

Critical Analysis Team Report #38

With Fluor responses

4 March 2004

As part of its mission, the (Critical Analysis Team) CAT has been planning Reliability, Availability and Maintainability (RAM) reviews for the three silo projects. The goal is to conduct the reviews when construction is essentially complete, but well in advance of facility startup. This allows the CAT to conduct a comprehensive review, yet still allows time for the projects' to implement recommended changes. During the first week of March 2004, the CAT conducted its RAM review of the Silo 3 project. The CAT thanks Fernald personnel for their time and effort in supporting the CAT's review.

Overall, the facility appears to have been designed and constructed for a brief operating period and a low-maintenance philosophy. In other words, equipment and instrument locations, room geometry and organization, safety equipment presence and locations all appear to assume that the facility will operate as planned with little or no equipment failure or upset conditions. If this proves to be the case, the facility as constructed will be suitable to meet the project's mission. If, on the other hand, difficulties are encountered, they could 'snowball, making recovery a difficult and costly process. Many of the design oversights observed are probably not intentional. Rather, they are likely a result of inadequate involvement of human factors and qualified operations and maintenance personnel during design review.

Response: Operations and maintenance and safety personnel were involved during design review.

Following are several comments that illustrate the above point:

- Many valves, lights, cameras, heaters and dampers are located in areas that appear extremely difficult to access for maintenance, replacement or adjustment purposes.
- No first aid kits, stations or emergency equipment are visible.
Response: Equipment will be on emergency vehicles. If supervision becomes trained as "First-Responders" equipment may be added to facility).

- While exits are labeled, exit arrows/routes are not yet present throughout the facility.

Response: Emergency egress routes were posted on each exit door.

- While the screw feeders are generally reliable, their location in the Silo 3 facility would make replacement activities very challenging (e.g. FDR-10-5102).

Response: Low probability for 3-6 months operation.

- The location of dust collectors and filters (e.g. FLT-10-5005, DCL-10-5002, DCL-19-5202A and DCL-19-5202B) will make bag-out activities very difficult. In addition, the project should consider using 'greenhouses' to control contamination if filter bag-out is necessary.

Response: Upper section of DCL-19-5202 A&B are housings that address above comment.. Also only one unit is planned for operations, second unit is redundant. Changeout of bags and cartridges for FLT-10-5005 and DCL-10-5002 is not expected for short duration of operations. Containment will be addressed by procedure and/or rad control requirements, and would not be installed unless changeout required.

- Much of the equipment is accessed via ladders. These ladders will be difficult to negotiate with clipboards, tools, air tanks and hoses. The ladders from the second to the third floor, and from the third floor to the fourth, in particular should be caged.

Response: Ladders are compliant with OSHA, and will not be caged. Operations controls equipment form the first floor. Operations will have one person per shift conduct rounds of upper level.

- Have plans been developed to evacuate an injured person from the second or third floor?

Response: CAT was informed that a walkdown with Facility Responders (Crosby TWP fire department) and site had already occurred and evacuation route determined. Emergency response planning is continuing.

- Because of its location, the position (closed or open) of DMP-19-5008 cannot be read.

Response: Punch-list item,

- The lights above the Blower/HEPA filter pad are high and difficult to access. It appeared that two of the three lights in this location were not working.

Response: Some of the lights are part of the emergency lighting system. Punch-list item: All lamps will be walked prior to start of operations.

- The entire facility includes three eyewash/safety shower stations. None have drains or catch pans.

Response: Correct. Water will be caught in container during testing of stations in an effort to maintain dry floors as an operations preference. Regardless floor drains have been installed that pump to the wastewater tanks for disposal. One of the safety showers is poorly located in the wastewater tank area. It is difficult to access and is adjacent to a source of chemical spray from the pressurized piping or pumps.

Approved location, no change planned.

- The facility does not yet have provisions for anti-c or chemical clothing donning and doffing requirements.

Response: Provisions are in place. During SOT PPE is not used. Will be added for ISOT.

- The facility does not appear to contain any fire protection beyond smoke detectors and fire extinguishers. Is the facility compliant with DOE fire protection requirements?

Response: Yes, CAT was advised that it is addressed , ref. DBR, code review, FHA, NHASP. Specifically DOE Memorandum, DOE-0320-00, J. Craig to D.L. Dever, January 22, 1999, *Change in Maximum Possible Loss Criteria at the Fernald Environmental Management Project*) requires fire protection (e.g., sprinklers) for

facilities with a value above a specified level; the Silo 3 facility is below the level requiring fire protection

- Manual dampers DMP-19-5206A and B are not within reasonable reach.

