U. S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket No.	70-7002
Certificate No.	GDP-2
Observation Report No.	70-7002/96008(DNMS)
Applicant:	United States Enrichment Corporation
Facility Name:	Portsmouth Gaseous Diffusion Plant
Location:	3930 U. S. Route 23 South P. O. Box 628 Piketon, OH 45661
Dates:	December 7, 1996, through January 24, 1997
Inspectors:	C. R. Cox, Senior Resident Inspector D. J. Hartland, Resident Inspector
Approved By:	Gary L. Shear, Chief Fuel Cycle Branch

EXECUTIVE SUMMARY

United States Enrichment Corporation
Portsmouth Gaseous Diffusion Plant
NRC Inspection Report 70-7002/96008(DNMS)

This observation report includes aspects of plant operations, maintenance, and engineering. Observations were made by the resident inspectors as part of their routine duties.

Authority Statement: The Department of Energy (DOE) and the Nuclear Regulatory Commission (NRC) have agreed to cooperate to facilitate the NRC's obtaining of information and knowledge regarding the gaseous diffusion plants and the United States Enrichment Corporation's (USEC) operation thereof through observation/inspection activities during the interim period before the NRC assumes regulatory responsibility. This report is a summary of NRC observations for the period stated. Each of the observations was communicated to the DOE site safety staff and USEC site staff during and at the end of the observation period to allow for their future followup and evaluation, as appropriate.

Plant Operations

The December 16, 1996, movement of a cylinder by unauthorized means demonstrated that the corrective actions from a previous event in 1994 were not effective (Section O1.2).

A prolonged unreviewed safety question determination for a Safety Analysis Report discrepancy identified poor coordination among plant departments and led to inadequate compensatory actions (Section O1.3).

An unauthorized cylinder fed into the cascade was symptomatic of continued problems with the conduct of operations, communications among work groups, and inadequate corrective actions (Section O1.4).

The facility was initiating a formal tracking system for identified uranium deposits in the cascade. However, the large tails imbalance indicated a potential for a number of unidentified deposits (Section O1.5).

Maintenance

Materiel condition issues continue to impact the reliability of safety-related systems and provide challenges/distractions to operators, increasing the probability of a significant event (Section M2.1).

Engineering

Despite having several previous opportunities, the facility failed to identify and correct Safety Analysis Report (SAR) and Operational Safety Requirement (OSR) non-compliances regarding the use of raschig rings in scale pits (Section E2.1).

While there were no immediate nuclear criticality safety (NCS) concerns with regard to an unbuffered uranium deposit in the cascade, the plant continued to have problems with lack of rigor in engineering analyses and comprehensive corrective actions (Section E2.2).

REPORT DETAILS

Summary of Plant Status

The plant operated at approximately 1450 MW during most of this observation period. High enriched uranium (HEU) refeeding operations were resumed during this observation period.

I. Operations

O1 Conduct of Operations[1]

O1.1 General Comments

The inspectors observed selected operational activities. Specific events and noteworthy observations are detailed in the sections below.

O1.2 Movement of Cylinder By Unauthorized Method

a. Inspection Scope

The inspectors reviewed the events involving a tails cylinder that was moved by a straddle carrier before its cooldown period was completed. Inspection activities included reviewing reports, observing the critique, and interviewing personnel.

b. Observations and Findings

On December 16, 1996, three-fourteen ton uranium hexafluoride (UF_6) filled tails cylinders were scheduled to be moved, by a straddle carrier, from a railcar in the Tails Withdrawal area to the cylinder yard. At approximately 12:00 a.m., on December 16, 1996, a Tails operator was assigned to remove the caution tags and valve covers after verifying that the cooldown period had been met. The operator removed the tags and valve covers on two of the cylinders but noted that the third cylinder's caution tag stated that the cooldown period would not be met until 1:15 p.m., on December 16, 1996. Therefore, the operator did not remove the tag or valve cover for that cylinder. The operator then left the Tails Withdrawal area to notify his first line supervisor about the third cylinder.

