

## XI.M39 LUBRICATING OIL ANALYSIS

### Program Description

The purpose of the Lubricating Oil Analysis program is to ensure that the oil environment in the mechanical systems is maintained to the required quality to prevent or mitigate age-related degradation of components within the scope of this program. This program maintains oil systems contaminants (primarily water and particulates) within acceptable limits, thereby preserving an environment that is not conducive to loss of material or reduction of heat transfer. Lubricating oil testing activities include sampling and analysis of lubricating oil for detrimental contaminants. The presence of water or particulates may also be indicative of inleakage and corrosion product buildup.

Although primarily a sampling program, the lubricating oil analysis program is generally effective in monitoring and controlling impurities. This report identifies when the program is to be augmented to manage the effects of aging for license renewal. Accordingly, in certain cases identified in this report, verification of the effectiveness of the program is undertaken to ensure that significant degradation is not occurring and that the component's intended function is maintained during the period of extended operation. For these specific cases, an acceptable verification program is a one-time inspection of selected components at susceptible locations in the system.

### Evaluation and Technical Basis

1. **Scope of Program:** The program manages the aging effects of loss of material due to corrosion or reduction of heat transfer due to fouling. Components within the scope of the program include piping, piping components, and piping elements; heat exchanger tubes; reactor coolant pump elements; and any other plant components subject to aging management review that are exposed to an environment of lubricating oil (including non-water-based hydraulic oils).
2. **Preventive Actions:** The Lubricating Oil Analysis program maintains oil system contaminants (primarily water and particulates) within acceptable limits.
3. **Parameters Monitored/Inspected:** This program performs a check for water and a particle count to detect evidence of contamination by moisture or excessive corrosion.
4. **Detection of Aging Effects:** Moisture or corrosion products increase the potential for, or may be indicative of, loss of material due to corrosion and reduction of heat transfer due to fouling. The program performs periodic sampling and testing of lubricating oil for moisture and corrosion particles in accordance with industry standards. The program recommends sampling and testing of the old oil following periodic oil changes or on a schedule consistent with equipment manufacturer's recommendations or industry standards (e.g., American Society for Testing of Materials [ASTM] D 6224-02). Plant-specific operating experience also may be used to augment manufacturer's recommendations or industry standards in determining the schedule for periodic sampling and testing when justified by prior sampling results.

In certain cases, as identified by the AMR Items in this report, inspection of selected components is to be undertaken to verify the effectiveness of the program and to ensure

that significant degradation is not occurring and that the component intended function is maintained during the period of extended operation.

5. **Monitoring and Trending:** Oil analysis results are reviewed to determine if alert levels or limits have been reached or exceeded. This review also checks for unusual trends.
6. **Acceptance Criteria:** Water and particle concentration should not exceed limits based on equipment manufacturer's recommendations or industry standards. Phase-separated water in any amount is not acceptable.
7. **Corrective Actions:** Pursuant to 10 CFR Part 50, Appendix B, specific corrective actions are implemented in accordance with the plant quality assurance (QA) program. For example, if a limit is reached or exceeded, actions to address the condition are taken. These may include increased monitoring, corrective maintenance, further laboratory analysis, and engineering evaluation of the system. As discussed in the Appendix for GALL, the staff finds the requirements of 10 CFR Part 50, Appendix B, acceptable to address the corrective actions.
8. **Confirmation Process:** Site QA procedures, review and approval processes, and administrative controls are implemented in accordance with the requirements of 10 CFR Part 50, Appendix B. As discussed in the Appendix for GALL, the staff finds the requirements of 10 CFR Part 50, Appendix B, acceptable to address the confirmation process and administrative controls.
9. **Administrative Controls:** The administrative controls for this program provide for a formal review and approval of corrective actions. The administrative controls for this program are implemented through the site's QA program in accordance with the requirements of 10 CFR Part 50, Appendix B.
10. **Operating Experience:** The operating experience at some plants has identified (a) water in the lubricating oil and (b) particulate contamination. However, no instances of component failures attributed to lubricating oil contamination have been identified.

## References

- 10 CFR Part 50, Appendix B, *Quality Assurance Criteria for Nuclear Power Plants*, Office of the Federal Register, National Archives and Records Administration, 2009.
- ASTM D 6224-02, *Standard Practice for In-Service Monitoring of Lubricating Oil for Auxiliary Power Plant Equipment*, American Society of Testing Materials, West Conshohocken, PA, 2002.