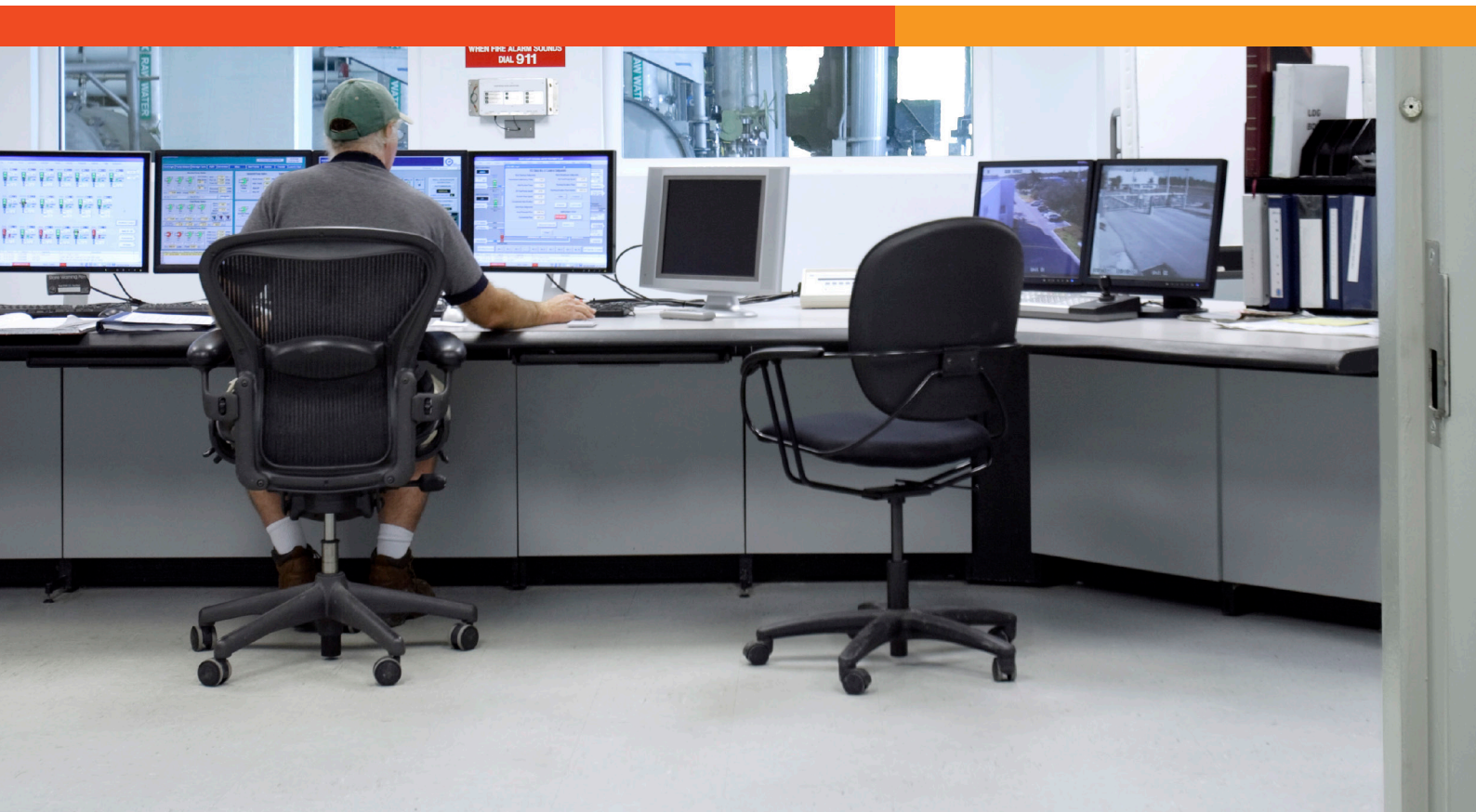




excellence in *Dependable Automation*

ALARM MANAGEMENT



www.exida.com

*Improve the **performance** of your **operators** through effective Alarm Management.*

Typical alarm management issues that hamper operator performance

- » Alarm Overload (Too many alarms)
- » Alarm Floods
- » Nuisance Alarms
- » Chattering / Fleeting Alarms
- » Standing / Stale Alarms
- » Bad Actors / Frequently Occurring Alarms
- » Redundant Alarms
- » Alarms without a Response
- » Alarms with the Wrong Priority


Having effective operators in a process plant is critical to maximizing production efficiency, product quality, and plant reliability.



