules. Project management conducted a survey that identified a 10-hour, four-day-a-week schedule is preferred by the staff. The new schedule, which was adopted at the beginning of the calendar year, allows work crews greater productivity during a work day.

CONCLUSIONS

The VE team gathered to answer one primary question, “What are we spending our money and energy on now that was supporting the old PFP operating scenario versus what should we spend it on now that it no longer has any operating likelihood or mission?”

Through open, honest discussion and exploration of the answers to this question, the team came up with recommendations that helped the project safely and compliantly make gains in the schedule. Continuing at the same trajectory, the project is anticipated to meet the 2016 completion milestone.