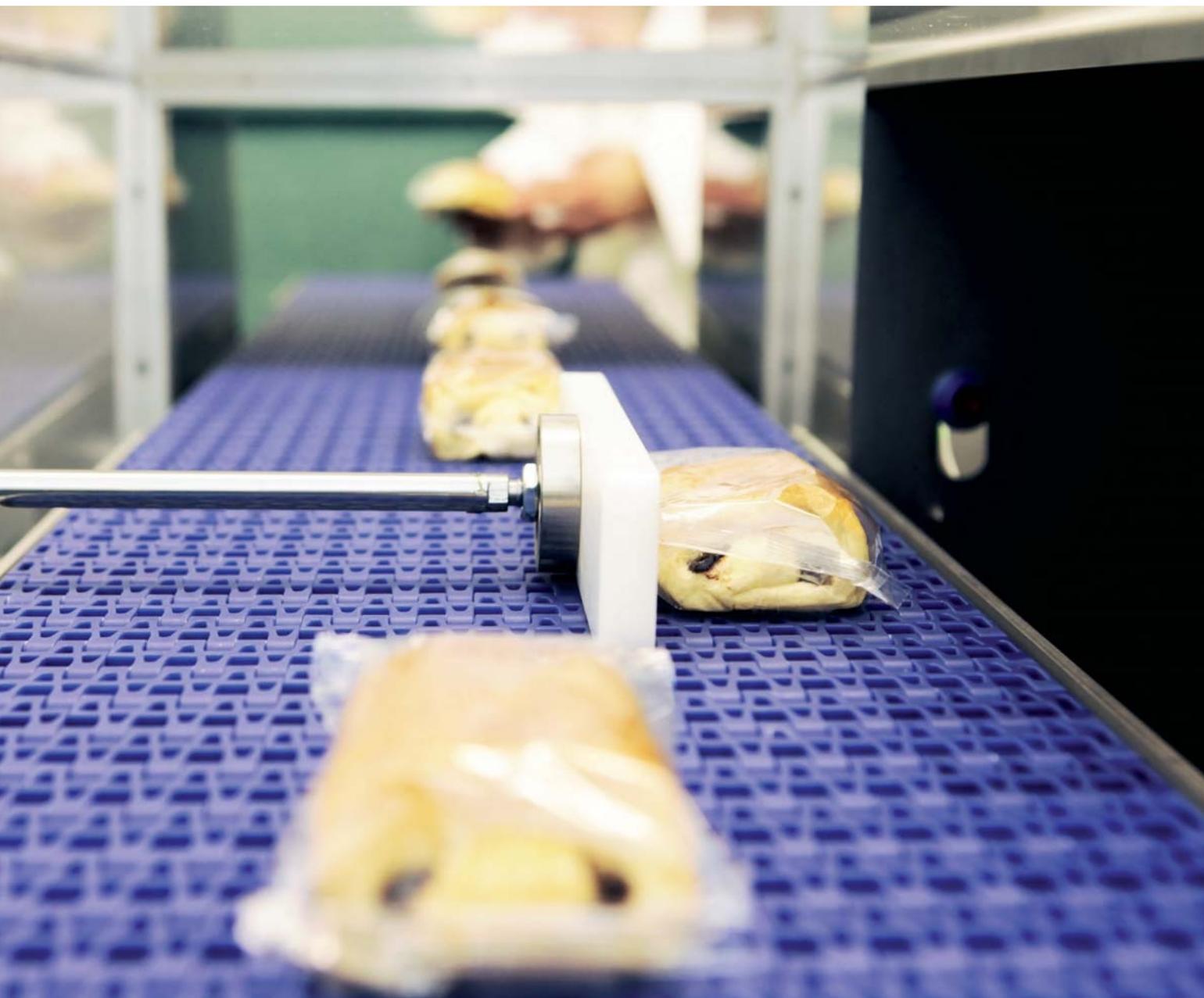


inspecting the **UNEXPECTED**



Bakers must work with packaging and inspection companies to ensure end-of-line quality and safety.

by Karlee Renkoski

A bakery product might have an aroma that makes the mouth water, an ingredient list that says health and wellness, and a look that is more than picture perfect; it might even be “Insta-worthy.” However, if a consumer takes a bite and finds the unwanted and unforeseen — perhaps something inedible — the moment of satisfaction is erased. Suddenly a bakery is receiving a complaint, which could spiral into other, bigger consequences.