During a single shift, operators make numerous decisions that affect plant profitability. These include actions to avoid unplanned upsets or to mitigate events that could lead to plant outages. A well-designed and highly-functional alarm system can add to the operator's decision-making ability.

An effective alarm management program can deliverable quantifiable business benefits in the following areas:

- » Reduction in unplanned downtime (lost production)
- » Increased operator productivity
- » Reduction in avoidable maintenance of process equipment
- » Production optimization / debottlenecking / increased throughput
- » Capital savings for SIL requirement reductions (improved safety)
- » Reduced environmental / regulatory incidents
- » Energy savings

 Benefit	Quantifiable Business Benefits (typical)*	Financial Impact (See Notes)
Reduction in unplanned downtime (lost production)	Decrease by 30%	\$432,000 ¹
Increased operator productivity	Increase by 8%	\$210,240 ²
Reduction in avoidable maintenance of process equipment	Decrease by 5%	\$500,000 ³
Production optimization / debottlenecking / increased throughput	Increase by 0.25%	\$438,000 ⁴
Capital savings for SIL requirement reductions (improved safety)	Save \$50,000 per SIF	\$200,000 ⁵

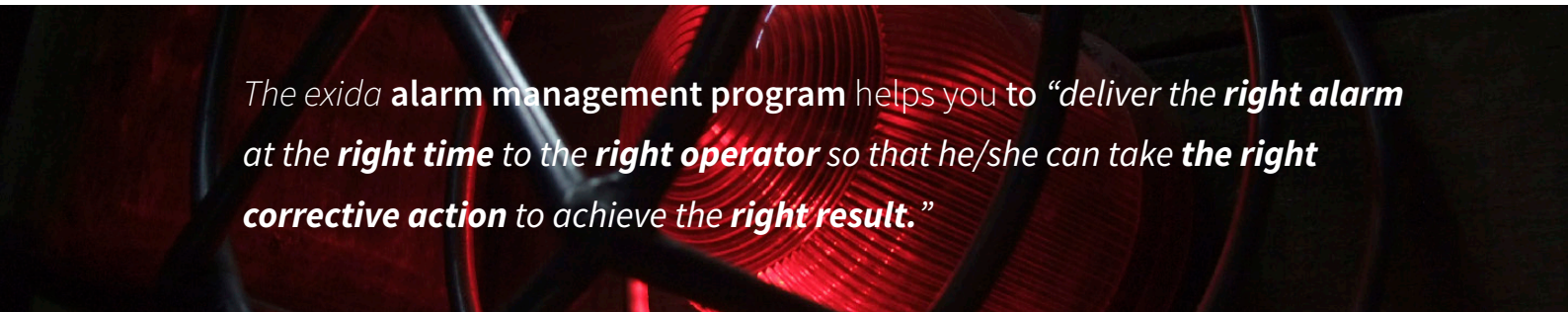
NOTES

1. Cost of Lost production = \$20,000 / hr, Average annual unplanned production loss = 72 hours.
2. Two (2) operators per shift x 24 x 7, Average burdened cost = \$150 /hr.
3. Annual Maintenance Budget = \$10M.
4. Facility operates continuously 24 x 7, Value of production time = \$20,000/hr.
5. Four (4) safety instrumented functions (SIF) have their safety integrity requirements reduced from SIL 2 to SIL 1.

What Makes an Effective Alarm Management Program?

