5694

REMEDIAL ACTION WORK PLAN

FOR SILOS 1 AND 2 REMEDIATION FACILITY

40750-WP-0001

Revision 0

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1 INTRODUCTION

This Remedial Action Work Plan (RAWP) details the plan and schedule for implementation of treatment, packaging, and disposal of the material in Silos 1 and 2. The design and construction of the necessary facilities for Silos 1 and 2 remediation, and plans for implementation of the other portions of the Operable Unit 4 remedial action, are specified in the documentation described in Section 1.2.

1.1 Scope

This RAWP addresses the operations associated with:

- Receipt of Silos 1 and 2 material from the Transfer Tank Area (TTA)
- Dewatering, and treatment of the material; and
- Packaging of the treated Silos 1 and 2 material and preparation for transportation;

This RAWP also defines the scope of subsequent Remedial Action documents and specifies appropriate remedial action milestones.

1.2 Related Documentation

1.2.1 Explanation of Significant Differences for Silos 1 and 2 Remedial Action

The final selected remedy for treatment and offsite disposal of Silos 1 and 2 material is specified by the Explanation of Significant Differences for Silos 1 and 2 Remedial Action, which was signed by the DOE on November 7, 2003 and by the USEPA on November 24, 2003. As defined by the ESD, the remedy addressed by this RAWP consists of:

- Complete removal of contents of Silos 1 and 2 and the Decant Sump Tank System sludge from the Transfer Tank Area followed by treatment using chemical stabilization; and
- Off-site shipment and disposal of the chemically stabilized waste at the NTS or an appropriately permitted commercial disposal facility.

1.2.2 Silos 1 and 2 Remedial Design Work Plan

The Remedial Design Work Plan (RDWP) for Silos 1 and 2 defined the scope, content of subsequent deliverables related to implementation of the Silos 1 and 2 Remedial Action. The final revision of the Silos 1 and 2 RDWP (40700-WP-0002, Rev. 2) was approved by the Ohio Environmental Protection Agency (OEPA) on October 25, 2001, and by the United States Environmental Protection Agency (USEPA) on October 26, 2001.

1.2.3 Silos 1 and 2 Remedial Design Package

The design of the Silos 1 and 2 Remediation Facility is documented in the Remedial Design Package for the Silos 1 and 2 Remediation Facility (40750-RP-0028) which was approved by the U.S. EPA on June 4, 2003 and by the OEPA on June 5, 2003.

2 REMEDIAL ACTION OPERATION AND MAINTENANCE

The following sections provide a summary-level description of the operation and maintenance of the Silos 1 and 2 Remediation Facility. Additional details concerning the equipment design, controls and methodologies are provided in the Project Remedial Design Package.

2.1 Process Overview

The Silos 1 and 2 Remediation Facility will consist of a Remediation Building, warehouse, office trailers, personal protective equipment (PPE) change facilities, vehicle staging area, and rail spurs. The Remediation Building will contain the control room, process and support systems for the slurry receipt, feed preparation, chemical stabilization/product forming, containerization and loading of the treated K-65 materials for shipment to an off-site disposal facility.

Silos 1 and 2 materials will be treated using a chemical stabilization process where chemical formulations (e.g., Portland cement, and fly ash) chemically and physically bind the silo materials. A thickening step will be included in the process to increase the waste loading in the final product. This will be accomplished using a combination of mixing tanks for chemical addition and a clarifier for gravity thickening. Addition of polymer will be used to improve settling. Treatability studies have shown that only polymer is required to enhance settling, and only cement and fly ash are required for stabilization. However, current plans are to also add a superplasticizer to each batch of treated waste in order to delay the setup time of the final product.

Filled waste containers will be staged, both indoors and outdoors, before being shipped off-site for disposal. The infrastructure described in the RD Package will accommodate transportation by either rail (direct or intermodal) or direct truck to the selected disposal facility. The certified shipping containers will accommodate both truck and rail transport. The loading facility is designed to accommodate both railcars and trucks. Customized truck trailers are currently being procured for transportation of the containers to the NTS.

The intent of the shipping program will be to maintain ongoing shipments of treated Silos 1 and 2 material to that NTS at a rate matched with the production rate of the remediation facility and with the disposal schedule at the NTS (currently planned at four days per week). Therefore, if both the remediation facility and the shipping program are maintaining their target rates, individual containers will be staged onsite for only the time required to prepare the associated documentation and release the shipments.

In the event of a temporary interruption in the shipment program, onsite staging may be required in order to maintain operation of the remediation facility until shipments can resume. The capacity of the onsite staging areas is estimated to be sufficient to absorb one to two weeks of containers, depending upon the remediation facility production rate, until shipments are resumed. Prolonged onsite staging or storage of filled containers of treated Silos 1 and 2 material would require reevaluation of procedures and controls and revision of the Transportation and Disposal Plan.

