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IN 85-06

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

January 23, 1985

IE INFORMATION NOTICE NO. 85-06: CONTAMINATION OF BREATHING AIR SYSTEMS

Addressees:

All nuclear power reactor facilities holding an operating license (OL) or construction permit (CP).

Purpose:

This information notice is provided to alert licensees to two events resulting in the radioactive contamination of compressed air systems used to supply breathing air to respirator users at nuclear power plants. It supplements information previously provided in Information Notice 79-08 which discussed similar events. Licensee corrective actions and lessons learned from the two relatively recent events and other previously documented occurrences are discussed. It is expected that recipients will review this information for applicability to their facilities and consider actions, if appropriate, to preclude similar problems occurring 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:

Event 1

During September 1984, portions of the Browns Ferry service air system (SAS) were contaminated with gaseous radioactivity directly from the station's augmented offgas system (AOG). The SAS and AOG were cross-connected via a rubber hose (with a single check-valve). Air from the SAS was being supplied to remove moisture from the AOG hydrogen analyzer sample line downstream of the AOG hydrogen/oxygen recombiner. Evidently this was a routine maintenance activity. When the SAS on-line and backup air compressors failed and the air receivers bled down, freshly produced radioactive offgas entered the service air through the temporary hose connection. This condition existed for approximately 2 1/2 hours; fortunately, no one used the system as a breathing air supply during this period.

Plant personnel became aware of the problem after the air compressors were once again operable. Apparently the offgas in a portion of the SAS line near an area radiation monitor (ARM) was compressed and caused the ARM to alarm (10mR/hr alarm set point). Only short-lived noble gases and their daughter

products were found in the SAS, and no explosive or flammability problems were reported. Along with tightened administrative controls, double check-valve backflow protection is now required when cross-connecting to the SAS.

Event 2

On July 19, 1983, workmen while cutting up spent fuel racks inside a tent-containment structure at H.B. Robinson were wearing air-line respirators fed by the plant's instrument air system (IAS). While attempting to connect the air manifold assembly to a different IAS supply point before putting on their respirators, two workers were exposed to dust and rust particles from the initial air surge. When "frisked," the two workers found themselves contaminated. Air sampled from the contaminated air line contained about 6.6E-8 μCi/cc (corresponding to an MPC fraction of 14.1). On the basis of these air samples and the whole-body counting, the workers involved were assigned radioactive intakes of less than 40 MPC-hrs.

The licensee investigated the incident, sampled other portions of the IAS, and found no other radioactive contamination problems. The source of the IAS contamination could not be definitely determined. Therefore, as part of the corrective actions taken, the licensee now samples and analyzes for radioactivity at each air supply connection point before the breathing air is used.

Discussion

The NRC staff is aware of other instances where installed service air systems used to provide personnel breathing air have been contaminated (see Attachment 1 for references). On the basis of a review of licensees' corrective actions and discussions with the licensees' operating staff, the lessons learned from the referenced events are summarized as follows:

1. Radiological air sampling before use can help prevent inadvertent intakes of radioactivity when infrequently-used portions of service/instrument air systems are used as breathing air sources. This precautionary radiological sampling of the air system would complement the periodic radiological sampling and industrial hygiene sampling necessary to ensure continued Grade D quality (or better) for supplied air as required by 30 CFR 11 and 10 CFR 20.

2. Operating procedures can provide for effective administrative controls and establish physical separation criteria to prevent cross-contamination when air systems are temporarily connected to contaminated systems. To minimize the potential for cross-contamination, some licensees use intermediate air motors (driven by service air) to directly supply air to a contaminated system. This approach is applicable only when the air supply loads are low enough to be supplied by the air motors.

3. There is that potential for "an unreviewed safety question" situation when system operations are changed from what is described in the Safety Analysis Report, such as cross-connecting contaminated and noncontaminated systems. IE Circular No. 80-18, "10 CFR 50.59 Safety Evaluations for

Changes to Radioactive Waste Treatment Systems" discusses general principles and philosophy of the 10 CFR 50.59 safety evaluation guidance and provides insight as to when safety evaluations are necessary to ensure that changes to SAR-described systems are properly evaluated.

4. For permanent, as-designed interconnections between installed compressed air systems and contaminated systems, periodic function checks and maintenance of the system separation protection features (e.g., check valves and air operated ball valves) can help ensure continued integrity of the separation.

5. Procedures governing the startup, operation, and maintenance of "add-on" air handling equipment (e.g., pressure regulating/filtration manifold) can ensure proper air purging (blowing down) to remove contaminants such as dead-leg water and rust before the air is used for breathing.

While a separate breathing air supply and distribution system is the ideal source of worker-supplied air and this can be justified for plants at the design stage, the physical and economic constraints of installing a separate breathing air system in an existing facility might be overly burdensome. Properly modified plant SASs and IASs, with attendant maintenance and sampling surveillance programs, can be adequate, reliable sources of breathing air for plant workers.

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.

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Attachments:
1. References
2. List of Recently Issued IE Information Notices

## References

1. U.S. Nuclear Regulatory Commisssion, Office of Inspection and Enforcement, Information Notice No. 79-08, "Interconnection of Contaminated Systems with Service Air Systems used as a Source of Breathing Air," March 28, 1979.

2. Institute for Nuclear Power Operations, Significant Event Report (SER) 26-82, "Radioactive Contamination of Service Air System," issued 1982.

Attachment 2
IN 85-06
January 23, 1985

LIST OF RECENTLY ISSUED
IE INFORMATION NOTICES

| Information Notice No. | Subject | Date of Issue | Issued to |
|---|---|---|---|
| 85-05 | Pipe Whip Restraints | 1/23/85 | All power reactor facilities holding an OL or CP |
| 85-04 | Inadequate Management Of Security Response Drills | 1/17/85 | All power reactor facilities holding an OL or CP, & fuel fabrication & processing facilities |
| 85-03 | Separation Of Primary Reactor Coolant Pump Shaft And Impeller | 1/15/85 | All pressurized water power reactor facilities holding an OL or CP |
| 85-02 | Improper Installation And Testing Of Differential Pressure Transmitters | 1/15/85 | All power reactor facilities holding an OL or CP |
| 85-01 | Continuous Supervision Of Irradiators | 1/10/85 | All material licensees possessing irradiators that are not self-shielded and contain more than 10,000 curies of radioactive material |
| 84-94 | Reconcentration Of Radionuclides Involving Discharges Into Sanitary Sewage Systems Permitted Under 10 CFR 20.303 | 12/21/84 | All NRC materials licensees other than licensees that use sealed sources only |
| 84-93 | Potential For Loss Of Water From The Refueling Cavity | 12/17/84 | All power reactor facilities holding an OL or CP |
| 84-92 | Cracking Of Flywheel On Cummins Fire Pump Diesel Engines | 12/17/84 | All power reactor facilities holding an OL or CP |

OL = Operating License
CP = Construction Permit