

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
WASHINGTON, D.C. 20555-0001

September 29, 2003

NRC INFORMATION NOTICE 2003-17: REDUCED SERVICE LIFE OF AUTOMATIC SWITCH COMPANY (ASCO) SOLENOID VALVES WITH BUNA-N MATERIAL

Addressees

All holders of operating licenses for nuclear power reactors.

Purpose

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice to alert addressees to potential problems caused by the hardening of Buna-N material used in fabricating solenoid valves manufactured by Automatic Switch Company (ASCO). The NRC expects recipients to review the information for applicability to their facilities and consider actions, as appropriate, to avoid similar problems. However, suggestions contained in this information notice do not constitute NRC requirements and, therefore, do not require any specific action or written response.

Description of Circumstances

On September 1, 2002, at Dresden Nuclear Power Station, Unit 2, scram testing identified an unexpected number of control rod drives (CRDs) that were slow to respond. As part of the resulting troubleshooting plan, the licensee removed a set of scram solenoid pilot valves (SSPVs) from the unit and sent them to the vendor (ASCO) for analysis. In conjunction with General Electric (GE), ASCO tested the set of SSPVs and determined that their response times were slow and out of specification for a new set of SSPVs. GE/ASCO further determined that the increased response times were attributable to hardening of the exhaust port diaphragm.

Discussion

The SSPV exhaust port diaphragm is composed of Buna-N material. When exposed to heat and air, this Buna-N material ages by becoming hard. As the diaphragm hardens, it becomes less flexible and, therefore, does not move off of its seat as far, and thereby reduces the rate at which the air can vent off of the scram valve actuators. This slower venting rate causes a delay in the start of motion during scram testing, and can cause the CRD to be slow in responding. The diaphragm will eventually harden and then fail (break), which could prevent the desired scram of the CRD.

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Dresden Unit 2 and Quad Cities Nuclear Power Station have both experienced problems resulting from premature aging of the dual ASCO SSPV exhaust diaphragms that are fabricated using Buna-N material. In response, GE performed an evaluation of Quad Cities scram times and the qualified lifetime of the Buna-N material. The evaluation concluded that the qualified lifetime of Buna-N material should be reduced from 10 years to 6 years. In addition, based on a review of the plant scram time data over the current operating cycle, GE determined that the rate of scram time degradation is approximately .042 seconds every 120 days. Consequently, GE recommended an aggressive schedule of testing the CRD scram timing at a rate of 25 percent per week for all control rods that were not tested in 2003 to determine the actual 5 percent start of motion. This amounts to a total of 138 control rods. The alternative solution is to replace all SSPVs within the same time period.

This information notice does not require any specific action or written response. If you have any questions about the information in this notice, please contact either of the technical contacts listed below or the appropriate project manager in the NRC's Office of Nuclear Reactor Regulation (NRR).

Related Generic Communications

The NRC issued Information Notice 96-07, "Slow Five Percent Scram Insertion Times Caused By Viton Diaphragms In Scram Solenoid Pilot Valves," on January 26, 1996, to alert licensees to slow scram insertion times associated with fluoroelastometric (Viton) diaphragms used in SSPVs. The NRC issued Information Notice 94-71, "Degradation of Scram Solenoid Pilot Valve Pressure and Exhaust Diaphragms," on October 4, 1994, to alert licensees to embrittlement and cracking of Buna-N diaphragms used in SSPVs.

Other operating experience associated with Buna-N aging includes NRC Information Notice 86-109, "Diaphragm Failure in Scram Outlet Valve Causing Rod Insertion" which identified a nuclear power plant experiencing a single control rod scram (insertion) when the diaphragm in the air operator of the scram outlet valve failed. Investigation revealed that the diaphragm failed because of an aging process that resulted in a radial crack in the rubber (Buna-N and nylon material).

Information Notice 98-31, "Fire Protection System Design Deficiencies and Common-Mode Flooding of Emergency Core Cooling System Rooms at Washington Nuclear Project Unit 2" provides an example where age hardening of an ASCO solenoid operated valve contributed to room flooding.

/RA/

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Information Notice No.	Subject	Date of Issuance	Issued to
2003-16	Icing Conditions Between Bottom of Dry Storage System and Storage Pad	Pending	All 10 CFR Part 72 licensees and certificate holders.
2003-15	Importance of Followup Activities in Resolving Maintenance Issues	09/05/2003	All holders of operating licenses for nuclear power reactors except those who have permanently ceased operation and have certified that fuel has been permanently removed from the reactor vessel.
2003-14	Potential Vulnerability of Plant Computer Network to Worm Infection	08/29/2003	All holders of operating licenses for nuclear power reactors, except those who have permanently ceased operations and have certified that fuel has been permanently removed from the reactor vessel.
2003-13	Steam Generator Tube Degradation at Diablo Canyon	08/28/2003	All holders of operating licenses for pressurized-water reactors (PWRs), except those who have permanently ceased operations and have certified that fuel has been permanently removed from the reactor.

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