Although precautionary actions are taken before the packaging stage, a product should be inspected in its final form — even after being bagged or boxed up — to ensure safety and quality has not been breached just before or during packaging. Baking and snack companies can use X-rays, metal detectors and vision systems individually or in combination to eliminate products that contain metal, glass, plastic or even accidental allergens. But these detectors and reject systems also have to keep up with high-speed lines.

“The trouble is we’ve got to make a decision in real time,” said Steve Gidman, president, Fortress Technology. “Dealing with highspeed lines does not give us the luxury to say, ‘Let’s just look at your loaf of bread. We’ll come back to you in 20 minutes with a decision.’ We’ve got milliseconds to know if it’s good or a reject.”

Bakers also must consider the type, size and temperature of a product and, in the packaging stage, understand how certain materials will affect inspection.

Detection challenges post packaging

End-of-line safety equipment has its challenges when trying to get a clear picture of the product. And as one might guess, a big issue can be packaging materials getting in the way. It’s a lot easier to inspect a snack bar without its package than an individually wrapped bar or, worse, multiple ones inside a box.

Dennis Gunnell, vice-president of sales, Formost Fuji,

said seal integrity and bag closures must be built into the packages and will affect what type of packaging material is chosen. “Customers need to communicate what their expectations are and what they want to test for and talk to all the groups involved,” he said. “They could come to us and say, ‘We’re going to use metalized film.’ Then it might get out of our machine and go right into a metal detector, and they’ve got a problem.”

Cookie packages are typically inert because they use mostly plastic or paper, but some types of packaging can cause a problem. “Metalized film is a bit of a different beast,” Mr. Gidman said. “It’s just a sprayed-on aluminum coating on the plastic, so it’s actually metal, but it produces a large signal that is well-defined and doesn’t change with the temperature.”

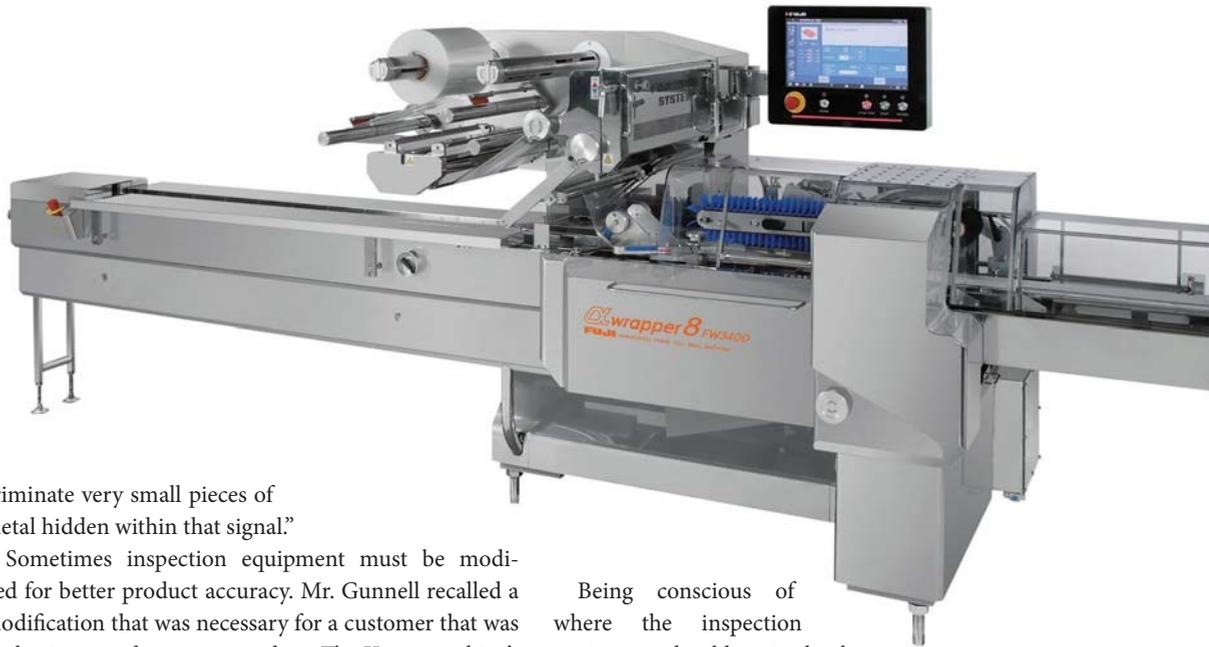
However, using a metal detector for these types of film packages will give at least 50% of a performance when compared with that same product unpackaged. “It is a concern,” Mr. Gidman continued. “We’re always looking at what your packaging is, and if it’s metalized film, you may need to inspect both before and after packaging in order to optimize protection.”

