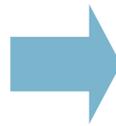
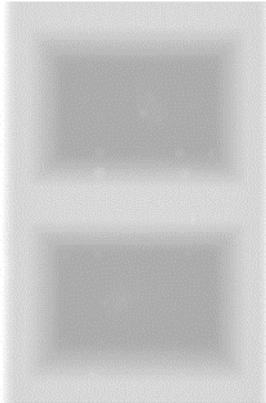




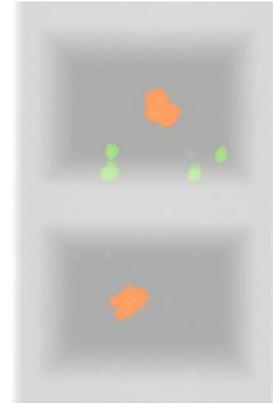
CASE STUDY:

PLASTIC CONTAMINANT DETECTION IN CHOCOLATE

Standard X-ray absorption contrast imaging



IBEX-enabled contaminant detection



IBEX-equipped detectors extend the sensitivity of conventional X-ray inspection tools to enable detection of embedded plastic (above right: contaminant in orange, bubbles in pale green).

Seeing in the dark

X-ray inspection is a well-established tool for the detection of metal and stone contaminants in food. However, due to a reliance on detecting absorption contrast between the product and an impurity, the technique has little or no sensitivity to low density contaminants, such as organic materials and plastics.

The additional materials information generated by the patented IBEX detector technology can reliably detect plastic contaminants in chocolate bars down to 0.5 mm thickness, despite a lack of definitive absorption contrast in the image

IBEX – a material improvement

The IBEX technology adds a patented Multi-Absorption Plate (MAP) and advanced software algorithms to existing X-ray detectors to determine pixel-pixel energy changes in the X-ray beam. This information is then used to generate images showing contrast between materials, even when there is little or no absorption contrast.

Training an IBEX-equipped system on known good product enables non-conforming products to be rejected on the basis of changes in material composition, via quantitative pass/fail thresholds.

See more...

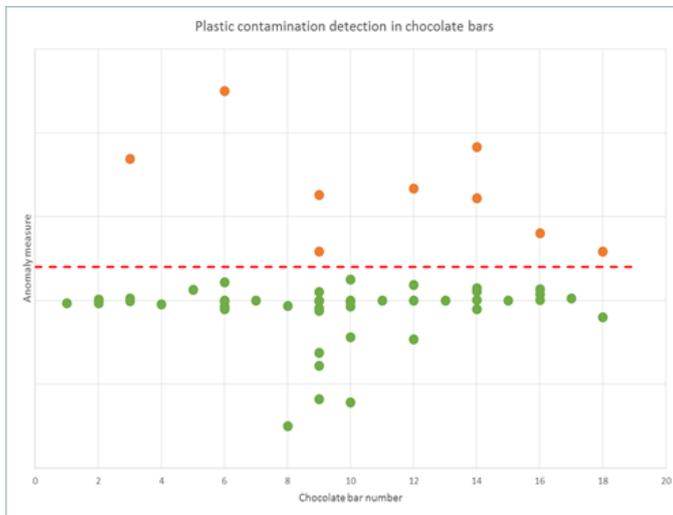
-  X-ray contaminant detection of plastics
-  Robust pass/fail test with no false positives
-  Self-learning algorithm accounts for normal product variation

...with IBEX

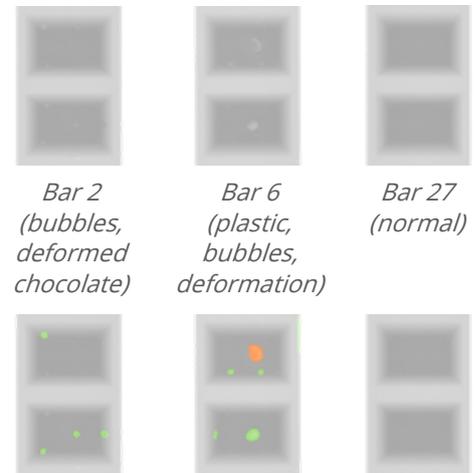
-  Retrofits to existing X-ray imaging systems
-  Compatible with production line speeds
-  Works with any line or 2D X-ray detector, including Si and CdTe

RELIABLE CONTAMINANT DETECTION FOR LOW CONTRAST IMPURITIES

Bringing contamination to light



Absorption contrast images



IBEX materials contrast images.

Contaminants in orange;
bubbles/deformation in green.

Solid chocolate bars

Seven out of 18 chocolate bars were deliberately contaminated with 2 mm thick fragments of stiff plastic embedded in the chocolate. Classic absorption contrast X-ray imaging is normally insensitive to such impurities, since plastic and chocolate absorb X-rays similarly.

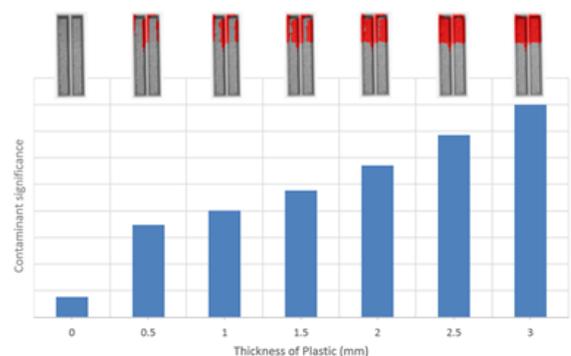
Contaminated product was successfully identified using IBEX technology. The method also identified the presence of unusual bubbles or local deformations in the chocolate, some of which were deliberately made. These are flagged as unusual but not as potentially harmful plastic contaminant.

Quantitative pass/fail thresholds may be set to reject only products differing significantly from the taught norm. Beyond the initial training set of "clean" chocolate bars, other bars classed as "normal" are added to the model, meaning that results only become more accurate as time goes on.

All chocolate is not the same

The sensitivity of the IBEX technology to plastic impurities in chocolate wafer bars was also tested. Such products pose a greater challenge to existing X-ray inspection methods due to natural product variation in the wafer.

In this test, thin films of plastic 0.5 mm to 3 mm thick were placed on wrapped samples. IBEX-enabled detectors and analysis identified the added plastic down to 0.5 mm thickness, despite a lack of clear absorption contrast.



Chocolate wafer bars: 0.5 mm plastic films are reliably detected with IBEX technology