TECHNICAL ARTICLES

## Guide to create an Alarm Management Program using ISA-18.2 standard

By Graham Nasby, co-managing director of ISA18 committee

SCADA alarm systems – whether they generate screen alarms, control room alarms, mobile device alarms, or call-out alarms – are a vital component of any SCADA system. SCADA systems, known as supervisory control and data acquisition, perform a vital role modern water utilities by monitoring, controlling, logging, and alarming a wide range of processes, including pumping, purification, storage, distribution, and ultimately the collection and treatment of wastewater.

To ensure the continued effectiveness of the SCADA alarm system, an ongoing alarm management program is needed to monitor the performance of alarms and make alarm programming adjustments as required. The ISA-18.2 alarm management standard provides standardized framework and work procedures for developing and maintaining an effective SCADA alarm system.

At a minimum, an effective alarm management program that is part of water facility operations should consist of:

- A master alarm database (MADB) is used to document the agreed-to configuration of each alarm, including the expected operator response, expected speed of operator response required, and the purpose of each alarm. The master alarm database should be readily accessible to operations.
- A program where alarm system statistics are gathered continuously, or at set intervals, so the performance of alarms over time can be monitored. This includes statistics such as number alarm activations per hour, number of standing alarms, alarm acknowledgement times, operator response times, and the most commonly activated alarms. While informal/manual methods can be used, software tools should be used to automatically create these reports.
- Periodic meetings with the operations, compliance, management, and SCADA team members, plus other stakeholders as needed, to review alarm system performance, and to discuss potential improvements that can be made to problematic alarms and/or alarm conditions
- Establishing a clear identification and rationalization process that is used when adding new alarms. Identification is the ISA18.2 work process where opportunities for adding alarms are identified, and rationalization is when potential new alarms are reviewed to ensure they will be useful/effective prior to them being added to the alarm system.
- Periodic alarm system audits to ensure that in-service alarm settings are in alignment with what is documented in the master alarm database.

• Having documented procedures for shelving or putting alarms out of service in a controlled way, in the case of known equipment problems or when parts of a facility that are currently not in use. Ideally, the SCADA system software will have built-in support for controlling and logging when alarms are shelved and/or put out of service, including requiring users to enter in a reason when alarm temporarily disabled and when (or if) it should be restored.

A more complete guide to establishing an alarm management program can be found in the ISA18.2 alarm management standard and associated technical reports. ISA members can view the ISA18.2 standard at no cost at <u>www.isa.org</u>, and copies can be purchased at <u>www.isa.org/standards</u>.



ISA18.2 Alarm Management Lifecycle (source: ISA 18.2-2016)

Alarm performance metrics based upon at least 30 days of data		
Metric	Target value	
Annunciated alarms per time:	Target value: Very likely to be acceptable	Target value: Maximum manageable
Annunciated alarms per day per operating position	~150 alarms per day	~300 alarms per day
Annunciated alarms per hour per operating position	~6 (average)	~12 (average)
Annunciated alarms per 10 minutes per operating position	~1 (average)	~2 (average)
Metric	Target value	
Percentage of hours containing more than 30 alarms	~<1%	
Percentage of 10-minute periods containing more than 10 alarms	~1<%	
Maximum number of alarms in a <u>10</u> minute period	s10	
Percentage of time the alarm system is in a flood condition	~<1%	
Percentage contribution of the top 10 most frequent alarms to the overall alarm load	~<1% to 5% maximum, with action plans to address deficiencies.	
Quantity of chattering and fleeting alarms	Zero action plans to correct any that occur.	
Stale alarms	Less than 5 present on any day, with action plans to address	
Annunciated priority distribution	3 priorities: ~80% Low, ~15% Medium, ~5% High or 4 priorities: ~80% Low, ~15% Medium, ~5% High, ~<1% "highest" Other special-purpose priorities excluded from the calculation	
Unauthorized alarm suppression	Zero alarms suppressed outside of controlled or approved methodologies	
Unauthorized alarm attribute changes	Zero alarm attribute changes outside of approved methodologies or MOC	

Summary of Maximum Recommended Alarm Rates from Alarm Systems (source: ISA 18.2-TR5 Alarm System Monitoring, Assessment, and Auditing)

**About the Author:** Graham Nasby, P.Eng has over 20 years of experience with SCADA, OT and industrial automation systems. From 2010-2022 he worked in the municipal water/wastewater sector in both the utility and consultant roles. He is co-managing director of the ISA18 alarm management committee. Since 2022, he has held the position of Senior Manager of OT Security Architecture at CN Rail. Contact: graham.nasby@grahamnasby.com