

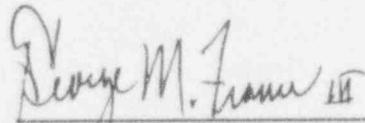
U. S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 07000036/94001(DRSS)
Docket No. 070-00036
License No. SNM-33
Licensee: Combustion Engineering, Inc.
Nuclear Power Systems
Windsor, CT 06095

Facility Name: Hematite Facility
Inspection At: Hematite, Missouri
Inspection Conducted: April 25-27, 1994

Inspector:



George M. France, III
Fuel Facilities Inspector

06/01/94

Date

Approved By:



George M. McCann, Chief
Fuel Facilities and Decommissioning
Section

06/1/94

Date

Inspection Summary

Inspection on April 25-27, 1994 (Report No. 070-00036/94001(DRSS))

Areas Inspected: This was a special inspection to observe the licensee's nuclear criticality safety controls relative to the buildup of special nuclear material in plant equipment. The inspector also observed facility modifications to the slugging press and the hydrogen fluoride gas scrubber.

Results: Within the scope of this inspection, no violations were identified. The licensee has corrected all but one of the deficiencies identified during a previous inspection (Inspection Report No. 070-00036/93003 (DRSS)). The deficiency pertaining to the slugging press will be corrected when the equipment modification is completed.

Redesigning the slugging press with a new powder handling system between the slugging press and the pellet press to eliminate the use of tape and caulking material to seal components of the press.

DETAILS

1. Persons Contacted

S. Borell, Manager, Chemical Operations
E. Criddle, Supervisor, Health Physics
M. Eastburn, Criticality Safety Specialist
H. Eskridge, Senior Consultant Regulatory Compliance
A. Noack, Superintendent, Facilities
G. Page, Manager Assembly Operations
G. Palmer, Manager, Ceramic Operations
R. Sharkey, Manager, Regulatory Compliance

The personnel listed above attended the exit meeting on April 27, 1994. The inspector also interviewed selected personnel assigned to uranium dioxide (UO_2) pellet production operations.

2. License Program

Combustion Engineering's Hematite facility produces uranium dioxide (UO_2) fuel for the commercial nuclear power industry. Low enriched uranium hexafluoride (UF_6) limited to maximum enrichment of 5% uranium-235 is received from Department of Energy (DOE) gaseous diffusion facilities in 2.5 ton, 30 inch (76.20 centimeters) diameter cylinders. The licensee processes UF_6 through a series of three reactors (R-1, R-2, & R-3) where UF_6 is converted to an oxide powder (UO_2). The UO_2 powder is pelletized, packaged as fuel rods and used for commercial fuel.

The inspector determined that the licensee converted its inventory of UF_6 into reactor fuel before March 1, 1994. The receipt of UF_6 to continue conversion operations is not scheduled to resume until May/June 1994. Meanwhile, the plant is engaged in a maintenance shutdown to include the installation of a new HF scrubber system and the modification of a slugging press.

3. Operations Review (IP 88020); Criticality Safety (IP 88015)

The inspector observed that the HF scrubber and the slugging press were being modified to improve process operating efficiency. The licensee indicated that there was no evidence of a buildup of fissile quantities of SNM material discovered while the scrubber system and the slugging press were being dismantled.

a. HF Scrubber System

In the first fluidized bed reactor (R-1), gaseous HF is formed when UF_6 is reacted with steam. Gaseous HF and excess steam from R-1 exit the reactor through porous metal filters. The off-gas from R-2 and R-3 is routed to dry scrubbers filled with calcium carbonate (limestone rock) to remove most of the HF before it is released to the atmosphere.

Larger scrubber towers are being installed to provide greater reaction and residence time between the HF and limestone. This modification should lessen HF emissions. The limestone will be loaded into each scrubber tower by an automated lifting device (elevator). The powered systems associated with the HF scrubber operation such as the elevator motor and the controller for the heaters will be housed in a new concrete structure. This arrangement should lessen the operator's handling and subsequent exposure to limestone dust.

