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Improve Safety Applications by Using Wireless Technology

Leveraging Mobility to Increase Productivity and Efficiency

Wireless technology is increasingly used in machine safety applications. New solutions introduce mobility and offer higher levels of flexibility and safety for plant floor operators. This ebook explores how modern wireless implementations can increase user safety and mobility, reduce installation costs, and boost productivity.

Wireless versus wired

While improving safety of operators, wireless solutions present significant advantages in terms of efficiency, cost, installation time and diagnostics. Machine builders and end users are accelerating their use of wireless technologies in order to enhance overall competitiveness.

Operator proximity and mobility

Wireless remote control systems allow operators to be remote from the hazard. Rather than needing to control and monitor the application in close proximity, these devices enable operators to distance themselves from potential hazards. The ability to move freely without cabling allows the operator to work more quickly and with broader perspective. Diagnostics and preventive maintenance data from the asset can easily be accessed on the remote control device without moving from the floor, improving overall efficiency by preventing downtime.

Installation and maintenance

In a wired control device situation, the cabling of the control station accounts for 15% of the installation cost. Replacement time and maintenance of damaged cabling can result in machinery being down for prolonged periods of time.

With a wireless remote control system, installation and commissioning time is reduced significantly. Maintenance and ongoing lifecycle management are also improved due to the ability to quickly swap remote control devices, which can easily be paired at distance with the base station installed on the asset.

Maintaining and monitoring applications is key to ensuring operator safety. System parameters and alarms can be set by operators to ensure that if the solution tries to exceed specified ranges or components need service, the operator is notified. This helps to ensure the safety of factory floor personnel and prevent damage to the installation.

Reliable wireless protocols

The leading inhibitor of wireless adoption for safety applications is the perceived reliability of such systems due to floor layout, signal strength, etc. However, these concerns are being overcome by rigorous assessment and proven technology.

Challenges and solutions

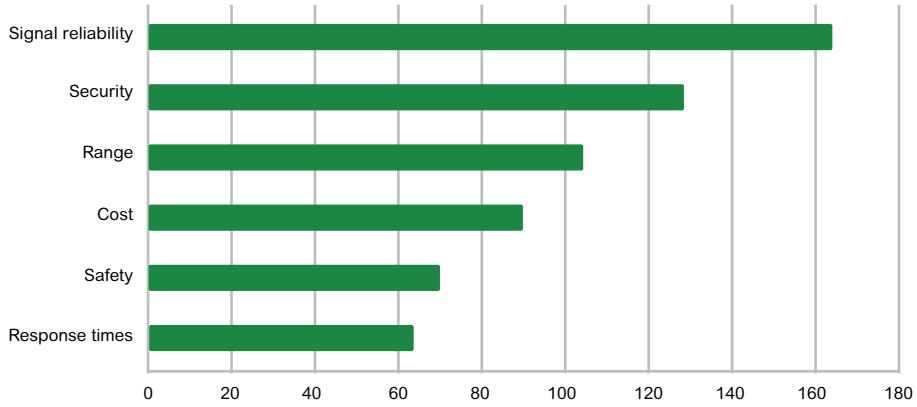
Frequency

The 2.4GHz frequency has become preferred to reduce radio transmission interference, because its signal reliability is stronger than the traditional lower frequencies. Bluetooth Low Energy also helps to further improve confidence in the reliability of mobile wireless control systems. This technology uses a floating frequency hopping mechanism to avoid possible interference from other devices operating on the same frequency channels.

The leading inhibitors of wireless adoption are signal reliability, security and range — these have now been overcome by new technology.

Analysis of Concerns with Implementation of Industrial Wireless Solutions

What are the concerns or limitations with an industrial wireless network at your company?



Sample Frame: All respondents who have mobile devices on the factory floor (Question 21)
(Respondents may provide multiple answers) Sample Size: 272
Source: IHS Oct. 14

Reliable wireless protocols

Smart antennas

The innovation of smart antennas increases or decreases the working distance of the system to the adapted values for the specific application. The working range must be limited to the precise area where the operator can control the machine, in order to maintain safe working parameters.

Security

As more automation devices are networked and wireless remote control systems are adopted, the concern over data and network security continues to grow.

OEMs and end users must adopt a multi-layer security approach. The use of specific functions, such as code sequencing and encrypted communication, help to protect against external attacks. Provisions must also be taken to guard against non-malicious intrusions, through educating operators and clear operating procedures.

Battery technology

New battery technologies for wireless remote control devices, such as Lithium Iron Phosphate ($LiFePO_4$), now allow the uptime of the application to be maximised. Due to the very high ratio of time to charge/autonomy; charging the battery for a few minutes provides autonomy for a full working day. This technology, already being used in electric vehicles, also improves overall battery lifetime when compared with traditional technologies.

Broken or lost devices

Due to their nature, wireless remote control devices are more susceptible to being broken or lost, which can be time consuming and impactful on overall productivity.

Some wireless remote control systems use a pairing procedure enabling fast and easy replacement of the remote control device. The new remote control device simply pairs with the existing installation and the application is operational again.

Compliance with safety standards

Wireless remote control systems must be compliant with the relevant standards. These can be general standards pertaining to radio emissions and functional safety, or can be for specific types of machinery.

Radio emissions

The 2.4GHz frequency band has universal acceptance and doesn't require a specific license to be used worldwide. However, product manufacturers are required to obtain an international radio certification. This demonstrates that there is no risk of interference with other wireless devices.

Functional safety

The evolution from electromechanical to electronic safety, and the increasing levels of functionality that result, require safety solutions which integrate intelligence to monitor and control unintended movements of the machine or unexpected changes to the process. This includes addressing operational stops, whereby the stop control does not remove power supply to the actuators.

The increasing use of mobile wireless controls and variable speed drives requires monitoring of all related functions of the machine, not only for stop functions but also for motion functions. This is already required in the current European Machine Directive 2006/42/CE. More advanced wireless remote control systems integrate monitoring of the stop function and motion function without the need for additional safety devices. For more specific parameters, please download the Schneider Electric white paper, Wireless Technology – Changing the Face of Safety Applications.

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Conclusion

The more information that operators can access, the better positioned they are to avoid and manage unexpected machine stops. With a remote control device, an alert is issued to the operator if the communication signal between the device and the base station drops to a low level. The system is automatically stopped when valid frames are no longer transmitted or received.

In the realm of machine safety applications, wireless technology is beginning to emerge as a core technology. Safety must remain the primary reason for adopting wireless remote control systems, which will steadily increase in applications where operator mobility is beneficial to safety, productivity, and costs of operation and maintenance.

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