The chemical stabilization process flow diagram, Figure 1-1, shows the basic flow of materials through the facility. The treatment process will continuously produce a stabilized product using several systems, some that will operate in a batch fashion, and others that will operate continuously. Multiple lines of equipment will be used to ensure that batch operations performed sequentially result in a continuous overall operation.

The Remediation Facility will include the following six major process systems.

<u>TTA Waste Retrieval System</u>

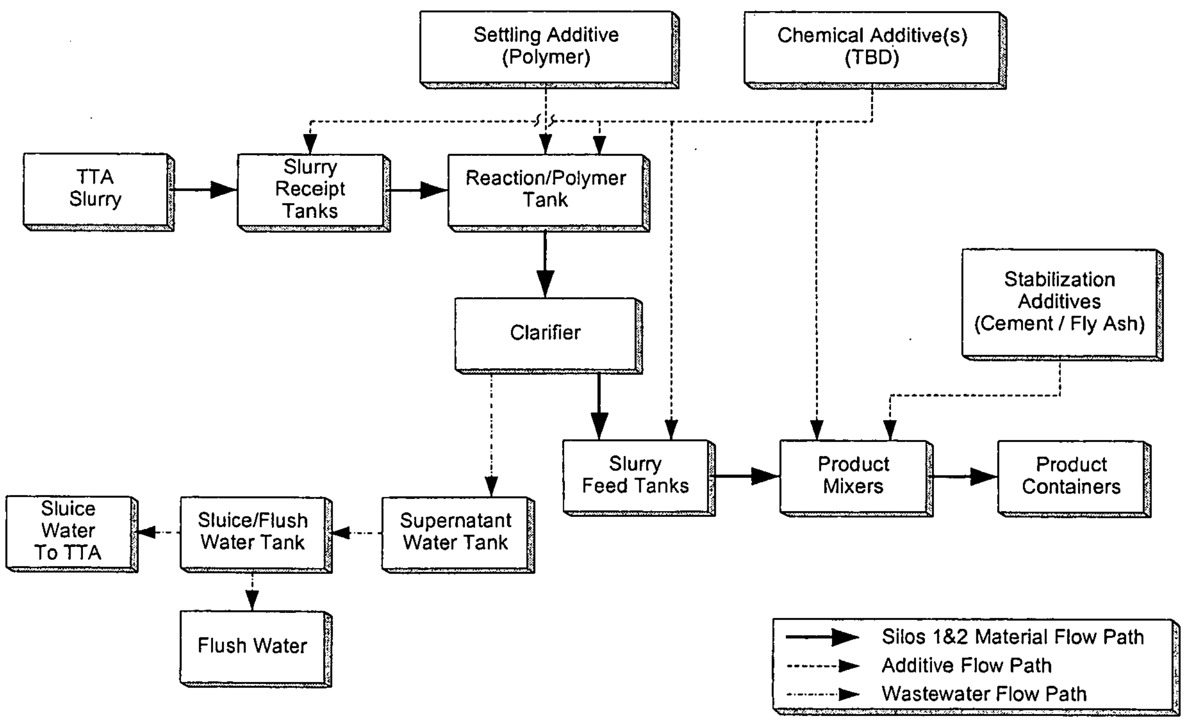
In the TTA Waste Retrieval System, Silos 1 and 2 materials will be pumped as a slurry at approximately 350 gallons per minute (gpm) and 5-15 wt % solids from the TTA to the Remediation Building via one of two elevated, double-walled transfer lines. The material will be delivered to one of three carbon steel slurry receipt tanks. From the slurry receipt tanks, the material will be pumped through the reaction tank into the polymer addition tank in the Feed Preparation System.

Feed Preparation System

In the feed preparation system, slurry from the receipt tanks can be mixed together with chemical additives. Based on bench-scale treatability studies, the only additive required to enhance settling of suspended solids, is a polymer flocculating agent. Other chemicals could be added, if necessary, through a spare chemical additive system. The additives, if necessary, would be added in the reaction tank. No additives are currently

FIGURE 1-1

CHEMICAL STABILIZATION PROCESS FLOW



planned to be added to the reaction tank at this time. Polymer will be added in the polymer addition tank. The contents of the reaction tank and the polymer addition tank will overflow to a clarifier to thicken the slurry to approximately 30 wt % solids in preparation for product mixing.

Processor Feed System

The clarifier will continuously feeds thickened slurry (nominally 30 wt% solids) to one of three slurry feed tanks in the processor feed system. The thickened slurry is then transferred by batches to the product mixers. Materials from downstream processes may also be recycled to the clarifier.

Product Additive System

In the product additive system, cement and fly ash are unloaded and transferred to the product mixers.

Processor System

In the processor system, three product mixers are used to mix the thickened slurry with cement and fly ash on a batch basis. After mixing has been completed, the chemically stabilized product is discharged via gravity to the transport/disposal containers.

Container Handling System

The container handling system consists of mechanical subsystems for the receipt, preparation, and filling of the containers to be used for packaging of the chemically stabilized product, and for the loading of the containers onto railcars or trucks for transportation and disposal.

