Executive Summary

Alarm management affects the bottom line in any industrial plant. Operations management improvements also affect profitability. Implemented successfully, the work practices and tools that support them help the plant run closer to their ideal operating point—leading to higher yields, reduced production costs, increased throughput, better quality and greater profits.

The industry has long considered the right way to improve operations is to start with alarm management. When complete or in control, they can then take on the necessary operations management improvements. With this traditional approach, facilities find completing alarm improvement programs including rationalization to be very challenging. Thus, they often do not fully finish or they move on to the next task without addressing their operations management priorities. This means alarms continue to drive decisions on operational strategies, electronic logbooks are used the same way as outdated paper logbooks, and most control room personnel do not know the “sweet spot” of their operation.

Experience has shown that industrial organizations should undertake alarm management and operations management as a single, combined effort in their drive towards optimization. These initiatives have consistent desired outcomes, and should be part of a larger program incorporating all the work processes and technologies necessary to achieve operational excellence.

Unlike a serial approach, which often loses steam after implementing some or all alarm system improvements, the combined approach to managing alarms and operations “supercharges” process plants—shortening project length and meeting key objectives sooner.
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Introduction

The recent economic downturn had a significant effect on manufacturers in the process industries. In this environment, poor alarm management is a major barrier to reaching operational excellence. It is one of the leading causes of unplanned downtime and also impacts the safety of a plant and its personnel.

A widespread issue in industrial plants is alarm overload. As formerly independent systems are integrated, each operator has to monitor an increasingly wider area and, consequently, deal with more alarms. Without rigorous alarm rationalization efforts, nuisance alarms and alarm flooding become a serious problem that increases the risk of safety and environmental incidents.

In addition, plants running outside their best operating zone due to an inadequate understanding of the operating limits can incur serious consequences. Equipment reliability will not be at industry norms or design expectations, or at necessary levels to meet production plans. This can result in unacceptable incident rates.

Now, more than ever, industrial organizations need a holistic approach that addresses alarm management alongside operations management as part of a larger strategy to improve overall plant performance.

Today’s Operating Challenges

The advent of the distributed control system (DCS) provided significant benefits in improving control in industrial plants, as well as alerting operators to potentially costly or dangerous situations. But, since the addition of alarms was a low-cost endeavor, a rigorous engineering process was not always employed when new alarms were configured. As a result, most facilities alarmed virtually every reading, creating a much more costly issue—alarm floods that prevented operators from properly assessing the root cause of problems (See Fig. 1).

![Figure 1: In process industry facilities, alarm floods prevent operators from properly assessing the root cause of problems](image)

Increased levels of automation, coupled with a reduced number of operators working in many facilities, have only compounded alarm issues in recent years. Even experienced operators are challenged with understanding how to monitor and handle specific events, especially during stressful, safety-related situations where the health and safety of critical assets are at risk.

In addition, many plants suffer from a lack of experience and know-how when it comes to establishing and executing alarm improvement projects. This can lead to such activities being put off in favor of more “important” initiatives.
Alarm management, by definition, is a process by which alarms are engineered, monitored, and managed to ensure safe, reliable operations. Most plant personnel equate alarm management with reducing alarms; however, this is not entirely accurate. Rather, it is about providing operations with quality alarms. The overall task involves providing control room staff with enough information to prevent abnormal situations, and to deter the escalation of those situations that cannot be prevented. (See Fig. 2).

**Figure 2:** Most plant personnel equate alarm management with reducing alarms; however, this is only one piece of the puzzle

Operations management, on the other hand, implements effective work practices and tools for the operations team. It provides solutions to help operators remain within the best operating zone or operating envelope, define planned targets and stay as close to plan as possible, capture observations and call attention to problem areas for continuous improvement, enable effective shift handover, and enable plants to meet regulatory requirements.

After alarm improvement efforts are considered complete, facilities typically focus on the next challenge and do not proceed with operations management efforts. The result: alarms continue to drive decisions on operational strategies, electronic logbooks are used the same way as paper logbooks, and most control room personnel do not know the “sweet spot” of their operation.

