Test center

Keeping pizza dough pure

A metal detection equipment supplier uses its test center to custom-design a metal detection and reject system for Domino's Pizza distribution centers.

Domino's Pizza, headquartered in Ann Arbor, Mich., operates 18 regional distribution centers throughout the US. Each distribution center produces all of the different types and sizes of pizza dough used by Domino's pizza stores. The company uses metal detection equipment in each of the processing lines to ensure the pizza dough's quality and safety. Recently, the company worked with a metal detection equipment supplier at the supplier's test center to improve its metal detection capabilities.

Making pizza dough

After a Domino's distribution center produces a batch of dough, the dough is sent through a divider that cuts the dough into the appropriate size, depending on the type being produced. The cut pieces are conveyed to a series of rounders that convert them into dough balls. The dough balls discharge from the last rounder via a conveyor to a picking conveyor, which conveys them to an area in the distribution center where team members manually place the dough balls into trays. The full trays are conveyed into a cooler. From the cooler, the trays are loaded onto trucks and delivered directly to the pizza stores to ensure freshness. Because the company uses stainless steel equipment to produce and handle the dough balls, it installed metal detection equipment in the processing lines to ensure product quality and safety.

Improving the process

In fall 2001, the company took a proactive step and initiated a project to upgrade and install metal detection equipment in all 18 distribution centers to improve and strengthen its product quality assurance guarantee. The company contacted various metal detection equipment suppliers to evaluate their equipment. The company didn't have a problem finding a supplier that could provide effective metal detection equipment. It did,

The supplier custom-designed a metal detection and reject system for each of the company's processing lines.

however, have a problem finding a supplier that could provide an effective reject system to remove a contaminated dough ball from the line.

Tony DelGuzzo, Domino's Pizza senior director of warehouse and production equipment procurement, contacted Eriez Magnetics. The Erie, Pa., supplier supplies magnetic separation, metal detection, and other equipment to the process and metalworking industries. The supplier also operates the Eriez Technical Center, which is a 10,000-square-foot test and lab center located in a separate building adjacent to its headquarters.

Visiting the test center

DelGuzzo talked with Ray Spurgeon, Eriez Magnetics assistant product manager, metal detection division, about the company's metal detection and reject system requirements. Based on the size and types of metal the company wanted detected, Spurgeon worked with the Technical Center's staff to design and build a metal detection and reject system prototype in the test center. Because the company planned to install the metal detection and reject system between the rounder and picking conveyor, the supplier mounted the prototype's metal detection and reject system on a short conveyor section, which has its own motor and power source. Since most standard conveyors aren't suited for metal detection, the supplier custom-designed the conveyor section so that the metal detector would function properly.

A metal detector's aperture emits a balanced electromagnetic field. When metal passes through the aperture, it disrupts the field. The detector's sensitivity to this field disruption can be adjusted so that the detector only alerts when the field is disrupted to a certain degree. The more sensitive the detector, the smaller the metal piece that's detected. The less sensitive the detector, the larger the metal piece that's detected.

To establish the detector's baseline sensitivity, the test center used the largest dough ball with the most amount of salt (which is very conductive and difficult for detectors to handle) and programmed the detector to detect stainless, ferrous, and non-fer-

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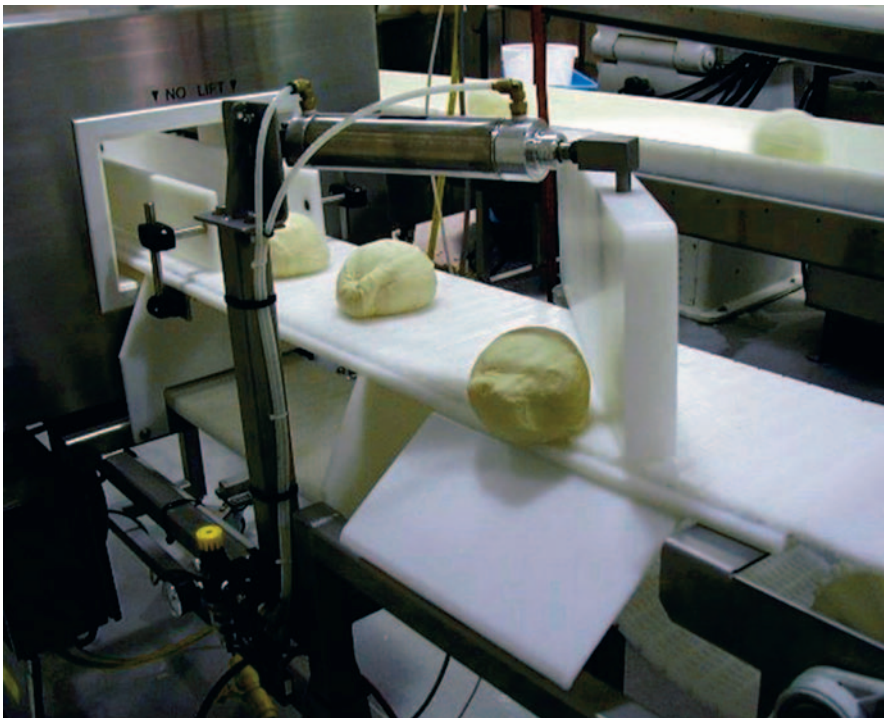

The reject system's diverter arm sweeps across the conveyor's top to remove a contaminated dough ball from the reject zone.

rous contaminants as specified by the company. By doing this, the metal detector can easily detect metal contaminants in all other dough types and dough ball sizes that pass through the detector without having to change sensitivity settings.