We at exida will work with you to craft a program that is tailored to your requirements, complies with industry standards and guidelines on alarm management (e.g., EEMUA 191, ISA-18.2), improves operational performance, and is sustainable over the long term. It typically consists of the following steps:

1. Benchmark Alarm System Performance
2. Development of an Alarm Philosophy Document
3. Alarm Rationalization
4. Advanced Alarm Design (e.g., dynamic alarming)
5. Implementation of Rationalization results and creation of Alarm Response Procedures
6. Alarm System Performance Monitoring & Assessment
7. Auditing Alarm System Practices and Procedures



*The exida alarm management program helps you to “deliver the **right alarm** at the **right time** to the **right operator** so that he/she can take the **right corrective action** to achieve the **right result**.”*

Alarm Rationalization: The Key to Improving Alarm System Performance

Alarm rationalization is the process of systematically reviewing alarms to make sure that they are meaningful and relevant when presented to the operator. It also ensures that the operator will have sufficient time to respond with a predefined corrective action in order to prevent an unwanted consequence (lost production, personnel safety, environmental release, asset damage, etc.). Rationalization improves the alarm system, which in turn impacts the bottom line.

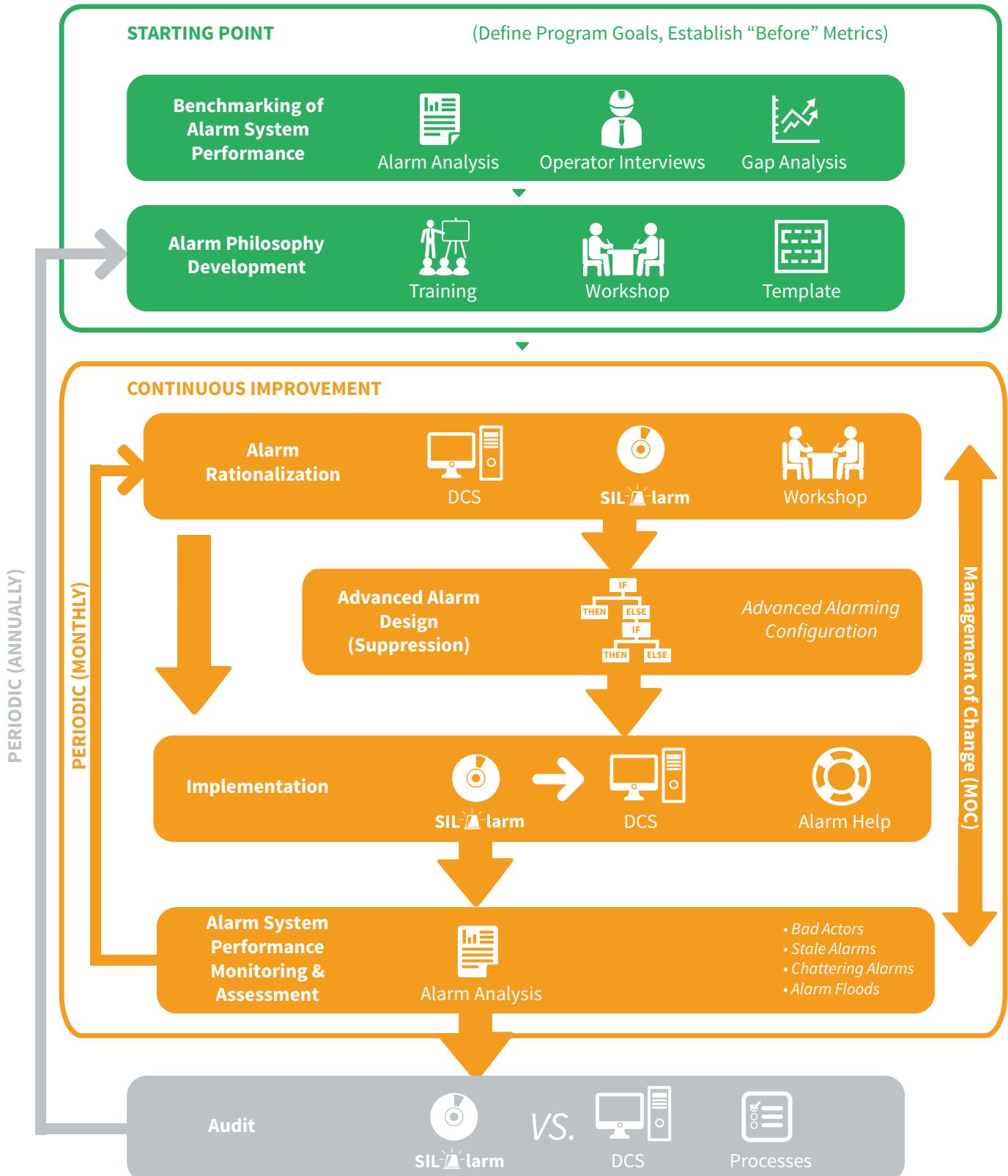
How Rationalization Improves Alarm System Performance

