



## When two beams are better than one

Since Wilhelm Conrad Röntgen discovered 'invisible rays' in 1895 X-ray diagnostics became established practice in the medical field. Today X-rays are also helping the food industry to ensure food quality and safety, even in challenging applications.

X-ray technology offers a reliable method of food inspection. It is used to detect physical foreign bodies or examine the internal structure of foods. As a component of the HACCP concept (hazard analysis and critical control points), it helps meet the increasing demands of consumers and regulatory bodies. X-ray inspection

systems have become more powerful, reliable and user-friendly in recent years. Some systems not only detect foreign bodies but also check weight, the number of product ingredients, fill levels or sealed seam integrity.

A detector is similar to an optical sensor, except that it consists of photo diodes. The X-ray detection area consists of a scintillator that can convert invisible X-rays into visible light. This area is located under a small window on the top of the detector. Since the X-ray generator is normally situated in the top part of the housing, the X-ray is directed down through the product and the conveyor belt before it reaches the detector. The more X-rays reach the scintillator, the brighter it illuminates. This means that the output power of the scintillator is proportional to the amount of X-radiation it receives.

### Film processing software

An X-ray inspection system works in a similar way to an office scanner. As the product passes the X-ray at a constant speed, a new line of image data is generated for each movement of the product (every 0.8 mm, for example). As soon as the image is completely captured, a greyscale picture of the product is generated on the computer, which is then analysed using inspection algorithms and examined for foreign bodies.

### Sensitivity in food applications

X-ray inspection seeks out foreign bodies that absorb a higher amount of X-rays than the product being inspected. Therefore, reliable detection of foreign bodies is only possible if they have a comparably greater density than the product.

The type of X-ray system used will be determined by the product and its orientation. A top down shooter, for example - where the X-ray comes from directly above the product - is the most commonly used system in food applications. These inspection systems are usually situated at the end of the packaging line and inspect individual packages lying flat. The product has a smaller thickness when the packaging is lying flat, which allows for better detection sensitivity.

Side shooter X-ray inspection systems - where the X-ray comes from the side of the conveyor belt - are often used for packaged products which are taller than they are wide. Again, it is important that the product runs through the X-ray beam with its flattest side facing the beam.

Glass jars and bottles probably pose the greatest challenge in X-ray inspection because glass foreign bodies are the most likely contaminants to occur.

## Press Release // X-ray inspection

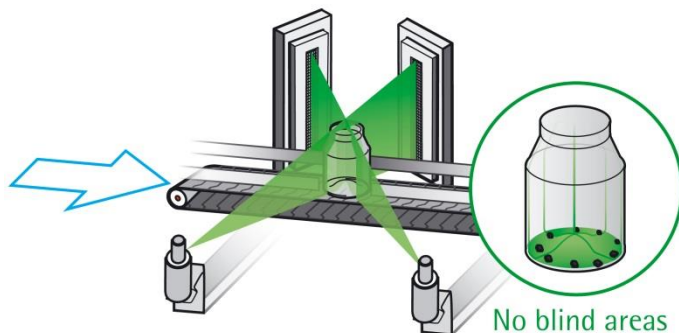
In addition to the packaging the product itself also affects glass-in-glass inspection. The products are often liquid/viscous, which can affect any foreign bodies in them. While foreign bodies sink to the bottom of the bottle or jar in thin liquid products in marmalade, for example, a foreign body can often lie directly under the jar cover. However, both the bottom and top cover of a glass container are especially difficult to examine with a traditional X-ray inspection system because the greatest fluctuations in signal occur at these points. Systems with only one X-ray beam often reach their limits here.

A solution to this dilemma can now be found in a patented system which includes an additional X-ray beam, placed at a position offset by 90° and a second detector is used. This double-beam side shooter set-up allows for complete inspection of the raised bottom of a glass jar, ensuring maximum reliability when detecting foreign bodies.

This solution not only improves inspection of the raised bottom of jars, but also inspection along the glass wall. Small foreign bodies, which come directly into contact with the glass wall, come into focus in the image processing software when inspection is rotated by 90° and can be more reliably identified as foreign bodies.

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Image



No blind areas: Two beams are better than one when inspecting glass jars

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