2.2 Operation and Control of the Silos 1 and 2 Remediation Facility

2.2.1 Silo 1 and 2 Central Control System (CCS)

The Silo 1 and 2 CCS is an electronically isolated industrial Ethernet network that provides processor-to-processor communications among controllers, servers, workstations, and other Ethernet devices using Siemens Ethernet switches. The CCS includes Profibus DP input/output (I/O) sub-networks within its structure for the connection of Siemens ET200M I/O racks, variable frequency drives (VFDs), the Siemens S7-416 PLCs and other third-party packaged systems. The Human Machine Interface (HMI) consists of ten custom operator stations two of which incorporate joystick-based controls interfaced to Siemens controllers via Profibus DP for operation of the sluicer modules.

2.2.2 TTA Waste Retrieval System (System 13)

The TTA Waste Retrieval System is responsible for the transfer of slurry from the TTA tanks to the slurry receipt tanks (TNK-13-1000A/B/C) and from the slurry receipt tanks to the reaction tank (TNK-15-1003A) or the clarifier (TNK-15-1004). The TTA Waste Retrieval System is designed to transfer slurry without allowing the solids to settle. This is accomplished by agitation of the material inside the slurry receipt tanks. The slurry receipt tank agitators, MXA-13-1000A/B/C, are designed to continuously mix the slurry in the tanks to ensure a homogenous feed to the reaction tank. Within the remediation facility, slurry is transferred using heavy-duty centrifugal slurry pumps (PMP-13-1001A/B/C) from the slurry receipt tanks to the reaction tank. The system is also designed to permit the transfer of slurry between each of the three slurry receipt tanks. In addition to receiving flows from the TTA tanks or one of the other receipt tanks, the system is designed to receive flow from the Slurry Feed Tanks (TNK-16-1000A/B/C), sumps, and the flush water system.

The TTA Waste Retrieval System operating and shutdown sequences are limited to level interlocks and permissives for the tanks, pumps, agitators, samplers, and valves for slurry transfer and line flushing. All control system (CS) communications with this system are via hardwired I/O status switches, hardwired hand switches, and field mounted instrumentation directly connected to the CS.

2.2.3 Feed Preparation System (System 15)

The Feed Preparation System is responsible for the conditioning of slurry to promote settling, settling of the conditioned (thickened) slurry, and transfer of thickened slurry to a series of batch tanks (i.e., slurry feed tanks) for further processing. The Feed Preparation System is designed to continuously treat, settle, and transfer slurry 24 hours per day. The design throughput of the system is 78,078 pounds of K-65 solids, dry weight basis, per day. To accomplish slurry conditioning, the Feed Preparation System uses a polymer addition skid package to deliver dilute polymer to the polymer addition tank (TNK-15-

1003B) or to the centerwell of the clarifier (TNK-15-1004). Results of previously conducted treatability studies indicate that polymer is the only additive needed to promote settling of the slurry. As an added precaution, another package system has been added for the addition of superplasticizer to the product mixers in order to delay setup time.

Each of the package units is configured with metering pumps: PMP-15-1010A/B for polymer addition to the polymer addition tank (TNK-15-1003B). On the chemical addition skid, a small chemical-duty centrifugal pump (PMP-15-1001A) will be used to transfer bulk volumes of superplasticizer to the product mixers, as needed.

Slurry transferred from the slurry receipt tanks to the reaction tank will be continuously agitated by reaction tank mixer (MXA-15-1003A). Slurry leaving the reaction tank will flow into the polymer addition tank through a common underflow nozzle. The polymer addition tank is continuously agitated by the polymer addition tank mixer (MXA-15-1003B). This rapid mix tank is used to interact the slurry with polymer prior to entry into the clarifier feedwell for settling.

Once slurry conditioned with polymer has gravity flowed from the polymer addition tank to the clarifier feedwell, the slurry is allowed to gravity settle in the clarifier. Treatability studies have indicated that the slurry settles rapidly, so to ensure that the clarifier does not become plugged; the clarifier will be continuously stirred. The clarifier rake (MXA-15-1004) will continuously stir the contents of the clarifier at a relatively slow (~1rpm) rate. The rake is designed to direct settled solids to the clarifier sump for removal via pump.

Once slurry has settled to a sufficient solids concentration, the clarifier underflow pumps (PMP-15-1004A/B/C) will be used to transfer thickened slurry to the slurry feed tanks. However, based on the settling velocity limitations and the particle characteristics of the slurry, normal operation of the clarifier underflow pumps will involve recycling thickened slurry back the clarifier. Periodically, slurry will be transferred to one of the three slurry feed tanks using a diverter valve. During this diversion, the recycle header will be flushed to reduce occurrence of settling. The water will be recycled and overflow the clarifier perimeter weir. Following transfer operations (i.e., slurry batch requirements for the slurry feed tanks are fulfilled), the slurry transfer line will be flushed as described in the System

62 section. Once the system flush is complete, the pump in question will be shutdown while another of the three pumps will simultaneously begin recycle operations.

