

Alarm Management

A Practical Guide for Users

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Increased alarm functionality, inherent in today's control, data acquisition and information management systems, presents users with a new problem – "Given this multitude of options, how can we make the most of what is available without operational overload?"

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Most, if not all computer based control and monitoring packages used in a variety of industries offer alarm handling facilities, allowing configuration of multiple alarm states, (hi, lo, deviation, rate of change, out of range etc.) as well as priority rating, reporting options, audible and visual attributes and so on. In combination this can add up to 20 or more different alarm attributes on a single variable. A recent study revealed a 60,000 I/O DCS installation had a minimum of two and a maximum of 8 alarm states per configured process point, as well as system alarms and event recording. Confused? - so were the operators. Add to this the 'nuisance alarm' (caused by faulty equipment, poor setting or consequential alarming) combined with operator frustration, and you can see how high-profile incidents (like 3 Mile Island) and near-miss situations arise. It is becoming increasingly important to be able to demonstrate that the alarm management problem is being actively addressed - when was the last time your control system was not in alarm or didn't have some standing alarms?

In the UK the HSE have highlighted the importance of having a consistent and methodical approach to alarm handling. In the USA the Abnormal Situation Management (ASM) Consortium recognise that Alarm Management is key to safe and efficient operation. The EEMUA 191 publication provides guidelines against which alarm systems can be measured and compared to recognised good practice.

Whether you are dealing with an established alarm system or a new one, understanding and defining your starting point and goals will help enormously in achieving a safe, realistic, beneficial and operational system.

Understanding where you are now

The first step to establishing management control over alarm handling is to clearly understand the hazards being monitored, the alarm settings, what is expected of the operator and so on. This is typically achieved through a thorough design review or site survey, examination of procedures and suitable benchmarking, although other techniques are available if appropriate. In most cases design or historic data will be available in the form of hazard analyses, a statement of alarm philosophy, process and instrument records and operating instructions. This data tells you where you intended to be, and is often different to concept or reality for a multitude of reasons. When design, equipment and process changes occur, operating methods evolve, throughputs increase this is not always reflected in the available documentation. The best source of actual operating data is the current operating team, they are also invaluable in articulating any shortcomings. Statistical analysis of the performance of the alarm system may reveal rogue alarms, reconciling the design intent with current operating reality, benchmarking against industry best practice and identifying problem areas will define, sometimes surprisingly, the issues to be addressed.

Where do you want to be?

The next step is to recognise and agree what the desired outcome of the management process should be. Building on the understanding gained during the first stage, some or all of the following may be relevant to establishing your goals:

- Define alarm management philosophy
- Establish alarm management procedures
- Review settings, priorities, groupings etc. against philosophy
- Review operation against management procedures
- Identify areas requiring change
- Set up periodic review and change control.

It is important that the goals are both technically realistic and commercially beneficial. Achieving regulatory compliance should not be at odds with either of these ideals. Goals such as “eliminate nuisance alarms” are laudable but not realistic. It may be more beneficial to strive for a 50% reduction in nuisance alarms per annum by causal analysis and instigation of change, thereby addressing the root problem. Setting of priorities for action will help ensure that the greatest benefit is achieved in the shortest period of time.

How to get to where you want to be

A clear and agreed plan of action, detailing tasks, resources, timescales and ownership provides a means of defining the activities required to achieve your goals. Progress can be monitored and managed using this plan, remedial action, should any be needed can be identified and scheduled. Financial or resourcing constraints may dictate the rate at which progress can be made against the plan, therefore it may be prudent to identify those actions which can be shown to have a fast payback, maximum benefit for minimum expenditure or legislative compliance issues for early action.

It should also be remembered that Alarm Management impacts three diverse areas, hardware, procedure and people. Changes to hardware are relatively easy to achieve, procedural change may require cultural change and changing people requires both training and motivation.

Have the goals been achieved?

This final question is often disregarded as being obvious, ‘of course we have done what we intended, we delivered the project on time, on cost and in full’. Have the goals really been achieved, though? Has the number of high priority alarms been reduced? Do the operators respond in the manner desired? Are the instances of nuisance alarms reduced to a tolerable level?

By assessing the impact of the changes made against the findings gathered in the first stage of gaining management control over the alarm function these questions can be examined and a measure of success determined. This assessment gives a measure of the success or otherwise of a project, as already stated, but also provides a marker of the value gained, and is valuable in re-assessing priorities for repeat or future work.

And there's more!

Spin-off benefits have been identified from gaining control over alarm systems, their management, operation and maintenance including:

- Greater understanding of the process
- Operator time freed up for other tasks
- Less routine testing
- Maintenance effort concentrated on the priority issues
- Product quality and throughput improvements
- Analysis of incidents and events leading to beneficial operational change
- Regulatory compliance
- Consistent approach and common understanding

In conclusion

This article is intended to give those involved in alarm management some pointers towards the processes and techniques that may be used in alarm management. It may prompt consideration of the wider issues, and the benefits to be found from not just being able to demonstrate compliance to others, but in gaining real control over this important factor in safe and productive operation.

References:

1. Alarms Systems, A guide to design, management and procurement, Publication No. 191 Engineering Equipment and Materials Users Association (EEMUA), ISBN 085931 076 0
2. Better Alarm Handling, Health and Safety Executive (HSE) Information sheet – Chemicals Sheet No 6