

U. S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No.: 50-440/90004(DRS)

Docket No.: 50-440

License No. NPF-58

Licensee: The Cleveland Electric Illuminating Company
10 Center Road
Perry, OH 44081

Facility Name: Perry Nuclear Power Plant

Inspection At: Perry, OH 44081

Inspection Conducted: March 5-8; April 16-19; June 20-22; and July 2, 1990

Inspector:

John F. Jaster Jr.
W. C. Liu

7/19/90
Date

Approved By:

Mark Danielson
D. H. Danielson, Chief
Materials and Processes Section

7/20/90
Date

Inspection Summary

Inspection from March 5 through July 2, 1990 (Report No. 50-440/90004(DRS))

Areas Inspected: Special inspection of licensee actions associated with the off-gas system operation (37701).

Results: No violations or deviations were identified. During the course of the inspection, the following strengths and weaknesses of licensee activities pertaining to the off-gas system operation were noted:

Strengths

- ° There appeared to be a high degree of licensee management involvement in all aspects of corrective action programs to improve the system operation.
- ° The licensee's engineering staff appeared to be technically competent and well motivated.
- ° Root cause evaluations by the licensee identified a significant number of problems which had caused adverse effects to the system operation.

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Weaknesses

- ° A number of poor engineering designs were found in the original design of the system.
- ° In a few instances, inadequate procedures were found for the system operation.

DETAILS

1. Persons Contacted

The Cleveland Electric Illuminating Company (CEI)

- *R. Stratman, General Manager
- *S. Kensicki, Director
- *V. Concel, Manager/SES
- *W. Coleman, Manager/QAS
- *T. Remick, Task Force Chairman
- *B. Nelson, HVAC Lead
- *G. Osborne, System Engineer
- +*C. Elberfeld, Operations Analyst
- *J. Grimin, Plant Chemist
- *C. Page, Staff Member/ISEG
- *F. Moore, HVAC Engineer
- H. Hegrat, Compliance Lead

Nuclear Regulatory Commission (NRC)

- P. Hiland, Senior Resident Inspector
- *G. O'Dwyer, Resident Inspector

*Denotes those attending the exit interview on June 22, 1990, at the Perry Nuclear Power Plant.

+Denotes the person participating in the telephone exit conference call on July 2, 1990.

2. Background Information

Between September 1988 and January 1990, a total of 14 major events pertaining to off-gas system operation occurred. Although no Technical Specification violations were identified as a result of these events, the licensee management has fully realized the seriousness of the off-gas problem and has worked promptly to correct the situation. An Off-Gas Task Force was formed by the licensee on January 5, 1990, to review and evaluate all aspects of the system operation. This task force consists of members from most of the plant and engineering sections and has recommended a series of changes to improve the system operation.

Following is a summary of the 14 events:

a. September 4, 1988

Charcoal fire caused by a hydrogen detonation due to inadequate training of operating personnel (CR 88-215).

b. September 16, 1988

Charcoal fire caused by a hydrogen detonation due to inadequate training of operating personnel (CR 88-226).

c. October 14, 1988

Loss of dryer/chiller loop seal due to a lack of procedural control (CR 88-251).

d. November 19, 1988

Loss of dryer/chiller loop seal due to a lack of procedural control (CR 88-278).

e. December 21, 1988

Dryer isolation valve failed to open causing loop seals to blow out. The failure was due to the presence of the valve's locking collar (CR 88-306).

f. February 2, 1989

Loss of holdup line loop seal due to leakage of the drain valve (CR 89-055).

g. February 14, 1989

Loss of prefilter loop seal due to leakage of the drain valve (CR 89-055).

h. October 16, 1989

Loss of dryer/chiller loop seal due to leakage of the drain valve (CR 89-366).

i. December 7, 1989

Loss of dryer/chiller loop seal due to leakage of the drain valve (CR 89-417).

j. December 28, 1989

Loss of dryer/chiller loop seal due to failure of the pressure control valve (CR 89-437).

k. December 29, 1989

Loss of dryer/chiller loop seal due to the regeneration lineup valve failure to open (CR 89-438).

1. January 1, 1990

Loss of holdup line loop seal due to leakage of the drain valve (CR 90-002).

m. January 7, 1990

Reverse flow of process gas into the condenser where it was exhausted by the mechanical vacuum pumps. This was due to a lack of procedural control for closing the isolation valve (CR 90-006).

n. January 31, 1990

Loss of cooler condenser loop seal due to pressure/flow perturbation caused by introducing water into the off-gas process stream (CR 90-019).

3. Task Force Activities

a. The goal of the Task Force was to increase the reliability of the off-gas system operation. This includes all aspects and components of the system and those subsystems needed for its proper performance.

b. The functions of the Task Force are:

- ° To review all design changes, setpoint changes, and procedure changes pertaining to the off-gas system.
- ° To participate in major preplanned system operations and corrective actions.
- ° To recommend short and long term corrective actions to improve the system operation.

c. The Task Force will be active for a minimum period of 12 months and is to be re-evaluated on a periodic basis thereafter, until plant management is satisfied with the system operation.

4. Problems Identified Resulting From Root Cause Evaluation

The following problems were identified as a result of the root cause evaluations by the licensee:

- a. Loop seal drain valve leakage due to poor material used in the original design (CR 89-417).
- b. Barton level switches at the holdup pipe, cooler condenser, and prefilter loop seal piping were not working properly (CR 90-048 and CR 89-055).

