

TiPS TechDoc: White Paper: The Real Cause of Alarm Problems

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Introduction

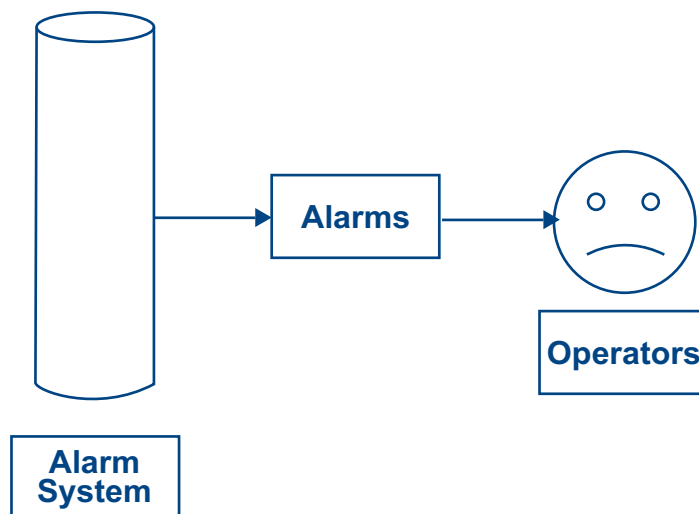
Alarm management is a relatively new concept in automation. Although it appears to be very straightforward - "Got an alarm problem? Fix the alarm system." It's really not that simple. Alarms are a symptom, they're not the problem. The alarm system is a dumping ground for numerous operations and business issues. Researching alarm problems will lead to unexpected discoveries about the quality of control room information and the many reasons alarms misbehave.

Too many alarms is a symptom, not the problem

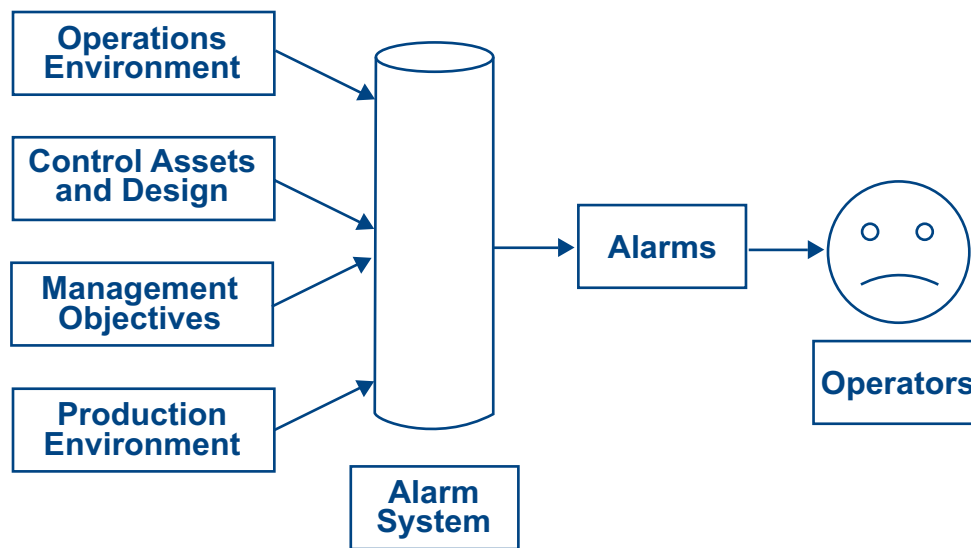
The Problem Begins

Operators are the ultimate "users" of plant alarms. In the context of the control room, alarms are intended to call attention to situations that require operator intervention. If alarms become useless or distracting, they will interfere with an operator's ability to meet performance objectives. Operators, like any human, can process and respond to a limited amount of information. Alarms must be integrated into all other demands on their time and abilities. Alarm management creates a system for planning and designing the delivery of plant information within the constraints of human information capacity.

Many alarm management efforts focus only on alarm settings. Successful alarm management focuses on overall operator loading and information delivery. In fact, poor alarm system performance is not always caused by poor alarm system design. There are many other factors that impact the performance of an alarm system. Alarms can be influenced by maintenance, engineering, the production environment - even an organization's business drivers.



Influences on the Alarm System



There are many factors that influence the design and performance of an alarm system. Some are within our realm of control, some are not. For example, we can control the trip point of an alarm, but we cannot predict a pump failure. The various items that influence alarms tend to group into four categories:

- Operations Environment
- Control Assets and Design
- Management Objectives
- Production Environment

Successfully evaluating alarm issues within each category requires an understanding of how alarm behavior can be traced to its root cause.

