NRC Form 366
(9-83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES: 8/31/85

# LICENSEE EVENT REPORT (LER)

| FACILITY NAME (1) | DOCKET NUMBER (2) | PAGE (3) |
|---|---|---|
| Duane Arnold Energy Center | 0 5 0 0 0 3 3 1 | 1 OF 0 4 |

TITLE (4)
Control Room Air Treatment System - SFU Initiation Failures

| EVENT DATE (5) | | | LER NUMBER (6) | | | | | REPORT DATE (7) | | | OTHER FACILITIES INVOLVED (8) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MONTH | DAY | YEAR | YEAR | | SEQUENTIAL NUMBER | | REVISION NUMBER | MONTH | DAY | YEAR | FACILITY NAMES | DOCKET NUMBER(S) |
| | | | | | | | | | | | N/A | 0 5 0 0 0 |
| 0 1 | 1 0 | 8 4 | 8 4 | - | 0 0 4 | - | 0 0 | 0 2 | 0 9 | 8 4 | N/A | 0 5 0 0 0 |

| OPERATING MODE (9) | | THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11) | | | |
|---|---|---|---|---|---|
| N | | 20.402(b) | 20.405(c) | X 50.73(a)(2)(iv) | 73.71(b) |
| POWER LEVEL (10) | | 20.405(a)(1)(i) | 50.36(c)(1) | X 50.73(a)(2)(v) | 73.71(c) |
| 0 1 3 | 2 | 20.405(a)(1)(ii) | 50.36(c)(2) | X 50.73(a)(2)(vii) | OTHER (Specify in Abstract below and in Text, NRC Form 366A) |
| | | 20.405(a)(1)(iii) | 50.73(a)(2)(i) | 50.73(a)(2)(viii)(A) | |
| | | 20.405(a)(1)(iv) | 50.73(a)(2)(ii) | 50.73(a)(2)(viii)(B) | |
| | | 20.405(a)(1)(v) | 50.73(a)(2)(iii) | 50.73(a)(2)(x) | |

LICENSEE CONTACT FOR THIS LER (12)

| NAME | TELEPHONE NUMBER |
|---|---|
| William J. Miller/ David B. Hamel, Technical Support Engineers | AREA CODE 3 1 9 — 8 5 1 - 7 2 3 8 |

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

| CAUSE | SYSTEM | COMPONENT | MANUFACTURER | REPORTABLE TO NPRDS | | CAUSE | SYSTEM | COMPONENT | MANUFACTURER | REPORTABLE TO NPRDS | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| B | V I | P D S V | A 4 9 9 | Y | | | | | | | |
| | | | | | | | | | | | |

| SUPPLEMENTAL REPORT EXPECTED (14) | | EXPECTED SUBMISSION DATE (15) | MONTH | DAY | YEAR |
|---|---|---|---|---|---|
| YES (If yes, complete EXPECTED SUBMISSION DATE) | X NO | | | | |


ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)

On 01/10/84 at 2228 hours during reactor startup, the normal control building ventilation system isolated due to low inlet air temperature (setpoint 40 degrees F), but both trains of make-up air standby filter units (SFU) failed to initiate properly. SFU inlet dampers AV-7301A & B did not open on demand, because the pilot solenoids SV-7301A & B misoperated by failing to vent the damper air operators when de-energized. Operations personnel promptly opened the dampers by locally isolating instrument air. AV-7301B was demonstrated operable after being cycled, but AV-7301A kept sticking. SFU-B was kept running, but SFU-A was declared inoperable entering a 7 day LCO. The failed safety-related solenoids are ASCO #8316 internally piloted diaphram valves that require a minimum pressure differential between the exhaust and pressure ports in order to go through their operating cycle. When maintenance removed a restricting adaptor elbow (3/8 NPT to 1/4 in. tubing) from the exhaust port of SV-7301A, it operated satisfactorily, and a similar fitting was removed from SV-7301B. Within 24 hours of the original failure, SFU-A was tested and declared operable, thus ending the L.C.O. Foreign material in the instrument airway may have contributed to the failures. The plant is being inspected to verify that no other restrictions are on similar safety-related solenoid valves.




