technology

Building the perfect light curtain

We don't give them much thought, and nor should we – assuming they're doing their job properly. Duff McCutcheon reports on applications in conversation with Joe Lazarra and Sergio Aguilar at Omron STI

Omron STI approaches the application of light curtain safety with the premise of seamless integration

Omron STI's Joe Lazarra wants to change the way you think about light curtains, and about safety technology in general. Rather than safety tech being something tacked on at the end of designing a machine or assembly process, Lazarra wants engineers integrating safety into the application at the design stage.

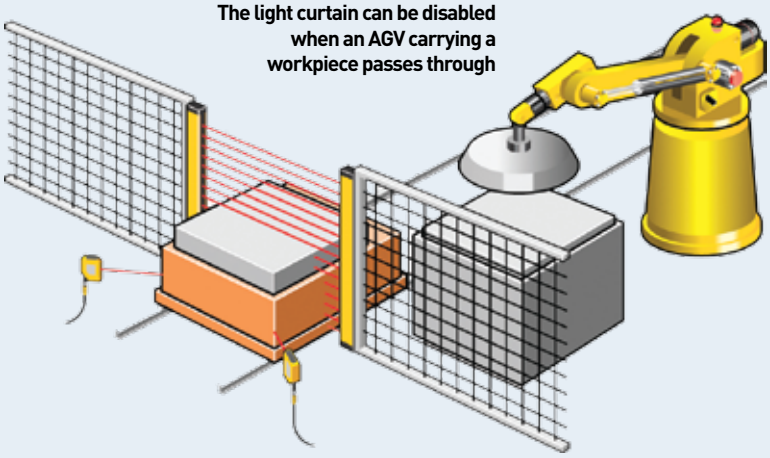
"Before, people would think of safety devices as something they needed to add on to an application," he says. "We're trying to get people to think of it as integrating safety into their application. Sometimes, when you're integrating it more tightly with the application, you can utilise some of these advanced features. You can use it to enhance productivity rather than just guard the application."

In integrating a light curtain into a given application so that it's a seamless part of the equipment, Lazzara and his colleague Sergio Aguilar say you need to start with the premise of an "ideal" light curtain. This is one that you install, whether it's configured for a specific application or a more generic use. "In the end that light curtain needs to perform, needs to seamlessly integrate with the equipment, and needs to become almost invisible to its owner. After they install it they have a piece of equipment that produces parts, not a piece of equipment with a light curtain on it."

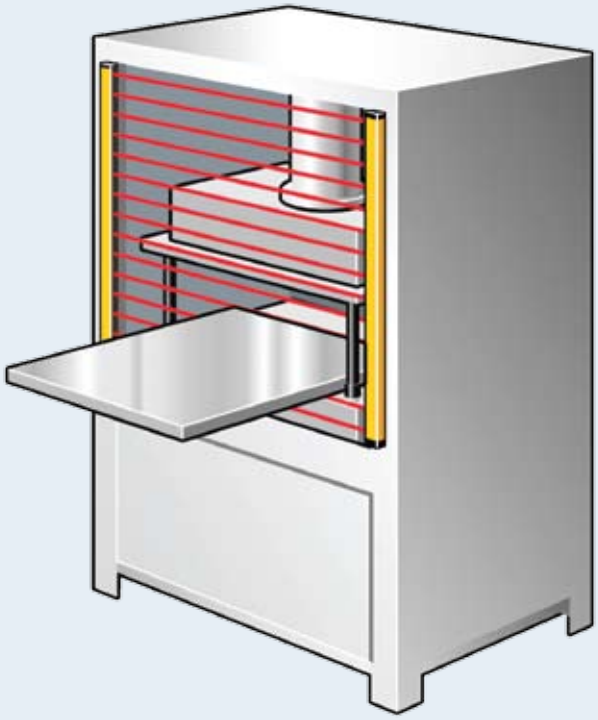
The ideal light curtain is not your father's safety device. These are sophisticated guarding tools with multiple built-in functions that allow the designer to do much more than stop a machine if an assembly associate breaches the light. Today's light curtains now have numerous feature sets that aid productivity and equipment efficiency, while still doing duty as an equipment guard.