The early morning shift for the Uranium Material Handling (UMH) crew arrived at the Tails Withdrawal Station at approximately 1:20 a.m., on December 16, 1996, with orders to move the three cylinders. The crew's crane operator moved the two cylinders that

---

[1]Topical headings such as O1, M8, etc., are used in accordance with the NRC standardized inspection report outline contained in NRC Manual Chapter 0610. Individual reports are not expected to address all outline topics, and the topical headings are therefore not always sequential.

had the caution tags and valve covers removed into the track alley for the straddle carrier driver to pick up. When the crane operator saw that the third cylinder still had its caution tag and valve cover attached, he briefly looked at the caution tag and noted that the end date for the cooldown period met the day's date so he removed the tag and valve cover. The crane operator then moved the cylinder into the track alley. The straddle carrier operator then moved the three cylinders into the cylinder storage yard.

Shortly after the movement of the three cylinders, the Tails operator came back to the Tails Withdrawal area and asked the crane operator where the third cylinder was. The crane operator stated what had happened and the Tails operator said that he thought there was a problem in that the five day cooldown period had not been met for that cylinder. The two personnel then went to the storage area and verified that the cooldown period would not have been met until 1:15 p.m., on that day. The Plant Shift Supervisor (PSS) was notified that there was a movement of a cylinder by unauthorized means. The PSS had barricades placed around the cylinder and a critique was held at 5:00 a.m., that morning. The UMH crew stated during the critique that they all knew that the cooldown periods for cylinders had to be met before movement by mobile equipment. They stated that at the Low Assay Withdrawal (LAW) station and the Extended Range Product (ERP) station, a station operator, acting as a spotter, would verify that the cooldown period had been met; at the Tails station, the crane operator would do the verification; and at the X-340 complex, the straddle carrier or forklift drivers would do the verification.

The movement of the cylinder before the cooldown period had been met was being reviewed by the Department of Energy (DOE) for regulatory action.

c. Conclusion

Moving a liquid UF_6 cylinder with mobile equipment is a primary contributor to the design basis accident of a ruptured cylinder. As a result of a 1978 event, where a liquid UF_6 cylinder was dropped, the facility's SAR and Technical Safety Requirements (TSRs) specifically prohibited the movement of cylinders that have not completed the required cooldown period. The event was the second movement of a cylinder by unauthorized means in two years. The other event was the movement of a ten ton cylinder on December 29, 1994, and documented in Portsmouth Observation Report 70-7002/95001(DRSS).

The five day cooldown period was missed by only 12 hours for the recent event and therefore, the potential for a large release was minimized. However, the corrective actions from the 1994 event failed to prevent the recent event. The organizational

fragmentation noted in 1994 was demonstrated in 1996 when the Tails operator left the cylinder after verifying the cooldown period had not been met and the UMH crew moved the cylinder without any communications with or turnover from the Tails operator required. The lack of communications or turnover left no one responsible for the cylinder. The differences in administrative controls noted in 1994, were again demonstrated in 1996 when the job classification deemed responsible to verify the cooldown period differed at the various areas where the cylinders were handled.

O1.3 Failure to Use Pigtail-Plug Switch at ERP Station

a. Inspection Scope

The inspectors reviewed the circumstances regarding the plant's failure to take action to correct a deviation from the FSAR in a timely manner.

b. Observations and Findings

On December 23, 1996, the plant reported, per DOE notification requirements, the failure to use the pigtail-plug switches associated with cylinder movements at the ERP station. When used, the switch was threaded into the open pigtail nut in order to activate a solenoid valve in the air supply line to the scale cart. This would prevent an operator from moving the cart from the station with the pigtail attached to the cylinder.

