EFCOG Best Practice #145

Title: Disposal Innovations for Large Components Onsite at Savannah River Site

Facility: E-Area Low Level Waste Facility / Savannah River Site, South Carolina

Point of contact: John Gilmour, Savannah River Nuclear Solutions, 803-208-3211, john.gilmour@srs.gov

Brief description of Best Practice:
Savannah River Nuclear Solutions (SRNS) successfully disposed of several large components in the Savannah River Site (SRS) E-Area Low Level Waste Facility (ELLWF) that would otherwise have been problematic for disposal off-site. Each component exceeded some aspect of the generic Waste Acceptance Criteria (WAC) (e.g., radiological disposal limits) or was outside the normal disposal operations (e.g., containers exceeded disposal unit geometry and extreme weight impacted equipment stand off limits). Utilization of the Unreviewed Disposal Question (UDQ) process resulted in additional analyses that identified special waste form disposal limits and operational measures that would allow the large components to be disposed in ELLWF (on-site) without impacting compliance with the performance objectives of DOE Order 435.1 for low level waste disposal facilities. On-site disposal was cost efficient and safer compared to off-site disposal.

The UDQ process was used for three types of large components: the Process Vessel for the Heavy Water Components Test Reactor (HWCTR), Tall Used Equipment Boxes, and Reactor Heat Exchangers. The analysis performed during the UDQ process was specific for each type of large component and was based on a graded approach, as briefly described below.

The HWCTR Process Vessel did not meet generic isotope disposal limits for multiple isotopes. A Special Analysis (SA) was conducted for this vessel which took into consideration the waste form and ability of the radionuclides to be released from the waste form. Additionally, it was determined that grouting below and up to the midpoint of the vessel would further reduce migration of the radionuclides. As a result of the new analysis (with a key assumption that the vessel is grouted), special waste form limits for the isotopes of concern were identified. The radionuclide inventory of the vessel was below the special waste form limits and so it was disposed in the ELLWF and grouted as required without impacting performance objectives of the disposal facility.

Though the Tall Used Equipment Boxes met the generic radionuclide limits, some of the boxes were taller than the standard dimensions of the disposal unit (i.e., Slit Trench) which were modeled and constructed to allow 16 ft of waste, 4 ft of soil cover over the waste, and a minimum depth to groundwater. Using the graded approach allowed by the UDQ process, a UDQ Evaluation was performed which noted that an additional 10 ft could be dug in the Slit Trench footprint to accommodate the tall boxes and still have adequate depth to groundwater. This change in the disposal unit geometry did not challenge performance objectives due to the geology in the area. Operational challenges also existed with these tall boxes, and a new ramp had to be constructed to allow the boxes to be driven in instead of being craned in from the sides of the disposal unit which was a safety concern for slope stability.

There were 49 Reactor Heat Exchangers at SRS for disposal, each approximately 25 ft long and 12 ft in diameter and weighed up to 190,000 lbs. Preliminary characterization showed that none of these heat exchangers met the WAC disposal limits. However, there was no funding for off-site disposal of these heat exchangers, as to do so would be very costly. Additional data was gathered and the heat exchangers were re-characterized, indicating

that 30 of the 49 heat exchangers met the generic radionuclide limits in the WAC and could be disposed in the ELLWF Slit Trenches without impact to the performance objectives of the disposal facility. The remaining 19 did not meet the generic WAC limits. Operational challenges also existed that impacted the ability to dispose of the heat exchangers. Due to the size and weight of the heat exchangers, the equipment used to place waste in the disposal unit had to stand off a minimum of 25 ft (this stand off distance was not available due to the configuration of the disposal units). To address the 19 heat exchangers that did not meet the generic limits, an SA was developed that took into consideration that 1) the inventory in the heat exchangers was not instantaneously available for transport by groundwater, 2) the heat exchanger itself provided a hydraulic barrier for release of the radionuclides, and 3) much of the contamination was embedded in the metal and would only become mobile through corrosion (conditions that were not considered during development of the generic WAC limits). Additionally, it was determined that sealing the flanges and drain ports would further reduce migration of the radionuclides. As a result of the SA, (with a key assumption that the flanges and drain ports are sealed) special waste form limits were developed for the two radionuclides of concern (H-3 and C-14). The radionuclide inventories for the 19 heat exchangers were below the special waste form limits and so they were disposed in the ELLWF (after sealing the flanges and drain ports as required). To address the operational challenge of placing the heat exchangers in the disposal unit, due to timing of disposal, the ramp constructed for disposal of the Tall Used Equipment Boxes in the Slit Trench was able to be utilized for disposal of the heat exchangers. Disposal of the heat exchangers did not impact performance objectives of the disposal facility.

Why the Best Practice was used:

The UDQ process was utilized to evaluate on-site disposal of large components that would have been costly, problematic logistically, and a greater risk to the public and environment if disposed off-site.

What are the benefits of the Best Practice:

The benefits of using this structured UDQ process allowed a graded approach to evaluating the disposal issues with the large components against the Performance Assessment (and WAC) requirements ensuring compliance with DOE Order 435.1 performance objectives. The other benefit of using the process includes identification of cost effective measures to address the specific factors that contribute to exceeding the generic requirements or the normal disposal operations. The mitigative actions identified were implemented and the large components were successfully and efficiently disposed on-site at the ELLWF.

What problems/issues were associated with the Best Practice:

No problems or issues were associated with implementation of the UDQ process for evaluating on-site disposal of the large components.

How the success of the Best Practice was measured:

Success of implementing the UDQ process for these large components is measured by the fact that SRNS safely disposed of the large components on-site at the ELLWF without impacting compliance with DOE Order 435.1 and without the additional cost and hazards associated with off-site disposal.