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WHITE PAPER

SAFETY LIGHT CURTAINS
– SAFETY LIGHT CURTAINS ARE MORE THAN A COMMODITY

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ABSTRACT

How you can use safety light curtains to collect and communicate data from your manufacturing processes.

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Introduction

In 2017, 115,550 injury cases were reported in the manufacturing industry to OSHA. OSHA cited a lack of machine safeguarding as one of its top violations of the year. When safeguarding machines, safety light curtains are a core necessity. Safety light curtains are an advanced, reliable, and cost effective way to protect personnel from the many hazards in a factory or warehouse. But there is an incorrect perception that safety light curtains are a commodity and not useful beyond basic safety functions.

Components and functionality of safety light curtains

Safety light curtains consist of a sender and a receiver. The sender projects a series of parallel infrared light beams to the receiver. When one or more the light beams are completely interrupted, the safety light curtain reports the interruption in the light beam to the secure output signal switching device (OSSDs) by a signal change. The machine or its control must accurately analyze the signals and safely stop the machine.

Application examples

Safety light curtains can be used in many different applications. For example, in entry/exit applications, safety light curtains can be used without the need for muting sensors that temporarily deactivate the protective function on a safety device. Horizontally-arranged safety light curtains are applied near the doorway. When objects enter or exit a hazardous location, safety light curtains are able to actively differentiate between a person and a machine. Using pattern recognition to identify unique interruptions, like a person's legs versus a pallet carrier, safety light curtains help safely move materials into safeguarded areas. Without the need of muting sensors, there is less mechanical mounting efforts and less wiring needed.

But because stopping machines safely is its primary function, safety light curtains are often thought to be synonymous with an on/off switch for machines. Safety light curtains are undervalued because it is commonly believed that there is no return on investment with these safety devices. But with advances in technology like IO-Link, safety light curtains have proven their worth with many other functions, in addition to safety.

Collecting and communicating data with IO-Link

One of the biggest technological advancements featured in safety light curtains is IO-Link. IO-Link is a point-to-point serial communication protocol used to communicate with sensors and actuators. It is a nonproprietary system not tied to any specific vendor. The IO-Link system consists of an IO-Link master and connected IO-Link devices, such as sensors, that use fieldbuses to communicate. The IO-Link master is the interface that is used to communicate with PLCs and controls the communication between the IO-Link devices.

IO-Link collects service data, process data, and event data. Service data is information that is relative to the device itself, not to the device's function. Process data is information on what the sensor is reading, such as temperature or distance. Event data is the notifications or flags indicating, for example, a dirty lenses, an error, or communication loss to a sensor.

The data collected by IO-Link can be remotely accessed and translated into plant-wide diagnostics, such as power consumption information and other production data. Using IO-Link, safety light curtains become a powerful data collection tool for both operators and maintenance personnel.

Individual beam data in action

One of the types of data IO-Link communicates to a user from a safety light curtain is individual beam data. Individual beam data is information that the light curtain makes available to a user to identify status of the series of parallel light beams. Individual beam data is generated by the optics of the light curtain and indicates which beam is blocked. It is then routed through the micro-controllers built into the device. The data is utilized via IO-Link communications and can be sent to a PLC or other reading devices. With many different functions, individual beam data makes safety light curtains a powerful asset, not just for safety but also in other applications.

### Application example: end of line packaging – height measurement

Using individual beam data, the heights of pallets can be measured. This application is usually done by other sensors. By using a safety light curtain instead, companies can save money on buying another piece of automation equipment and time spent wiring, commissioning, and programming.

When a pallet gets stacked with goods, they need to be secured with stretch wrap for shipping. The individual beam data indicates how many beams are blocked in the light curtain. With this information, the stretch wrapper knows how high the arm needs to go to wrap the pallet of goods effectively. Having an accurate height for wrapping saves the company time and money by preventing the wrapper from wrapping higher than needed.
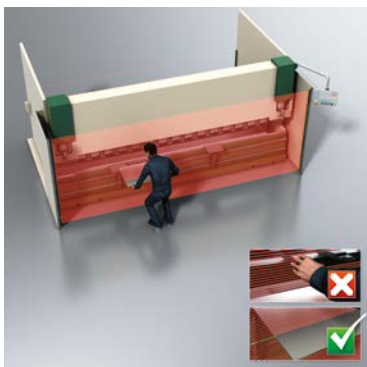
Application example: machine building – handling and assembly

Press brakes have very precise bending motions, and if material isn't positioned correctly, it can cause scrap and potential hazardous situations. In machine building, a common application of safety light curtains is to safeguard press machines to ensure workers don't get too close to the machine, while still allowing material to go through during normal operation. The safety light curtain can be used for quality control when using individual beam data. The data provides information about where and how the material is being fed into the machine, ensuring it is bending at the right speed in the right direction.
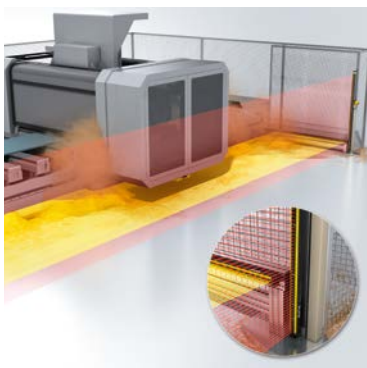
Application example: machine building – nuisance tripping identification

When working with machines that produce a lot of debris, such as wood and metal shavings, other safety sensors can be incorrectly tripped by the nuisances. Safety light curtains are able to ignore these small objects while still detecting larger and unsafe objects and workers. Eliminating nuisance trips leads to less downtime and a more productive factory.

Nuisance trips may still happen, but by using individual beam data, the safety light curtain can identify where the material falls through the curtain. This data can pinpoint if there is a pattern to how the material falls to help locate where trips commonly occur. Locating where nuisance trips occur can help eliminate them and create a more efficient factory.

Conclusion

As a cost efficient solution for many safety problems, safety light curtains are often perceived as a commodity, rather than a valuable piece of equipment that can help with automation tasks, quality control, and to eliminate the need for other sensors. Most people are unaware of the untapped capabilities of safety light curtains to bring their factories into Industry 4.0. Safety light curtains can be used in many different applications with manual and automatic features that serve to make more productive and safe working environments.

SICK will be happy to support you in identifying and exploiting this untapped potential of your safety light curtains.

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