Certain types of end products pose a problem at the packaging stage as well. A dry snack or bakery product such as a cookie doesn’t contain a lot of moisture and salt content, so, according to Mr. Gidman, a metal detector would consider it mostly inert and would see product defects more clearly. However, a moist, hot bread that just came out of the oven has quite a bit of added salt. An ohmmeter would think it’s conductive, and a metal detector would determine it’s metal due to its resistance across the ends of the loaf. “The product signal can be 10 times bigger than the metal signal,” Mr. Gidman explained. “Our challenge in those applications is much greater where we have to compensate for that quite large effect coming from the product and still dis-

End-of-line inspection allows bakers to eject products that might have been compromised before or during packaging.

Fortress Technology

INLINE SAFETY



Packaging equipment must often be integrated with object detection equipment for efficiency and a high-quality performance.

Formost Fuji

criminate very small pieces of metal hidden within that signal.”

Sometimes inspection equipment must be modified for better product accuracy. Mr. Gunnell recalled a modification that was necessary for a customer that was packaging a wide, square product. The X-ray machine’s beam inspected it from the top and through. After a few days of this process, the customer discovered that, because of the product’s width and height, the beam wasn’t reaching a small corner on each side or the furthest surface area of the square. As a result, the X-ray had to be modified to reach the uninspected areas.

Equipment that’s too sensitive or not sensitive enough to properly inspect packaged products can also present challenges, according to Bill Kehrl, vice-president of

Being conscious of where the inspection equipment should go is also key.



sales and marketing, Cavanna Packaging. “With metal detectors, if it’s too sensitive, then it kicks everything off the line and picks up metal from all over the building. The same goes with an X-ray,” he said. “Or, if a shard of metal or glass is so small, it doesn’t get picked up and goes through. There’s not a 100% fail-safe system.”

Fitting together puzzle pieces

More often than not, bakers will need to integrate various types of equipment to maintain or increase the speed of production and achieve more accurate results. This might require some modification to the equipment to accommodate certain considerations.

“If you have a checkweigher, you have to remove vibrations; if you have a metal detector, you need to pay attention to the conveyor design to move metal away from the aperture,” Mr. Gidman said. “Each of these machines has their own little quirks that need to be considered, so we tend to be aware of what’s there and don’t interfere with what’s happening in front of or behind us.”

Being conscious of where the inspection equipment should go is also key.

“With a metal detector, we might build a metal-free zone into our discharge conveyor and mount the metal detector, so it’s built directly into our discharge conveyor right at the end of our wrap,” Mr. Gunnell said.

Fortress Technology often shares reject systems with other processing or inspection equipment. Mr. Gidman mentioned that the company is sometimes asked to install multiple reject stations on its equipment: one for metal, another for a checkweigher, a third for a vision system.

On the other end, Formost Fuji will combine reject units on some lines or have multiple reject units in others. Cavanna Packaging integrates both mechanically and electrically for effective communication. “If they give us a fail signal, we will divert a product, maybe shut a line down, maybe send another signal,” Mr. Kehrl said.

However, integration might not always require merging machines. It could mean using the same algorithms when data is collected in the same system. “Quite often, data from the line is being fed back to a common collection system, and we need to ensure that what we’re sending is readable and compatible by whatever the baker’s using,” Mr. Gidman said. “That’s the kind of thing where a lot of bakers can really benefit from having their equipment adapt to their common standards and then collect that data and use it in a very sensible way.”

