## **AMP 128 COMPRESSED Air Monitoring (VERSION 2017)**

### Programme Description

The purpose of the compressed air monitoring programme is to provide reasonable assurance of the integrity of the compressed air system. The programme consists of monitoring moisture content, corrosion, and performance of the compressed air system. This includes (a) preventive monitoring of water (moisture) and other potential contaminants to keep within the specified limits; and (b) inspection of components for indications of loss of material due to corrosion.

The compressed air monitoring AMP is based on results of the plant owner’s response to national regulation requirements and industry operation experiences feedback reports [1-6] to perform an extensive design and operations review and verification for maintaining proper instrument air quality.

This AMP includes preventative measures, inspections of components, and testing to ensure that the compressed air system will be able to perform its intended function for the period of extended operation. The AMP also incorporates the air quality provisions provided in the applicable guidance documents [7-8], and references standard [9]. References standard [10] provides additional guidance for maintenance of the instrument air system by offering recommended test methods, test intervals, parameters to be measured and evaluated, acceptance criteria, corrective actions, and records requirements.

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### Evaluation and Technical Basis

1. ***Scope of the ageing management programme based on understanding ageing:***

The programme manages the ageing effects of loss of material due to corrosion in compressed air systems.

1. ***Preventive actions to minimize and control ageing degradation:***

For the purposes of ageing management, moisture and other corrosive contaminants in the system’s air are maintained below specified limits to ensure that the system and components maintain their intended functions. These limits are prepared from consideration of manufacturer's recommendations for individual components and applicable guidelines [7-8, 10-11], and references standard [9].

1. ***Detection of ageing effects:***

Moisture and other corrosives increase the potential for loss of material due to corrosion. The programme periodically samples and tests the air quality in the compressed system for moisture and other corrosives in accordance with industry standards, such as references standards [11]. Periodic and opportunistic inspections of accessible internal surfaces are performed for signs of corrosion and abnormal corrosion products that might indicate a loss of material within the system.

1. ***Monitoring and trending of ageing effects:***

The reading of dew point are recorded and trended. Air quality analysis results are reviewed to determine if alert levels or limits have been reached or exceeded. This review also checks for unusual trends. References standard [10] provides guidance for monitoring and trending data. Visual inspection results are compared to previous results to ascertain if adverse long-term trends exist. The effects of corrosion are monitored by visual inspection. Test data are analyzed and compared to data from previous tests to provide for the timely detection of ageing effects on passive components.

1. ***Mitigating ageing effects:***

Maintaining moisture and other corrosive contaminants below acceptable limits mitigates loss of material due to corrosion.

1. ***Acceptance criteria:***

Acceptance criteria for air quality moisture limits are established based on accepted industry standards [11]. Internal surfaces should not show signs of corrosion (general, pitting, and crevice) that could indicate the potential loss of function of the component. Manufacturers’ certifications can be used to demonstrate that the bottled air meets acceptable quality standards.

1. ***Corrective actions:***

Corrective actions are taken if any parameters are out of acceptable ranges, such as moisture content in the system air.

1. ***Operating experience feedback and feedback of research and development results:***

This AMP addresses the industry-wide generic experience. Relevant plant-specific operating experience is considered in the development of the plant AMP to ensure the AMP is adequate for the plant. The plant implements a feedback process to periodically evaluate plant and industry-wide operating experience and research and development (R&D) results, and, as necessary, either modifies the plant AMP or takes additional actions (e.g. develop a new plant-specific AMP) to ensure the continued effectiveness of the ageing management.

Potentially significant safety-related problems pertaining to air systems have been documented in references document [3-4, 12]. Some of the systems that have been significantly degraded or that have failed due to the problems in the air system include the decay heat removal, auxiliary feedwater, main steam isolation, containment isolation, and fuel pool seal systems.

At the time when this AMP was produced, no relevant R&D was identified.

1. ***Quality management:***

Site quality assurance procedures, review and approval processes, and administrative controls are implemented in accordance with the different national requirements (e.g., 10 CFR Part 50, Appendix B [13]).

### References

1. UNITED STATES NUCLEAR REGULATORY COMMISSION, Generic Aging Lessons Learned (GALL) Report — Final Report (NUREG-1801, Revision 2), USNRC, 2010.
2. UNITED STATES NUCLEAR REGULATORY COMMISSION, Generic Letter 88-14, Instrument Air Supply Problems Affecting Safety-Related Components, USNRC, August 8, 1988.
3. UNITED STATES NUCLEAR REGULATORY COMMISSION, Information Notice 81-38, Potentially Significant Components Failures Resulting from Contamination of Air-Operated Systems, USNRC, December 17, 1981.
4. UNITED STATES NUCLEAR REGULATORY COMMISSION, Information Notice 87-28, Air Systems Problems at U.S. Light Water Reactors, USNRC, June 22, 1987.
5. UNITED STATES NUCLEAR REGULATORY COMMISSION, Information Notice 87-28, Supplement 1, Air Systems Problems at U.S. Light Water Reactors, USNRC, December 28, 1987.
6. UNITED STATES NUCLEAR REGULATORY COMMISSION, Information Notice 2008-06, Instrument Air System Failure Resulting In Manual Reactor Trip, USNRC, April 10, 2008.
7. ELECTRIC POWER RESEARCH INSTITUTE, Instrument Air System: A Guide for Power Plant Maintenance Personnel, NP-7079, EPRI, Palo Alto, CA, December 1990.
8. ELECTRIC POWER RESEARCH INSTITUTE NUCLEAR MAINTENANCE APPLICATION CENTER, Compressor and Instrument Air System Maintenance Guide: Revision to NP-7079, EPRI/NMAC TR-108147, EPRI, Palo Alto, CA, March 1998.
9. INTERNATIONAL ORGANIZATION FOR STANDARDIZATION, ISO 8573.1-2010, Compressed Air – Part 1: Contaminants and purity classes, ISO, April 2010.
10. AMERICAN SOCIETY OF MECHANICAL ENGINEERS, ASME OM-2009, Operation and Maintenance of Nuclear Power Plants, Part 28, Mandatory Appendix VI, Specific Testing Requirements of Instrument Air Systems in LWR Power Plants, ASME, New York, NY, 2009.
11. AMERICAN NATIONAL STANDARDS INSTITUTE, ANSI/ISA-7.0.01-1996, Quality Standard for Instrument Air, ANSI, 1996.
12. UNITED STATES NUCLEAR REGULATORY COMMISSION, Licensee Event Report 50-237/94-005-3, Manual Reactor Scram due to Loss of Instrument Air Resulting from Air Receiver Pipe Failure Caused by Improper Installation of Threaded Pipe during Initial Construction, USNRC, April 23, 1997.
13. UNITED STATES NUCLEAR REGULATORY COMMISION, 10 CFR Part 50, Appendix B, Quality Assurance Criteria for Nuclear Power Plants, Office of the Federal Register, National Archives and Records Administration, USNRC, Latest Edition.