Given the current business pressures, alarm improvements must be made concurrent with an overall operations management strategy, which addresses important facility challenges to competitiveness. These include a lack of timely and reliable data on which to base decisions and analyze problems, lack of cohesion and visibility across plant processes, inconsistent work processes, inability to anticipate and avoid incidents, and difficulty maintaining alignment between production and customer orders.

An effective operations management program overcomes today’s hurdles by providing a consistent, organized and integrated approach to meeting production plans while staying within the best operating zone to avoid negative impacts on equipment maintenance and reliability, as well as process safety management and environmental compliance. In the end, everyone on the operations staff and those that support it share a consistent understanding of the state of the process and have plenty of context with which to make immediate and future decisions.

**Traditional Project Approach**

At modern industrial sites, alarm management and operations management are normally separate pursuits, often undertaken using a step-wise approach. Engineers, operators, maintenance departments and other stakeholders tend to regard alarm management as an activity aimed solely at improving alarm system performance, rather than part of a wider endeavor incorporating all the work processes and technologies necessary to achieve overall operational excellence.
Alarm management and operations management do, in fact share common goals:

- Fewer unplanned outages
- Reduced production losses
- Fewer environmental excursions
- Reduced safety incidents

Serial Effort

With a traditional approach, alarm management concerns are addressed before dealing with other operational considerations. Many feel that without addressing the alarm problem, operators will have no time to deal with the other important operations work practices. While this thinking appears sound, it can lead to rework and elongated project schedules when the facility is ready to move to the operations management improvements.

The project team starts by creating an alarm philosophy, which addresses basic criteria such as the definition of an alarm, how priorities are set based on criticality and time to respond, general alarm considerations, and alarm performance criteria and resolution activities. This is followed by an audit to establish a baseline for alarm performance, including a review of standing alarm reports, safety-related alarms and actions, and shelved alarms. The initial process can span approximately three months in a medium-sized facility (See Figure 3).

Based on the audit results, the project team will seek immediate improvements through bad actor cleanup — a procedure that can take a couple of months to accomplish depending on the results of the audit. The alarm system is then routinely audited to ensure consistent activities and ongoing improvements. Alarm review activities may be incorporated in a site’s operational policies and become part of a monthly safety meeting or, more often, are done during a weekly operations/engineering/maintenance meeting. Participants review chattering and most frequent alarm reports, assign responsibility for alarm issues, and discuss repeat offenders on the list.

Comprehensive alarm rationalization typically is required as the next phase of alarm management improvements. The objectives are to: re-engineer the alarm priorities and trip limits consistently, and provide operators with online documentation of the causes of a specific alarm; establish methods to verify it is, in fact, the suspected problem; and recommend corrective actions and the consequences if the alarm is not handled properly. This online information helps control room personnel respond more effectively to abnormal situations (See Fig. 4).
Once alarm management is essentially in maintenance mode—roughly a year into the project—plants can begin to focus on operations management. However, experience has shown that these activities may be delayed or not considered at all at this point. The project team is often ready to move back to their normal roles or management may be ready to tackle a new initiative. But, if they do stay the course, the operations management activities include monitoring optimal operating limits that define the best operating zone—a region inside the alarm limits. Some facilities may add operating instructions at the same time as the plan limits should be constrained the alarm and operating limits and are a component of their best operating zone.

To better deal with their operational challenges, many plants have adopted electronic logbooks. These tools integrate data from disparate sources, including alarm key performance indicators (KPIs) appropriate for shift handover review, deviations from best operating zones, etc. They also enable the use of shift feedback in alarm management cycles (See Fig. 5). But, in the traditional approach, the first year’s efforts of the alarm improvement program do not have this shift by shift feedback to help with their improvement actions.

The problem with the traditional serial effort is that shortcomings in the existing process alarm strategy may not be uncovered until after considerable work has gone into identifying limits and best operating zones, thus requiring redesign of alarm schemes and rework of rationalization. Organizations frequently devote up to two years of planning and labor before tangible benefits from alarm management, and later operations management, ever become a reality.

**Improved Strategy for Plants**

As outlined in this whitepaper, there are numerous failure modes associated with the traditional approach to handling alarm management and operations management. Project teams may ignore alarm rationalization after bad actor cleanup, or even jump to flood strategies like suppression. KPIs can go un-reviewed and un-worked, and team members often become bogged down in alarms and never have time to take up operations-related requirements. In addition, company management can lose interest in funding a project that stretches a year or more.