IE22
1/1

NRC Form 366
(9-83)

| FACILITY NAME (1) | DOCKET NUMBER (2) | LER NUMBER (6) | | | PAGE (3) |
|---|---|---|---|---|---|
| | | YEAR | SEQUENTIAL NUMBER | REVISION NUMBER | |
| Duane Arnold Energy Center | 0 5 0 0 0 3 3 1 | 8 4 | — 0 0 4 | — 0 0 | 0 2 OF 0 4 |

TEXT (If more space is required, use additional NRC Form 366A's) (17)

On January 10, 1984, at 2228 hours while restarting the reactor from an unrelated scram, the control building ventilation system ("A" train) isolated on a low temperature signal from the main inlet air, (TS-6124A) set point 40 degrees F. However the safety related control room intake treatment system, standby filter unit train-A (IV-SFU-30A) did not auto-initiate properly. An immediate control room back panel check by the operator showed that the SFU-A inlet flow damper AV-7301A had failed to open as required. The operators manually initiated the SFU-B train and observed that the SFU-B train inlet flow damper, AV-7301B, also failed to open as required. Both of these dampers are air-operated, solenoid piloted and designed to fail open upon loss of air or electrical power. (All other ventilation isolation functions and dampers performed as designed.) An operator went to the SFU room, which is immediately above the control room and locally isolated the instrument air to the dampers at which time they both opened.

The safety related SFU inlet valves were cycled remotely several times, and AV-7301A was still hanging-up. The SFU-B was left running and operable, while the SFU-A was secured and declared inoperable, entering a 7 day LCO (T.S.3.10.A.3) at 2245 hrs. The necessary notifications were made pursuant to 10CFR50.72. Plant operation and the public health and safety were not affected.

On 01-11-84, at 0830 hours, plant maintenance personnel inspected and repaired the valves. The pilot solenoid valves that actuate damper operators (SV-7301 A&B) had failed to cycle closed when de-energized. The ASCO model HT-831655 valve is internally piloted and diaphram operated, requiring a minimum of 10 psi pressure differential between the pressure and exhaust ports to operate. When de-energized, SV-7301A blew air through the exhaust port but failed to vent the damper operator cylinder. A restricting fitting was found on the exhaust port, which caused back pressure that impeded the differential pressure necessary to operate the valve. This fitting was an adapter elbow (3/8 NPT to 1/4 inch tubing) which reduced the vent port opening from 1/2" TO 1/8". When the fitting was removed, the solenoid valve operated properly. A similar fitting was removed from SV-7301B, and the valve was later tested satisfactorily. It appears that foreign matter or moisture in the main plant instrument air may have contributed to the concurrent failures of air operated solenoid valves SV-7301A and B, but was cleared when the valves were successfully cycled.

Since the failures occurred together after 10 years of successful operation, it is felt that another contributing factor was acting. Another contributing factor to the solenoid valve failures could have been stiffening of the valve operating diaphrams. An inspection of the non-safety related control building main air inlet preheat coils discovered the bottom 2 heat exchangers were leaking water. The air openings were blocked, and the coils were isolated and drained. See LER 84-003 for further discussion of preheating coil problems. Cold from the outside air and ice from the malfunctioning preheat coils could have stiffened valve actuator diaphrams so that a greater than normal differential pressure was required

to operate the solenoid valves through their full closing cycle. The manufacturers instructions call for internal inspection and cleaning for sluggish valves and the replacement of worn parts. Though SV-7301A and B are now fully operable and not now sluggish, they will be internally inspected and cleaned when the replacement parts are received.

The plant operators tested SFU-A train to demonstrate operability and it was declared operable by 1430 hours 01-11-84. While SFU-B was operating, the isolation dampers remained closed on the control building main air intake (IV-AD-30A & B) and on the exhaust (IV-AD-31A & B).

