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DEC 19 2003

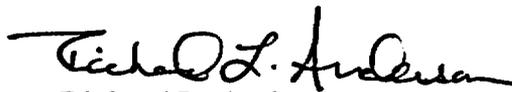
U.S. Nuclear Regulatory Commission
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**SUSQUEHANNA STEAM ELECTRIC STATION
LICENSEE EVENT REPORT 50-387/2003-007-00
LICENSE NO. NPF-14
PLA-5700**

Docket No. 50-387

Attached is Licensee Event Report 50-387/2003-007-00. This event was determined reportable per 10 CFR 50.73(a)(2)(vii) in that both the Unit 1 and Unit 2 'D' Core Spray pumps were declared inoperable due to excessive oil foaming experienced during quarterly surveillance testing. Contaminants in the oil and inadequate antifoaming additives were responsible for the oil foaming condition observed in both pumps. The loss of one Core Spray pump in both Susquehanna Units under these circumstances constitutes a common cause inoperability of two independent channels designed to mitigate the consequences of an accident. This occurrence did not challenge any plant safety systems. There were no actual consequences to the health and safety of the public as a result of this event.

No new regulatory commitments have been created through issuance of this report.


Richard L. Anderson
Vice President - Nuclear Operations

Attachment

IE22

cc: **Mr. H. J. Miller**
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U.S. Nuclear Regulatory Commission
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Mr. S. L. Hansell
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Estimated burden per response to comply with this mandatory information collection request: 50 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records Management Branch (T-8 E8), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to bjs1@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NE08-10202 (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

1. FACILITY NAME Susquehanna Steam Electric Station - Unit 1	2. DOCKET NUMBER 05000387	3. PAGE 1 OF 4
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4. TITLE
Common Cause Inoperability of Multiple Core Spray Channels

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MO	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
10	23	2003	2003	007	00	12	19	2003	Susq. SES - Unit 2	05000388
									FACILITY NAME	DOCKET NUMBER

9. OPERATING MODE 1	11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply)									
	20.2201(b)		20.2203(a)(3)(II)		50.73(a)(2)(II)(B)		50.73(a)(2)(IX)(A)			
10. POWER LEVEL 100	20.2201(d)		20.2203(a)(4)		50.73(a)(2)(III)		50.73(a)(2)(X)			
	20.2203(a)(1)		50.36(c)(1)(I)(A)		50.73(a)(2)(IV)(A)		73.71(a)(4)			
	20.2203(a)(2)(I)		50.36(c)(1)(II)(A)		50.73(a)(2)(V)(A)		73.71(a)(5)			
	20.2203(a)(2)(II)		50.36(c)(2)		50.73(a)(2)(V)(B)		OTHER Specify in Abstract below or in NRC Form 366A			
	20.2203(a)(2)(III)		50.46(a)(3)(II)		50.73(a)(2)(V)(C)					
	20.2203(a)(2)(IV)		50.73(a)(2)(I)(A)		50.73(a)(2)(V)(D)					
	20.2203(a)(2)(V)		50.73(a)(2)(I)(B)		X 50.73(a)(2)(VII)					
	20.2203(a)(2)(VI)		50.73(a)(2)(I)(C)		50.73(a)(2)(VIII)(A)					
20.2203(a)(3)(I)		50.73(a)(2)(II)(A)		50.73(a)(2)(VIII)(B)						

12. LICENSEE CONTACT FOR THIS LER

NAME Eric J. Miller - Nuclear Regulatory Affairs	TELEPHONE NUMBER (Include Area Code) 570 / 542-3321
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13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX

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

16. ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)

During performance of Core Spray quarterly flow surveillances conducted in October, 2003; the Unit 1 and the Unit 2 'D' Core Spray pumps were declared inoperable due to an oil foaming condition observed in the upper bearing oil reservoirs for each pump motor. Liquid oil levels dropped below established minimum levels for pump operation as a result of the foaming. In response, oil was drained, the oil reservoirs were inspected, and new Gulfcrest 32 oil was placed in the reservoirs. Oil foaming was not observed during subsequent pump runs and oil levels remained in the normal range.