Spurgeon's next goal was to figure out a way to efficiently remove a contaminated dough ball from the line. The dough balls range in size from a cue ball to larger than a softball and the conveyor runs at a constant speed. After passing through the metal detector the larger dough balls reach the reject system sooner than the smaller balls do. To compensate for this, the test center programmed the system's controller to actuate the reject system at a different time interval for each dough ball size — the larger the dough ball, the shorter the time interval, and vice versa.

"If the metal detector detects a contaminated dough ball, the controller initiates an output relay that's timed to fire an air solenoid based on the dough ball's size," says Spurgeon. "The air solenoid actuates a reject device as the dough ball passes through the reject zone. The reject device consists of a diverter arm that moves across the conveyor's top to remove the dough ball from the conveyor. The rejected dough ball falls into a bin, where it's inspected. The line is shut down until this process is complete. The reject device then moves back to the start position, allowing the next dough balls to pass by."

Spurgeon also programmed the metal detection and reject system's controller to keep track of the number of dough balls that pass through the metal detector as well as the number of rejects and why each was rejected, allowing the company to document each batch run.

In summer 2002, Spurgeon invited DelGuzzo to visit the test center to witness the prototype tests. DelGuzzo liked what he saw, especially the properly functioning reject system, and decided to move forward with the project.

Testing the second prototype

To prove the metal detection and reject system even further, Spurgeon and the Technical Center's staff designed and built a second prototype to install in the company's distribution center in Ann Arbor for testing in a real-time environment with the company's product. About 6 weeks after the initial tests, the prototype was ready for installation.

To install the second prototype in the processing line, the supplier removed an existing conveyor section and slipped the metal detection and reject system into the gap. The supplier used the data and equipment settings recorded from the initial tests to calibrate the metal detector and reject system for the trial run. The supplier then connected the prototype's controller to the company's main production computer to record the results.

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After a couple of minor glitches, the supplier field-tested and recalibrated the metal detection and reject system to get it operating properly. "The initial tests give us a good guideline of what to expect concerning the metal detection and reject system's operation in the field," says Spurgeon. "We use that information as a starting point to calibrate the equipment after we install it. But because the equipment can sometimes operate differently in a real-time application than in the lab, some field-testing and recalibration is always going to be needed."

The Technical Center has more than 150 different types of equipment and conducts more than 600 material tests each year.

DelGuzzo and other company reps witnessed the successful trial run and were pleased with the results. Shortly thereafter, the company decided to purchase 23 units to install in the distribution centers' processing lines. Because each distribution center is a little different, the supplier customized each metal detection and reject system to fit a particular processing line.

Detecting success

"One of the reasons that we decided to go with the supplier's equipment was that we were able to travel to the test center, watch our product run through the equipment, and interact with the people who were building it," says DelGuzzo. "This gave us a much better feeling about the equipment we were buying."

Since installing the metal detection and reject systems, DelGuzzo says, "The biggest benefit that we've experienced is peace of mind, knowing that every piece of dough that leaves a distribution center is 100 percent safe because it goes through metal detection. It's also easy to operate — the controller is programmed so that when we switch dough ball sizes, an operator just has to push one button to automatically reset the reject system settings."

DelGuzzo concludes, "After the supplier installed the metal detection and reject systems, we set up a national plan where two supplier reps traveled to each of our eighteen distribution centers to retrain the operators and recalibrate the equipment. Since then, I haven't had one call concerning metal detection; it's like the equipment has become transparent."

Technical Center facts

Originally built in 1963, the Eriez Technical Center has been added onto several times, increasing its capacity nearly threefold. The center currently houses a library, computer lab, conference center, sample storage area, dust room, and three main testing areas. The center houses more than 150 different types of permanent magnetic, electromagnetic, vibratory, conveying, and metal detection equipment. This equipment ranges from simple plates, grates, and traps to sophisticated devices such as a rare-earth roll separator, an eddy-current separator, and a superconducting high-gradient magnetic separator system.

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The center operates 8 hours a day, 5 days a week and is staffed by three PhDs, seven engineers, and 15 support technicians. Each year, the center hosts more than 150 customers and runs more than 600 tests on a variety of material samples received from companies from all over the world. Materials tested range from coffee beans, cocoa, and salt to lampblack, crushed flashlight batteries, incinerator refuse, and iron ore.

To have tests performed, contact the supplier's sales department, which will send you the forms required to submit a sample. Then identify the sample with a sample authorization number, which will be supplied by the center. You'll also need to fill out a laboratory test data sheet to define the desired results and include a hazard declaration form and material safety data sheet (MSDS). **PBE**

Note: To find other articles on this topic, go to www.powderbulk.com, click on "Article Index," and look under the subject heading "Metal detection," or see *Powder and Bulk Engineering*'s comprehensive "Index to Articles" in the December 2004 issue.

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