Influences on the Alarm System (continued)

Operations Environment

Weaknesses in an operator's ability to understand plant condition or anticipate a disturbance will often prompt a change in the alarm system. If a disturbance can't be "seen", an alarm is added. On a case-by-case basis, these alarms may not seem bad, but in bulk, they can be very disruptive.

Researching the cause of alarm issues in this category will lead to issues with graphic design, navigation, screen size, control room layout, documentation, training, many factors that reduce operator effectiveness, leading to potential alarm system issues.

Control Assets and Design

Equipment in need of maintenance or out of service can cause a good alarm system to perform poorly. Asset and control performance can negatively influence the design of the alarm system if a change is made to accommodate a short-term condition without regard to a net effect or identification of the best resolution rather than the easiest or least expensive.

Fixing alarm issues from this category might involve replacing or repairing a valve or sensor, or designing alarm logic that disables alarms for a deactivated pump.

Management Objectives

Business managers often view alarms as a simple, low-cost option for raising the visibility of important issues or information. Following an incident or near miss, alarms may be added as a safeguard. Management may adopt a manufacturing key performance indicator (KPI) and place alarms on related attributes. In any case, the net effect of the additional alarms may not be considered.

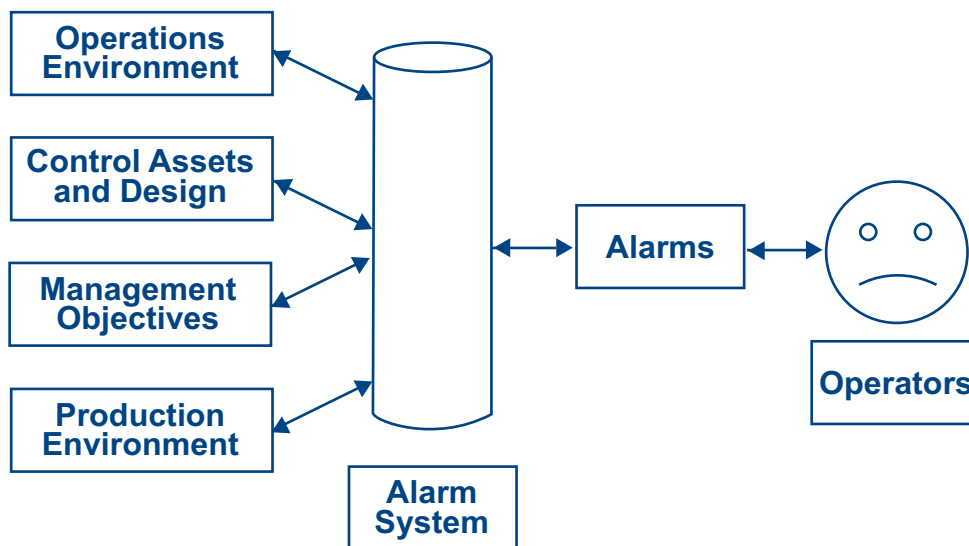
Controlling this issue requires that management understand the importance of operator awareness and its contribution to business goals. As management grasps the idea that alarms can actually harm an operator's ability meet performance targets, they will be more willing to accept a good engineering approach to operator information delivery.

Production Environment

The physical environment in which a plant operates is in a state of constant change. Variances in temperature, humidity, wind, power supplies, feedstock, even personnel, can impact operating conditions. Good design and planning can compensate for many environmental variances, however, even the best design can have shortcomings.

When alarms activate in response to an environmental change, operators should be able to determine the cause and feel empowered to adjust accordingly.