The clarifier weir is designed to collect water that is displaced from the input and settling of solids into the clarifier. The water that overflows the weir is routed through gravity flow to the Supernatant System (System 55).

The Feed Preparation System operating and shutdown sequences are limited to level interlocks and permissives for the tanks, pumps, agitators, samplers, and valves for slurry transfer and line flushing. All CS communications with this system are via hardwired I/O status switches, hardwired hand switches, and field mounted instrumentation directly connected to the CS.

2.2.4 Processor Feed System (System 16)

The Slurry Feed System (System 16) is responsible for storing thickened slurry from the Clarifier (TNK-15-1004) and transferring the thickened slurry to the product mixers (MXB-17-1000A, MXB-17-1000B, and MXB-17-1000C). The Slurry Feed System is designed to transfer slurry without allowing the solids to settle. This is accomplished by agitation of the material inside the Slurry Feed Tank (TNK-16-1000A, TNK-16-1000B, and TNK-16-1000C). The Slurry Feed Tank Agitators (MXA-16-1000A, MXA-16-1000B, and MXA-16-1000C) are designed to continuously mix the slurry in the tanks to ensure a homogenous feed to the product mixers. Within the remediation facility, slurry is transferred using heavy-duty centrifugal slurry pumps (PMP-16-1001A, PMP-16-1001B, and PMP-16-1001C) from the Slurry Feed Tanks to the Product Mixers. The system is also designed to permit the transfer of slurry between each of the three Slurry Feed Tanks. In addition to receiving flow from the Clarifier Tank or one of the other feed tanks the system is designed to receive flow from the Product Mixer Vent Scrubber Pump (PMP-19-1000) and the flush water system.

The Product Feed System operating and shutdown sequences are limited to level interlocks and permissives for the tanks, pumps, agitators, samplers, and valves for slurry transfer and line flushing. All CS communications with this system are via hardwired I/O status switches, hardwired hand switches, and field mounted instrumentation directly connected to the CS.

2.2.5 Processor System (System 17)

The Processor System is responsible for blending slurry with dry additives (cement and fly ash) to produce a grout-like product that is suitable for disposal at a permitted facility. The primary component of the Processor System is the ribbon-type blenders (MXB-17-1000A/B/C). The blenders will receive slurry from the slurry feed tanks (TNK-16-1000A/B/C) in various batch sizes, based upon the measured solids content of the feed.

The slurry transferred from the slurry feed tanks will be mixed with cement and fly ash that is delivered from a series of rotary air locks that are connected to cement and fly ash weight hoppers (System 44).

The Processor System operating and shutdown sequences are limited to valve position interlocks and permissives for the discharge valves and mixer agitators for product blending and discharge. All CS communications with this system are via hardwired I/O status switches, hardwired hand switches, and field mounted instrumentation directly connected to the CS.

2.2.6 Product Mixer Vent Scrubber System (System 19)

The Product Mixer Vent Scrubber System is responsible for removing particulates (cement, fly ash, and K-65 slurry) from the air exhausted from the product mixer headspaces. The primary components of the system are the Scrubber (SCR-19-1000), circulating pump (PMP-19-1000), pump suction strainer (STR-19-1000) and Ejector (EJE-19-1000).

The operating and shutdown sequences are limited to valve position interlocks and permissives for the scrubber, pump, and valves for blow down. All CS communications with this system are via hardwired I/O status switches, hardwired hand switches, and field mounted instrumentation directly connected to the CS.

2.2.7 Radon Control System (System 20)

The RCS in the Remediation Facility is responsible for removal of radon from the tanks and mixers and sending it to the main system. RCS users include receipt tanks (TNK-13-1000A, B, and C), feed tanks (TNK-16-1000A, B, and C), reaction and polymer addition tanks (TNK-15-1003A and B), clarifier (TNK-15-1004), product mixer vent scrubber (SCR-19-1000), supernatant tank (TNK-55-1000), and the sluice and flush water tank (TNK-62-1000). The RCS is expected to operate 24 hours per day. Details concerning operation and control of the RCS are provided in the RD/RA documentation for the AWR Project.

2.2.8 Container Receipt And Preparation System (System 23)

The Container Receipt and Preparation System shall provide the ability to off-load, stage, inspect, track, and weigh empty containers as they enter the Silos 1&2 Remediation Facility to be filled. The Container Receipt and Preparation System shall operate continuously for 24 hours a day. The system shall provide containers continuously to the Remediation Facility, but will only receive empty containers during the day. The major equipment associated with the Container Receipt and Preparation System includes the following:

- Empty Container Unloading Monorails, CRH-23-1001A, B & C
- Container Staging Entrance Doors, RDR-23-1003A, B & C
- Container Lid Inspection Hoist, CRH-23-1021
- Roller Conveyor System
- Reject Container Hoist, CRH-23-1020
- Vestibule Doors, ASD-23-1014 & ASD-23-1019
- Car Loading Monorail, CRH-24-1001
- Car Loading Container Grapple, RLD-24-1000

The empty container unloading monorails are positioned outside the empty container staging room and are used to manually unload empty containers off the incoming trucks and place them on the conveyor system.