- » Reduce the alarm load on the operator by eliminating alarms that are not useful. This frees them up to concentrate on optimizing the process or performing other value-added tasks
- » Prioritize alarms so that operators know which to respond to first (ensuring that they don't miss the critical alarm that prevents the unplanned shutdown or the environmental release)
- » Reposition alarm limits to allow the process to run closer to its operating limits (without exceeding them) based on proper consideration of process dynamics, operator response time, equipment / process constraints
- » Capture knowledge of senior operators and make available in alarm response procedures (drive consistency in response and support inexperienced operators)
- » Qualify operator response to alarms as an effective independent protection layer (risk reduction factor 2 – 10) reducing SIL requirements for other layers of protection such as a safety instrumented systems



exida Alarm Management Program

(Adapted from the ISA-18.2 Alarm Management Lifecycle)

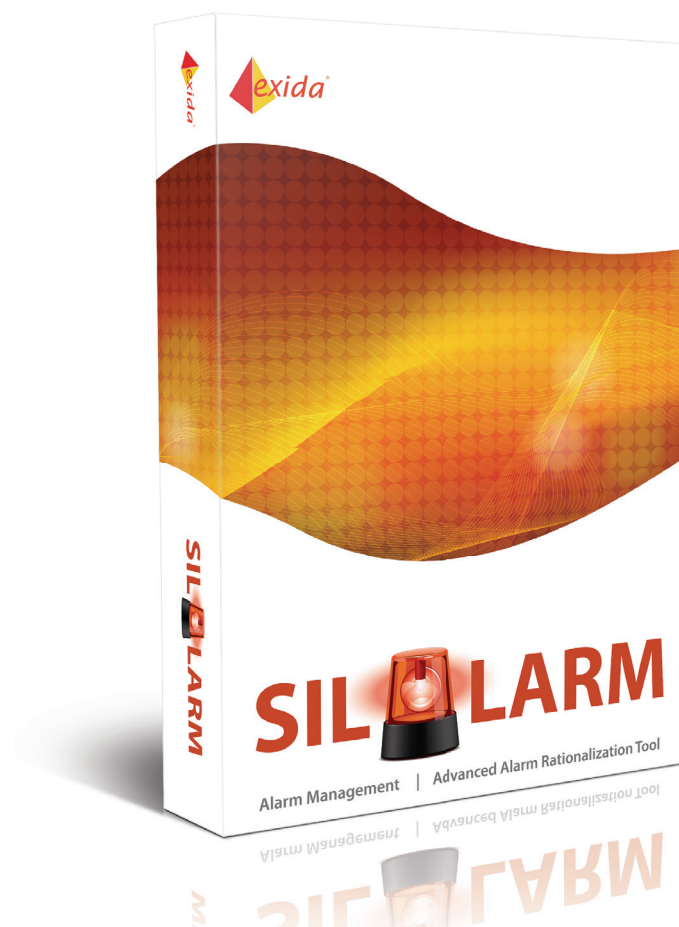


Alarm Management Products & Services

Task	Description	Services
<p>Alarm System Performance Benchmarking (Initial)</p>	<p>Establish initial baseline for ongoing comparison as part of a comprehensive alarm management program. Identify the most pressing alarm management problems and the biggest opportunities for improvement.</p>	<p>Alarm System Performance Benchmark (tailored to customer’s budget)</p> <ul style="list-style-type: none"> • Operator Interviews – gather qualitative feedback from the users of the alarm system • Measure / Document initial alarm system performance (number of alarms / day, stale alarms, top ten most frequent alarms) • Evaluate Control System Alarm Configuration vs. Benchmarks • Alarm System Gap Analysis Report
<p>Alarm Philosophy Development</p>	<p>Documents the objectives, guidelines and work processes for alarm management at a site. Includes definition of what should be alarmed, how to prioritize alarms, use of shelving, personnel roles & responsibilities, alarm system KPIs, etc.. (Prerequisite for Alarm Rationalization)</p>	<p>Alarm Philosophy Development (APD)</p> <ul style="list-style-type: none"> • exida APD template – comprehensive starting point full of best practices and made to comply with ISA-18.2 • Alarm Management Practices & Principles Training (1 day) – to prepare participants to support development of the APD • Alarm Philosophy Development Workshop (2 days) – a guided process designed which draws out requirements for the APD <p>Alarm Philosophy Gap Analysis – Review existing document against ISA-18.2’s requirements, identify gaps, and provide recommendations for closure.</p>