Response: Dampers outside of the facility are accessed using manlifts. Once dampers are adjusted during SOT no further adjustments are planned.

- The facility has many pieces of low-hanging and protruding pipes and angles where heads could easily get bumped. Pipes near the screw conveyor on the second floor are one example

Response: These pipes are on the backside of the screw-feeder where operator would not normally travel. The project is continuing to evaluate and pad head bump obstacles.

- The on-off switch for Fan 77-5792 is located in the back of the wastewater tank area; it would be more appropriate near the entry door.

Response: Operated by PLC

- Do the two ladders that allow ingress and egress from the Additive Storage Area require safety chains?

Response: No, below OSHA required height, also not a working platform, only for access over dike.

- Air blowers instruments (BLR-10-5006 and 5008) are nearly seven feet off the ground. They include a sign that reads, 'drain daily,' which could be difficult. In addition, the individual opening the device will be standing directly under the drain.

Response: will evaluate access in field with operations using step or ladder.

- The areas that may become contaminated under reasonable scenarios are not designed for decontamination. There are many flat surfaces (e.g. lights, junction boxes, cable trays, etc.) that are difficult to access and will act as contamination traps.

Response: Safe-shutdown will decontaminate and lock-down facility for disposal in the site OSDF. Areas are not accessed for decontamination. Typically the shear cuts and lowers items for disposal. Decon occurs at the floor elevation.

Although the operating schedule is planned to be of a short duration, the facility is not user-friendly from accident, failed equipment replacement, or maintenance standpoints. Because of this, the project should consider preparing 'what if' plans for potential off-normal events. Each plan should briefly describe the options that would be taken to rectify the event.

Response: Contracts are in place for vendor technical support. Redundant equipment for critical systems are already in place ie. 2 PVS dust collectors, 2 pneumatic blowers, 2 packaging lines, 2 retrieval methods, spare ACU.

Truck Additive Unloading Station

Historically, truck unloading stations are a high incident area. Therefore, truck unloading stations need to protect against misconnections, spills and generally foreseeable events. The truck additive unloading station should...

...have a light installed directly above the station to ensure adequate illumination for evening or night delivery. The current light is tens of feet away at the corner of the building.

Response: No deliveries received at night.

...provide a catch-pan for any spills.

Response: Portable catch-pans are used and placed during unloading. Not kept on the pad during SOT.

...ensure that transfer connections are unique to prevent misrouting. The ferrous sulfate line connector and the LPW-625107-2"-101 connector are the same. These should be different size or type connectors to prevent inadvertently pumping ferrous sulfate into the water system.

Response: Verified connections are unique.

...not have the spill retrieval line connected to the additive storage tank as it is currently (this solution would more appropriately be transferred to the wastewater tank or sump).

Response: This capability was provided for safe-shutdown phase providing two tanks for decon water.. Transfer line would be closed during operations.

...ensure the truck driver cannot overfill the additive tank.

Response: Instrumentation in place with alarms (Hi and Hi-Hi Level.)

...provide for communication with the control room.

Response: Vendors are escorted, supervised, radios available, also CCTV located over load-out area.

Blower/HEPA Pad should be enclosed in a building.

The CAT strongly recommends that this pad be enclosed for the following reasons:

Response: Will not be done due to operating schedule in summer and short duration 3-6 months.

- It is likely that during wet, cold and windy weather, the HEPA filters will collect condensation. This could result in filter failure.
- The HEPA filter banks should include preheaters to avoid condensation and should be heat traced unless they are in a heated enclosure.
- Instruments and motors are exposed to the elements. Some pressure gauges are already showing signs of condensation (PDI-FLT-19-5204BA).
- Bagging out and changing filters outdoors could be difficult in inclement weather.
- One filter door is six and a half feet above the ground and weighs 60 pounds. Changing this filter will be a difficult, multiple-person job. It will be made even more difficult if it must be done outdoors in freezing weather.
- Response: Site uses buddy system. Filters have already been installed without difficulty. Worker access platforms are used.
- Currently, seven downspouts collect stormwater and deposit it on the pad. The pad is not suitably sloped to ensure drainage. As a result, the pad could be dangerous during rain, snow, ice and freezing rain events.

