

NRC-Approved Technology to Extend Calibration Intervals of Pressure, Level, and Flow Transmitters

November 2022

Overview

In August 2021, the NRC approved a Topical Report (TR) written by Analysis and Measurement Services Corporation (AMS) to use online monitoring (OLM) technology to extend the calibration intervals of safety-related nuclear plant pressure, level, and flow transmitters. The technology can extend calibration intervals for up to 12 or more operating cycles (versus the every other cycle calibration intervals using the Surveillance Frequency Control Program (SFCP)). For a typical 4-loop PWR, OLM implementation could eliminate calibrations of nearly 100 pressure transmitters every refueling outage. For a BWR, there are approximately 75 transmitter calibrations that could be eliminated.

As shown in Figure 1, the OLM technology is based on AMS performing a statistical analysis of transmitter data stored in the plant computer or data historian and typically ~90% of the transmitters within the scope of OLM will not require calibration during the refueling outage. The OLM analysis methodologies make use of the existing plant instrument uncertainties and no plant modifications or changes to instrument setpoint calculations are required.

The business case for implementation of the OLM technology is positive and it can reduce (1) worker industrial safety risk, (2) radiological dose, (3) outage O&M labor and I&C resources, (4) human errors, (5) costs for replacement parts, (6) outage delays and plant impacts, and (7) rework.

Plant Computer /
Data Historian



AMS Statistical Analysis of Transmitter Data

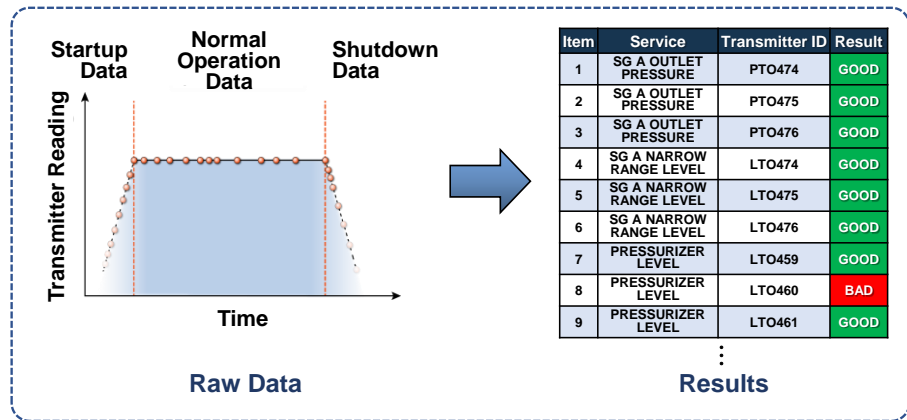


Figure 1. OLM Implementation Process

Analysis and Outage Planning

Using OLM technologies, transmitter data from the plant computer is analyzed during startup, normal operation, and shutdown to verify calibration over much of their range and to identify transmitters whose calibration must be checked, and those that can be left alone. To facilitate outage preparation, preliminary data analysis is provided to the site mid-cycle with final results submitted within a couple of days after the shutdown of the plant. There is commonly good agreement between the mid-cycle and final results, with one or two transmitters occasionally added to the outage scope.

Benefits

Significant O&M savings and reduced capacity factor risk are available with this newly NRC-approved technology. Aside from direct costs, pressure transmitter miscalibration and misalignment issues have occurred causing delays, plant trips, or forced shutdowns. Examples of direct and indirect cost savings include:

1. Improved Safety through Reduced Opportunity for Personal Injury
2. Reduced Radiological Dose (ALARA)
3. Ability to Reduce and Reallocate I&C Outage Resources
4. Ability to Reduce the Number of I&C Outage Supplemental Workers
5. Reduced Maintenance-Induced Errors (up to 5% of calibrations per industry data)
6. Reduced Calibration-Induced Wear and Tear of Transmitters
7. Reduced Need for Expensive EQ Qualified Gaskets, O-rings, and Lugs
8. Reduced Instrument Line and Valve Rework/Replacement
9. Elimination of Calibration-Induced Plant Trips
10. Reduced Start-Up Delays and Outage Duration
11. Reduced at Power Re-calibrations of Transmitters

The new OLM methodology provides the basis for significantly longer calibration extensions when compared to the SFCP, and it does not require positively indicating as-found/as-left (AFAL) drift evaluations, which have prevented calibration extensions using the SFCP. The methodology also does not require extensive Probabilistic Risk Assessment (PRA) analyses like the SFCP.

Implementing OLM

OLM implementation requires a license amendment request (LAR) for each plant. AMS is currently working with Southern Nuclear to submit the first plant-specific LAR in December 2022, with approval expected in 2023. Submittal of this first LAR will streamline the process for subsequent plant-specific LAR development and approvals. Fleet LARs can further streamline the work and reduce NRC review costs.

AMS is currently in discussion with multiple utilities that are interested in the benefits of implementing the OLM methodology. If you would like to get more information for your facility, please contact Ryan O'Hagan at AMS (ryan@ams-corp.com).