The container staging entrance rollup doors allow containers to enter the Empty Container Staging Room.

The container lid inspection hoist is used to manually remove the container lid and inspect the lid, gasket, and flange on the container prior to releasing the container to the system.

The roller conveyor system is used to transport and stage empty containers before they are used in the filling process. The roller conveyor system is supplied with a fully tested and operationally ready control system.

A manual chain hoist is used to remove defective containers.

The automatic sliding vestibule doors allow for the containment of potentially contaminated air while allowing containers to enter the Container Survey and Decon Room.

The car loading monorail and car loading container grapple are used to remotely transfer an empty container from the car loading conveyor in the Container Survey and Decon Room onto a container transfer car, for subsequent entry into the Product Fill Rooms.

The car loading monorail is a 15-ton crane, equipped with a hoist and container grapple, which is moved over the container to be transferred. The crane and hoist with grapple together provide movement in the x and z directions. There are a total of three motions that the monorail system performs: 1) crane motion (x axis), 2) hoist motion (z axis), and 3) grapple motion (engaged, disengaged). Each of these motions is performed one at a time and movement is relatively slow. The crane is equipped with distance measuring lasers for precise positioning. The hoist is lowered and the grapple is engaged to the container, as verified by indicator lights. The container is then raised off of the car loading conveyor and moved by the crane. A weigh cell that is integral to the crane, located between the hook and the grapple, is used to indicate whether the grapple is lifting the container. The container is then lowered onto a container transfer car. The grapple is disengaged, raised by the hoist, and moved by the crane to pick up the next empty container after it is brought into the Container Survey and Decon Room. The car loading monorail is supplied with a fully tested and operationally ready control system.

The container transfer operations are typically performed remotely from the main Control Room. The Container Survey and Decon Room has two car loading cameras that provide views to the operator in the Control Room.

The roller conveyor system is provided with a dedicated programmable logic controller (PLC), which controls all functions of the roller conveyors. This PLC will be referred to as the conveyor staging control system (CSCS) and communicates to the CS using both Ethernet and Profibus protocols. The conveyor system is operated from a local CSCS HMI.

The car loading monorail and associated equipment is supplied with a dedicated PLC for controlling and monitoring its movement and positioning. It receives information from the crane distance measuring lasers, motor drives, and the hoist's weighing device. This PLC will be referred to as the monorail control system (MCS) and receives commands from and provides information to the CS using both Ethernet and Profibus protocols.

The car loading monorail and associated equipment is typically operated remotely from the Control Room. The operator uses a CS HMI screen, which includes camera views of the operations to transfer the container from the conveyor to the transfer car.

2.2.9 Container Filling System (System 24)

The Container Filling System is divided into four distinct areas:

- Container transfer,
- Container filling,
- Container inspection, and
- Lid replacement/fastening.

Container Transfer

In the Container Filling System, each product container is moved by one of three container transfer cars. Each transfer car holds one product container. The transfer car is driven by a servomotor connected to a gearbox, which rotates the rear wheels and provides movement along two parallel rails. The wheels of the container transfer cars are connected to the gearbox by axles. The container transfer cars are equipped with an electric brake for safety, front and rear lights, as well as audible and visible alarms for warning that a transfer car is moving or about to move. When one of the two laser scanners on each transfer car is triggered, or when one of three E-stop buttons is pushed, movement of the transfer car is stopped. A positioning frame is located in the center of each container transfer car so that the container is correctly aligned when the monorail hoist places it on the transfer car. During container filling system operations, the transfer car is positioned in the fill and lid/un-lid stations by a laser-positioning system. Two wallmounted laser distance meters use reflectors on the container transfer car to ensure that the transfer car is in the correct position for system operations.

Container Filling

Each container transfer car, which moves on rails, is moved into one of three Product Fill Rooms after a door (ASD-24-1008A, -B, or -C) is opened. Container transfer car CRT-24-1002A is filled in Room 134; container transfer car CRT-24-1002B is filled in Room 135; and container transfer car CRT-24-1002C is filled in Room 136. After the container transfer car is positioned within the Product Fill Room, the door is closed. The transfer car is positioned under a gantry manipulator in front of an operator-viewing window at the lid/un-lid station. The gantry manipulator can accurately position end effector tools, using four degrees of freedom (x, y, z, and theta). The motive forces for all degrees of freedom are electric servomotors. The gantry manipulator is equipped with a vision system used for locating certain features of the container and lid. The vision system guides the gantry manipulator, equipped with a gripping end effector tool, to raise the lid above the container. The lid may be stored on the nearby tool table if desired.

