Alarm Management Solutions for Ovation™ Automation Technology

An effective alarm management program is essential for safe and effective plant operations. Emerson offers a variety of alarm management solutions for customers who use Ovation™ automation technology. The following options provide a complete, robust and sustainable alarm management strategy that is compliant with industry alarming standards:

- Native Ovation alarm functions provided standard with every Ovation system
- High-performance alarm management services
- Scheduled alarm management services
- Optional application software
  - Ovation alarm health advisor
  - AgileOps™ alarm management software

Native Ovation Alarm Functions

Every Ovation disturbed control system is delivered with standard, native alarm management functions. The embedded Ovation alarm strategy is combined with the implementation of hardware and software to clearly convey the emergence of potential problems to operators. The alarm management system focuses the operator on important plant activities that deviate from normal operation including points out of range, digital state changes and drop time-outs. Alarms are displayed in the Ovation HMI alarm window and can be sent to the audio annunciator, the Ovation process historian and the alarm printer.

The Ovation alarm system follows the guidelines and conventions defined within the ANSI/ISA 18.2, EEMUA 191 and IEC 62682 standards. Additional features and functions incorporated into the Ovation system helps users to document, design, recognize, understand and manage annunciations.

Alarm Description

All Ovation database points have an English description that is displayed and used throughout the Ovation system. In addition to the English description, an alarm description is available for use within the alarm system. The alarm description clarifies or expands upon the English description, especially when the descriptions are in opposite process states. The alarm system can be configured to display the English or the alarm description on

the alarm display screen. When the alarm description is selected, but the field is blank, the display function will revert to the English description.

Highly Managed Alarms

Database points include a highly-managed alarm configuration parameter. A point identified as highly managed is assigned restrictions, such as disabled alarm shelving, to ensure proper and safe operation.

Alarm Suppression and Cutout

The alarm suppression function prevents points from alarming based on equipment or plant conditions. This function is beneficial for normal or steady state alarmed conditions, for equipment that is not running or for any alarm that is consistently unnoticed by the operations staff. Alarms can be suppressed until they are deemed meaningful. Alarm suppression by design uses "cutout" database parameters that contain:

- Cutout name – an annunciation can be suppressed based on a derived digital or packed point. When using a digital point, all associated annunciations will be enabled or disabled. When using a packed point, bit masking can be enabled, or a specific bit can be assigned, to customize which annunciations are suppressed.

- Delay time – when suppression is removed, a delay time can be integrated to allow the process to return to a steady state. This parameter is tunable.

- Cutout on zero – when using a digital point to suppress annunciations, this configuration indicates that the digital point value should be false, or zero, to enable the cutout.

- Cutout sensor alarm – for hardwired I/O points, the sensor alarm can also be suppressed for transmitters with irregular behavior outside of defined operating ranges.

Sensor Alarm

Analog input points can generate an annunciation when the module value exceeds a high or low limit that is expressed in a unit of measurement such as volts, millivolts, amps or milliamps. An alarm annunciation indicates a possible problem with the signal strength or loss of signal. Sensor alarms can become a nuisance as transmitters can have differing performance characteristics and tolerations for noise. To help alleviate sensor alarms from inundating the operator, but still provide needed alerts, the Ovation system includes an integrated set of functions including:

- Sensor limit high deadband – helps prevent the sensor alarm from chattering high

- Sensor limit low deadband – helps prevent the sensor alarm from chattering low

- Sensor characteristics – establish/apply an alarm filter or alarm group

- Sensor alarm priority – differentiate sensor alarm from other process alarm conditions

Alarm Shelving

Alarms can be temporarily disabled or suppressed in the Ovation system. Shelving an annunciation allows an operator to document the reason for disabling the alarm and to set a timer for automatic return to service.

Long-term shelving or taking an annunciation out-of-service is also available and can be activated based on user account security permissions. Manually suppressed annunciations are recorded within the alarm summary suppression log. Suppressing whole points or designated analog limits, such as Low1 while still retaining Low2 readiness, is also available.