Response: Construction worked on the pad and roof during this past winter and address the drainage issues. Downspouts are a punchlist item for structural contractor to complete when he returns to complete walkplanks.

If the Blower/HEPA Pad is not enclosed, the project will likely experience operations delays and interruptions.

Roots Blowers

The Roots blowers are critical to the operation of the pneumatic system. Although reliable, replacement blowers are not likely readily available and, therefore, a blower failure would have significant project impacts.

Response: Have smaller spare blower. Also have spare parts list for components located inside sound-control housing.

The Roots blowers (BLR-10-5006 and 5008) do not appear to be rigidly mounted to the slab and leveled as per the installation manual. In addition, the Roots blowers installation manuals suggest expansion joints on the inlet and outlet to protect the case and isolate piping loads and vibration. The large blower as installed at Silo 3 does not have such expansion joints. The smaller Roots blower is properly isolated as are the adjacent HVAC exhaust air fans. Lastly, this may be a high-noise area requiring hearing protection.

Response: The blower provided by Hi-Vac was also part of their engineered design and provided without flex joints. Discussions with Hi-Vac engineering manager confirm that expansion joints are not required for this installation, and that piping is sufficiently supported to prevent damage to the blower. The blower is located inside of a sound enclosure. Noise levels will be checked. Area not normally occupied.

The Roots blowers have very tight tolerances. The vendor data identifies the need to ensure the inlet piping is inspected for cleanliness before connecting to the blower inlet flange. This is very important. A piece of rust or sand could damage or even destroy the blower. The pipe between the HEPA Filter and the blower inlet should be re-inspected and wiped clean prior to blower startup.

Response: QA verified flush and cleanliness. All equipment has been opened and inspected by SOT team. Unit has been run-in tested already.

Excavator Room

The excavator room currently has at least one leak in the roof through a roof penetration.

Response: Leaks are known and on punch-list item. Leaks could not be repaired during cold weather. Contractor is scheduled to make repairs

An easy-to-decontaminate paint (such as Amercoat) should be applied to the excavator room walls, ceiling and floor. The current wall and floor coating has left pitting and roughness features that will be very difficult to decontaminate.

Response: The concrete has been sealed and additional coatings will not be applied as a cost-saving measure. This was the recommendation of the site team that addressed safe shutdown requirements. The site has equipment that can decon with or without paint.

The facility valves and switches should be protected from inadvertent or unauthorized operation.

Response: Per site procedure valves are not locked out for operational control. Valves are controlled by PLC. During SOT valves and switches that are part of SOT they are identified by sign "Test in Progress"

Following are several examples of valves and switches that appeared particularly in need of locking out:

- AOV-10-5836, AOV-10-5837, AOV-10-5838, AOV-10-5839, and AOV-10-5840.
- Fan-71-5760A and B.

Radon detector may not be placed appropriately

In the process bag filling area, where the radon detector is located, the air enters the process room at approximately 20 feet above the floor and exits at approximately 15 feet above the floor. Because radon is lighter than air, it is unlikely that radon would be detected given the current position of the detector.

The CAT found no evidence on either the drawings or in the facility of Continuous Air Monitors, friskers, portal monitors, or survey stations. Is the facility compliant with radiation control requirements?

Response: Radon detectors are placed in accordance with requirements established in the approved Health Physics Plan, Appendix H in the NHASP. The placement of the equipment would not be on the engineered drawings since they are portable and final locations may vary depending on the air flow of facility. Some units are shown on the drawings for installation of receptacles. Not all monitors were placed during CAT visit.

Breathing Air

The facility contains six breathing air stations. All of these are located in potentially contaminated areas.

Response: Units located based on need and accessibility, and in accordance with site practices, and compliant.

The CAT could not locate the back-up portable breathing air system or its connection point identified on Sheet N0110.

Response: Was not installed at time of visit. Work scheduled for week of 3/15/04.

The existing breathing air system does not provide for humidification of air. The breathing air system should ensure air is humidified after the dryer but prior to reaching the worker to prevent the discomfort of breathing unusually dry air.

Response: Units are compliant with requirements for breathing air.

The temporary enclosure surrounding the plant air and breathing air generation area should be permanent to protect these systems from the elements.

Response: Permanent enclosure has been installed. Only the additional panels and insulation blankets added during winter for maintaining warm temperatures will be removed.