<p>Alarm Rationalization</p>	<p>Process for verifying alarms are necessary and meaningful, establishing their design (priority, limit, deadband) and documenting their basis (cause, consequence, corrective action) in a Master Alarm Database (MADB)</p>	<p>SILAlarm rationalization tool</p> <p>SILAlarm Product Training (2 days, hands on)</p> <p>Rationalization Ready Service – prepare customer’s master alarm database so that it is ready for rationalization</p> <p>Rationalization Facilitation Workshop - kickoff / lead the alarm rationalization process, document the results in SILAlarm, and train client personnel to be able to lead the process</p> <p>Lead Alarm Rationalization ongoing or until completion</p>

Task	Description	Services
<p>Advanced Alarm System Design</p>	<p>Configure alarm system to modify alarm behavior dynamically based on the state of the process or equipment</p>	<p>Define advanced alarming / alarm suppression schemes in SILAlarm for implementation in the control system. These include (state-based suppression, alarm flood suppression, dynamic alarming, conditional alarming)</p>
<p>Implementation</p>	<p>Configuration of Alarm Rationalization results (alarm settings and design) in the control system.</p> <p>Creation of alarm response procedures from results of rationalization.</p>	<p>Update / Modify Control System Alarm System Configuration</p> <ul style="list-style-type: none"> • Import alarm settings from SILAlarm into the control system • Configure Alarm Suppression in the control system • Integrate alarm response procedures into the operator HMI • Configure alarm shelving parameters (max shelving time)
<p>Alarm System Performance Monitoring & Assessment (Ongoing)</p>	<p>Measure alarm system performance on a regular basis (e.g., monthly), compare against KPIs, and Identify problem alarms to be addressed (via rationalization)</p>	<p>Measure and Analyze Alarm System Performance</p> <p>Create and review reports (annunciated alarm rate, alarm flood analysis, alarms out-of-service, annunciated alarm priority distribution, stale / standing alarms, frequently occurring alarms / bad actors, chattering alarm list, redundant alarms, etc.)</p>
<p>Audit</p>	<p>Periodic review of alarm management procedures (e.g. MOC) to verify integrity of Alarm System</p>	<p>Compare Control system configuration (actual) vs. SILAlarm MADB (expected) – identifies unauthorized changes to alarm system configuration so that they can be reset (enforcement)</p> <p>Audit of Process / Procedural Documentation and Comparison to Alarm Philosophy - to verify that the documented practices and procedures are being followed</p>

Alarm Rationalization Made Easy with SILAlarm™



SILAlarm™ is a tool for facilitating and documenting the results of alarm rationalization in a master alarm database for both new (greenfield) and existing (brownfield) systems. It was developed in accordance with the ISA-18.2 standard “Management of Alarm Systems for the Process Industries” and EEMUA 191.