Filtering Alarms by Destination

Process control systems or sub-systems with similar destinations can be filtered or sorted on the alarm screen. The destination, identified in the first position in the 8-position characteristic field, is used to filter alarm screen information associated with a specific plant processes.

Alarm Icon

Ovation operator graphics include an alarm icon that provides a visual equivalent of hardware annunciators (light boxes) based on priority. The alarm icon is applied to a single database point to represent the alarm state (unacknowledged or acknowledged). The icon indicates the alarm priority using color, a numerical priority value and a priority icon shape. Triple-redundant annunciation indication helps address color blindness, as well as other color deficiencies.
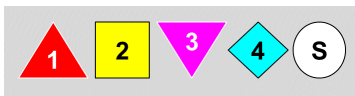
Alarm Summary Suppressed Log

The Ovation alarm summary screen presents alarm information via segmentation tabs and a tabular log. For example, one tab can display all active suppression through cutout, alarming shelving and alarms out-of-service and includes important information such as the type of suppression, manually entered justification descriptions and automatic return to service times as applicable.

Summary of Highly-Frequent Alarms

A common control system issue for operators is frequent alarm annunciations. A segmented log within the Ovation alarm summary screen lists all live annunciation events on a point-by-point bases, revealing the worst offenders. The quantities show the sum of all annunciations for a given point regardless of the annunciation type such as SENSOR, LOW1, HIGH1 or LOW2. Detailed analysis and metrics for frequent alarms are provided within the Ovation alarm health advisor application.

Name	Description	AP	AY	Alarm Frequency Count	Characteristics
1RW-LT1023A	RAW WTR TANK LVL A	3	C	921	WR-T----
1CF-LT2108-SEL	CLARIFIER 8 TANK LVL SELECT	3	C	728	WRCT----
1BF-PS0501	BFPA LO STRNR PRS HI	3	C	409	BF-O----
1FF-DMP204-FCL	FABRC FLT DMPR 203 FAIL TO CLS	3	C	156	FFD----D
1FU-IGN4C-LOF	IGNITER 4C LOSS OF FLAME	2	C	89	BB1----D
1BF-VLV204-MRE	BFPA LO BYPASS VLV MAN REJ	2	C	6	BF-O----

List History Acknowledged Unacknowledged Reset Alarm Suppressed **Alarm Frequency**

Total Alarm: 685 Acknowledged: 51 Unacknowledged: 685 Reset: 0 Suppressed: 51

High-Performance Alarm Management Services

High-performance alarm management is a service offered by Emerson that integrates advanced alarm management into a control system, with or without high-performance graphic displays, to help operators identify problems early and take quick, corrective action. The service includes

- Alarm management philosophy definition
- Implementation strategies including static alarm rationalization and dynamic alarm suppression

High-performance alarm management services combine best-in-class philosophy with the implementation of software applications and alarming strategies that enable operators to quickly identify, mitigate and manage abnormal conditions. Decades of experience in control system engineering, technical troubleshooting, project management, alarm management and operator interface design are leveraged with industry and international standards to develop a robust alarm management system that enables:

- Identification and elimination of nuisance alarms
- Identification and elimination of standing alarms
- Identification and resolution of chattering alarms
- Elimination of alarms with the same root cause
- Tuning and proper assignment of alarm priorities
- Increased knowledge of alarm system configuration
- Analysis, comparison and mitigation of flood events
- Measurement and comparison of alarm activity with targeted performance rates
- Performance analysis for the unit and/or subsystem alarms
- Development and enforcement of a standard alarm philosophy that emphasizes consistency and continuous improvement

The benefits of a standard alarm management strategy include:

- Reduces operator stress
- Increases operator trust and confidence
- Reduces operator response times
- Improves performance – operating within normal ranges
- Strengthens production reliability
- Diminishes equipment degradation
- Promotes knowledge transfer among facility personnel

Alarm Management Philosophy

An effective alarm management system is based on an established alarm management philosophy that follows guidelines presented in ANSI/ISA 18.2, EEMUA 191 and IEC 62682 industry standards.