The container transfer car is then moved to the fill station. Each container fill station is located beneath a product fill chute (LSR-24-1007A, -B, or -C), which is attached to an 18-inch-diameter discharge valve from one of the mixers located above each Product Fill Room. The fill chute has a bellows portion, which is extended so that the fill chute is coupled to the container opening. When a positive coupling is sensed, the mixer discharge valve (upper knife-gate valve) and the lower knife-gate valve are opened and product material is allowed to flow by gravity from the mixer towards the container. When a product sample is needed, the lower-knife gate valve in the fill chute remains closed so that an ISOLOCK® sampler can take samples of the final product held up in the fill chute. After sampling is complete, the lower valve is opened, and the product material flows into the container. A catch tray under the product fill chute is retracted away from the fill chute during filling operations and repositioned/extended under the fill chute afterwards to minimize the potential for product material to drip and contaminate container surfaces or the surrounding area.

Container Inspection

After the container is filled with product material, the container transfer car is moved to an inspection/lid fastening station next to the gantry manipulator in front of the operator-viewing window. An operator inspects the container, using a remotely operated camera and the viewing window, to determine whether any product has dripped or splashed onto the container surface.

Lid Replacement/Fastening

After container inspection is complete, the gantry manipulator is engaged by the operator to automatically replace the container lid using the vision system (with cameras) and alignment pins, and fasten the lid with rivets. The gantry manipulator interfaces with a tool exchange system for switching end effectors (between the lid gripper and the riveter end effectors). The end effectors are stored on a tool table within reach of the gantry manipulator. The riveter end effector is powered by a high-pressure hydraulic unit. The vision system and a precise registration mark painted on the container lid enable the programmable logic controller (PLC) to identify the locations of the rivet holes and accurately and automatically insert the rivets. After the container lid is fastened, the door (ASD-24-1008A, -B, or -C) is opened, the container transfer car is moved out of the Product Fill Room, and the door is closed.

2.2.9.1 Sequence of Operations

The following steps are performed during the Container Filling System operations:

- Open Fill Room door
- Move transfer car to un-lid station at gantry manipulator
- Close Fill Room door
- Remove container lid (using gantry manipulator controls)
  - Return riveter end effector to tool table (if needed)
  - Change to lid gripper end effector
  - Acquire image of container handle
  - Remove lid from container
  - Park lid on tool table
- Move transfer car to fill station at fill chute
- Retract catch tray (away from fill chute)
- Lower fill chute

- Open upper knife-gate valve (open lower knife-gate valve first if not taking a sample)
- Take a sample if needed or skip this step
- Open lower knife-gate valve
- Wait while product is discharged from product mixer
- Close upper knife-gate valve
- Vibrate the fill chute
- Close lower knife-gate valve
- Raise fill chute
- Extend catch tray (under fill chute)
- Move transfer car to lid station at gantry manipulator
- Inspect product container for spills
- Fasten lid onto product container (using gantry manipulator controls)
  - Retrieve lid from tool table
  - Acquire container image
  - Position lid on container
  - Return lid gripper end effector to tool table
  - Change to riveter end effector
  - Pick up, insert, and install 6 rivets (one at a time)
- Open Fill Room door
- Move transfer car out of Fill Room into Survey and Decon Room
- Close Fill Room door
- Survey filled container and decontaminate if necessary

The container transfer car is supplied with a PLC for controlling and monitoring its movement and positioning. The product fill chute is controlled by the Fill Room integration system; fill chute instrumentation and control devices include solenoid valves and position detection devices (limit and proximity switches). The transfer car PLC provides information to the integration system PLC by Ethernet/Profibus. The Fill Room integration system has a dedicated human-machine interface (HMI) screen.

The gantry manipulator system has three main control components: 1) a PLC, 2) a motion controller for all the drives and servomotors for motion along each axis (x, y, z, and theta), and 3) an HMI screen. The gantry manipulator CS communicates with the integration system PLC by Ethernet/Profibus. The gantry manipulator has a dedicated HMI screen.

2.2.10 Container Shipping System (System 25)

The Container Shipping System (System 25) contains the processes and equipment to load and ship the filled product containers. The Container Loading Area in the Remediation Facility is used for loading the filled product containers onto the transportation vehicles.

Loading operations are performed remotely while cameras are used for viewing. First, a door (ASD-25-1000A, -B, or –C) is opened between the Container Survey and Decontamination Room and the Container Loading Area. The container transfer car is then moved into the Container Loading Area, and the door is closed. A 15-ton bridge crane and trolley equipped with a hoist and container grapple is moved over the container to be shipped.

The bridge crane, trolley, and hoist with grapple together provide movement in the x, y, and z directions. There are a total of four motions that the crane system performs: 1) bridge crane motion (x axis), 2) trolley motion (y axis), 3) hoist motion (z axis), and 4) grapple motion (engaged, disengaged). Each of these motions is performed one at a time and movement is relatively slow. The bridge crane and trolley are equipped with distance measuring lasers for precise positioning.

