SAFETY

No cause for alarm

Andy Brazier outlines some of the principles and pitfalls involved in alarm management

Alarm systems support safety by warning of situations needing attention. However, poorly designed or managed systems become a liability by overwhelming users, delaying actions and contributing to failures.

The Engineering Equipment and Materials Users Association (EEMUA) issued guidance on alarm management, known as EEMUA 191, in 1999 and a fourth edition was published in November 2024. Although EEMUA 191 has been aimed at the process industry, the underlying principles are applicable more widely.

A clear definition is the first step in understanding the role of alarms and EEMUA 191 uses the following: An alarm is an audible and/or visible means of indicating to the operator an equipment malfunction, process deviation, or abnormal condition requiring a timely response.

A shared understanding of the role of alarms is essential and organisations should have a clear definition and alarm philosophy.

Alarms are often handled by standard control or monitoring systems that may not achieve any defined level of reliability. The person responding may also have played a role in creating the problem it signals – and this lack of independence can lead to a view that alarms can't be relied upon to control risks, with technology-based safeguards that don't rely on a human response seen as preferable. However, these add expense and complexity and come with their own risks.

Despite these concerns, alarms give people the chance to respond before a situation becomes hazardous. No safeguard is perfect and having multiple layers of protection, including effective alarms, creates safety and reliability.

Some alarms are more demanding because alternative safeguards aren't sufficient to achieve requirements and a human response may be the last line of defence. These are known as **Highly Managed Alarms** (HMA) and require more administration and documentation than most 'normal' alarms. Each one should have a detailed alarm response procedure and competence standard, as well as a defined proof of test method frequency.

Unnecessary alarms cause distraction and add workload. Some exist because of custom and practice, while others are motivated by a concern that people may miss things if an alarm isn't provided.

Using other types of notification, such as 'alerts' and 'prompts', can reduce problems with alarms.

Alerts are useful for situational awareness but they don't require a response. They can help run a process more efficiently and reduce the number of alarms when problems occur.

Prompts are a non-time-critical trigger for acting. Typical uses are batch processes and automated sequences such as equipment start-up.

An alarm is no use if it isn't noticed. An audible signal is usually used and previous guidance recommended alarms should be 10 decibels above background noise. However, modern control rooms are often very quiet and this sound level may startle and interfere with verbal communication, so three to four decibels above is more appropriate.

EEMUA 191 suggests a maximum of four different sounds that are easy to distinguish may be used to differentiate between types of alarm. This is quite limited but should be sufficient for a well-managed system that doesn't overload the user.

Prioritisation helps users to respond when multiple alarms occur. If only one alarm is active, a response should be immediate, no matter its priority. Low priority doesn't mean it can be ignored or warrant a delayed response.

EEMUA 191 provides some guidance, but organisations should develop their own methods for prioritisation and document it in their alarm philosophy.

Alarm rationalisation is a formal study that looks at the system and requires a review of every alarm, identifying unnecessary ones and prioritising and collecting relevant information. Studies should be part of any major project and repeated throughout a facility's life.

Every alarm should be justified, balancing benefits with negative impact from overloading or distracting people. The table on the following page may be used to guide this justification.

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Human capabilities also need to be considered. People are fallible. They can miss alarms, make the wrong response or choose not to respond at all. But people also have remarkable capabilities that have proven difficult to replicate with technology. They recognise visual patterns and notice very minor changes. They take information from many different sources to support situational awareness.

When someone notices an alarm, they access live and historical data from the system. They also consider information from many sources, for example, messages at shift handover, emails and reports received, direct observations and environmental conditions.

Conclusion

EEMUA 191 has sold thousands of copies worldwide. Organisations report significant improvements from investing necessary time and resources in alarm management and the underlying principles of the guide should be applicable in many industries.

Lasting success depends on understanding the role of alarms and the risks of a poor system. There's no 'right' answer and informed judgement is often needed to reach the optimum solution. There's also no quick fix and systems must be actively maintained and supported by adequate resources and people with the right competencies. ■

Effective alarm management requires:

- A good definition of alarm.
- A documented alarm philosophy.
- Focus on operator requirements, based on a sound understanding of human factors.
- Well-engineered systems that have applied inherent safety and the hierarchy of risk control.
- A full database of all alarms received by the operator.
- Rationalisation and prioritisation, removing unnecessary alarms, using alerts and prompts when appropriate and supporting the operator to respond correctly.
- Clear leadership and sustained management commitment to provide necessary resources and a consistent approach.

About the author

Andy Brazier is a risk consultant specialising in human factors and the founder of AB Risk. He is the lead author of the fourth edition of EEMUA 191. Find out more at **www.eemua.org**

Checklist for evaluating an alarm

Characteristic	Questions
Relevant?	Does the user need to know this?
Unique?	Is there another alarm with the same duty?
Timely?	Will the user have time to respond?
Prioritised?	Does the alarm indicate its importance?
	Does the alarm need special action above others?
Understandable?	Will the message be understood by the user?
Diagnostic?	Does the message identify the problem that has occurred?
	Can the user quickly get to more detailed information?
Advisory?	Does it indicate the action to be taken?
	If not, where can this information be found?
Focusing?	Does the alarm draw the user's attention to the most important issues?