When is a safety mat better than a laser scanner?

It was a question that Omron Automation and Safety Account Manager Mike Gaskill was determined to answer. In January 2015, Gaskill visited one of the most advanced automobile facilities in the world. This state of the art plant produces sophisticated passenger vehicles using robots designed to mimic a cellular manufacturing operation. Unlike the classic industrial robot applications, where robots operate in a shielded environment for safety reasons, the plant’s robots operate in the proximity of humans and autonomous guided carts (AGCs) and autonomous guided vehicles (AGVs), so that safety has to be guaranteed.

“It is an amazing place,” said Gaskill.

Inside the main assembly building, over 150 robots do everything from build complex components to lift and maneuver entire cars. Even with so much automation, the plant’s managers are always looking for new ways to use robotics to further reduce costs, improve efficiency, and better interface with a human operator. To that end, they assigned a special team to equip a section of the loading-dock bay with a robot and WiFi-based autonomous guided forklifts. The team was tasked with creating two load and unload cells that could automatically transfer tires from parked semi-trailers to the plant’s vehicle-assembly line.

While the autonomous guided forklifts were equipped with an on-board safety system consisting of six area scanners, the robot required an aftermarket solution that would protect any workers who might enter its motion path but would not impede operation or maintenance. To mitigate this risk and bring the equipment into operation, the customer’s project team asked the local solution integrator, Pampa Technologies, to partner with Gaskill and Omron Product Marketing Manager Matt Dodds to come up with a strategy that would establish safety zones around and within each work cell.

Plant standards called for work-cell safety

Since each work cell measured 13 feet by 13 feet (4 meters by 4 meters), both zones were candidates for a safety laser scanner system. “Safety laser scanners are typically the best choice for protecting a large area,” said Dodds.

Companies like safety laser scanners because the units are fast in response, flexible in application, and effective in performance. Since their introduction in the 1990s, they have become the default solution for protecting workers who occupy dangerous production environments.

Gaskill considered using the laser-scanner approach. The Omron model OS32C scanner he had in mind offered a best in class low profile, compact size, and easy configuration. It could be easily installed quickly over a weekend when the plant was idle. And a unique Ethernet feature would enable the customer to network the scanners and check zone states, measurement data, and other operational details remotely in real-time — a plus for personnel who might be working on the other side of the company’s 500,000 square foot building.

However, the environment proved to be problematic. The plant was located in a dry and arid region. The loading-
dock bay doors were usually open and allowed in so much silica dust, dirt, and grime that the laser scanner's built-in pollution tolerance mode and reference boundary monitor function could not prevent false detections. In addition, the plant's modern layout with many windows was problematic as lighting was variable during a typical operational day. Geometry would also need to be considered to allow for cobotic operation. Gaskill needed another strategy.

**Omron safety mats are a proven, simple technology**

Mature technology is sometimes the best technology. That was the case after Gaskill and Dodds assessed their options for creating safety perimeters around the plant’s tire load and unload cells.

"Because safety mats are low-tech, they are often overlooked in favor of more complicated solutions," Gaskill said.

Safety mats, which have been protecting workers since the 1950s, are simple. They are essentially pressure-sensitive open switches sandwiched between sheets of insulating material and hardwired to nearby machine controllers. If a person or thing entering the safety perimeter is heavy enough to close the switch, the safety mat instantly signals the machine controller to enter a safe mode.

Redundant wiring and molded construction makes Omron’s safety mats very durable and reliable. Available custom layouts mean the mats can be tailored to fit oddly shaped spaces. For the plant, those qualities made safety mats a perfect solution for a challenging space with less than ideal environmental conditions.

**Installation takes hours not days**

For each work cell, Gaskill and Dodds used seven Omron UMQ quick disconnect safety mats and one Omron MC3 controller to create a safety zone. Six of the seven safety mats were customized to wrap around four foot pedestals. The pedestals support the tire cassette that the autonomous guided forklift delivers and retrieves from the work cell.

Beyond the safety-mat zone, a 48-inch-deep (123-centimeter) deep protective warning zone was created by specifying two horizontally mounted Omron F3SG-RA advanced safety light curtains. Depending on the customer’s preference, the light curtains could be configured to alarm only or alarm and stop operations if an intrusion is detected. When paired with Omron’s NJ SQL solution, real-time logging of operations and intrusions could be achieved. The F3SG-RA advanced software also allows the user to control blanking, muting, and up to finger-protection resolution. The customer can fine-tune these and other features using an available Bluetooth-enabled communications application.

A four-person team headed by Omron’s Machine Safety Division (MSD) group and supported by Omron Project Integration Manager Jeff Hollis was able to install all the safety equipment for both cells within two shifts. They secured the mats in place using Omron aluminum trim anchored to the bay’s concrete floor. The trim also provides a protective channel for running signal wires back to the MC3 controller.

"The customer gave us a substantial area to protect," said Dodds. "The environmental issues were a challenge, but safety mats and light curtains gave us the tools we needed to provide complete and reliable coverage."