CASE STUDY

Smart sensing drives press productivity

Omron Automation and Safety Account Manager Mike Gaskill had a pressing problem. Or rather, he had a customer with a problematic press.

“The customer has a number of 10-ton hydraulic presses in its automobile production line,” he said. “On one press, workers have to load fasteners into an assembly before activating the press. If any of the fasteners are not positioned correctly, compressive force can destroy the press’s aluminum die, which costs upwards of $10,000 to replace.”

The customer also was concerned about being proactive with safety. Press line production runs today are much smaller and changeovers are numerous. Manufacturers are demanding flexible systems as they are critical differentiators in today’s challenging automotive market. Improperly aligned parts can shatter under pressure and put workers at risk. In the U.S., the Occupational Safety and Health Administration (OSHA) routinely issues large fines when companies allow this type of workplace accident to occur.

LED laser sensing only provides a partial solution

In the automotive industry, sheet metal stamping is the process of forming and cutting metal alloys into frame members and other part forms using a press tool. Metal stamping dies are used to create high precision metal parts that are equal in shape and size. On average it takes over 200 dies to create the over 45 major vehicle frame panels for one vehicle model. Since these parts are often visible and have high tolerance specifications for safety and performance, the metal stamping process requires a specific thickness to ensure the parts are equal, and to ensure the die is not damaged during this process. Whenever a die is damaged, the press is idled until a backup die can be installed. Besides the replacement cost for the die, lost production on the press affects the entire plant’s output.

Manufacturers can avoid damaged equipment, downtime, and potential safety incidents by installing sensors that prevent equipment from operating when parts are incorrectly positioned. Gaskill thought a single-beam light emitting diode (LED) laser kit might provide the most affordable solution for updating the customer’s hydraulic presses. He decided to try an Omron safety sensor kit that had proved effective in similar applications. The kit is simple to install and uses a low-cost safety controller that is ideal for stand-alone equipment.

“Even if a sensor looks like it will work, I like to try it before presenting my recommendation to the customer,” Gaskill said. Using an idle hydraulic press, he quickly set up the sensor kit and began testing its ability to detect misaligned fasteners. “In this case, I discovered that the laser’s beam was too narrow to fill the entire cavity on the assembly.”

Gaskill was disappointed but confident he could find a more effective solution among Omron’s extensive produce line, which includes many of the industry’s most advanced sensors, controllers, switches, relays, and power supplies. The sensor products, in particular, offer many options for detecting changes in position, length, height, displacement, and appearance. It was simply a matter of finding the right solution for this specific application.

Business Need
In most press shops, damaged tooling is the number one cause of downtime. Misalignment, short feed, over feed, slug stacking and part ejection failures can damage dies that cost upwards of $10,000 to replace and create hazardous conditions for operators.

Unique Challenges
Omron’s E32-T16WR wide-area fiber optic sensor provides a more reliable and flexible solution for preventing press equipment damage and improving worker safety. Omron’s CP1L controller with embedded Ethernet and Zen V2 programmable relay provides real-time and simple to control functions enabling customers to capture press operation and part data.

Customer Benefits
With our extensive experience in press safety solutions and die protection sensing, Omron can provide a wide variety of solutions to fit a wide range of technologies ensuring safety while improving productivity and flexibility. Our intelligent solutions allow for full visibility and tracking to the point of operation.
Fiber optic sensor looks like the better solution

Each part placed into the press had two identical cavities for receiving the fasteners. Each cavity measured 254 millimeters (10 inches) long by 35 millimeters (1.38 inches) wide by 11 millimeters (.43 inches) high. Since the width and height dimensions were constricted, Gaskill thought a fiber optic sensor would be more effective in filling the space and detecting misaligned fasteners.

While fiber optic sensors can be more expensive than conventional electronic sensors, their use in industry is becoming commonplace as companies gain experience with this versatile technology. By configuring different light amplifiers, special fibers, variable-spot lenses, and filters, engineers can modulate a sensor so it performs reliability under a wide range of challenging conditions.

Fiber optic sensors are particularly well suited for high-voltage and explosive environments. They do not conduct electricity and can be configured to work in locations where electromagnetic interference and high temperatures would render conventional sensors inoperable. This flexibility makes them suitable for many monitoring tasks, where traditional sensing would fail.

Tabletop test run demonstrates the value of fiber optic solution

Gaskill decided to test an Omron E32-T16WR fiber optic area sensor. This special-beam configuration provided a 30-millimeter-wide (1.18 inch) sensing band that appeared to be well suited for filling the part cavity. Although a 10-ton press was not available, he was able to mock up the cavity opening on his kitchen table.

“There were 10 misalignment variations that could happen, he said. “After testing, I was very confident in the fiber optic sensor solution.”

An Omron CP1L controller with embedded Ethernet and Zen V2 programmable relay provided control functions for the sensor. Both units are simple to program and enable the customer to begin capturing data about the hydraulic press and part assemblies. They include RS-485 outputs for networking with other compatible devices. The CP1L controller also includes an embedded Ethernet port that provides even more communications flexibility.

Gaskill received permission to try his solution on one of the customer’s hydraulic presses. For the test, he only needed to install an emitting and receiving unit on either side of each cavity to validate that the beam could intercept all possible fastener positions.

“The customer was very impressed with the beam’s ability to catch random positions,” he said. “Through evaluation, we determined that the emitter or receiver had to be canted at three feet off parallel for optimal performance.”

The test also revealed that the sensor was more reliable when an Omron E3NX-FA Super Giga-Ray amplifier was included in the configuration. The amplifier allowed Gaskill to tune the beam’s light intensity so it could more easily traverse the length of the cavity. Its Smart Noise Reduction algorithm also improved performance by more than doubling the sensor’s signal-to-noise ratio.

“It’s a very flexible and durable solution,” he said. “And there have been no vibration or g-force problems, which is always a concern with a hydraulic press. In this case, a fiber sensor was clearly superior to the laser alternative.”