Unreacted UF_6 , in the absence of steam, would pass through the porous metal filter (upstream of R-1) to the HF scrubber system. These filters are designed to trap solid uranyl fluoride (UO_2F_2), the product formed from the reaction of UF_6 and steam. Past process upsets have shown that unreacted UF_6 will pass through the filters, the HF scrubber, and finally to the atmosphere through the HF scrubber stack. Past experiences have also shown that most unreacted UF_6 will react with moisture and HF in the off-gas, leaving a visible deposit of UO_2F_2 (yellow) or uranium tetrafluoride (UF_4 , {green}), on the heated limestone. However, the installation of the new software enables the control room operator to shut off the steam and the UF_6 supply. Consequently, this would limit the accumulation of SNM material in the HF scrubber.

Secondly, limestone rock is replaced in the towers about every 24 hours. The radioactive concentration is determined for each spent limestone batch. Under routine operations, this is generally less than 10 picocuries per gram (0.37 becquerels per gram). The licensee plans to use the spent limestone as fill material around the plant site. Spent limestone that is contaminated above release limits is shipped to a commercial waste disposal site.

The inspector determined that centrally located engineering devices which support safe criticality practices are in place to prevent fissile quantities of special nuclear material (SNM) from accumulating in the HF scrubber system.

b. Slugging Press

Blended UO_2 powder can be aggregated by a dry powder slugging press. This provides a consistent press feed for making pellets. However, some operators have experienced difficulty in operating the slugging press. This was discussed in Inspection Report No. 070-00036/93003, and is being tracked as Inspection Follow-up Item No. IFI 070-00036/93003-02. The operator has to use a mallet to tap the outside of the transfer chute to make the powder flow. This occasionally weakens the seal/caulking around the powder transfer chute and causes UO_2 powder to release into the work area.

Modifications to both slugging presses are planned to mitigate this problem. A screw conveyor device will be installed to control the powder feed. This modification is scheduled for both slugging presses.

The inspector observed that one slugging press had already been dismantled. The licensee indicated that loose UO_2 powder was vacuum transferred to a geometrically favorable container "before and as" the press was disassembled. There was no indication that a fissile quantity of SNM material was hidden in the various components of the slugging press.

Routinely, UO_2 powder fines are vacuum transferred at the end of every batch or several times during the shift. At the end of each shift, the slugging press is also wiped down. This effort also prevents a buildup of fissile quantities of SNM material while the slugging press is running.

The inspector did not identify fissile quantities of SNM material in any of the disassembled components of the slugging press.

No violations or deviations were identified.

4. Radiation Protection (IP 83822)

Operators assigned to the task of disassembling the HF scrubber and the slugging press were issued radiation protection equipment (a personal air monitor and a Powered Air Purifying Respirator, gloves, shoes and coveralls, etc.) in accordance with Operating Sheet 202, "Health Physics Controls."

The licensee indicated that the radiation exposure, "total effective dose equivalent," (TEDE) received by personnel performing maintenance and facility modifications during the March through April operating period did not exceed NRC regulations. TEDE monthly values were less than the licensee's action level of 400 millirems (mrem) or 5 millisieverts (mSv).

No violations or deviations were identified.

5. Licensee Actions on Previous Inspection Findings

Response to Notice of Violation

1. (Closed) Violation (VIO) No. 070-00036/93003-01: Contrary to Special Nuclear Material license SNM-33, License Condition No. 28., combustible material had been placed on the cylinder storage pad.

The inspector confirmed that the vegetation growing around the area was removed, a gravel barrier was installed and all other combustibles were removed.

2. (Closed) Violation (VIO) No. 070-00036/93003-02: An operator failed to close the bottom valve of a sampling manifold. Due to a failed upper valve, UO_2F_2 was released and caused a sensing device (smoke detector) to deactivate the ventilation system. Failure to close the bottom valve is a violation of Operating Sheet 601.10.

To prevent recurrence, the upper valve was rebuilt, the procedure was clarified and the operators were retrained. The smoke detectors were relocated between HEPA filter banks in concurrence with American Nuclear Insurers (ANI) officials to prevent the shutdown of plant ventilation which occurred when the detector was mounted downstream of the filter banks.

3. (Closed) Violation (VIO) No. 070-00036/93003-03: Failure to obtain a nasal smear following a UO_2 release is a violation of Operating Sheet 324.

