

PFP meets milestone nine months early

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Earlier this month, Fluor Hanford personnel at the Department of Energy's Plutonium Finishing Plant completed repackaging all of the plutonium-bearing residues that were part of a major milestone set for the plant by the Defense Nuclear Facilities Safety Board. The DNFSB milestone called for having this material processed no later than April 2004.

Residues are a diverse collection of materials: oxides and mixed oxides, called OX/MOX; sand, slag and crucible, or SS&C, remaining from the making of plutonium metal "buttons"; at least two types of alloys containing plutonium; plutonium-bearing ash; and other miscellaneous solid and powdered materials.

The residues are slated for permanent disposal at the Waste Isolation Pilot Plant in Carlsbad, N.M. To expedite the shipping of the residues from PFP to WIPP, nuclear chemical operators were trained to meet WIPP certification requirements and to prepare specific data packages for WIPP. Hanford's SS&C waste was so well characterized by the PFP Residues Team that WIPP began accepting shipments this past May.

PFP's collection of residues is part of the approximately 18 metric tons of plutonium-bearing materials that were left in the historic facility when defense production ended there in 1989. In both 1994 and 2000, the DNFSB recommended timely repackaging of the residues in sturdy containers suitable for permanent disposal. Unlike some other forms of plutonium leftovers at PFP such as solutions and polycubes, residues do not have to be stabilized.

Agreements between DOE and the DNFSB designated nearly four tons of PFP's leftovers as residues to be repackaged by next April, and those have been repackaged. An additional 2 metric tons of material were subsequently designated as residues, however, and work continues on repackaging that material.

The milestone work also included nondestructive assay (measurement) of the residues, plus loading and sealing them into special stainless-steel-lined drums called pipe overpack containers, or POCs, which allow for permanent disposal.



Members of PFP's Residues Team open old containers of plutonium-bearing residues in heavy plastic bags inside a containment tent.

PFPP meets milestone nine months early, cont.

Repackaging residues involves sorting, processing and transferring certain plutonium-bearing solids and dense powders into new billet cans. The work is done inside a glovebox in the main PFPP processing facility, the 234-5Z Building, long known to Hanford workers as “Dash 5.” The billet cans are placed inside thick bags that are vented and filtered. Then the plutonium content is measured and the cans are placed inside the overpack container. The POCs each hold one to four billet cans and have secondary HEPA (high-efficiency particulate air) filtration.

Ash completed first

The first groups of residues to be repackaged at PFPP were two sets of plutonium-laced ash from incinerators that operated at both Hanford and Rocky Flats during the 1960s and '70s. The incinerators were run as plutonium-recovery works. They burned plutonium-contaminated combustibles such as used protective clothing, rags and glovebox debris to retrieve plutonium from the ash. The plutonium was extracted through a process that used acids to pull the plutonium out of the ash.



Repackaged plutonium-bearing residues in plastic bags sit inside a billet can inside a pipe overpack container just before final closure.

Beginning in 2000, PFPP workers repackaged nearly 550 items containing ash from Hanford’s incinerator, and more than 400 items of ash from the Rocky Flats unit. The ash was packaged into POCs and sent to Hanford’s Central Waste Complex for eventual shipment to the WIPP facility.

PFPP employees finished processing the Rocky Flats ash in March 2001, and the Hanford ash in February 2002. Shipments to the Central Waste Complex were completed the following month, nearly five months ahead of a milestone in the Tri-Party Agreement, the DOE cleanup pact with the Washington Department of Ecology and the U.S. Environmental Protection Agency.

Chris Yale, Fluor Hanford’s lead operator for what is known as the “Residues Q Shift” at PFPP, recalls that the first ash-repackaging work was very challenging. “We were a new team working together and the ash was very flighty and fine,” he said. “It would expand as the old cans were opened. The operators suggested many revisions and improvements as we did that early work. Management had an open door and an open ear, and we made changes that improved the safety and efficiency of the work.”

SS&C, Group 1 alloys

Next came the large sub-group of residues known as sand, slag and crucible material. Special molds called crucibles made of magnesium oxide were the holders — structures in which plutonium fluoride was fired to produce buttons of plutonium metal during the weapons-production era at Hanford. The crucibles were broken to remove the buttons. “Slag” is the solid residue that was left clinging to the pieces of the crucibles after they were broken. And excess magnesium-oxide powder from the firing of the plutonium fluoride is known as “sand.”

In the SS&C repackaging work, which took place during a 10-month period during 2002, more than 1,400 cans of materials were processed into just under 800 new billet cans. The job was finished six months ahead of schedule. The SS&C repackaging involved handling a bulk weight of about 2,500 kilograms of plutonium-bearing materials, including more than 40 kilograms of plutonium.

Continued on page 3.

PFP meets milestone nine months early, cont. 2

Processing of a smaller group of residues known as “Group 1 Alloys” (plutonium-aluminum alloys) was completed at about the same time.

“We have a dedicated and talented team here at PFP, including all of the technical, operations, support and administrative staff,” said Brian Skeels, Fluor Hanford residues stabilization manager. “Our team has a tremendous feeling of accomplishment.”

OX/MOX, Group 2 alloys

As soon as Skeels’ team finished SS&C repackaging, it switched the “feed stream” to OX/MOX (oxide/mixed oxide) scrap. The team began repackaging the OX/MOX collection in December 2002, and is scheduled to finish in November. The OX/MOX scrap items with low plutonium content by weight will be sent to WIPP in New Mexico, while the items with more plutonium will go to the Savannah River Site.

In late March, the Residues Team also completed measuring and transferring the large SS&C residues group to the Central Waste Complex to await shipment for permanent disposal off site. They began repackaging reduction residues and a small collection of “Group 2 alloys” in May. Recently, they started repackaging hold-up plutonium (plutonium being cleaned out of PFP equipment as part of decontamination and decommissioning), as well as a special 900-kilogram collection of OX/MOX residues.

Other PFP progress

The Residues Sub-Project is one of three major sub-projects at PFP that are on track to stabilize and repackage all the material at PFP ahead of the May 2004 agreements with DOE and the DNFSB. The Thermal Stabilization Sub-Project led by Rob Cantwell finished stabilizing plutonium-laced cubes of polystyrene known as polycubes in February, and has begun washing and stabilizing oxides containing high amounts of chlorides.

A team led by Rob Gregory completed stabilizing and canning plutonium metals in September 2001 and is working to complete canning plutonium oxides by early 2004. The metals and oxides are being placed into new stainless steel “3013” cans that meet the stringent new specifications of DOE’s Standard 3013.

In addition, a team led by Bob Heineman is planning to accelerate deactivating the 61 structures in the PFP complex, while Tom Halverson leads efforts to ship stabilized plutonium away from the Hanford Site. ■