- c. Loop seal configuration at the dryer skid revealed inadequate design consideration due to lack of level instrumentation (CR 89-438).
- d. The pressure control valve at the dryer skid was incorrectly designed. (CR 89-417)
- e. The level instrument at the holdup loop seal piping was incorrectly designed in 1987 (CR 90-048).
- f. The original loop seal configuration at the holdup pipe, cooler condenser, and prefilter was incorrectly designed due to the potential for siphoning effects to drain the entire loop seal (CR 89-055).
- g. Inadequate procedures were found:
 - (1) Improper operation of the intercondenser loop seal drain valve closure (CR 90-006).
 - (2) Improper isolation and filling of the loop seal prior to commencing a regeneration cycle at the dryer skid (CR 89-438).
- h. Inadequate training of operating personnel (CR 88-215 and CR 88-226).

5. Corrective Actions That Have Been Completed

The following corrective actions are intended to resolve portions of the problems identified in the previous paragraph.

- a. Cut and cap the dryer/chiller loop seals downstream of the drain valve to stop leakage.
- b. Add a stainless valve disk in the holdup pipe loop seal drain valve to stop leakage.
- c. Repair prefilter loop seal drain valve to minimize leakage.
- d. Add additional charcoal to the adsorber vessels to increase delay time.
- e. Replace the pressure control valves on both of the dryer skids.
- f. Continue to replace the heaters on the vault refrigeration air handling units.
- g. Dryer skids are now operated in manual instead of automatic.
- h. A procedure change was made to isolate and fill the loop seal prior to commencing a regeneration cycle at the dryer skids.
- i. A procedure change was made to ensure that the intercondenser loop seal drain valve is closed at the correct time.

6. Corrective Actions to be Implemented During the Upcoming Refueling Outage (Will Start in September 1990)

The following corrective actions are additional efforts not only to resolve the problems identified in Paragraph 5, but also to improve the system operation.

- a. Add level switches to the dryer/chiller loop seals (DCP 88-347 and DCP 90-007).
- b. Replace the existing level switches at the holdup pipe, cooler condenser, and the prefilter loops seals with the new and more reliable level switches (DCP 90-011).
- c. Restore the adsorber charcoal beds which were damaged by the hydrogen detonations (DCP 89-213, for 12A and B charcoal beds).
- d. Add the stainless steel valve disks to the cooler condenser and prefilter loop seal drain valves to stop leakage (Work Orders 90-1125 and 90-1126).
- e. Replace Fisher 3-way actuator on the vault refrigeration brine bypass valve to reduce the level of vibration (DCP 90-039).
- f. Continue changeout of vault refrigeration air handling unit heaters for more effective operation (DCP 89-222).
- g. Remove dryer skid valve locking collars to increase operation efficiency (DCP 87-343).

7. General Electric Loop Seal Study

The NRC inspector held discussions with licensee representatives regarding the evaluation of the GE loop seal study. The inspector noted that:

- a. The GE loop seal study had been reviewed and evaluated by the licensee during the month of March 1990.
- b. The intent of the GE recommendations will be essentially incorporated and implemented in the action plan during the upcoming refueling outage (DCP 88-347 and DC) 90-011).

8. Licensee's Future Efforts

The following future action plans are considered as enhancement programs for the system operation:

- a. Feasibility study for "an ambient temperature system" so that the charcoal absorbers can be operated at higher temperatures instead of the current zero degree temperature.

- b. Evaluation of decreasing the condenser air in-leakage rate to reduce the duty on system components and drains.
- c. Evaluation of operating the steam jet air ejectors at lower pressures, to reduce the offsite release.
- d. Evaluation of a possible single train operation of the absorber beds. The absorber beds of both trains are currently in use.
- e. Evaluation of adding off-gas parameters to emergency response information system (ERIS) to provide a more human factored display for the operators.

9. Evaluation of Barton Level Switches in Safety-Related Applications

During the course of the inspection, the NRC inspector noted that the Barton level switches, used in the off-gas system, experienced a variety of problems in terms of performing their intended function. Consequently, the NRC inspector requested that an evaluation be performed to determine whether the Barton level switches used in safety-related applications have any negative impact on system operation.

The licensee's response to the above concern was documented in a memorandum dated June 27, 1990. The memorandum concluded that only four safety-related level switches exist at the plant and there was no evidence that these instruments had caused a negative impact on system operation. The matter is considered closed.

10. Status of System Operation

The system has continued to perform well and no events or transients have occurred since February 1990. The future activities of the Off-Gas Task Force have not changed from those delineated in Paragraph 3. The major activity will be to monitor system performance after the modifications are implemented in the upcoming refueling outage.

11. Conclusion

The off-gas system performance has improved since February 1990. This is, in part, due to the completion of the short term corrective actions taken by the licensee. All of the long term items as delineated in Paragraph 6 needed to correct the system's problems are to be implemented during the upcoming refueling outage which will start in September 1990. By that time, the system operation is expected to be substantially improved.

12. Exit Interview

The inspector met with licensee representatives denoted in Paragraph 1 during and at the conclusion of the onsite inspection on June 22, 1990. The inspector also contacted licensee representatives via telephone

denoted in Paragraph 1, on July 2, 1990, to discuss the evaluation of Barton level switches and future work activity of the Off-Gas Task Force pertaining to off-gas system operations. The inspector summarized the scope and results of the inspection and discussed the likely content of this inspection report. The licensee acknowledged the information and did not indicate that any of the information disclosed during the inspection could be considered proprietary in nature.