The plant determined that the condition was reportable as an unreviewed safety question due to the increase in the probability of an occurrence resulting in an adverse consequence. The use of the switch as a safety feature was described in Section 4.2.2.4.6 of the DOE SAR. The inspectors noted that the condition was identified and documented in PR PTS-96-6328 on September 22, 1996. However, the plant did not take action to ensure that the switches were being used until the evaluation of the as-found condition was completed in December. The delay was apparently due to a lack of communication between regulatory assurance and operations in the plant.

c. Conclusion

The safety significance of the event was minimal as an additional feature existed to prevent cylinder movement with a pigtail attached. The air supply hose to the cart is locked to the hose reel and the key is attached to the pigtail before connecting the pigtail to the cylinder. However, coordination among plant departments and inadequate compensatory and/or corrective actions continue to be a problem in the plant.

O1.4 Unauthorized Cylinder Fed Into Cascade

a. Inspection Scope

The inspectors reviewed the circumstances regarding the unauthorized feeding of a cylinder into the cascade from the X-342 building.

b. Observations and Findings

On January 14, 1997, the plant discovered that an unauthorized cylinder was mistakenly fed into the cascade from the X-342 building. The cylinder number was included on a list of cylinders to feed, but was crossed out prior to being faxed to operations from customer order management. Operations apparently mistook the cross-out with other lines that appeared on the faxed page.

The inspectors noted, however, that the list provided by customer order management to operations was only intended to be used as a planning tool. Cylinder handlers and autoclave operators would use the order, and not verify on the Dynamic Materials Control and Accountability System (DYMCAS), that customer order management had authorized the cylinder to be fed prior to movement. While the operations procedures did not provide clear guidance on the use of the DYMACS as a second check, discussions with plant personnel indicated that the procedures' intent was to require a second method of verifying orders.

The inspectors also noted that a similar event occurred in September 1996, as documented by PR-PTS-96-6602. However, the plant had not yet implemented any corrective actions to prevent the latest occurrence. In response to the more recent event and the cylinder movement event noted in paragraph O1.1, the plant revised the process to require the use of DYMCAS as the sole source of information for cylinder status.

c. Conclusion

The event had no adverse affect on cascade operations. However, it is symptomatic of continued problems with conduct of operations, communications among work groups, and inadequate or untimely corrective actions.

O1.5 Tracking of Planned Expeditious Handling (PEH) Deposits Within the Cascade

a. Inspection Scope

The inspectors reviewed the status of identified deposits of UF_6 other uranium compounds within the cascade.

b. Observations and Findings

On January 21, 1997, the inspectors noted the continuing large tails imbalance and inquired into the large number of identified PEH deposits in the cascade and their status. As of that date there were eight PEH deposits in the cascade that were being tracked in the Nuclear Safety Issues list in the Morning Report and on the PSS's status board. One deposit in the X-330 Building had been identified as far back as May 7, 1996, and was still in place and undergoing cell treatment to try to remove the deposit.

The Cascade Manager acknowledged that the tracking system was informal and the staff was in the process of developing a procedure to formalize the tracking. The Cascade Manager recognized that the status of PEH equipment would become a TSR issue after certification due to the TSR requirements of developing a plan of action for treating the PEH deposit within 30 days of discovery, removing the equipment with the deposit within 180 days of removal of the fluorinating environment and/or ending cell treatment, and decontamination of the equipment within 72 hours from removal. Therefore, he had requested a more formal program be initiated.

The inspectors noted that cell treatments of the deposits were having a limited effectiveness due to complications caused by the poor materiel conditions in the cascade discussed in paragraph M2.1.b.

c. Conclusions

The continuing large tails imbalance discussed in previous reports, particularly Portsmouth Observation Report 70-7002/95005(DNMS), raises questions about how many more deposits are in the cascade that have not been identified and the effectiveness of the monitoring program to identify those deposits.

II. Maintenance

M2.1 Maintenance and Materiel Condition of Facilities and Equipment

a. Scope

The inspectors assessed the materiel condition of the plant for impact on equipment reliability and challenges to operators.

b. Observations and Findings

The inspectors noted the following materiel deficiencies during the period:

- The plant continued to have problems with Criticality Accident Alarm System (CAAS) detectors during the inspection period. Portsmouth Observation Report 70-7002/96007(DNMS) discussed failure of the "new" type detector crystals to pass as-found calibration testing. The plant determined at that time that the problem was due to excessive heat on the X-330 and X-333 cell floors, but that it was limited to the "new" crystals. As immediate corrective action, the plant decreased the surveillance interval from six to three months for the "new" crystals in high heat areas.