The hoist is lowered and the grapple is engaged to the container, as verified by indicator lights. The container is then raised off of the container transfer car, moved by the bridge crane, and weighed. A weigh cell that is integral to the bridge crane, located between the hook and the grapple, is used to weigh the containers. The weighing equipment is designed for calibration with known weights to ensure that measurements are accurate and repeatable. The container is then lowered either onto a truck. The grapple is disengaged, raised by the hoist, and moved by the bridge and trolley to pick up the next container after it is brought into the Container Loading Area.

The product container loading operations are typically performed remotely from the main Control Room. The Container Loading Area has several cameras that provide views to the operator in the Control Room. There are two shipping area surveillance cameras and two bridge crane alignment cameras.

2.2.10.1 Sequence of Operations

The following steps are performed during the Container Shipping System operations:

- Open door to Container Loading Area;
- Move container transfer car into Container Loading Area;
- Close door to Container Loading Area;
- Move bridge crane, trolley, and hoist with grapple over product container;

- Lower hoist and engage grapple onto product container;
- Raise hoist and lift product container off container transfer car;
- Weigh filled product container;
- Move bridge crane, trolley, and hoist with grapple and product container to correct position over transport vehicle;
- Lower hoist and position product container onto truck;
- Disengage grapple and raise hoist; and
- Move bridge, trolley, and hoist with grapple to pick up the next product container after it is brought into the Container Loading Area on another transfer car.

The bridge crane/trolley/hoist/grapple equipment is supplied with a programmable logic controller (PLC) for controlling and monitoring its movement and positioning. It receives information from the bridge crane and trolley distance measuring lasers, motor drives, and the hoist's weighing device. The PLC receives commands from and provides information to the central CS by Ethernet/Profibus. The bridge crane/trolley/hoist/grapple equipment is typically operated remotely from the Control Room. The operator uses an HMI screen, which includes camera views of the shipping area and bridge crane alignment with the container and transport vehicle, to perform the Container Shipping System operations.

2.2.11 Product Additive System (System 44)

The Product Additive System is responsible for providing cement and fly ash to the product mixers for blending with radioactive slurry to produce a grout-based waste product that is suitable for disposal at a permitted facility. The Product Additive System is composed of two parallel dense-phase pneumatic conveying systems designed for the delivery of cement and fly ash.

In the parallel lines, cement and fly ash are transferred from the large storage bins to the feeders. The feeders are pressurized to promote additive flow in the pneumatic piping. Along the piping system, a series of air control modules provided by the vendor, Dynamic Air, administer short bursts of compressed air to maintain the movement of dry additives through the pneumatic lines to the receiving bins. This method is referred to as dense-phase transfer. The receiving bins gravity feed the weigh bins. To prevent bridging in the receiving bin, a series of pulsed-air jets are included in the discharge cone to agitate the dry additives.

In the weigh bins, material is discharged using a screw feeder that discharges to a rotary air lock. A rotary air lock was selected to prevent the escape of radon gas, since the pneumatic conveying systems are considered "clean" (i.e., not contaminated by radioactive slurry or radon gas). The rotary air locks deliver the dry additives to the product mixers.

Only those components designated as a part of the Product Additive System (System 44) are discussed here. Components associated with the Compressed Air System (System 40) and the Processor System (System 17) are discussed in their respective sections.

2.2.12 Supernatant Water System (System 55)

The Supernatant Tank System is responsible for receiving supernatant water from the Clarifier (TNK-15-1004) overflow, flow from most sumps, scrubber blowdown from the Product Mixer Vent Scrubber (SCR-19-1000), and overflow from the Sluice/Flush Water Tank (TNK-62-1000). The tank is responsible for providing water to the Sluice/Flush Water Tank and settled solids to the Clarifier. The Supernatant Water System is designed to transfer slurry without allowing the solids to settle. This is accomplished by agitation of the material inside the Supernatant Water Tank (TNK-55-1000). The Supernatant Water Tank agitator, MXA-55-1000, is designed to continuously mix the supernatant water in the tank to ensure a homogenous feed to the Sluice/Flush Water Tank. Within the remediation facility, supernatant water is transferred using heavy-duty centrifugal slurry pumps (PMP-55-1000A and PMP-55-1000B) from the Supernatant Tank to the Sluice/Flush Water Tank.

The Supernatant Water System operating and shutdown sequences are limited to level interlocks and permissives for the tank, pumps, agitator, samplers and valves for supernatant water transfer and line flushing. All CS communications with this system are via hardwired I/O status switches, hardwired hand switches, and field mounted instrumentation directly connected to the CS.

2.2.13 Sluice/Flush Water System (System 62)

The sluice/flush water system is responsible for supplying sluicing water to the Transfer Tank Area (TTA) modules and providing flush water for the remediation facility piping.

Sluicing operations are expected to occur for approximately 3-6 hours per day; while flushing operations will be intermittent as needed throughout the remediation facility. The sluice/flush water system is designed to provide sluice water to the TTA sluicing nozzle at 200 psig and provide flush water in the remediation facility at 60 psig. The system is comprised of a tank (TNK-62-1000), pumps (PMP-62-1000A/B and PMP-62-1001A/B), and an agitator (MXA-62-1000). The agitator is not expected to operate continuously; rather the operation will be dictated by the presence of solids in the sluice/flush water tank. If solids are present in TNK-62-1000, the agitator can be used to suspend solids, while the flush water pumps transfer the solids laden water to a tank located upstream of the clarifier where solids can be removed.