Frequency selection/Scan codes

When multiple light curtains are used in high volume applications in small areas, often a phenomenon known as "cross talk" occurs, where one light curtain interferes with another. "In order to avoid that, light curtain manufacturers



The light curtain can be disabled when an AGV carrying a workpiece passes through



Fixed blanking is used to disable selected fixed areas in a light curtain's sensing field

have developed scan codes that set a specific light curtain to operate at a different frequency than the other ones, eliminating crosstalk," says Lazzara.

"The light curtain receiver and transmitter communicate with each other, usually via some kind of optical synchronisation. The scan code allows a specific curtain to have a specific frequency code and so the receiver only talks with the specific receiver. Another curtain operating nearby would operate on a different scan code and therefore the two would not interfere with one another."

Cascading light curtain

This feature allows you to guard two hazard points with one "segmented" light curtain. "Basically, you have the first segment, an interconnect cable, and a second segment – and they can be placed at different points around the machine. That comes with a lot of benefits for machine builders," says Aguilar. "When you build a machine, you have a control panel, and PLCs, and PLC costs are based on inputs and outputs. If you were to install two light curtains, you would need four I/Os on that PLC. But if you have one cascaded light curtain, you only need two. It lowers costs and makes installation simpler."

Fixed blanking

This light curtain feature is used to disable selected fixed areas in a light curtain's sensing field. Essentially, it assumes there is going to be a fixed object in a location that will continuously obstruct the sensing field of the light curtain. It could be a work piece, part of a tooling on a press: "Just something that's physically there and you need to tell the light curtain to ignore it. If, for some reason, the object is removed, then the light curtain detects its absence and sends a stop message to the machine," says Lazarra.

"A lot of times fixed blanking is used where there's been engineering changes to a workcell, like an additional barrier within the guarded area. If the intrusion is eternally fixed within the range of the light curtain, that 's where you would use fixed blanking to get around that obstruction," says Aguilar.

Floating blanking and muting

Floating blanking allows an operative to program the light curtain to accept an object of a certain size and shape to pass through the light beam without sending a stop signal. With this, you can have it set so it takes two beams to trigger a stop. "Let's say you're punching material and you have a feed of the material travelling through the light curtain's sensing area. You want to ignore that, but if you have a second beam broken somewhere else in the curtain, that would trigger a machine stop," says Aguilar.

In automotive assembly, Muting is often used to enable automated system feeding, a pallet or a car body entering into a specific work cell, for example. It provides an opening that allows the material to enter the work cell but bars a person from entering. It uses a combination of other sensors that, when they're triggered in the correct sequence, allows the light curtain to be muted or bypassed to allow

WIP or materials to enter and exit the cell.

"Let's say you've got a conveyor ferrying pallets into a palletizer," says Aguilar. "When the pallet goes through and into the palletizer, you don't want an operator going in there as well. As the pallet goes in, you have a couple of sensors – photo sensors, magnetic sensors – that the pallet will trip and they send a signal to the light curtain that an object that's allowed to enter is there.

"If a human enters, they won't trip the sensors in the right sequence, and the light curtain looks at that as an unauthorised intrusion and sends a stop signal. The key there is to properly position the muting sensors so they can differentiate between a person and a pallet. Or sometimes the pallet will be fitted with metallic disc and the sensor has a metal proximity sensor looking for it. Usually there's between two and four sensors sequenced to trigger a muting operation."

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– Joe Lazarra, Omron STI

Reduced resolution

This particular feature set helps to differentiate between larger objects and smaller objects – like torsos and fingers. Light curtains are generally purchased with a specific resolution, with the resolution generally determined by the type of the application being guarded. For "point of operation" guarding, where the goal is to protect fingers or hands, you use relatively high resolution that can detect smaller objects.

In other applications, like perimeter guarding, where you want to protect associates' arms or torso, the resolution of the light curtain doesn't need to be as sensitive.