SILAlarm guides a rationalization team through a systematic, tailored process of reviewing, justifying, and documenting the design of each alarm:

- » Evaluation of Consequences & Time to Respond
- » Prioritization
- » Document Cause, Consequence, Confirmation, Corrective Action, Design Intent, Testing Requirements
- » Classification
- » Setpoint (Limit) Determination
- » Setting of Deadbands and On/Off Delays
- » Alarm Suppression / Advanced Alarming
- » Cross-reference to PHA where alarm is safeguard and LOPA where alarm is an independent protection layer
- » Routing of Alarm Messages
- » Relation to Operating Boundaries and Safe Operating Limits

The level of design documentation for each alarm is set by the user. All fields can be exported / imported into a spreadsheet format for exchange with the control system or design documents (e.g., P&ID tools, PHA tools).

SILAlarm™ is an Emerson Process Management Solution Alliance product for alarm management.

Training Opportunities

Overview of Alarm Management Practices & Principles (One Day)

The purpose of this interactive seminar is to educate key personnel on the design principles of alarm management, the alarm management lifecycle, and the requirements / recommendations of the ISA-18.2 standard in order to improve the performance of their alarm system(s). The training is intended to create a common understanding of alarm management so that attendees can more effectively support their site alarm management program. The content of this seminar is based on current industry best practices, the ISA-18.2 standard, and ISA-18.2 Technical Reports. Attendees receive a copy of the ISA-18.2 standard as part of the training materials.



Target Audience: Individuals responsible for leading or supporting alarm management activities at site including creation of an alarm philosophy document, resolution of alarm management issues, or alarm rationalization.

We also offer customized training options available upon request

Alarm Rationalization with SILAlarm™ (Two Days, Hands On)

This class focuses on how to rationalize the alarms in your control system(s) using SILAlarm. It immerses participants in discussion and hands on exercises which have been designed to demonstrate the best practices and requirements for rationalization as taken from the ISA-18.2 alarm management standard and EEMUA 191 guideline. The class focuses on how rationalization can lead to improved operator performance by eliminating common alarm problems such as nuisance alarms, stale alarms, incorrect priority, alarm overload, and alarm floods. The class reviews how to exchange alarm configuration data between SILAlarm and your control system as well as how to manage change.

The training is tailored to the customer's application. Participants will work with their own control system configuration preloaded into SILAlarm. This ensures that participants are ready to begin rationalization of their system(s) at the completion of the class.

Target Audience: Individuals responsible for leading / facilitating alarm rationalization, maintaining the master alarm database, or configuring the control system based on the results of rationalization.

SAFETY *is* our Business



Why Use exida?

- » A global supplier of products, services, training and certifications for **functional safety**, **cybersecurity**, and **alarm management**.
- » **Expertise** – exida has a combined knowledge of 400 years of safety systems and process safety design. Our experts have written more books on functional safety than any other company.
- » **Certification** – exida has SIL-certified more instrumentation to IEC 61508 for use in safety instrumented systems than any other certification agency.
- » **Software Supplier** - Our portfolio includes software tools for process hazard analysis (PHA), alarm rationalization, and Safety Instrumented System (SIS) Design Our flagship product (exSILentia®) is the world's best-selling tool for SIL Verification.
- » **Alarm Management Subject Matter Experts** - exida personnel helped write the ISA-18.2 standard on alarm management and subsequent technical reports. We have also been involved as a reviewer for the EEMUA 191 guideline on alarm management.

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