Raising the curtain

Safety interlocks are standard stuff for all sorts of plant. But things get more difficult when access to automated machines is an essential part of operations. Brian Wall explains

When DS Smith Converters introduced automatic paper reel handling at its corrugated board production site in Louth, Lincolnshire, it faced a dilemma. The process was already automated, with operators ensuring that paper reels were received and fed, overseeing the line and transferring pallets of finished goods to storage. However, with the new addition – which transports 2.5 tonne reels along a conveyor track in the factory floor, before automatically picking them up and loading them onto one of five reel stands – there was a safety issue.

Operators, who need access to manually check and splice the reels, had to be protected from the new reel handling plant; but, since it's in continuous motion, fixed guards were impractical. DS' solution was electro-sensitive protection equipment (ESPE) – coincidentally recommended at the time in guidance notes on safety, then recently updated by the Confederation of Paper Industries (CPI).

Auto recognition

Making that work, however, wasn't going to be trivial, so the company commissioned integrator STech UK to develop a pilot safety system that would allow free flow of the reel handler, but also shut down, if an employee entered a restricted zone. STech managing director Sean Scott turned to Omron and says: "Two members of Omron's safety team visited Louth and, after consultation, we agreed on their SNC [Safety Network Controller] with a DeviceNet Safety network."

The pilot focused on a single reel stand, with the SNC installed in a master control unit and wiring running to a local I/O box close to the reel stand. Omron light curtains were positioned either side of the floor-mounted conveyor, and mirrors placed around the perimeter, providing a protected area. But now the clever bit: Omron's 'mute' facility, which stops the machine if people are detected, but allows reels to pass through the curtains without shutting down, because they conform to pre-defined parameters.

However, selectively stopping the paper reel machine was one thing: shutting down the overall process was another. STech needed to ensure that its safety system networked to the wider automation system and also to allow for the process to be stopped when a manual override was requested.

The Louth site uses 12 Omron PLCs for overall plant automation, all of which communicate via a DeviceNet digital plant network, with the cabling linked to local I/O boxes positioned along the production line. So STech used an SNC linked to an Omron CJ1M PLC to communicate with the wider DeviceNet network and synchronise operations.

Now, when an operator switches to automatic mode, the machine interlocking and safety curtain functions are checked to ensure they are active. If there is any discrepancy, the machine goes into emergency mode. Then, at the end of the automatic process, the safety system is deactivated, allowing the reel handler to feed in the next reel.

"The way we have programmed the SNC ensures a smooth, seamless process, [and] clear visual indication shows employees when the safety system is switched on or off," explains Scott. The system also features built-in maintenance counters to alert on components reaching their end-of-life, with these linking to an Omron HMI that provides visual indication of maintenance needs.

Following success of the pilot, DS Smith gave the go-ahead for the system to be rolled out to the remaining four reel stands, which has since been done. Says DS Smith plant operations manager Neil Osborne: "This is only phase one of our enhanced safety system. Due to the flexibility of Omron's SNC, we will be adding existing safety systems into the Omron system over the forthcoming months, which will give us total visibility over our safety systems."

And Mike Nichols, managing director of DS Smith Converters, adds: "SNC pushes the boundaries of what is achievable, in terms of delivering automation throughout the process, in tandem with progressive updating of the systems as new technology emerges." PE

Pointers

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DS Smith Converters' plant, which has been equipped with automatic paper reel handling machinery, protected by intelligent safety light curtains