

## Critical Analysis Team Report

### CAT Report #30

21 August 2002

The Critical Analysis Team attended the Accelerated Waste Retrieval Integrated Test Loop at TPG on August 20, 2002. The CAT thanks the TPG Applied Technology staff who were knowledgeable and very helpful in explaining the equipment, tests, and results.

Overall, the tests have provided confidence that Silos 1 and 2 K-65 materials can be successfully retrieved through sluicing. The test was very successful and appeared to adequately represent the current design.

Following are test observations that confirmed the current design:

- The sluicing nozzles, slurry pump and water jets on the slurry pump were able to form a sluicing pool and both bentonite and simulant were successfully retrieved. The CAT judges this equipment to be appropriate for successful sluicing of silos.
- The line size and velocities appeared sufficient to avoid plugging, even in the most conservative scenarios (e.g. complete cessation of pumping).
- Visual appearance of grab samples of the slurry were judged to be 20-30 weight percent solids.

Following are test observations that suggest design changes:

- The Isolock sampler did not appear to provide representative samples (in comparison with those taken from the slurry discharge line). Moreover, the use of the samplers is not absolutely required for this project. As a result, if minimal efforts cannot be found to ensure adequate performance, the Isolock samplers should be eliminated from the design.
- The lack of plugging during the test indicate the cleanout ports are probably not needed. In addition, these ports are expensive and pose maintenance difficulties. As a result, the project should consider removing the cleanout ports from the design.
- The agitator on the slurry pump does not appear to be assisting (and may be hindering) the retrieval process. The agitator should be removed and a 30 minute retrieval test run to validate this.
- Several of the instruments—density and pressure, in particular—are not providing useful information. The instrumentation needed for operations is the pump RPM and a magnetic flowmeter. The other instruments are not needed and the project should consider removing them from the design.
- A 250 gpm flush water line at 150 psig to the slurry pump suction to allow sluicing the pump into the solids and eliminate the high pressure system now in the design should be considered.

Additional Comments/recommendations:

- Test data should be analyzed and reports prepared prior to disassembly of the testing apparatus, in the event additional tests are needed.
- The video from the test should be shown at the 9 September 2002 Silo 3 Technical Roundtable.
- The CAT expected both AWR and Silos 1 and 2 project personnel to be present at the test. Engineering and Operations and Maintenance will need to ensure that project personnel are adequately updated on the findings of the tests.
- The success of this test shows the importance of mock-up in confirming design assumptions. As a result, the Silo 3 retrieval, as well as the Silo 1 and 2 cask handling and loading operations, should also be mocked up.
- The test plan states that the Cold Test Loop will be operated for 25 days (around the clock) to determine component erosion. This should be completed with the bentonite slurry, with subsequent inspections. This will likely give valuable insight into maintenance needs for the facility.
- While the larger particles settled rapidly, the bentonite did not appear to settle when the CAT visited the test facility the following day. Still, the supernatant should be suitable for sluicing the silos.
- The operation mode that seem to work best is to control flow with pump speed control and sluice with one 300 gpm sluicer at a time. The solids in the slurry will vary—from 5 to 30 wt. % solids with little to operating problems.
- The slurry flow rate dropped from about 300 gpm to 50-60 gpm at constant pump rpm near the end of the test. Recovery was achieved by reducing pump rpm briefly then increasing to previous setting. After the test, it was observed the holes in the upper part of the screen were plugged. Because this didn't occur with previous tests, it may indicate that bentonite 'stickiness' is plugging the screen.
- Two final concerns should be addressed by the project: (1) the ionic strength of the supernatant during sluicing may be much higher than the surrogate and could have a negative impact on settling rates; and (2) The silos chemical analysis should be reviewed to identify any soluble salts that could precipitate if flow stops or cools thereby creating a plug and making it more difficult to restart. Could sodium carbonate, sulfate or phosphates precipitate at transition temperatures within expected operating ranges?

The CAT again thanks, DOE, Fluor Fernald and TPG for the opportunity to observe the tests.