Turnover Packages

The Construction Acceptance Test Conditional Turnover packages seem to be a thorough and disciplined turn-over approach.

Package #309 covering system 19 was briefly reviewed. The vendor tab contained lists of vendor data document numbers for pressure and flow instruments but did not include the dust collectors DCL-19-5202A and B, HEPA filter units FLT-19-5204A and B, exhaust fans FAN-19-5206A and B or the backdraft damper BKD-195234.

Response: Package assembled for convenience of reviewer. Information available in ECDC, Will add for future reviews if determined necessary.

The stroke tab lists valves checked by the construction contractor quality organization. The operation of valves that control important functions should be verified by Fluor Fernald instrument staff.

Response: this has been done. Fluor Fernald QA is independent of the contractor and QEPs are submit by FF to verify contractor QC. The QEP list provided to the CAT for review was prepared by Fluor Fernald not the construction contractor.

Miscellaneous Observations and Comments

Attendance at a Silo 3 'plan of the day' meeting indicated work was well planned and coordinated and all involved appeared engaged and supportive of one another.

The project does not appear to be 90-95% complete with redlines.

Response: Initial set of redlines issued at TO at 100% complete for work completed todate. Redlines will continue to be revised upon completion of DCNs and to address changes made during SOTs. Prior to operations all drawings will be revised to next rev. number.

Lines PRS-105001-3"-126 and PRS-105060-3"-127 were installed for sampling activities on the fill unit. The samplers have been abandoned but the lines are still active and physically interfere with personnel on the walkway. These lines should be cut at the branch and capped.

Response: Lines are for vacuuming potential material spill or removeing material from packaging chute. Access to chute is at blind flange installed where sampler was previously located.

FDR-10-5104 is an unsupported stainless steel 3/8" air-line. It should be placed in a U-channel to prevent personnel from contacting and causing unintentional damage to the line.

Response: Comment noted.

A cursory review of Standard Operating Procedures shows no utilization of schematics. Schematics are useful to operators and should be included in the SOPs.

Response: Not per site procedures. Operators will use P&IDs. Also process engineers will remain on project during operations. As explained the operating schedule is too short to expect complete proficiency for all operating conditions. Not a long-term operation. For example, Jacobs P&ID Sheet N0101, is too busy and will be inconvenient for operators to use. Schematics should also be considered for field located control panels.

Response: Electronic schematics known as "face plates" are made for the HMIs. This will be available in a manual.

The Breathing Air Procedure (11-C-312, Rev. 0, page 4 of 11, 5.1.1) states a requirement for checking "once every calendar year to local procedures." However, there is no reference to what defines a 'local procedure.'

Response: Comment noted. Procedures are draft and will be reviewed by site committee for compliance with site procedure.

The Breathing Air Procedure (11-C-312, Rev. 0, page 6 of 11, 7.1.1) requires safety checks without defining how an operator determines whether such checks were made or what checks were required. Comment noted. Procedures are draft and will be reviewed by site committee for compliance with site procedure.

HEPA filter containments currently drain to the environment via a hand operated valve. This potential contamination source should be contained and collected in an appropriate vessel or sump.

Response: Drains were added at the vendor shop. They will be capped prior to operations.

DMP-19-5220 and DMP-19-5222 should be cut off flush with the pipe and sealed. These legs were provided for sampling but are not necessary. If left as is, the drop-legs could fill with liquid, freeze and break.

Response: Will address if operational during winter months.

CS-445326-1"-101-HC-ET is labeled only on duct tape.

Response: Punch-list item . Has since been completed.

FLT-41-5361, FLT-41-5362, FLT-41-5363, and FLT-41-5364A and B are not tagged.

Response: This was a punch-list item. Tags are normally placed with 2 days after item identified. These are now tagged.

The Silo 3 project should consider a 24 hour/day, 7 days/week operation to further shorten the operating schedule and provide a longer period of time between Silo 3 and AWR operation.

Response: This schedule is not in current contract. Different schedules evaluated and 4-24s are most cost-effective and complete operations in time needed for AWR..

The Silos Project should consider the significant increase in heavy truck traffic into and out of the Silos area. The existing roads are rough, narrow and include several sharp turns. A route should be installed to meet the requirements of heavy-duty use

Response: Addressed in Silos 1 and 2 Project scope. Upgrades will be done in time for shipping.