To prevent recurrence of a similar incident, both the operator and supervisor were counseled and contamination control training was conducted. Management oversight training emphasizing contamination and exposure control in preparation for the new 10 CFR 20 regulations was also conducted. Commencing January 1, 1994, the licensee increased surveillance by the Regulatory Compliance Staff.

Reply to NRC Concerns

1. (Closed) Inspection Followup Item (IFI) No. 070-00036/93003-01: The inspector observed that the cylinder storage pad and contiguous area were in disarray. There was no cognizant manager of the cylinder storage pad and the area contiguous to cylinder storage.

This IFI was previously closed/discussed (see Inspection Report No. 0070-00036/93004). The inspector confirmed during this inspection that a gravel barrier had been installed to prevent the growth of vegetation. Oxide operators and material handlers have been informed of the requirement to maintain good housekeeping.

Additionally, the Plant Manager issued a memorandum clarifying the responsibilities pertaining to the UF₆ storage pad. Effective February 15, 1994, the Production Support Manager took responsibility for maintaining the cylinder storage pad and the contiguous area. The inspector will monitor this area for the storage of unauthorized material during future inspections.

2. (Open) IFI No. 070-00036/93003-02: The inspector observed that tape and caulking material were used to seal components (the powder transfer chute and the panels in rear of the press) of the slugging press.

Oxide powder leaking from the slugging press can fall through the floor opening, where service lines are connected to the pellet press. The licensee plans to install a screw conveyed powder flow unit in the slugging press and close the opening in the floor. These modifications should improve the licensee's ALARA program. The inspector will review the modification of both slugging presses during a future inspection.

3. (Closed) IFI No. 070-00036/93003-03: Sampling R-1 and R-2 reactors. Discuss the safety implications of operator preference when the operator elects to sample reactor R-2 before completing the sampling on reactor R-1.

The revised procedure for sampling the R-1 reactor requires the operators to complete the sequence of sampling R-1 reactor before sampling R-2. This change was reviewed by the Plant Safety Committee.

The operators have been retrained according to the new procedure. The inspector will observe how operators follow the new procedure during future inspections.

4. (Closed) IFI No. 070-00036/93003-04: An apparent weakness regarding the response to air monitor alarms was identified during the inspection.

The licensee indicated that this weakness was caused by unfamiliarity with the new paging system. The correct phone numbers for paging site wide have been reinforced and personnel are now familiar with the paging system. The inspector will monitor the licensee's use of the paging system during emergency drills.

5. (Closed) IFI No. 070-00036/93003-05: The chemical reaction of HF on the HEPA filter media caused deterioration of filter material and led to the stack release of SNM.

The inspector confirmed that several equipment modifications have been made to reduce the possibility of HF going through the HEPA filter bank. The new HF scrubber has a secondary scrubber to

Lower the HF content in the off-gas leaving the primary scrubbers. Apparently, from the intake side of the filter banks, smoke detectors were sensing dust, HF, or UO_2F_2 and activating the smoke alarm, causing the ventilation system to shut down. To relieve this problem, the smoke detectors were relocated to a position between the filter banks.

The inspector was also concerned about the potential buildup of fissile quantities of UO_2 behind deteriorated filters. About 9 kilograms of debris was removed from the filter housings and the ventilation ducts. Although contamination was detected, most of the material was deteriorated fragments of the filters and residue from cleaning the duct work. Consequently, the inspector concluded that the accumulation of SNM material that occurred after/during the stack release was a contamination problem that did not include fissile quantities.

6. (Closed) IFI No. 070-00036/93003-06: Dust purported to be zirconium oxide (ZrO_2) is accumulating on the tube/rod slide where the rods exit from the fuel scanner.

The licensee indicated that the Chief metallurgist of its zirconium supplier confirmed that ZrO_2 is extremely stable. Tests on similar material showed that the material was not ignitable. The inspector acknowledged that the licensee had resolved this concern.

6. Exit Meeting

The scope and findings of the inspection were discussed with licensee representatives denoted in Section 1 of this report at the close of the onsite inspection on April 27, 1994.

During the course of the inspection and exit meeting, the licensee did not identify any documents or statements and references to specific processes as proprietary.

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