Dual-energy X-ray Machine

Meat Bone Solution

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Content

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Pain Points in Meat Industry

Boneless chicken

Boneless pork

Boneless beaf

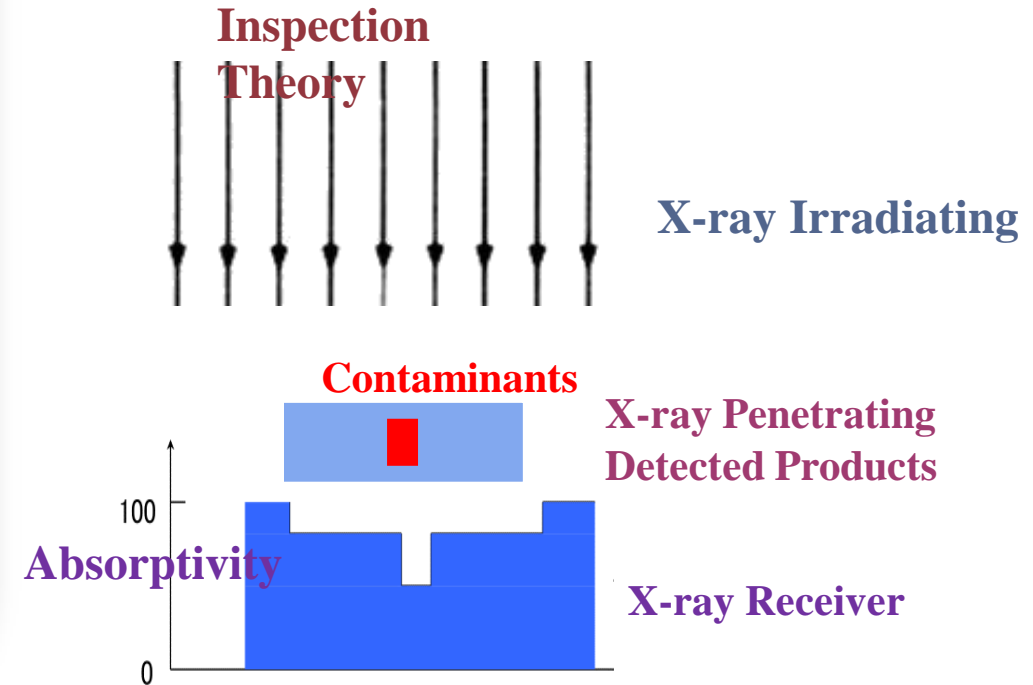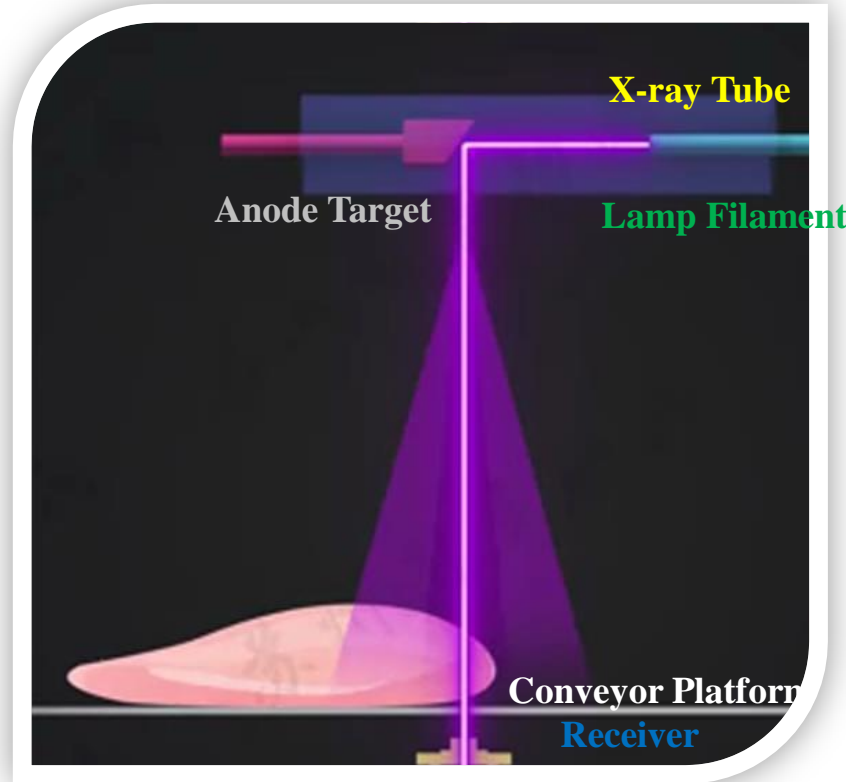Traditional X-ray mainly remove contaminants like metals, glass, ceramic, etc. Bones inspection is subsidiary.

