Don't be Panicked by Alarm Management of Building Systems

Jim Sinopoli, PE, RCDD, LEED AP, Managing Principal, Smart Buildings LLC

"*Facts are apt to alarm us more than the most dangerous principles*"

Building system alarms are an everyday fact of building operations. However, few building operators have a solid alarm management plan. The "plan" for many is to simply react to alarms when they occur and figure out what to do when it happens. This "ad-hoc" approach views alarms as nuisances that need attention rather than valuable data that can improve operations and tell a building owner a lot about how the building is performing.

Building system alarms are not just nuisances; they affect system performance, equipment lifecycles, life safety, regulatory compliance issues, energy consumption, lost occupant production and building technicians' efficiencies. To really handle alarms you need a detailed plan, the development of operational processes and a good suite of software tools. What follows are a few observations as well as an overview of the major activities and issues involving an alarm management plan.

System Integration Plays a Part

An alarm management system for a building has to incorporate alarms from multiple systems. Technicians can't jump from one workstation to another to address simultaneous alarms from different systems. Alarms for all building systems should be integrated into one alarm management program to provide a comprehensive, enterprise-wide view of systems' status; what we would call providing an operator with full "situational awareness". The enterprise system may only have "read" capabilities for some systems, such as fire alarm, but the building-wide or building portfolio view is required and will require some integration of system alarm data.

Identify and Plan For Every Alarm

It sounds and is laborious but these are the details and a foundation of any alarm management plan. You start with:

- Listing every possible alarm or relevant setpoint from each building system. While the alarms may be classified into larger groups, address each alarm and avoid any generalities or lumping them into large groups.
- Develop the basis or the rules on which the alarms will be prioritized and classified. Underlying the rules should be an assessment of the potential consequences of an alarm: is it related to life safety, critical operations, energy consumption, government regulations,

<table>
<tr><td>EXAMPLES OF ALARMS</td></tr>
<tr><td>Status alarm for pumps</td></tr>
<tr><td>Current sensors for fans</td></tr>
<tr><td>Space temperature alarms</td></tr>
<tr><td>Chilled water supply temperature alarm</td></tr>
<tr><td>CO^2 sensor alarms</td></tr>
<tr><td>Supply air temperature alarms</td></tr>
<tr><td>Refrigerant Leak sensor alarm</td></tr>
<tr><td>Differential Pressure alarms</td></tr>
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etc.? What are the potential impacts and business risks with each alarm?

- Determine which alarms are necessary

- Apply the prioritization and classification rules to each alarm

- Reconfigure alarm settings if needed (delay time, deadbands, etc.)

- For each alarm determine the response of the building technician or operator. Identify the roles and responsibilities of each person involved as well as the work process from alarm notification to resolution and documentation. Include hierarchy rules for escalation.

Alarm Metrics

Part of managing alarms is measuring and monitoring how good the management is, part of the process is setting up key performance indicators and analyzing the actions and responses of the operations organization and individuals involved with alarms. Examples of alarm metrics are:

Average Alarm Rate Per Facility Technician – This could be alarms per day or per week and could indicate whether an individual is overloaded with alarms or not. It also provides a means to compare workload or productivity between technicians.
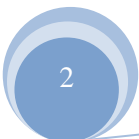
Percent Of Time In Alarm Flood – The average alarm rate does reflect what happens during an alarm "flood", that is when a technician may get dozens of alarms in a relatively short time period. The concern with an alarm flood is the risk the technician may miss a critical alarm. Software tools and a well-developed alarm management plan can help mitigate the problem, but there still may be some risk. As a manager you'll want to know the average rate of alarms and also alarm peaks.

Number Of Out-Of-Service Alarms – Some alarms may be suppressed by being manually turned off. Obviously if a high number of alarms are suppressed or disabled, it affects metrics for average rate of alarms and time in alarm flood, making those metrics look better than they actually are.

Prior to starting any new alarm management plan, it is important to benchmark the current status so you can measure the progress of deployment using these and other metrics.

