CRITICAL ANALYSIS TEAM TRIP REPORT
Silos 1 & 2 Fill System Demonstration, Duratek, Inc.
Knoxville, Tennessee
19 November 2003

Two members of the Critical Analysis Team (CAT) attended the Silos 1 & 2 Fill System Mock-up Demonstration in Knoxville, Tennessee on 19 November 2003. The fill station was mocked up to simulate the transfer cart, fill station, and lidding station. The gantry manipulator was also available, as were the control systems and the digital vision system. Two complete test cycles were run. On the second test, grout was placed in the container. The test went well with the exceptions noted below. The CAT felt the system would perform its intended functions, probably in less time than was predicted in the time and motion studies.

1. In general, the test was well organized, comprehensive and largely successful. Silos 1 and 2 is working closely with the several involved contractors to improve the reliability of the fill system, particularly the gantry manipulator. The Duratek "team" appeared competent, engaged, knowledgeable and willing to meet the project's challenges. The CAT thanks DOE-Fernald, Fluor Fernald and Duratek for the opportunity to observe this test.

2. The Z-motion (upward only) of the gantry manipulator caused the manipulator's end effector to vibrate. This was observed several times. The explanation provided was that during testing some wear had occurred and allowed slight vibration to occur. In addition, the length of the Z-motion amplified the vibration. The production manipulator's Z-motion will be about 18 inches less than the demonstration test manipulator. When time allows Silos 1 and 2 should examine the Z-motion assembly to verify wear is the cause of the vibration. If not, the cause should be determined and corrected. If so, repair parts for the assembly should be ordered and placed in warehouse storage should a repair during waste treatment be required. The gantry manipulator has not experienced a great number of cycles, and wear should not yet be a problem.

3. Silos 1 and 2 should perform "what if" studies to identify unusual/off-normal events that might occur during fill system operation. The results of this study should be used as appropriated to identify necessary design changes, needed spare parts or modified operating and maintenance procedures. The study should also identify the time and resources needed to recover from each postulated occurrence.

4. After waste container filling and during fill chute vibration, operations will be required to wear hearing protection because of the noise level.

5. During the test, there were four unusual occurrences: twice the manipulator failed to pick up rivets from the storage tray, one rivet was dropped and the lid missed the alignment pins once while being positioned on the cask. In each case, the gantry was repositioned and the action successfully completed. This represents four failures in two cycles. This is a much greater failure rate than was claimed for the past 120 (approximately) cycles.

6. Much of the fill system structure and associated support equipment is not assessable for maintenance: the top of the gantry manipulator, especially the Z-motion; the TV cameras; the manipulator motion limit switches; and, the gantry bridge and trolley. The only way these items could be accessed for maintenance would be through the use of a 15-foot stepladder placed beneath the gantry manipulator, or installing scaffolding.

7. The fill chute bellows bent in an awkward manner upon retraction. If the bellows bends in the same manner at each retraction, it could lead to a weakening and eventual failure.

8. The fill system has been cycled approximately 120 times in the past 2 months without any serious failures. FF estimated a failure rate of about 5%.

9. The software is working well. Minor changes are being made when the necessity arises. Access to the software is controlled.

10. The canister fill cycle time is averaging slightly less than 1 hour, better than anticipated.

11. The fill chute knife gate valve is still being modified to correct some potential deficiencies with the valve seal.

12. The gantry Z-motion can be quite rapid if desired. Would recommend a slow motion to prevent possible damage to the Z-drive should a rivet miss the hole and strike the lid resulting in an abrupt stop of the Z-motion.

13. The gantry manipulator now has only two end effectors, one for rivets and the other for lid movement. Both have been functioning well without any failures.

14. Operations personnel will be required to enter the fill cell once each shift to place rivets in the pickup tray. This should not present a problem given the low radiation levels present in the cell. However, procedures need to be prepared and tested to assure there will be no unanticipated problems when performing this operation.

15. The drip tray functioned will, but the tray was a temporary replacement while the original tray was undergoing some minor modifications. A very small amount of grout dripped into the tray. Evidently, the vibrator successfully cleared the fill chute.

16. The plan is to retain the mockup for several months and use it to develop operating and maintenance procedures, training and problem resolution.

CAT TEAM FERNALD SITE VISIT

On 20 November 2003, one member of the CAT visited the Fluor Fernald Sit for a brief review of the Silos Project status. The primary focus of the visit was to review the approach to the process control system software.

1. The control systems for the sluicer and the slurry pump have been received and were being tested. The sluicers and pumps are not yet installed, so operability testing is 2-3 month away.

2. The approach to the control system software appears disciplined, documented and controlled. The system design and logic is being developed by teams including design, process engineer, operations and the software developer. This approach will eliminate most of the problems encountered in the RCS startup.

3. Operations is beginning to add staff in preparation for control system testing, acceptance testing and operability testing.

4. Silos Construction has added significant resources since the CATs last visit. As a result, construction appears to be "under control". Schedules at the work package for Silo 3 were not completed because construction is supposed to be completed the first week in December. Crafts have also been added to the Silo 3 project.

5. AWR is also scheduled to complete construction in early December. Safety awareness has been emphasized on this project, with some disciplinary action being required, including one termination. Safety performance has improved significantly.

6. The second shifts appear to be effective. Saturday work is not routine, but being used judiciously to regain schedule.

7. Silo 3 is experiencing fit-up problems with vendor supplied equipment. The inclined conveyor was received and accepted with a flat belt instead of the "bucket type" belt specified. Given the slope of the conveyor (approximately 60 degrees) the conveyor cannot move material from the excavator room to the storage tanks. This could require some time to repair. The belt will probably not be replaced by the first week in December.

8. The operating and construction schedules have not yet been integrated. That may be achieved for Silos 1 and 2, but probably not for Silo 3 and AWR.

9. Most of the remaining construction work on AWR is small bore piping, electrical and instrumentation. These efforts can frequently be the most time consuming, depending upon the quality of the design documents.

10. The sluicer and slurry pump test stand appears to be a good effort. The pumps and sluicers are not yet installed, but the test stand should be an excellent tool for training operations and maintenance personnel, and developing procedures and techniques.

11. Both Operations and Construction are requiring more staff than anticipated. This is somewhat reflected in the October cost report cost overrun is now being shown as approximately $40 M.