



July 10, 1998  
GDP 98-1049

United States Nuclear Regulatory Commission  
Attention: Document Control Desk  
Washington, DC 20555-0001

**Paducah Gaseous Diffusion Plant (PGDP)**  
**Docket No. 70-7001**  
**Event Report ER-98-13, Rev. 1**

Pursuant to 10CFR76.120 (d)(2), enclosed is the required 30-day written Event Report covering the partial failure of the plant air system when two air compressors in Building C-335 tripped. The Nuclear Regulatory Commission (NRC) was notified of the event on May 14, 1998, at 1653 hrs. (NRC No. 34236). On June 12, 1998, an interim report relating to this event was provided to NRC. Changes are annotated by vertical lines in the right margin of this report. Enclosure 2 is a list of commitments.

Any questions regarding this matter should be directed to Larry Jackson at (502) 441-6796.

Sincerely,

Howard Pulley  
General Manager  
Paducah Gaseous Diffusion Plant

Enclosure: As Stated

cc: NRC Region III Office  
NRC Resident Inspector - PGDP

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EVENT REPORT  
ER-98-13, Rev. 1

DESCRIPTION OF EVENT

On May 14, 1998, at 0901 hrs., a partial failure of the plant air system occurred when two air compressors in Building C-335 tripped off-line. The partial failure of the plant air system caused the Criticality Accident Alarm System (CAAS) to be declared inoperable, due to reduced air capacity determined to be potentially required for the CAAS building horns. CAAS alarm capabilities supplied by plant air were declared inoperable due to inaudibility. However, CAAS detectability was not affected. Because of the rapid response to the trips, restart of the compressors occurred while Limiting Conditions for Operation (LCO) actions, as required by Technical Safety Requirements (TSR), were being determined. Therefore, LCO actions were not initiated. On May 14, 1998, at 1653 hrs., the Nuclear Regulatory Commission Headquarters (NRC-HQ) office was notified of this event in accordance with 10CFR76.120(c)(2) (NRC Event No. 34236).

Dry compressed air is required at the Paducah Gaseous Diffusion Plant (PGDP) to operate pneumatic instruments, controllers, and valves for plant processes. Air is also used for plant support production operations, steam plant operations, test facilities, and maintenance functions. Dry compressed air is supplied from three buildings (C-600, -620, -335) and an auxiliary air supply is located in Building C-607. Air compressor facilities may be operated separately or together to maintain air supply to the distribution headers. Dry compressed air is also used as the primary motive force to sound CAAS building horns. The requirements for compressed air capacity relative to the CAAS requirements have been assessed in Engineering Notice (EN) EN-C-822-98-027, Rev. 0, effective April 3, 1998. Plant Utility Operations issued Long Term Order (LTO) C600-98-01, Rev. 2, dated May 5, 1998, to assure the initial conditions of the EN, including CAAS operability, are maintained. The LTO defines the expectation for on-line plant air availability to be maintained at, or above, 11,250 scfm. The EN and LTO were subsequently refined to 11,000 scfm.

On May 14, 1998, at approximately 0850 hrs., a Centac compressor in Building C-335 tripped, discontinued operating, and was manually restarted in less than one minute. At approximately 0900 hrs., the same Centac tripped a second time and was immediately restarted. At approximately 0927 hrs., an XLE compressor tripped, discontinued operations, and was manually restarted after approximately three minutes. Both Centac compressor trips reduced plant air availability to less than 11,250 scfm; however, the XLE trip did not.