Residual bones are the pain points of all meat processing industry.

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Traditional X-ray Inspection

X-ray has the ability to penetrate. Greater the density of the material is, greater ratio of X-ray absorption, weaker X-ray penetration ability.

Foreign contamiants such as metal, stone, have higher density than food, higher absorption rate to X-ray.

Traditional X-ray Inspection

Contaminants

Needle

Hard Bone

Welding Slag/Stone

Broken Blade

Based on density difference between product and foreign contaminants.
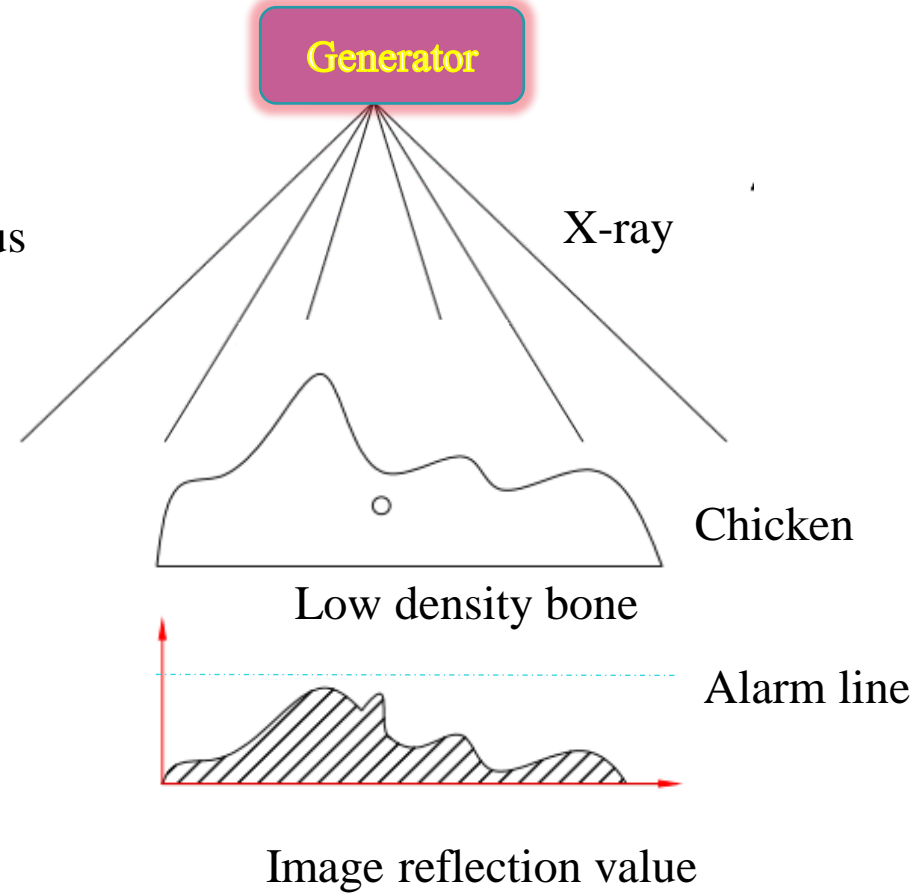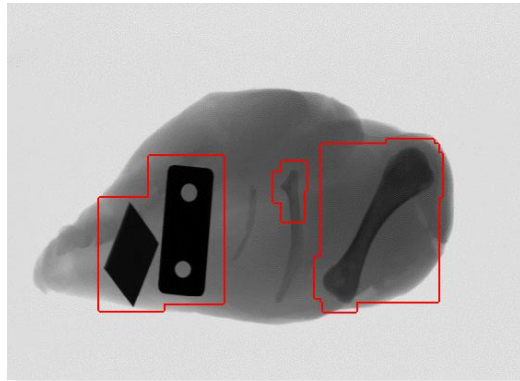Higher density of the contaminants, better sensitivity.

Weakness:

Small density differences, low sensitivity.

Uneven products and overlapping, low density.

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Traditional X-ray Inspection

Dangerous Products

Generator

X-ray

Chicken

Low density bone

Alarm line

Image reflection value

Metal contaminants, hard bones can be easily found.