  During the current inspection period, three of the "older" type detectors failed as-found testing. The plant took appropriate action to immediately declare questionable detectors inoperable and test them. The plant also decreased the surveillance interval for the "old" detectors located in high heat areas.

  The inspectors noted that the root cause for the high temperature on the cell floors was degraded ventilation systems. The plant has prepared an action plan to repair the ventilation and ensure long-term reliability of the CAAS detectors.

- The inspectors noted that the plant encountered a combination of materiel condition problems in the cascade including high freon content due to cooler inleakage, reroutes of process gas due to deposits, degraded X-333 cold recovery, and administrative and physical restrictions for bleeding oxidants from drums from the X-330 and X-333 buildings.

  These problems required work-arounds (i.e., special valve line-ups) to free up limited surge and waste drum space to support cell maintenance activities. The inspectors concluded that the work-arounds presented distractions/challenges to operators which increased the probability for a significant event.

- The plant was also having problems with the materiel condition of the condensate collection system for the cascade drop heaters. Condensate would back-up into the heaters, preventing them from maintaining desired temperatures in the housings. Low temperatures in the heaters could result in deposits, a nuclear criticality safety (NCS) concern, and may be a contributor to the continuing high tails imbalance. In response to the inspectors' concern, the plant has developed an action plan to upgrade the condensate collection system.

c. Conclusion

Materiel condition issues continue to impact the reliability of safety-related systems and provide challenges/distractions to operators, increasing the probability of a significant event.

III. Engineering

E2 Engineering Support of Facilities and Equipment

E2.1 Control of Nuclear Criticality Safety Features (Raschig Rings)

a. Scope

The inspectors reviewed the field verification process for implementation of Nuclear Criticality Safety Approvals (NCSAs)/Nuclear Criticality Safety Evaluations (NCSEs).

b. Observations and Findings

Nuclear Criticality Safety personnel conducted numerous field verifications of Plant Operations Review Committee (PORC) approved NCSAs in preparation for transition to NRC regulatory oversight. The field verification process was conducted as described in XP4-EG-NS1020 "Completeness Review and Field Verification of NCSAs/NCSEs". Numerous discrepancies were identified and were documented on the NCSA Completeness Checklist, Appendix A of XP4-EG-NS1020. Problem reports were generated to address the discrepancies.

On January 6, 1997, the ERP station scale pits were inspected to verify raschig ring depth. Raschig rings were added to sumps or pits to provide volume control and neutron absorbing poisons as an additional criticality safety control. The rings were borated glass rings. The depths in some of the scale pits were found to be less than the NCSA and TSR/OSR required depths of 12 inches and six inches. The ERP station was shutdown while a critique was held to investigate the OSR requirements. It was determined that one station could not be filled to the required 12 inch depth without hindering the scale's operation and therefore, further safety analysis had to be conducted to resolve the issue. As a result of the problem at the ERP station, the LAW station was secured and inspected for compliance with the TSR/OSR required raschig ring depth. The LAW station met the TSR/OSR requirements.

Initially, the Tails station was not included in the corrective action of additional inspections because the Tails station scale pits were inspected on December 20, 1996. That inspection identified a SAR non-compliance when rings made of polyvinyl chloride (PVC) were found in lieu of the borated glass raschig rings as described in the SAR. The PVC rings were replaced in December 1996 with the glass rings. The Tails station was later

included in the corrective actions and re-inspected on January 10, 1997. One of the four positions (position 2) was found to be slightly less than the TSR/OSR required six inches.

c. Conclusions

The raschig rings in the scale pits were not part of the double contingency for Nuclear Criticality Safety. Rather, they were relied upon as an additional control if the cylinders on the scales would have a major leak of uranium hexafluoride.

