SSINS No.: 6835
IN 87-16

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT
WASHINGTON, D.C. 20555

April 2, 1987

IE INFORMATION NOTICE NO. 87-16: DEGRADATION OF STATIC "O" RING PRESSURE SWITCHES

Addressees:

All light-water reactor facilities holding an operating license or a construction permit.

Purpose:

This notice is to alert addressees to the potential for degradation of certain Static "O" Ring (SOR) pressure switches with Kapton diaphragms caused by exposure to ammonia and other chemicals that may be present in the process medium. It is expected that recipients will review the information for applicability to their facilities and consider actions, if appropriate, to preclude similar problems occurring at their facilities. However, suggestions contained in this information notice do not constitute NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances:

A number of SOR pressure switches (Model No. 6TA-B4-NX-JJTTX6) were declared inoperable at the Davis-Besse Nuclear Power Plant between January 7 and 12, 1987, when results of a routine surveillance indicated that the pressure switch set points had drifted outside of technical specification tolerances. The SOR switches that were declared inoperable, are located on the lines supplying steam to the auxiliary feedwater (AFW) pump turbines and are used to detect a low steam pressure and isolate the affected AFW pump in the event of a steam line break.

Subsequent investigation by the licensee, Toledo Edison, and SOR revealed that ammonia present in the steam lines had interacted with the Kapton diaphragm of the pressure switch, permeated it, and formed a bubble between the laminations of the Kapton diaphragm (fluorinated silicone membrane). It is believed that the formation of this bubble between the diaphragm layers caused the set point of the switch to shift.

At Davis-Besse, ammonia is added to the feedwater system to help control chemistry--primarily pH. Hydrazine, which is regularly added to coolant systems to help control chemistry and to scavenge oxygen, also is a source of ammonia because hydrazine reacts with oxygen to form ammonia. SOR has stated that qualified pressure switch models beginning with 1, 4, 5, 6, 8, 9, 12, and 54 may be affected if ammonia is present in the process medium.

Discussion:

SOR generally uses Kapton as the primary diaphragm material in their Class 1E qualified switches. Toledo Edison had recently installed the environmentally qualified switches as part of a system upgrade. Earlier model commercial grade SOR pressure switches at Davis-Besse used BUNA-N diaphragms. In 1979, the BUNA-N diaphragms were replaced with 316 stainless steel diaphragms. Because there have been no reported malfunctions of pressure switches using stainless steel diaphragms and because stainless steel is impermeable to ammonia, the pressure switches using Kapton diaphragms were replaced with pressure switches using stainless steel diaphragms.

When Toledo Edison ordered the Class 1E switches from SOR, the environmental conditions that the switches would be subjected to during normal operation were not specified. Thus, the ability of the switch to perform its required function in response to an accident was degraded because the procurement documents did not specify the normal process medium.

The instrument drift condition can go undetected for a considerable period of time. At Davis-Besse, the switches are tested for operability during bimonthly surveillances. The calibration of the set point is verified during each refueling outage. Therefore, even though the switch may demonstrate operability, setpoint drift exceeding the specified limits may not be detected until refueling outage calibrations.

Another factor contributing to the instrument drift at Davis-Besse is that the set point for the pressure switches (20 psig) was on the lower end of the adjustable range (10-85 psig). The instrument drift condition caused by the formation of an ammonia bubble between the diaphragm layers may not be significant on switches used in high pressure applications.

Additionally, NRC has learned from DuPont, the manufacturer of Kapton, that certain concentrations of chemicals such as ammonium hydroxide, sodium hydroxide, and potassium hydroxide will cause Kapton to degrade. When determining the suitability of an SOR pressure switch using a Kapton diaphragm to a particular application, it may be desirable to examine the resistance of Kapton to chemicals present in the application environment. For further information on Kapton properties call:

DuPont Company
Electronics Department
High Performance Films Division
1-800-527-2601

No specific or written response is required by this notice. If you have any questions regarding this matter, please contact the Regional Administrator of the appropriate regional office or this office.

Edward L. Jordan, Director
Division of Emergency Preparedness
and Engineering Response
Office of Inspection and Enforcement

Technical Contact(s): K. R. Naidu, IE
(301) 492-4179

J. G. Glitter, IE
(301) 492-4043

Attachment:
List of Recently Issued IE Information Notices

Attachment 1
IN 87-16
April 2, 1987

LIST OF RECENTLY ISSUED
IE INFORMATION NOTICES

Information Notice No.	Subject	Date of Issue	Issued to
87-15	Complaince with the Posting Requirements of Subsection 223b of the Atomic Energy Act of 1954, as Amended	3/25/87	All power reactor facilities holding a CP and all firms supplying components or services to such facilities
87-14	Actuation of Fire Suppression System Causing Inoperability of Safety-Related Ventilation Equipment	3/23/87	All power reactor facilities holding an OL or CP
86-106 Sup. 2	Feedwater Line Break	3/18/87	All power reactor facilities holding an OL or CP
87-13	Potential for High Radiation Fields Following Loss of Water from Fuel Pool	2/24/87	All power reactor facilities holding an OL or CP except Fort St. Vrain.
86-106 Sup 1	Feedwater Line Break	2/13/87	All power reactor facilities holding an OL or CP
87-12	Potential Problems With Metal Clad Circuit Breakers, General Electric Type AKF-2-25	2/13/87	All power reactor facilities holding an OL or CP
87-11	Enclosure of Vital Equipment Within Designated Vital Areas	2/13/87	All power reactor facilities holding an OL or CP
87-10	Potential for Water Hammer During Restart of Residual Heat Removal Pumps	2/11/87	All BWR facilities holding an OL or CP
87-09	Emergency Diesel Generator Room Cooling Design Deficiency	2/5/87	All power reactor facilities holding an OL or CP
87-08	Degraded Motor Leads in Limitorque CO Motor Operators	2/4/87	All power reactor facilities holding an OL or CP

OL = Operating License
CP = Construction Permit

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