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Director of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Mail Station P1-137
Washington, DC 20555

Reference: Docket No. 50-186
University of Missouri
License R-103

Subject: Report as required by Technical Specification 6.1.h(2) concerning reactor operation with unreliable monitoring of the reactor facility stack effluent.

Introduction:

The reactor was operated from 1558 June 22, 1992, to 1519 June 23, 1992, with unreliable radiation monitoring of the exhaust stack effluent as required by Technical Specification 3.4.a. Several pieces of sheet metal used as bending vanes in the exhaust ventilation system were found to have broken loose, impacting the isokinetic sampling probe for the stack radiation monitor and causing it to become disconnected from the stack monitor sampling (suction) line. With the stack radiation monitor disconnected from the isokinetic sampling probe, the reactor control room stack monitor indications required by Technical Specification 3.4.a. were not reliable representations of exhaust stack effluent.

Description:

At approximately 1415 on June 23, 1992, the Reactor Shift Supervisor requested that the Health Physics Group investigate the cause of lower than normal chart recorder indication on the stack radiation monitor gas channel. The gas channel chart recorder was indicating the low count rate normally observed when the reactor is shutdown (approx. 30-40 counts/min). The particulate channel was indicating in its normal range and the iodine channel recorder indication was slightly lower than the normal range observed when the reactor operates at 10 MW.





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A Health Physicist, assisted by an Electronics Technician, performed an electronic and source calibration check of the stack monitor gas channel and found it to be operating normally. Further investigation by the Health Physicist revealed that the isokinetic probe was disconnected from the stack radiation monitor sampling line. At 1519 the isokinetic probe was reconnected to the sampling line and the gas channel indication immediately rose to the expected level.

Further investigation was made of the isokinetic probe and sampling line to determine why the probe had disconnected from the stack monitor sampling line. This investigation revealed that several large pieces of sheet metal were caught on the isokinetic probe, turning the probe 90° from its desired orientation. The reactor was shutdown at 1621 on June 23, 1992, in order to determine the source of the loose sheet metal pieces and to remove them from the exhaust plenum.

The sheet metal pieces were found to be flow bending vanes used in an exhaust system transition piece. This sheet metal had travelled through the exhaust ducting several feet before impacting the isokinetic probe. These loose pieces were removed and the exhaust ducting and remaining bending vanes were inspected. The remaining bending vanes were determined to be adequately secured within the exhaust duct transition piece. The isokinetic probe was removed and inspected. Several small dings were removed from the isokinetic probe and the probe was reinstalled. The exhaust ventilation system and the stack radiation monitoring system were tested and found to be operating normally. The reactor was refueled and returned to operation at 2227 on June 23, 1992.

**Analysis:**

The objective of Technical Specification 3.4.a. Reactor Instrumentation is to ensure that sufficient reliable information is presented to the reactor operators to assure safe operation of the reactor. Technical Specification 3.4.a. states "the reactor shall not be operated unless the instrument channels listed are operable." The stack radiation monitor is one of the five instrument channels listed in Technical Specification 3.4.a. as required for Mode I (10 MW) operation. A footnote to the stack radiation monitor requirement states the: ". . . monitor may be placed out of service for up to 2 hours for calibration and maintenance. During this out of service time, no experimental or maintenance activities will be conducted which could likely result in the release of unknown quantities of airborne radioactivity."

The longest period that the stack radiation monitor is believed to have been providing unreliable information is from 1558 on June 22 to 1519 on June 23, 1992. Review of stack radiation monitor charts the day of June 22, with the reactor shutdown for scheduled maintenance activities, show the normal response to hot

cell activities scheduled that day. Reactor Operators, as part of the Reactor Pre-Startup Checks, exercise the exhaust system fans shortly before startup to test alarms and the ability of the backup exhaust fan to start upon loss of the running fan. This testing of the two exhaust fans causes a flapper plate to shift within the ducting and creates significant air flow transients within the ducting. It is believed the bending vanes broke loose during these fan shifts and traveled several feet through the ducting before impacting the isokinetic probe, turning it 90° and causing the probe to be disconnected from the stack monitor sampling line. This sampling line and the base of the isokinetic probe is made of 3/4 inch diameter copper tubing. The connection between the two was thick-walled tygon tubing.

Reactor operations, laboratory work, hot cell activities, and pneumatic tube irradiations for the period of inadequate monitoring were reviewed to determine whether there had been any unusual situations which might have resulted in release of unknown quantities of airborne radioactivity. No unusual activities were found to have occurred during this time period. Containment air concentrations were continuously monitored by the air plenum radiation monitors during the time of inadequate stack monitoring. These monitors indicated no unusual airborne radioactivity during this time. The primary system fission product monitor was in continuous operation during this time and indicated no unusual activity in the primary system. The Alpha 6 air monitor was continuously monitoring the air exhaust from the Alpha laboratory during this time and indicated no abnormal readings.

The stack monitor filters (particulate and charcoal) which had been installed and sampling since June 16, 1992, at 0943, were pulled for analysis at 1755 on June 23. During this time frame, we were also running, for evaluation purposes, the new digital radiation monitoring system (NMC model RAK-22ABIB-P/6) which was monitoring the exhaust system effluent through a separate isokinetic probe situated about six feet downstream of the current stack monitor isokinetic probe. This new isokinetic probe was not affected by the loose pieces of sheet metal. The new monitor had been placed on-line for testing at 0856 on June 19, 1992. This system was being run to test new electronic components, but a new isotopic calibration had not yet been performed. This monitor's filters (particulate and charcoal) were also pulled for analysis at 1800 on June 23, 1992. On June 24, 1992, the historical data for the new monitor's gas channel was retrieved and calibration for the gas channel was checked using Argon-41. This historical data showed no abnormally high indications.

All analyses and review of activities showed the stack gas, particulate and iodine activities to be normal and within Technical Specification limits during the time the primary source of stack monitoring was inadequate. It is concluded from this review of MURR activities and the analysis of alternate sources of airborne effluent information that no abnormal release of radionuclides occurred during the time of inadequate stack monitoring.

**Corrective Actions:**

The immediate corrective action was to reconnect the isokinetic probe to the stack radiation monitor sampling line. Upon discovery that several pieces of sheet metal were impacting the isokinetic probe, the reactor was shutdown so that the loose pieces of sheet metal could be removed and the isokinetic probe could be inspected for damage. The exhaust ducting was inspected to ensure that no additional pieces of sheet metal were likely to come loose.

The tygon tubing connection between the stack monitor sampling line and the isokinetic probe was replaced by solid tubing with compression fittings during maintenance activities July 13, 1992.

The MURR engineering staff evaluation of the exhaust ducting indicated that no similar event is likely. However, to be conservative, the exhaust plenum transition piece that contains the bending vanes is being scheduled for replacement.

Licensed operators and Health Physics personnel discovered this problem while performing an investigation of unusually low readings on the stack monitor. After reviewing their actions and relating the circumstances of this event to all licensed personnel and Health Physics personnel, the importance was stressed of initiating investigations of unusually low readings on the stack monitor charts in a more timely fashion.

Sincerely,

Walter A. Meyer, Jr.
Reactor Manager

ENDORSEMENT:
Reviewed and Approved

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WAM:bjb

xc: Regional Administrator, NRC, Region III
Reactor Advisory Committee
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Christine M. Errante 7/22/92

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