The high-performance control room consultative workshop includes a session dedicated to alarm management strategies. During these sessions, alarm standards, best practices and plant-specific requirements are discussed with plant personnel. The result is the development of a new customized philosophy or an updated existing alarm management philosophy. The workshop is typically conducted on-site with all key stakeholders –

automation system owner, site superintendent, operations manager, maintenance manager, operators, technicians, plant engineers or any other personnel who have a vested interest. The output of the workshop is an alarm management philosophy tailored to the specific end-user.

Implementation Strategies

Emerson offers various alarm management implementation strategies based upon a customer's needs, schedule, budget, availability of personnel or other restrictions. The most common strategies are:

- Static alarm rationalization
- Dynamic alarm suppression

Implementing these strategies require a well-defined, documented alarm management philosophy that identifies standard definitions, conventions, guidelines and governing values specific to the identified facility.

Static Alarm Rationalization

Static alarm rationalization is based on the evaluation and organization of the control system database without historical or current performance data. This strategy, as a stand-alone effort, is helpful for new construction projects as it creates a solid foundation that can accommodate future performance improvements due to changes in plant processes, operation or equipment. Rationalization scope also pairs well with dynamic suppression efforts for all project types. Alarm rationalization standardizes database parameters such as:

- Priority
- Status checking
- Alarm description
- Set/reset description
- Sensor limits/deadbands

Standard device suppression logic for future cutout scope is often integrated at this time to reduce additional invasive work after a plant's startup and commissioning.

Alarm rationalization can also be expanded to include control logic practices such as:

- Redundant transmitters
- Compensated transmitters
- Duplicate/redundant annunciations
- Digital to analog conversion

Dynamic Alarm Suppression

Dynamic alarm suppression uses historical or current performance data to help mitigate alarm problem areas. While rationalization addresses the organization of annunciations, a dynamic suppression strategy reduces nuisance annunciations.

- First Pass (Nuisance Mitigation) - Historical data often reveals focus areas that incur highly frequent or chattering alarms and alarm floods. The first pass alarm evaluation and resulting changes significantly reduce alarm frequency by alleviating most nuisance annunciations. The first pass alarm suppression is often performed with static rationalization to maximize the outcome, however first pass suppression can be implemented as a stand-alone effort prior to an Ovation Evergreen. Emerson examines the focus area alarm patterns to formulate resolutions including:
  - Alarm delay

- o   Return delay
- o   Deadband
- o   Sensor limits and deadband
- o   Suppression (CUTOUT) logic

- ▪   Second Pass - If poor performance continues, or if metrics need to be improved, a second dynamic suppression is performed that evaluates the historical data for additional tuning and modifications. A second pass suppression may be required to account for changing process conditions at different times of the year or production needs.

Scheduled Alarm Services

Industry best practices recommend the following actions for maintaining an efficient alarm management system:
- ▪   Routine reporting of alarm frequency
- ▪   Identifying alarm deficiencies
- ▪   Implementing changes to eliminate or reduce unnecessary alarms
- ▪   Maintaining documentation of changes

The effort required to implement these strategies can add to the workload of the current staff. Emerson offers scheduled alarm management services to help keep alarm management systems current with plant, process and control system changes.

Enrolling in scheduled alarm management services provides access to Emerson's specialized alarm management group. This dedicated group can help remotely complete activities utilizing electronic data transfer of alarm configuration files and alarm history. Optionally, a group representative can make regularly scheduled onsite visits to complete the defined objectives. Implementing remote or onsite assistance from an Emerson alarm specialist keeps supplements your staff, to keep essential plant manpower focused on other important assignments.

