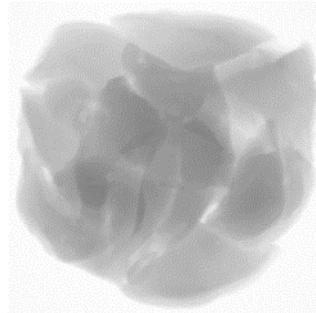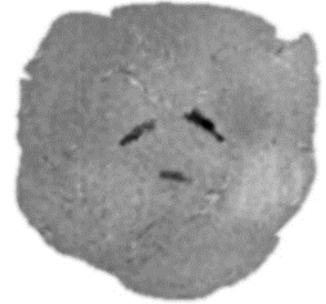# CASE STUDY:

DETECTING BONE FRAGMENTS IN FRESH MEAT PRODUCTS

Diced chicken in a plastic dish 12 cm across

Absorption contrast image

IBEX materials contrast image: chicken flesh grey, bone fragments black

Bringing bone fragments to light

The reliable detection of bone fragments in meat products is difficult to achieve with conventional X-ray inspection systems. This is due to poor (or no) absorption contrast between thin bone and thick flesh. The problem is compounded by the variable and unpredictable shape of potential contaminants, making edge and shape detection methods ineffective.

The additional materials information generated by the IBEX detector technology can reliably detect thin bone in chicken samples despite a significant variation in product shape. Even low-calcification fan -bone has been readily detected.

IBEX technology – a material difference

IBEX technology adds a patented Multi-Absorption Plate (MAP) and advanced software algorithms to existing X-ray detectors to recover energy-dependent information in a single exposure.

This additional information allows changes in material composition to be identified independently of contrast changes caused by thickness variations.

See more...

- Materials contrast from conventional X-ray detectors

- Detection of contaminants and unwanted material

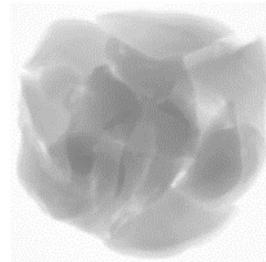- Quantitative measures allow pass/fail criteria to be set

...with IBEX

- May be retrofitted to existing X-ray imaging systems

- Compatible with product processing lines

- Line or 2D indirect and direct X-ray detectors

RELIABLE DETECTION OF BONE PIECES DESPITE A LACK OF ABSORPTION CONTRAST
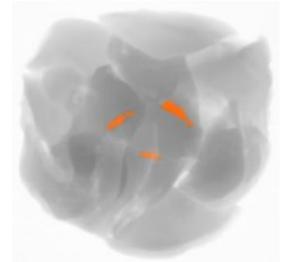
A material difference

Bone fragments in fresh chicken

Two examples are presented here. In the first, three slivers of bone were hidden in a mass of fresh diced chicken up to about 3.5 cm thick.

For the second, two rib bones and a fan bone were inserted into a whole large chicken breast at approximately the locations they might appear in a production scenario.

Shining a light on the problem

Transmission images were collected using a low power, micro-focus tungsten target X-ray source and a CMOS detector equipped with an IBEX MAP.

To train the system to recognise the material "signature" of chicken flesh, a separate image was collected of a controlled sample of chicken, covering a range of thicknesses.

Revealing hidden contaminants

MAP technology together with sophisticated software algorithms mean that the image can be transformed from absorption contrast to materials contrast. Anything which is not chicken flesh shows up as being different.

Once in materials space, materials processing techniques can be used to present the information in other ways, such as showing the bone locations only, or overlaying them on the absorption contrast image. Thresholding may be used to specify pass/fail criteria.

Absorption contrast, diced chicken

Bone locations (orange) overlaid on absorption contrast image
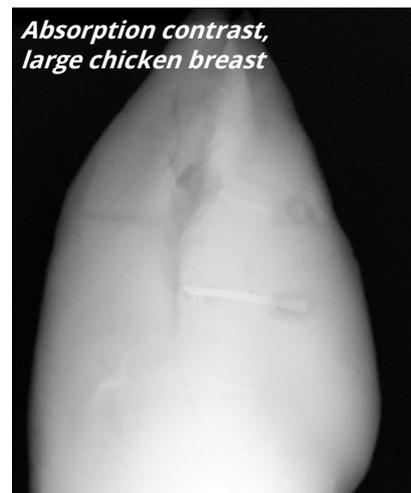
Absorption contrast, large chicken breast
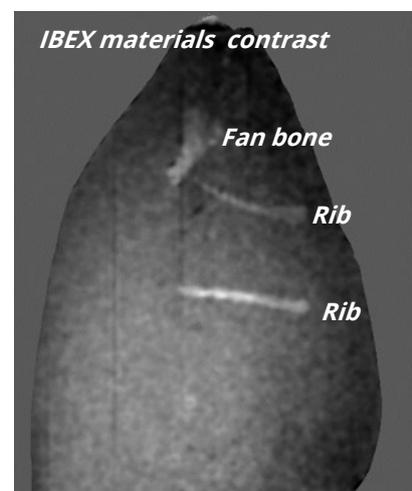
IBEX materials contrast

Fan bone

Rib

Rib