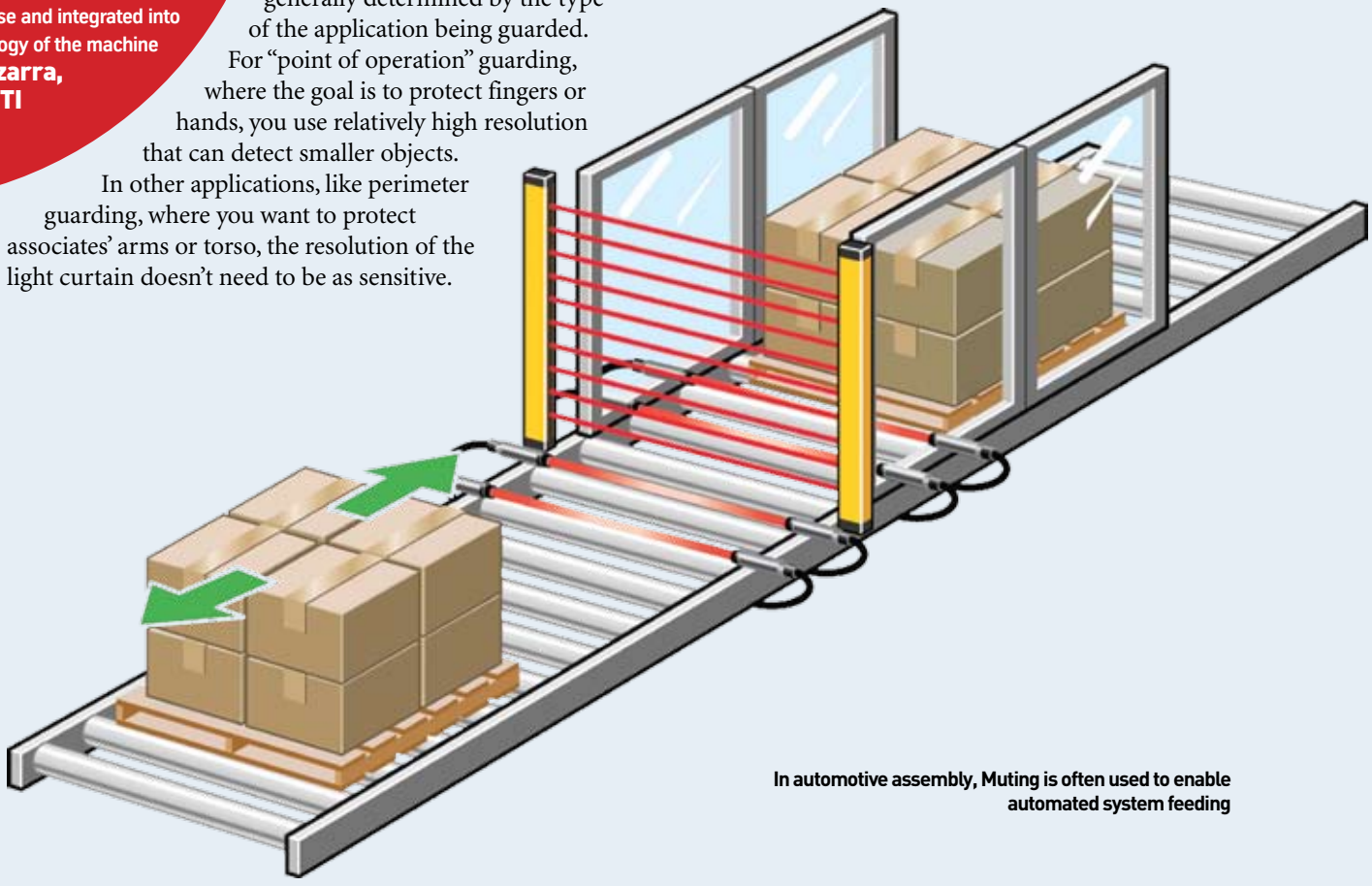
Regarding the fixed blanking, floating blanking and reduced resolution feature sets, all of these features can also be used in combination with each other, according to Aguilar. "For example, in a stamping operation, where you're feeding material into a press, sometimes you need fixed blanking in combination with floating blanking to allow that material to enter the tooling area. You've got small sheets of material that could be 30.48 centimetres in width and then you have sheets that could 20.32 centimetres in width. It rolls in, wobbles up and down, and you need some means to allow the material to enter without stopping the press from punching its parts out. That's when you would use the two features in combination."

So how have machine builders taken to the idea of integrating light curtains, through the use of advanced features, into their equipment designs?

"I think the concept is very good," says Lazarra. "We're trying to get them to think that safety devices aren't just bolted on at the end of a machine or process design, that they really should be thought about during the design phase and integrated into the technology of the machine."

Aguilar says some machine builders are actually taking the concept a step further, and doing whatever possible to design safety devices right out of the equation. "When you do risk assessments, the first thing you look at is not 'how can I guard the hazard, but how can I eliminate the hazard."

"Our goal is to make it a safe process and if they can eliminate the hazard, then they've accomplished that. Still gets to the bottom line – a safe operation."



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