Operator Pushback

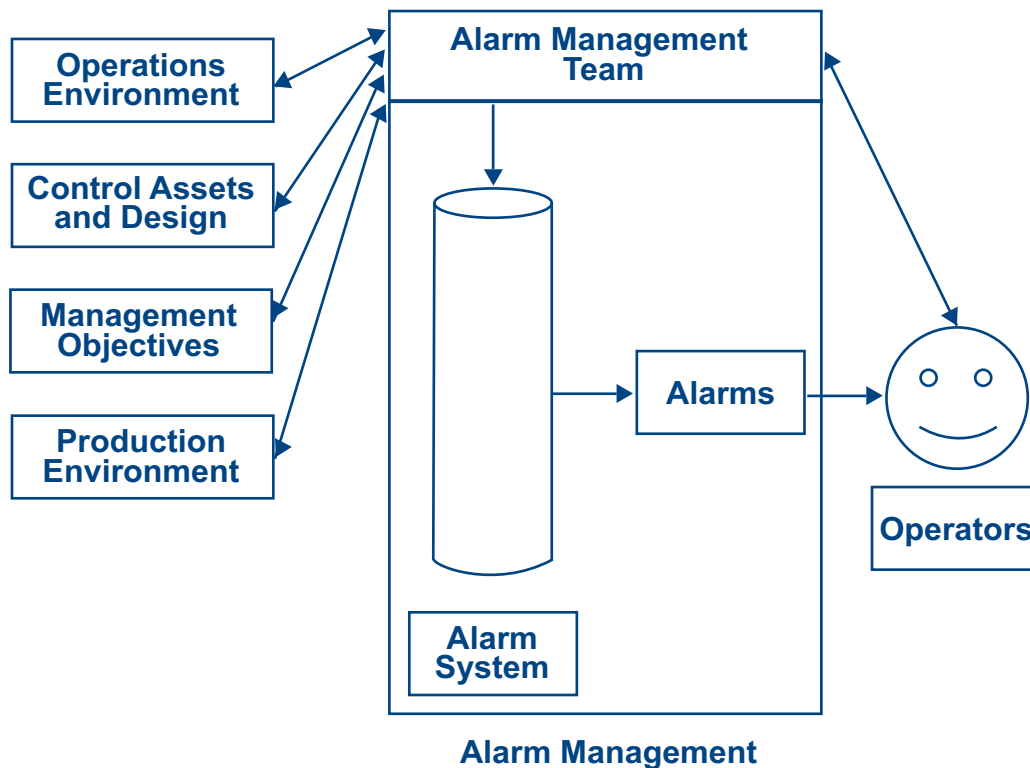


When considering the dizzying array of factors that influence alarm design and performance, it becomes clear that the alarm system is a hotly contested item. If the operating team begins to resist alarm change or complain about the alarm situation, the conversation can quickly degrade into arguments about who or what is right or wrong.

Where Does Alarm Management Fit In?

Alarm management is a structured process for submitting and reviewing alarm change requests and for review of alarm performance, offering all areas of the business, including operations, an equal voice in the design of the alarm system.

Where Does Alarm Management Fit In? (continued)



Potential changes to the alarm system are filtered through the alarm management process to ensure that they integrate well into the overall operations environment. During that review, a team will determine whether the alarm system is really at fault or if there is another reason for the alarm system misbehavior.

In addition to controlling alarm system design, alarm management can motivate change by establishing alarm performance requirements and evaluation. Target metrics for alarm system performance can be established by the alarm management team, evaluating the alarm system and alarm configuration in a controlled, measurable way.

Where Does Alarm Management Fit In? (continued)

The Alarm Management Team

It is entirely possible for one person to manage an alarm system; however, the number of interested parties and diplomacy involved encourages the creation of an interdepartmental team. The team should represent the areas that have influence on, and that are influenced by, changes to the alarm system.

Because alarm management focuses on operator loading, operations management should have strong influence over the design and performance of the alarm system. Operators should have an opportunity to discuss changes to alarms and their net effect on the environment in the control room.

What to Do Now?

Operators are integral to plant stability and performance. As people responsible for applying intuition and reasoning to operations, good information delivery is critical to their success. In the context of the control room alarms should enhance plant information, supporting operations as they work to prevent abnormal situations and other counterproductive states. Alarm management can help ensure that alarms are treated as a valuable information resource.

Getting started in alarm management requires little more than a basic understanding of the concept and a refusal to accept the status quo. Hopefully you now have an appreciation of the reach and influence of alarm management and are prepared to discuss the issue within your group. You may be able to begin the process of improving alarms on your own. Almost all alarm management efforts begin by assessing activity data to establish a familiarity with the current situation. Training by a subject matter expert is also helpful for properly laying the groundwork necessary to a successful alarm management process.

Remember that alarm management is better suited to be incorporated as a standard practice. Alarm management is never really finished, it becomes a natural part of maintaining a good control room environment.

Try One!

As a suggestion, try one. Pick an alarm that you know is troublesome and ask, "Why?" Trace the background of the alarm to find the reason it has become problematic. Document what you find, the conversations you have, and what you do to fix it. Then you will have a better understanding of what alarm management involves, why a team should be formed, and why it should become a part of standard operating practice.