Mr. Gunnell emphasized that bakers should communicate how equipment will be integrated up and down the line. “From our standpoint, it’s the ability to signal and know what up- and downstream issues to monitor in real-time and stop the machine if there’s a problem,” he said. “Communication is the key. The biggest thing is to identify what the requirements are or aren’t.”

At Heat and Control, Don Giles, director of sales, processing systems, said it’s important for bakers and equipment suppliers to work together to meet the needs and expectations of a product. “We ensure quality by

closely collaborating with other vendors and doing extensive in-house testing before the equipment is delivered to the customer,” he said.

Advancements toward zero defects

Over the years, end-of-line inspection systems have improved drastically, and innovation continues. Computers get better and faster every week, and software systems advance even more rapidly in comparison.

“We’re constantly striving to create better algorithms,” Mr. Gidman said. “There’s great opportunities for advancement, especially in hardware. New technology from the chip level has allowed us to transmit and receive with greater precision at the coil structure. Ten or 15 years ago, we couldn’t possibly imagine this because we could never afford it, so that’s been a huge step up.”

Mr. Kehrli said he’s also seen improvements specifically with vision-based camera systems. “It’s incredible how fast systems can now see imperfections with a baked good and reject it,” he said. “We’ve done some businesses of 800 snack cakes per minute per wrapper where our third-party supplier has been able to detect a problem, by using its camera technology, and remove it from the system.”

Perhaps the most important development with inspection equipment, as Mr. Gunnell noted, is with X-rays, which used to be more expensive and didn’t pick up as many safety hazards. “Hard inclusions like shells and rock have always been something that safety people try to eliminate, and there are some real advances in X-ray technology that are helping to improve the ability to sense a walnut shell or something similar in a package that they couldn’t before,” he explained.

Although X-ray systems won’t pick up aluminum very accurately, they will detect other types of metals. And as X-rays get cheaper and more flexible, Mr. Kehrli said he’s seen more bakers rely on them. Not only can these systems measure bulk density, but they can also see things that metal detectors were not built to find. “Take one of our customers, for example,” Mr. Kehrli said. “If you go into that bakery, and you’re holding a Bic pen, that’s a big no-no. They want you to go in with a metal pen and nothing plastic because if it falls into a mixer and gets ground up, it could go through the entire system and get into the food stream and through the metal detector. We’re seeing more and more people taking X-ray more seriously because it will pick up that plastic pen.”

For bakers and snack producers, it’s about seeking 100% safety combined with speed. “Obviously, our customers’ intent is for absolute zero-defect quality levels, and we’re always striving to improve that,” Mr. Gidman said. “And, of course, the smart processors use this as a way to remove contamination and measure the performance of the entire process.”

Front-of-line benefits

Taking inspection equipment upstream allows a bakery to filter out tiny contaminants that might be missed down the line. A piece of metal, for example, could go through the production line and get smaller and smaller with each step. And by the time it reaches packaging, it could become undetectable, even by a metal detector. These pieces would be easier to spot upstream where there’s greater machine sensitivity.

“There are often better places to achieve excellent sensitivity compared with the final product, which might have packaging that’s limiting the performance. Upstream is often the place where we can get two or three times the performance level,” said Steve Gidman, president, Fortress Technology. “There is a better opportunity to identify where the source of a potential problem may be if there are several units throughout the line, especially when adding ingredients at different points or doing a different process such as slicing or baking.”

For example, if a product’s packaging uses metalized film, but the company prefers to use a metal detector, the machine would typically be placed just ahead of the packaging equipment for quality and safety, according to Bill Kehrli, vice-president sales and marketing, Cavanna Packaging.

Baking and snack companies have to watch that upstream inspection equipment is doing its job to eject contaminated products; they must be aware that too many filtered products is not only an issue in and of itself, but it can also produce challenges for packaging down the line.

“The packaging systems are very repeatable. In one regard, upstream product inspection increases our efficiencies because it removes the bad products before reaching packaging,” Mr. Kehrli said. “However, if we’re removing too many products, it creates an inconsistent flow to packaging and causes additional failures or interruptions in the packaging system.”