# Optional Alarm Software Applications

Ovation Alarm Health Advisor

The Ovation alarm health advisor is an add-on application to the standard Ovation alarm system that provides a means for users to analyze, diagnose, troubleshoot and manage their alarm system as recommended by ANSI/ISA 18.2, EEMUA 191 and IEC 62682 industry standards. The application analyzes Ovation alarm data using:
- ▪   Off-line historical import – a legacy approach where users can analyze historical data outside of the Ovation system by exporting material out of the system and importing it manually into the application program
- ▪   On-line historical extraction – users can directly link to the Ovation system and extract required data utilizing the built-in tools and functions of the application, thus eliminating manual intervention.

The data collected by the Ovation alarm health advisor can be filtered by point name, point description, plant areas, time ranges and alarm type for further analysis.

Reports can be generated based on selected analysis parameters such as time/date/duration of data collection, filters by plant destination or annunciation priority. Reports be based on:

- Event overview – a summary overview of typical alarm events such as daily activity, top ten (10) daily activities, time statistics, average rate for priorities, etc.
- Chattering events – analysis of the top chattering annunciations
- Event floods – analysis of alarm flood events
- Event group – analysis of annunciations based upon type of IO
- Event priorities – analysis of annunciations based upon priority
- Event types – analysis of annunciations based upon type
- Frequent events – analysis of top frequent annunciations
- Standing events – analysis of all standing annunciations
- System database statistics – view off all points, hardwired vs soft points, configured annunciations by point type or configured annunciations by plant area.

Alarm Health Advisor - Event Flood Overview
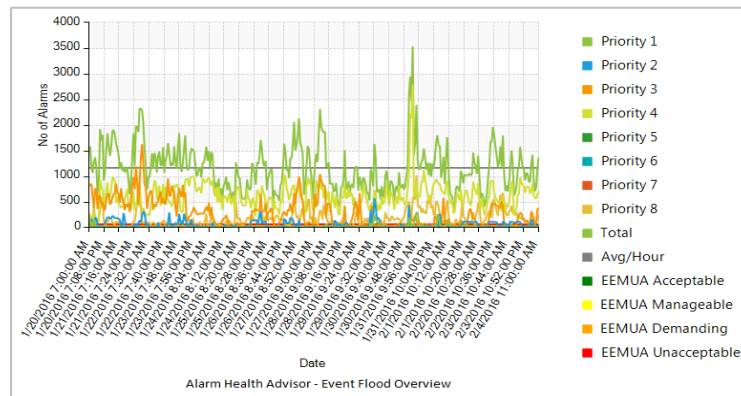
AgileOps™ Alarm Software

AgileOps™ software is a complete alarm management solution from Emerson that interfaces with Ovation systems to help maintain an optimal configuration for the process state. The AgileOps suite includes a master alarm database, advanced alarm shelving, dynamic alarming and alarm performance monitoring / auditing against industry standard KPI's.

- The master control system database is a central repository for viewing, configuring and managing all alarm data. AutoDiscovery automatically browses the control system and populates the database, then periodically scans for new or deleted items. Discrepancy reports and alarm enforcement can be enabled from the database.

- The dynamic management function enables alarm configuration changes based on dynamic logic of the operating state and process conditions. Dynamic management ensures smooth alarm transitions from one operating state to another using case logic.

- List management function manages malfunctioning alarms, broken instrumentation or stale alarms resulting in less nuisance alarms, minimized length of alarm summary and auto re-enables alarms.

- The EventKPI enterprise level function is a web-based, automatic alarm / event reporting tool that includes a development environment for fully customized reports and dashboards that are generated based on a set schedule or triggered by an event.

- The safety instrumented function tracker monitors the integrity of the safety system where degraded components can be easily identified and repaired before the SIS operation becomes unsafe.

AgileOps is compliant with API RP1167, IEC 62682 and ISA 18.2 standards and is designed to help customers meet these standards when coupled with other Emerson alarm management products and services.