Clearly, alarm management and operations management shouldn’t be separate efforts!

Unlike a serial approach, which often loses steam after implementing some or all of the alarm system improvements, the combined approach to managing alarms and operations “supercharges” process plants—shortening project length and meeting key objectives sooner.

**Combined Approach to Optimization**

An effective approach must incorporate alarm management and operational excellence initiatives, which are key to both short-term survival and future business growth. Many plants only consider the implementation of operations management after addressing their alarm issues. But alarm improvement projects are seldom actually completed, so solutions for operations may go unrealized.
With a combined approach to optimization, it is recommended that the project team consider building two, separate philosophy documents: one for alarms and another for operations. The alarm identification scope can now consider the operating philosophy as it may impact how alarms are defined. An audit is subsequently performed to establish a performance baseline, and the project team makes immediate enhancements with bad actor clean-up since some of these nuisance alarms are due to operating limits. Ongoing audits will be utilized to support continuous improvement for both alarm and operating processes.

While these combined efforts may add time in the initial stages of a project, they will shorten its length over the long term.

With the introduction of alarm rationalization, there should be corresponding activities to capture all operations-related limits, that will define the best operating zone, in a limit repository for use in operations management applications. It is important to focus on both the philosophy around how the plant operates, and how its process alarms function. This approach is crucial to effective operations monitoring; data will be readily available for defining alarm settings and monitoring/logging to obtain operator feedback. The activity to rationalize alarms naturally defines the operating limits, as all the right people are available when doing rationalization. Significant rework is avoided when this work is done at the same time. Training the operations team to work with the rationalized alarm system at the same time they understand how operations monitoring will help them understand and stay within their best operating zone is also a time saver. While not always applicable, providing an operating instructions capability that validates instructions against alarm and operating limits and then adds the plan limits to the best operating zone for the operator can also provide significant value. It is possible to address this all in a parallel fashion once the alarms and operating limits are defined in the rationalization process.

When the rationalized alarm limits are implemented with the operating limits and instructions, operators will stop operating by alarm and will focus on the actual operation as defined in your operating philosophy. Rather than the operator reacting to alarms that are outside the best operating zone, the operators will be taking action before an alarm occurs.

Implementing the electronic operations logbook at the same time provides an ideal mechanism for the operations team to provide shift-by-shift context back to the team that is working the bad actor cleanup and rationalization efforts. As mentioned earlier, these new work processes require effective training solutions for operators, engineers and other involved personnel (Fig. 6).

![Diagram](image)

**Figure 6:** With a combined approach to alarms and operations, the philosophy scope is expanded to address limits “inside” alarms, which help operators stay in the best operating zone

Here, too, routine audits are needed to maintain incremental improvements.

In summary, industrial organizations can expect the combined approach to alarm management and operations management to achieve their desired outcomes sooner than the traditional serial approach. It is advantageous for streamlining processes and eliminating rework that drives up costs and delays realization of operational and business benefits. A reduction in total project execution time of approximately four months would be expected for most facilities.
Choose the Right Partner

Complex manufacturing plants face a unique set of challenges to operate their facilities more safely, efficiently, economically, and with less impact to the environment. It is therefore important to choose a partner like Honeywell that can deliver a complete solution combining best-in-class products and proven expertise to optimize alarm management and operations management programs.

Deploy Advanced Technology

A well-functioning alarm system coupled with effective operations management work practices and tools are essential resources in helping processes run closer to their ideal operating point—leading to higher yields, reduced production costs, increased throughput, better quality and greater profits.

From an alarm management standpoint, plants should implement a master repository of boundary, limit, alarm and alert information, as well as solutions for operator performance analysis. A robust suite of tools is required for mode-based alarming and alarm suppression, alarm system performance analysis, and off-loading the alarm system. At a minimum, these tools should support alarms from disparate sources; provide the ability to measure, track, and archive performance; perform quality analysis such as Six Sigma; and enable either ad-hoc or programmatic, web-enabled access.