The facility had several previous opportunities to identify and correct the SAR and TSR/OSR non-compliances. The use of PVC raschig rings had been identified by the NRC in Paducah Observation Report 70-7001/94004(DRSS) and Portsmouth Observation Report 70-7002/95001(DRSS). The lack of American National Standards Institute/American Nuclear Society (ANSI/ANS) Standard 8.5 "Use of Borosilicate-Glass Raschig Rings as a Neutron Absorber in Solutions of Fissile Material" recommended surveillances for raschig rings was also noted in Portsmouth Observation Report 70-7002/95001(DRSS) and was also considered an example of the surveillance problem noted in Section 7.0 of Portsmouth Observation Report 70-7002/96-203(DNMS).

E2.2 No Safety Analysis Performed For Unbuffered Deposit

a. Inspection Scope

The inspectors reviewed the plant's response to the identification of a deposit in cascade piping during a maintenance activity.

b. Observations and Findings

On December 18, 1996, during cascade valve maintenance, the plant discovered a large uranyl fluoride (UO_2F_2) deposit in a normally dead-leg section of unit bypass piping. The deposit was estimated to be 1750 pounds in the 30 inch piping, well beyond the equipment removal limit.

The Operations Assessment Team (OAT), which was activated for the event, concluded that a cover gas was not needed for moderation control because it would take an extended period of time to collect enough moisture from wet air inleakage to result in an NCS concern. The OAT apparently based this determination on an existing safety analysis that was performed in 1992 that evaluated the failure of the dry air system used to buffer a cell containing a deposit.

The inspectors noted, however, that existing guidance from NCSA documents and future TSR requirements require a cover gas for moderation control under these conditions. Although plant management intended to operate with the unbuffered deposit for a

period of time while the valve maintenance was completed, no follow-up evaluation was performed to ensure that the condition was not unanalyzed. In response to the inspectors' concern, the plant agreed to perform an analysis which had not been completed at the end of the inspection period.

The inspectors also noted that the corrective actions to the event, although not yet documented for review, appeared to be narrow in scope based on discussions with plant personnel. Although the deposit appeared to have existed for a long period of time, the plant did not question why their radiation survey program did not detect it, nor did they survey similar piping configurations elsewhere in the cascade for other deposits. Similar questions involving the effectiveness of the monitoring program were raised in Portsmouth Observation Report 70-7002/95003(DRSS).

c. Conclusion

The inspectors concluded that there were no immediate safety concerns with regard to the unbuffered deposit. However, the plant continued to have problems with lack of rigor in engineering analyses and comprehensive corrective actions.

IV. Management Meetings

X1 Exit Meeting Summary

The inspectors met with facility management representatives and the DOE Site Safety Representatives throughout the observation period and on January 21, 1997. The likely informational content of the observation report was discussed. No classified or proprietary information was identified. No disagreement with observations or findings, as described by the inspectors at these meetings, was identified.

Partial List of Persons Contacted

Lockheed Martin Utility Services (LMUS)

*D. I. Allen, General Manager
*J. E. Shoemaker, Enrichment Plant Manager
*M. Hasty, Engineering Manager
*R. W. Gaston, Nuclear Regulatory Affairs Manager
*G. S. Price, Maintenance Manager
*C. W. Sheward, Operations Manager

United States Enrichment Corporation

J. H. Miller, USEC Vice President, Production
*L. Fink, Safety, Safeguards & Quality Manager

United States Department of Energy (DOE)

*J. A. Crum, Site Safety Representative
*J. C. Orrison, Site Safety Representative

Nuclear Regulatory Commission (NRC)

*G. L. Shear, Chief Fuel Cycle Branch
*C. R. Cox, Senior Resident Inspector
*D. J. Hartland, Resident Inspector
C. B. Sawyer, Project Manager

* Denotes those present at routine resident exit meeting held on January 21, 1997.

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

None

Closed

None

Discussed

None

Certification Issues - Closed

None