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

April 29, 1986

IE INFORMATION NOTICE NO. 86-30: DESIGN LIMITATIONS OF GASEOUS EFFLUENT  
MONITORING SYSTEMS

Addressees:

All nuclear power reactor facilities holding an operating license or a construction permit.

Purpose:

This notice is provided to alert licensees to two design limitations noted in the use of Eberline's SPING-4 (system particulate iodine and noble gas) gaseous effluent monitoring systems. The first deals with the limitations of the detection capability of the SPING-4 monitoring system. Some licensees are incorrectly relying on the SPING-4 to meet all of the post-accident requirements of NUREG-0737. The second deals with noble gas adsorption that could interfere with routine operational low-level monitoring.

It is expected that recipients will review this information for applicability to their facilities and consider actions, if appropriate, to preclude problems related to these limitations at their facilities. However, suggestions contained in this notice do not constitute NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances:

The Eberline SPING-4 is designed to monitor radioactive noble gases, particulates and iodines in plant gaseous effluents. By using three overlapping channels, the noble gas (NG) monitor has a detection capability of  $10^{-7}$  to  $10^5$   $\mu\text{Ci/cc}$  (Xe-133 equivalent). The low-range channel employs a beta scintillation detector. The mid- and high-range channels of the NG monitor use energy-compensated GM tube detectors.

Conformance to NUREG-0737 II.F.1:

Item II.F.1.1 of NUREG-0737, "Clarification of TMI Action Plan Requirements," issued November 1980, requires licensees to have the capability to detect and measure concentrations of NG fission products in plant effluents (up to  $10^5$   $\mu\text{Ci/cc}$  for undiluted containment exhaust) during and following an accident. Recent NRC regional inspections of NUREG-0737 implementation indicate that

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some licensees have installed SPING-4 monitors and mistakenly consider them adequate to meet all of the requirements of Item II.F.1.1. Although the SPING-4 does have an upper detection capability of  $10^5$   $\mu\text{Ci}/\text{cc}$ , its associated microcomputer is vulnerable to radiation damage from a total integrated dose greater than 1000 rads. Therefore, it is unlikely the SPING-4 would survive the course of an accident. Eberline has indicated that the SPING-4 was designed primarily as a normal-range monitor with extended capabilities for brief excursions to concentrations greater than  $10^2$   $\mu\text{Ci}/\text{cc}$ . Full-range monitoring consistent with Item II.F.1.1 can be achieved by using the SPING-4 in conjunction with an accident monitor (with a remote microprocessor) such as Eberline's model AXM-1. The accident monitor comes on line when excessively high activity levels are sensed while the SPING-4 isolates itself and goes into a purge cycle.

#### Noble Gas Adsorption:

Eberline has noted noble gas adsorption with the plastic scintillator while performing a SPING-4 calibration. This calibration compared the SPING-4 output with a GeLi detection system output, as the concentration of a reference gas (Xe-127) was decreased. The concentration of Xe-127 (initially at 210  $\mu\text{Ci}/\text{cc}$ ) in the closed test loop was decreased by vent and dilution operations. Calibration was interrupted after 2 days to correct problems with the GeLi system. The system was allowed to stand idle for 10 days with 0.3  $\mu\text{Ci}/\text{cc}$  Xe-127 concentration. When the calibration resumed, the response of the beta scintillator did not decrease in the expected proportions. An investigation indicated that both the inner and outer mylar sheets that cover the plastic scintillator had adsorbed Xe-127 gas.

Although the levels of activity used in this calibration were much higher than those normally encountered, the noble gas adsorption noted on the low range of the detection system could indicate a generic operational concern. The high background resulting from the adsorbed gas could cause overestimations in any effluent release calculations that are based on the monitor output. This is particularly true if low-level monitoring is resumed following either a large activity excursion (3 or 4 orders of magnitude above normal) or an extended moderate increase (1 order of magnitude for a week or more). Following such releases the monitor should be purged and a new background taken. It should be noted that this gas adsorption phenomenon is probably not unique to SPING-4 monitoring systems. Other manufacturers of plastic scintillation detectors use similar construction techniques. Any effluent monitor that employs a plastic scintillation detector may experience the same difficulties.

No specific action or written response is required by this information notice. If you have any questions about 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: Roger L. Pedersen, IE  
(301)492-9425

James E. Wigginton, IE  
(301)492-4967

Attachment:  
List of Recently Issued IE Information Notices

LIST OF RECENTLY ISSUED  
 IE INFORMATION NOTICES

Information Notice No.	Subject	Date of Issue	Issued to
86-29	Effects of Changing Valve Motor-Operator Switch Settings	4/25/86	All power reactor facilities holding an OL or a CP
86-28	Unauthorized Transfer and Loss of Control of Industrial Nuclear Gauges	4/28/86	All licensees authorized to possess and use industrial nuclear gauges.
86-27	Access Control at Nuclear Facilities	4/21/86	All power reactor facilities holding an OL or CP, research and nonpower reactor facilities, and fuel fabrication & processing facilities
86-26	Potential Problems In Generators Manufactured By Electrical Products Incorporated	4/17/86	All power reactor facilities holding an OL or CP
86-25	Traceability And Material Control Of Material And Equipment, Particularly Fasteners	4/11/86	All power reactor facilities holding an OL or CP
86-24	Respirator Users Notice: Increased Inspection Frequency For Certain Self-Contained Breathing Apparatus Air Cylinders	4/11/86	All power reactor facilities holding an OL or CP; research and test reactor facilities; fuel cycle licensees and Priority 1 material licensees
86-23	Excessive Skin Exposures Due To Contamination With Hot Particles	4/9/86	All power reactor facilities holding an OL or CP
86-22	Underresponse Of Radition Survey Instrument To High Radiation Fields	3/31/86	All power reactor facilities holding an OL or CP and research and test reactors

OL = Operating License

CP = Construction Permit