Automation suppliers such as Honeywell offer advanced alarm software to identify nuisance alarms and redundant alarms, which will reduce the overall number of process alarms to help plant personnel focus and respond to the most critical ones. These solutions empower personnel through workflow enhancements to detect and avoid abnormal situations. They feature a role-based dashboard allowing operators, engineers and managers to view the health of their alarm system at a glance (See Fig. 7).

![Advanced alarm solutions empower personnel through workflow enhancements to detect and avoid abnormal situations](image)

Alarm software tools can be used to generate web-based KPI reports that offer a snapshot of current alarm system performance. They also provide alarm system documentation and ongoing enforcement of alarm limits, online operator alarm help, reporting in support of change management, and offline configuration. The innovative software has added mobile device compatibility for viewing alarm metrics at any time, from almost any location. The software further reduces the load on operators by automatically monitoring process conditions and providing early automatic notification of events.
From an operations management standpoint, process industry plants need better ways to track their operating performance against targets and highlight problem areas. Improved operations monitoring will also help determine the causes of downtime and production inefficiencies.

The latest operations management solutions from Honeywell can be used to systematically set and communicate operating plans; establish, validate and monitor process data against limits; and highlight priorities on deviations. Plant personnel, in turn, gain a better understanding of performance versus industry norms, and knowledge of true operating limits for better reliability and agility. The solutions also help reduce energy use while improving yield, product consistency, and run lengths.

Plants can also apply a limit repository to define their operating envelope and gain an expanded view of limits from many applications, making it possible to see limits together and in context, regardless of their source. A single data model of the limit space (e.g. variables, boundaries, constraints, operating limits, modes) enables limits to be consistently managed via storage and retrieval (See Fig. 9).

Figure 8: Advanced alarm software solutions enable operators, engineers and managers to check the health of their alarm system at a glance, viewing alarm metrics anytime, anywhere.

Figure 9: Plants can apply limit repository tools to define their operating envelope and gain an expanded view of limits from many applications.
Honeywell’s new breed of operations monitoring software systematically monitors plant performance data and summarizes deviations from the operating plan. It enables the operations department to establish and manage engineering limits and constraints, monitor performance to plan and limits, and follow up on performance problems. They help address questions such as:

- Are operating plans being met?
- What are the safety, process, design and environmental limits, and are these being met consistently?
- If plans or limits are being violated, why?
- How can process performance and unit reliability be improved?

Software tools supporting operating instructions allow plants to establish and manage the operating plan so production plans can be executed safely, reliably and efficiently. Planners can communicate the plan, sequence of operations, and specific operating targets to the operations department, while ensuring all targets are within safe, appropriate limits.

Finally, Honeywell’s automated operations logbook enables industrial facilities to transition from labor-intensive legacy spreadsheets, Word documents or paper logbooks to a standardized system for facility-wide data collection, analysis and reporting. The logbook supports efficient and reliable shift handover work processes to reduce errors, avoid incidents and improve operational effectiveness. It can be used to keep a detailed record of events during an operator shift, delivering summary reports to optimize shift handover procedures and allowing the capture of operator comments and notes about daily operations (See Fig. 9).

![Figure 10: An automated operations logbook](image)

**Conclusion**

As described in this whitepaper, alarm management and operations management should not be regarded as separate, standalone pieces of the plant optimization puzzle. Rather, they are complementary initiatives, which are ideally performed in unison to realize the greatest benefits.

By aligning the tasks of alarm and operations management within an overall scope of activities—addressed simultaneously as a single combined effort rather than as separate—industrial organizations can realize significant economies-of-scale in their drive towards optimization. Plants can improve reliability and reduce incidents, increase efficiency, and achieve greater profitability by safely operating closer to plan. They can also simplify access to crucial operations information and improve collaboration for better decision-making. By turning operating plans and equipment constraints into actions that are systematically monitored, problems are highlighted before they become serious. This helps increase uptime while reducing energy usage, and improve yields, product consistency and run lengths.
New Approach to Alarm and Operations Management “Supercharges” Process Plants

References


For More Information

Learn more about how Honeywell’s alarm management solutions can improve your plant safety and profitability, visit our website www.honeywellprocess.com/software or contact your Honeywell account manager.

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