Software Tools

Software applications for alarm management are important, but secondary to detailed planning for alarm management and restructuring as needed in the operational processes in response to an alarm. Major building management systems (BMS) will have an alarm management application. The potential downside to using a BMS is that the BMS may not interface or integrate all the

Top 10 Alarms

Count	Tagname	Status	Value	Description	Priority
64647	04HTA11CT001_FLT	CFN	ALARM	Raw Gas Temp Absorber Flt	MEDIUM
53609	03HTG10CF901_FLT	CFN	ALARM	Flow Oxi Air Oxi Air Blwr 3 Flt	LOW
45437	03SGA01CF001_FLT	CFN	ALARM	F/fighting Water Flow U3 Fault	LOW
9845	04HTA10CT003_FLT	CFN	ALARM	Raw Gas Temp Comb ID Fan Flt	MEDIUM
4034	02HNC10CT005_FLT	CFN	ALARM	ID Fan Temperature Flt	MEDIUM
3816	00HTR10CQ001_LO_3	CFN	ALARM	WWT Desat Tank 1 pH Lo Warning	LOW
3269	03HTF24CD001_FLT	CFN	ALARM	Susp Mass Density Abs Unit 3 Flt	LOW
2125	00HTT10CE001_LO_3	CFN	ALARM	Mtr Current Agi Abs Blow Lo Warning	LOW
1371	04HTQ21CF001_HI_4	CFN	ALARM	P/water Flow Drop/Sep U3 Hi Alarm	MEDIUM
1359	02HTQ01CP001_LO_3	CFN	ALARM	P/Water Press Pump IA Lo Warning	MEDIUM

systems with which you want to monitor alarms. The emerging Integrated Building Management Systems (IBMS) can incorporate all the building systems and provide a complete building alarm database. Some of the software aspects to consider are:

Multiple Alarms – Many times one event triggers multiple alarms. Rather than chasing down all the alarms and wasting time you'll want software that can correlate related alarms and provide information on the one event that's triggered the multiple alarms.

Predictive Alarming – This application uses alarm data and trends to predict equipment issues with the result being prevention and reduction of equipment downtime.

Dashboards – Dashboards are the standard Human-Machine-Interface (HMI) today. Dashboards need to be targeted to different constituencies (technician, executive, engineer, departments, etc.) and present timely, actionable information to each in a clear and intuitive manner on one screen. An alarm management software application should provide standard dashboards that can be customized for each user group.

Multiple Means Of Access – Alarm data and access to the alarm software should be available via web portal, information displays, smartphones, tablets, electronic alarm notification via texting or email, printed reporting and the routing relevant of alarm data to other business or facility management systems.

Functions – At a minimum, alarm management software needs to provide for:

- Alarm acknowledgment - where it is recognized that someone is aware of the alarm and addressing it
- Repetitive alarms - where alarm history is archived and trends in alarms, including repetitive alarms, can be provided
- Status of out-of-service alarms - including their history and changes in status
- Reporting on any sub-system communications or component failure

Alarm Management Elsewhere

In other industries, alarm management is more developed than it is in building operations. This is particularly true for the process industry. Process industries include chemicals, pharmaceuticals, petroleum, plastics, wood and paper. These are industries where there is a continuous production of material and any alarm that interrupts the production process costs time, money and possibly risks safety. The International Society of Automation (www.isa.org) developed the ANSI/ISA-18.2 standard in 2009 for the management of alarm systems for process industries which describes a methodology for alarm management. While the details and
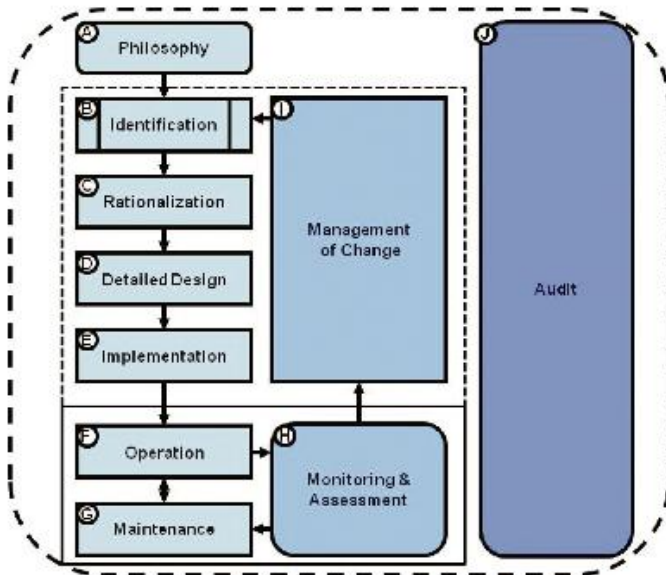
Alarm Management Lifecycle per ANSI/ISA-18.2-2009

applications are different than building operations the methodology for development of an alarm management plan is sound and should be of value to building operators.

Alarm management may not be one of the more exciting aspects of building operations, but is critical for a number of reasons. We need to view alarm management as providing data on the building performance that improves building operations.

For more information, write us at info@smart-buildings.com .