The sluice/flush water system operating and shutdown sequences are limited to level interlocks and permissives for the tanks, pumps, agitators, samplers, and valves for slurry transfer and line flushing. All CS communications with this system are via hardwired I/O status switches, hardwired hand switches, and field mounted instrumentation directly connected to the CS.

2.2.14 Wastewater Disposition

Engineering evaluations have been conducted of potential wastewater generation during the Silos 1 and 2 bulk waste retrieval and heel removal operations of the AWR Project, Operation of the Silos 1 and 2 remediation facility, and during subsequent safe shutdown and D&D operations. Conservative estimates based upon evaluation of water balance and heat and material balance estimates indicate that total excess wastewater generation could range from 500,000 to 2,600,000 gallons. It is anticipated that this wastewater may require pretreatment for removal of lead and radium prior to treatment and discharge in accordance with the FCP NPDES permit. The current concept is to provide for pretreatment treatment capacity in the range of 50 GPM through use of either the existing FCP Slurry Dewatering facility, or by installation of a temporary package pretreatment unit. The current plan is to accumulate the wastewater requiring pretreatment in onsite tanks for batch pretreatment, treatment and discharge following completion of Silos 1 and 2 Remediation Facility operations. According to the current schedule, pretreatment capability will be necessary by late 2005. The details of the selected pretreatment approach will be reviewed with OEPA and USEPA prior to implementation.

2.2.15 Utility and Support Systems

Although the following utility and support systems are also a part of the Silos 1 and 2 Remediation Facility, their operation will not be detailed in this RAWP:

- Diesel Generator Standby Power System (System 31)
- Primary (Normal) Electrical System (Systems 32 and 33)
- Uninterruptible Power Supply System (System 33)
- Plant and Instrument Air System (System 40)
- Breathing Air System (System 41)
- Process Water System (System 50)
- Potable Water System (System 51)
- Fire Alarm System (System 52)
- Seal Water System (54)
- Chilled Water System (System 56)

3 Remedial Action Documentation

3.1 Remedial Action Package

The RD Work Plan for Silos 1 and 2 specified that an RA Package would be submitted subsequent to this RAWP to provide appropriate documentation of the operations phase of the Silos 1 and 2 Project. As discussed in further detail below, each of the components identified for inclusion in the RA package is either no longer required, or is being addressed elsewhere. A standalone RA Package will, therefore, not be required.

Sampling and Analysis Plan - As defined in the RDWP, the purpose of the Sampling and Analysis plan was to document the sampling and analysis program to be used to demonstrate that the treated material met the numerical performance standards of the selected remedy. The ESD for Silos 1 and 2 removed the RCRA TC limits for metals as performance criteria for treatment, and requires that the material be treated, using chemical stabilization to meet disposal facility WAC. Consistent with what was agreed for the Silo 3 remedial action, a treated waste Sampling and Analysis Plan is no longer necessary as a Remedial Action deliverable. The final waste acceptance process at the selected disposal facility(s) will confirm the requirements, including any necessary process control or treated waste sampling and analysis data, for demonstration that the treated Silos 1 and 2 material meets the disposal facility waste acceptance criteria.

Health and Safety Plan - A summary of the health and safety controls is provided in Sections 2.5 and 8.0 of the RD Package.

Operation and Maintenance Plan - Included as section 2.0 of this RAWP

Gross Decontamination Plan – This will be addressed by the D&D Implementation Plan for the Silos 1 and 2 complex, which is to be submitted by December 16, 2004 in accordance with the OU3 Integrated RD/RA Work Plan.

3.2 Transportation and Disposal Plan

After being filled, waste containers will be staged, both indoors and outdoors, before being shipped off-site for disposal. The current plan is for direct truck shipment to the NTS. The on-site transportation infrastructure will, however accommodate transportation by either rail (direct or intermodal) or direct truck. The details of the transportation and disposal of treated Silos 1 and 2 material, including details on the disposal container and transportation vehicles, will be documented in the Transportation and Disposal Plan, which will be submitted in accordance with the milestone established in Section 4.

4 MILESTONES

ACTIVITY / DELIVERABLE	MILESTONE
Submit Silos 1 and 2 Transportation and Disposal Plan to U.S. EPA for review	September 15, 2004
Submit D&D Implementation for the Silos 1 and 2 Complex (including methods for decontamination of facilities and equipment) to U.S. EPA for review	December 16, 2004[1]
Initiate Silos 1 and 2 Remediation Facility Operations	October 1, 2005

[1]Existing milestone pursuant to OU3 Integrated Remedial Design/Remedial Action Work Plan as amended by DOE-0244-04, 5/6/04