In the isolation mode, the DAEC control building ventilation system isolates the building from normal outside air intake, recirculates the ventilation air to the essential switchgear rooms, battery rooms, and the control room, and supplies treated make-up air through the standby filter units (SFU) to balance the battery rooms exhaust. The safety related function of the SFU and control building isolation functions is to minimize operator radiation exposure by filtration of intake air and recirculating air rather than providing full flow makeup. The SFU also auto-initiates on low inlet temperature for the comfort of control room personnel and to protect equipment from eventually freezing on low inlet temperature as discussed in UFSAR chapter 9. Low inlet temperature causes an engineered safety feature (the SFU's) to initiate. If the SFU's and control building isolation were not to occur on low inlet temperature, ample time would be available for operators to protect equipment within the building from freezing. Inadequate circulation from the non-safety related main hot water loop seems to be the root cause of freezing the preheating coils; investigation is continuing. The plant continued to operate normally during and following the initiations.

Our review indicates that the manufacturer cautions against restricting the exhaust port of these 3-way diaphram-operated, pilot-controlled solenoid valves. A check of the other safety related solenoids of internally piloted design in the control building ventilation system found no further instance of this restriction on "exhaust" or "pressure" ports. The fitting was part of the original installation, but this is the first recorded failure of SV-7301A & B of this type in 10 years operation. ASCO model families 8316, 8321 (HVA-90-405)are of 3-way internally piloted design. 2-way ASCO valves types 8210,8211,8215 and 8223 also have minimum differential pressure because of internal pilots. Our review has indicated approximately 84 of these solenoid valves are in use at DAEC in safety related applications. These are being inspected to ensure restricting orifices are not installed. All accessible solenoids will be inspected to verify the orifice is not restricted during February.

Related corrective action is continuing. This includes engineering actions to upgrade the capacity and the quality of the main instrument air system. (We note that significant problems with moisture in the instrument air system have not

| FACILITY NAME (1) | DOCKET NUMBER (2) | LER NUMBER (6) | | | PAGE (3) |
|---|---|---|---|---|---|
| | | YEAR | SEQUENTIAL NUMBER | REVISION NUMBER | |
| Duane Arnold Energy Center | 0 5 0 0 0 3 3 1 | 8 4 | — 0 0 4 | — 0 0 | 0 4 OF 0 4 |

TEXT *(If more space is required, use additional NRC Form 366A's)* (17)

been observed since major work on this system was performed in 1982 and early in 1983.) The main plant instrument and service air system normally supplies the control building ventilation system with high pressure air, but two division[illegible]lized, safety related compressors backup this supply. These engineering actions, combined with the removal of the solenoid valve restrictive orfice, the general maintenance on the dampers and actuators, the continued repair of the non-safety related preheating coils, the planned rebuilding of the solenoid valves when safety related parts are procured, and the inspection of other solenoid valves for restricting orifices, concludes our corrective action. We note that SFU initiations also occurred prior to this event (on January 2 and 4 SFU-B successfully initiated* and on January 6 SFU-A successfully initiated) and following maintenance and post-maintenance testing on both SFU-A and SFU-B (on January 16 both SFU-A and B successfully initiated). Maintenance will review and make the addition of similar, safety-related solenoid valves to the PM program as necessary to meet the manufacturers recommendations for inspection, cleaning and renewal parts.

* As designed, each SFU has independent logic and temperature sensors. Whether one or both SFU's initiate depends upon the temperature that is sensed by their respective sensors.

Iowa Electric Light and Power Company

February 9, 1984

DAEC-84-69

U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, D. C. 20555

Subject: Duane Arnold Energy Center
Docket No. 50-331
Op. License DPR-49
Licensee Event Report No. 84-004

Gentlemen:

In accordance with 10 CFR 50.73 please find attached a copy of the subject Licensee Event Report.

Very truly yours,

for

Daniel L. Mineck
Plant Superintendent - Nuclear
Duane Arnold Energy Center

DLM/DBH/pv

attachment

cc: Mr. James G. Keppler
Regional Administrator
Region III
U. S. Nuclear Regulatory Commission
799 Roosevelt Road
Glen Ellyn, IL 60137

NRC Resident Inspector - DAEC

File A-118a

IE-22
1/1