A modern era for HMIs and alarm management systems

Alarm management systems, and high-performance HMIs can have a significant influence on how effective operators are in the job according to an expert in both fields, Hector R Perez, of **PAS**

A modern operator room incorporating modern alarm management systems and HMI interface

In any company, an employee's performance affects its productivity, profitability, and reputation. In manufacturing, the link is immediately apparent because the process is directly controlled by the real-time actions of a console operator. If that operator makes a critical mistake, the entire company may be adversely affected. By creating an optimal work environment, manufacturers can improve their operator's 'human reliability' while also achieving the ultimate goals of optimal safety and profitability.

Alarm management systems

Alarm management systems are greatly influencing how effective operators are at their job.

Unfortunately, it is common for alarm systems to be misconfigured and overwhelm the operator with alarms. Prior to the arrival of the modern distributed control system (DCS), the creation of a new alarm required the addition of physical alarm panels and associated wiring. Since each alarm had a discrete cost associated with it, only the essential alarms were installed. In a modern DCS, however, alarms require minimal parameter configuration and have no associated discrete cost. As a result, the number of alarms configured in a typical plant has grown over the last few decades.

It is not unusual for DCS operator consoles to have over 3,500 configured alarms, which often results in thousands of announced alarms each day. Many of these alarm events are caused by a small group of nuisance alarm types, which include: alarm floods (large numbers of alarms triggered within a short timeframe); chattering (caused by measurements oscillating in and out of their alarm state frequently); stale alarms (measurements remaining in an alarm state for a prolonged timeframe); and predictive maintenance information wrongly expressed on the screen as an alarm. These factors contribute to operator overload and reduce human reliability, risking critical alarms to be missed.

Last year, PAS implemented its comprehensive alarm management software at 12 Scottish Power sites comprising gas-fired, coal-fired, and hydro-electric power generation stations. Scottish Power chose PAS' technologies to help it avoid abnormal operating situations, improve the situation awareness of their plant operators, and provide better control of its plants.

Human Machine Interfaces

Another factor often cited in industrial incident reports is poor human machine interfaces (HMIs). In the late 1970s when graphics-based operating displays were introduced, there were no guidelines for their effective design. Rather, they were implemented based upon the plant piping and instrumentation diagrams (P&IDs), which are simply schematic representations of the plant. These were then 'sprinkled' with live numbers and a variety of other attributes to convey operational data, such as colours, animation, and shape changes. The result was typically far from optimal.

These schematics are still used. There is generally too much raw data on the screen, which can obscure the operator's ability to quickly identify problems. Since their human interface does not provide the context necessary for situation awareness, operators are forced to react to alarms instead of proactively manage problems before alarms occur.

The aim of a high performance HMI is to increase the situational awareness of operators by providing optimal awareness of the state of the process; making operators aware of key indicators and trends; enabling immediate detection of abnormal conditions; increasing the success rate for handling abnormal situations; and reducing the time to complete mitigation tasks.

The underlying principle of a high-performance HMI is that, wherever possible, operational values should be shown in an informational context rather than as 'raw data'. Informational context is achieved through consistent and effective use of analogue indicators, trends, colour, proper alarm depiction, and taking advantage of human factors, such as pattern recognition. With this informational context, even untrained operators can tell if the process is running at peak efficiency or is about to fail.

By optimising the alarm system and implementing high performance HMIs, human reliability can be significantly increased and operators can work proactively rather than reactively. They can detect disturbances as they emerge and intervene before an upset occurs.

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