On May 14, 1998, troubleshooting was initiated to determine the cause for the partial loss of plant air. The Centac tripped, on both occasions, due to a reduction in water flow to the compressor which caused an increase in the compressor's oil temperature (2 to 6 degrees Fahrenheit) which led to the trip, as designed. The reduction in water is attributed to spray-down testing of the deluge system for transformer No. 72, C-537 switchyard. Compressor trips have previously occurred during spray-down testing of the deluge systems in the switchyards. To minimize the risk of a compressor trip, prior to this event, testing was initiated with the transformer deluge system's S2 valve closed. This method had been used previously with no resultant compressor trips. To preclude a surge of water that could reduce water flow, the S2 valve was slowly opened. However, the full flow of water through the transformer deluge system resulted in a reduced flow of cooling water available to the Centac compressor. As an additional precaution, prior to this event, a Utilities operator was assigned to Building C-335 to assure operation of the compressors and to initiate appropriate actions to restart the compressors in the event a compressor tripped. Pre-positioning of the operator led to a rapid restart of the compressors subsequent to each trip. Water flow adjustments being made to the Centac resulted in the XLE compressor trip.

On May 15, 1998, deluge spray-down testing of the switchyard transformers was suspended. On June 19, 1998, routine maintenance or testing of fire hydrant and suppression systems that place flow demands on the sanitary and fire water systems were curtailed. Since the implementation of these two short-term corrective actions, there have been no additional compressor trips attributed to a reduction in water flow to the compressors.

On June 15, 1998, Plant Operations established a committee of subject matter experts (SME) to analyze causes, and make recommendations for short-term corrective actions, relative to the partial loss of plant air resulting from compressor trips and subsequent CAAS inoperability. Additionally, the committee will examine the need for conducting reliability assessments of selected non-safety systems impacting safety-related systems. An appropriate corrective action plan will be published by July 22, 1998.

The safety significance of this event was a partial loss of plant air supply affected the CAAS alarm capabilities supplied by plant air; however, the CAAS detectability was not affected. Additionally, four of the feed autoclave high pressure isolation valves in C-333-A and C-337-A utilize plant air to assist in closure that could be affected by the loss of air, although the valves are designed to fail in the safe (closed) position.

## CAUSE OF THE EVENT

### A. Direct Cause

The direct cause of this event was the inoperability of the Centac compressors in Building C-335. The failure of the compressors and partial loss of the plant air system resulted in a CAAS inaudibility.

### B. Root Cause

The root cause for this event was a failure to implement effective controls of the activity to prevent recurrence of the compressor trips. An awareness that previous compressor trips occurred as a result of spray-down testing of transformers existed and steps were initiated to prevent recurrence by slowly opening the S2 valve to preclude a water surge that would reduce the flow of cooling water availability to the compressors. This method had been successful in the past. However, these precautions were not sufficient to prevent the trips.

## CORRECTIVE ACTIONS

### A. Completed Corrective Actions

1. On February 16, 1998, Engineering Service Order (ESO) Z99920 was issued which will upgrade the cooling water supply to the compressors in Building C-335 to minimize trips by the Centac compressors.
2. On May 15, 1998, to maintain effective control of this activity to prevent recurrence, the deluge system spray-down testing of the switchyard transformers was suspended. This suspension will remain in place until corrective actions are sufficient to prevent recurrence.
3. On June 19, 1998, routine testing or maintenance of fire hydrant and suppression systems that place flow demands on the sanitary and fire water system were curtailed to further enhance effective controls of this activity to prevent recurrence. This suspension will remain in place until corrective actions are sufficient to prevent recurrence.

B. Planned Corrective Actions

1. By August 3, 1998, Engineering will complete re-assessment of ESO Z99920 relative to cooling water flow capabilities in Building C-335 plant air compressors, as related to supporting CAAS demands, to determine whether additional actions are necessary to enhance water flow.
2. By October 1, 1998, Operations will prepare an appropriate corrective action plan in response to the cooling water flow re-assessment in corrective action 1 above, as applicable.
3. By December 15, 1998, Engineering will complete a construction project that will remove the CAAS dependence on the existing air system by installing air accumulators and air distribution piping that will be dedicated to supplying compressed air to the CAAS horns.

EXTENT EXPOSURE OF INDIVIDUALS TO RADIATION OR RADIOACTIVE MATERIALS

None

LESSONS LEARNED

If the possibility exists that, based on previous experience, an event may occur upon initiation of an activity, the endeavor should not be undertaken. If conditions warrant proceeding, an appropriate LCO should be entered and steps taken to minimize the risk.

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**List of Commitments**

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