X-ray inspection and its quality role in brand protection

Brand reputation is hard won and easily lost. Food manufacturers invest a great deal of time and effort in establishing the appropriate image for their product in order to gain consumer trust and confidence, but all this hard work can easily be wasted overnight through just one error or oversight.

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Consumers are becoming increasingly focused on quality and have high expectations of the products they buy. Research by Harris Interactive has revealed that 55% of people would switch brands following a product recall, even if only temporarily; and 21% of people said they would actively avoid any product made by the manufacturer at the centre of a recall, not just the recalled product itself.

The growth of social media means that consumers now have the opportunity easily and quickly to share any dissatisfaction with a wide audience. Retailers too are very conscious of their reputations with their customers and are therefore setting increasingly high standards for their suppliers.

The cost implications of any type of product quality issue can also be significant. Alongside the impact on sales and the loss of brand reputation, there are also the practical costs such as large retailer fines and the logistics of any product recall. The need to deliver foods of a consistently high quality has never been more important. At the same time, markets are becoming increasingly competitive, requiring companies to focus just as much on maximising efficiencies and throughput in their operations.

Automation of many manufacturing and packing processes is helping them to achieve this but less human intervention on the line means fewer opportunities to pick up on something that has gone wrong.

All of this means the selection of the correct inspection equipment is an increasingly important factor in ensuring companies are able to maintain the highest quality standards.

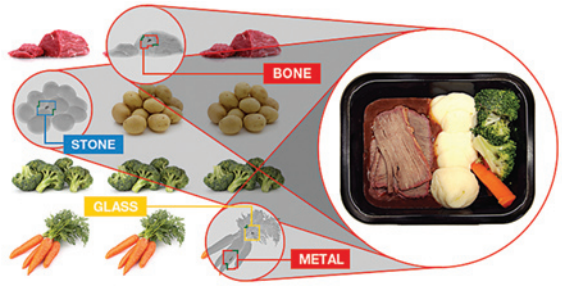
Identifying contaminants

In terms of the need to prevent foreign bodies in products, the focus was initially on metal detection, with the major risk deemed to be from the many different metal components coming into contact with a product during the production and packing process.

However, the potential for contamination is much wider than this and there are several non-metallic contaminants – glass, plastic, stone and rubber for example – that could also cause a quality issue.

Products that are picked and packed fresh from the ground can provide particular challenges. Shell fragments in processed seafood are another example where enhanced quality monitoring may be necessary. A particular specialist challenge is detecting bones in meat and poultry fillets. In these scenarios, it is the ability of x-ray inspection systems to spot a wider variety of foreign bodies that is leading to the technology being adopted for many food applications.

X-ray inspection technology offers greater versatility in terms of the contaminants it can detect.



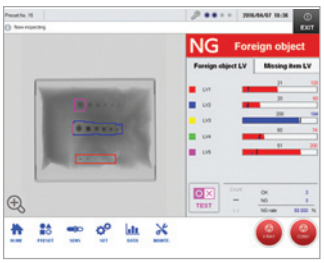
X-ray systems can operate effectively in all types of factory environments.

X-ray inspection involves the projection of relatively low energy x-rays onto a sensor or detector. As the product or pack passes through the x-ray beam, only the residual energy reaches the sensor.

Measurement of the difference in the absorption level of the x-ray energy between the product and a foreign body enables the foreign body to be detected.

X-ray technology is able to work undeterred in even the harshest of environments, such as humid, wet and temperature controlled atmospheres. Foreign bodies can be detected through aluminium foil and also in tins, regardless of the temperature or the salt and water content of the product – which is not the case for metal detectors. Inspection systems can handle a variety of pack formats including top sealed and thermoformed trays and flexible bags as well as unpacked and bulk product.

Equally important, high quality producers are acutely aware that product quality is more than just the prevention of foreign bodies.



Many x-ray systems are capable of finding much smaller foreign bodies than metal detection systems.

A deformed product, a missing item, even a damaged pack are all quality issues that can irritate consumers and generate complaints.

It is in this area that x-ray technology can demonstrate even greater versatility through the ability to spot other quality issues. It can detect broken, undersized or missing items in packs; deformed product and packaging; under-filled compartments in ready meals, product with cracks or fissures, grains stuck together in granular or powder products and missing metal clips. Additional quality control checks include product grading by length, and checking the presence of bottle caps and fill-levels.

Effective weight estimation

X-ray inspection systems can also carry out effective weight estimation. One of the advantages in this area against a more traditional weight check using a checkweigher is that they can spot a problem which weighing alone could not detect.

If a pack is supposed to contain four pieces of meat of approximately the same weight but one piece is considerably over weight and one considerably under, then the total weight of the pack may still be correct but the end consumer will not be satisfied with the overall pack contents.

A further significant benefit of x-ray inspection is its ability to offer

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full traceability. In the event of a complaint, data management systems linked to x-ray inspection and labelling can enable retrieval of the x-ray image of a particular pack, establishing beyond doubt whether or not there was a problem.

In selecting an x-ray system from the increasingly wide choice of models available, it is important for manufacturers to carefully assess their requirements, taking into account areas such as the products to be inspected, the most frequent type of foreign bodies to be searched for, and the length and frequency of production runs.

Single or dual energy

One of the first considerations will be whether a single or dual energy machine is required. A single energy inspection system uses one x-ray sensor to scan the product.

This means there needs to be a reasonable variation in the density of the product and the foreign body in order for the machine to successfully identify it.

Dual energy systems use two x-ray sensors to generate two images and therefore a much better contrast, which enables them to more easily pick out low density foreign bodies.

One of the most common applications for this technology is to detect small pieces of bone in poultry fillets. Another is to identify (low density) porous stones in nuts.

Many x-ray systems are capable of finding much smaller foreign bodies than metal detection systems, for example down to 0.3mm in some instances. Advanced genetic algorithm technologies can enable a machine to be trained to better identify specific objects.

However, sensitivity levels need to be applied with care. An oversensitised x-ray machine may lead to exceptionally small fragments, which are harmless to the consumer, being identified.

This can result in unnecessary product or packs being rejected – and potentially wasted – as well as increased line stoppages.

The type of product being inspected may also dictate where an x-ray inspection system is placed on the line. Typically the machine will be deployed to inspect finished packs as a final quality check.

However, it may be more appropriate to inspect product before it enters the processing and packing operation, for example salad, vegetables, and nuts; or to inspect for metal pieces in meat carcases or bulk cheese to avoid damaging the cutting blades.

Certain applications could require the installation of two x-ray machines, one to carry out inspection of bulk product and another for finished packs.

Businesses have long recognised that product quality is a vital element in their continued success. However, in today's highly competitive markets and an environment where problems can be more easily publicised and shared, the need to provide effective inline quality inspection has taken on even greater significance. The versatility of x-ray inspection can provide valuable support to companies and brand owners who are intent on maximising quality to enhance and protect their reputations. ■

There are a wide range of x-ray inspection models available.