Oil samples taken from the affected pump motors, when analyzed for foaming tendency and stability levels, were found to exceed industry standard warning limits. The samples also yielded contaminants that mix with additives contained in the Gulfcrest 32 product to form a salt or soap compound capable of altering the foaming properties of Gulfcrest 32. An oil previously used in the Core Spray application is the probable source of these contaminants. Compatibility between the two oils was not considered during the design change process. Additionally, susceptibility to foaming can occur when anti-foaming additives "settle" during long term storage and fail to transfer in proper proportion as the oil is siphoned off for use. The plant intends to replace the Gulfcrest 32 used in selected equipment, revise change processes to ensure product compatibilities, and adjust inventory levels to reduce settling.

This event is reportable as a common cause inoperability of multiple Core Spray channels per 10 CFR 50.73(a)(2)(vii). There were no actual adverse consequences to the fuel, any plant equipment, or to the health and safety of the public as a result of this event.

LICENSEE EVENT REPORT (LER)

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17. NARRATIVE (If more space is required, use additional copies of NRC Form 366A)

EVENT DESCRIPTION

During performance of Core Spray (EIS Code: BM) quarterly flow surveillances performed on July 17 (Unit 1) and July 18, 2003 (Unit 2); visible oil foaming was observed in the upper motor bearing sight-glass during both the Unit 1 'D' (1D) and Unit 2 'D' (2D) Core Spray pump runs. Because oil levels were reported to be in the operating range during these runs, the 1D and 2D Core Spray pumps were considered to be operable following the surveillance. Subsequent routine lube oil analysis did not identify abnormalities. Planned actions to drain the upper motor bearing reservoir for inspection, originally scheduled before the next Core Spray surveillance runs required in October, were postponed due to conflict with other station work activities.

With both Unit 1 and Unit 2 in Mode 1 at 100% power, the Core Spray quarterly flow surveillances were performed again on October 21 and 23, 2003 for Unit 2 and Unit 1, respectively. Once again, the oil foaming condition was observed during both the Unit 1 and Unit 2 'D' pump runs. During the Unit 1 run conducted on October 23, oil level for the 1D Core Spray motor dropped below the minimum level. The pump was shutdown and declared inoperable at 1330 hours. While oil level for the 2D Core Spray motor was characterized as being "at or slightly below" the minimum level during its October 21 run, the 2D pump was not declared inoperable at that time based on discussions with General Electric. However, subsequent evaluation combined with the oil level response observed during the 1D pump operation also resulted in an inoperable declaration for the 2D pump on October 23. Although the 1D and the 2D Core Spray pumps were conservatively declared inoperable, it should be noted that motor bearing temperature and pump vibration levels were normal during all the aforementioned pump runs. This suggests that the oil/foam mixture was providing adequate lubrication for the pump motors. There were no actual component failures or detrimental effects that occurred as a result of the observed foaming condition.

In response, oil was drained to facilitate upper motor bearing reservoir inspections for both the 1D and 2D Core Spray pumps. No abnormalities were found. On October 24, 2003, after new oil was placed in the 1D and 2D oil reservoirs, quarterly flow surveillance runs were successfully performed on both Core Spray pumps. A 4-hour extended run was also performed on the 1B (previously unaffected by oil foaming) and the 1D Core Spray pumps. No foam was observed during either the surveillance or extended runs and liquid oil level remained in the normal range. Accordingly, the pumps were restored to operable status on October 24.

Oil samples taken from the 1D and 2D Core Spray pump motors were shipped to two independent laboratories and the manufacturer for evaluation. The foaming tendency and stability levels were found to exceed industry standard warning limits. Oil in the upper bearings of the two Core Spray motors was also contaminated with low levels of zinc, calcium and phosphorus. While these additives are commonly used in anti-wear (AW) oils, they are not required for the Core Spray application and are not intentionally introduced in the oil used therein (Gulfcrest 32).

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17. NARRATIVE (If more space is required, use additional copies of NRC Form 366A)

CAUSE OF EVENT

Contamination of the oil has been identified as a cause for this event. While there are several ways the oil could have become contaminated, it is believed the contamination was most likely caused by a Core Spray application change from Gulf Harmony 32 AW to Gulfcrest 32. Calcium sulfonate additives present in the anti-wear Gulf Harmony oil can mix with the acidic additives found in Gulfcrest 32 to form a salt or soap compound that can alter the foaming properties of Gulfcrest 32. The station did not evaluate compatibility of these oils and did not appreciate the potential for this reaction upon mixing of Gulf Harmony 32 AW and Gulfcrest 32.

Inadequacy of antifoam additives present in Gulfcrest 32 has also been identified as a cause for this event. As is discussed in ASTM D 892 "Standard Test Method for Foaming Characteristics of Lubrication Oils.", these additives can be adversely affected by product quality and storage practices. In inactive systems (such as a storage drum), these additive tend to agglomerate and will settle-out or cling to contaminants over time. Methods for dispensing oil (i.e. 5 gallons removed from a 55 gallon drum) may also reduce the effectiveness of the antifoam additive present in the Gulfcrest 32 product. When oil is dispensed in this manner, additives that may have "settled" during long-term storage may not transfer in proper proportion with the oil.

EXTENT OF CONDITION

Similar oil foaming problems could exist in any component using Gulfcrest 32. However, components that originally used Gulf Harmony 32 AW and have been changed to Gulfcrest 32 are more vulnerable. At Susquehanna, Core Spray pumps and the Residual Heat Removal Service Water pumps (EIS Code: BS) are the only safety related components that have undergone this change. It should be noted that there are no other reported foaming issues associated with Gulfcrest 32.

REPORTABILITY/SAFETY CONSEQUENCES ANALYSIS

This event was determined to be reportable under 10 CFR 50.73(a)(2)(vii) in that multiple Core Spray channels were rendered inoperable via common cause.

Actual: This event had no detrimental consequences on the Core Spray system. Surveillance history, including the October 2003 surveillances where oil level dropped below the minimum operating range, indicate all pump and motor performance parameters (motor bearing temperature and vibration) were normal. The lack of elevated temperatures suggests that adequate lubrication occurred through the oil/foam mixture.

The potential for bearing degradation is monitored using vibration analysis during surveillance runs. Following the oil change, no changes in vibration were detected as a result of this event.

Potential: Inadequate lubrication can lead to mechanical failure of lubricated components. If inadequate lubrication exists, bearing metal temperature would increase and, if left unchecked, could result in bearing failure. In the event of a Core Spray pump failure, the redundant Core Spray division would still be capable of providing design injection flow for the system.

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17. NARRATIVE (If more space is required, use additional copies of NRC Form 366A)

CORRECTIVE ACTIONS

The following corrective actions for this event have been completed:

- The 1D and 2D upper motor bearing reservoirs were drained and inspected. Oil ports were verified to be properly sized and unobstructed.
- The 1D and 2D upper motor bearing reservoirs were re-filled with new oil.
- Surveillance and extended runs were performed on multiple Core Spray pumps with no foaming observed.
- Oil samples were analyzed and evaluated by the manufacturer and two independent laboratories.

The following corrective actions are planned:

- The purity of Gulfcrest 32 used in selected plant equipment will be ensured through replacement.
- Oil receipt inspection and used oil testing will be reviewed against ASTM D 6224 "Standard Practice for In-Service Monitoring of Lubricating Oil for Auxiliary Power Plant Equipment" and ASTM D 4378 "Standard Practice For In-Service Monitoring of Mineral Turbine Oils for Steam and Gas Turbines" to identify and realize oil program improvements.
- Inventory levels of Gulfcrest 32 will be adjusted to reduce the potential for "settling" of additives associated with long-term storage of this product.
- Benchmarking will be performed to identify industry best practices in the areas of lubricant control, dispensing, usage tracking and product selection. Gathered information will be used as the basis for the potential establishment of a formal "Lubrication Program" at Susquehanna.
- The modification process will be revised to ensure all critical characteristics are reviewed and documented as part of the design change package. Compatibility between new and existing components such as lubricants, gaskets and o-rings must be addressed by this revised process.

ADDITIONAL INFORMATION

Failed Component Information:

None

Previous Similar Events:

None