Scapula and sternum are difficult to be solved.

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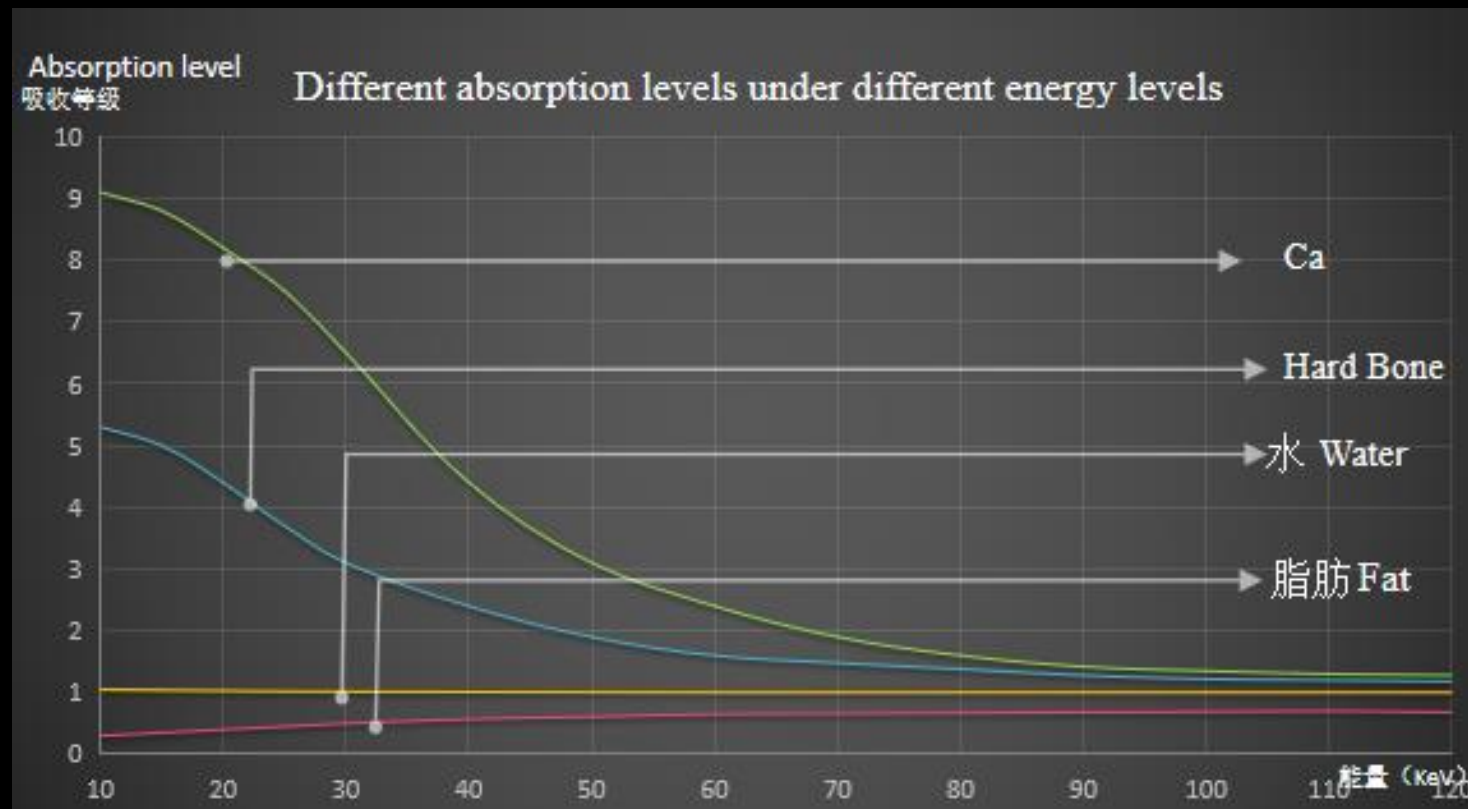
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Dual Energy X-ray Absorptiometry

X-ray passes through the object to the detector and is firstly received by the low-energy detector to obtain the low-energy data. The high-energy part is filtered through a copper strip low-energy filter to remove the low-energy part and the remaining high-energy part is received by the high-energy detector at the next layer to obtain the high-energy data. The high and low energy signals obtained by the dual-energy system are input to a PC computer, which are calculated by a series of data processing and attribute values related to the equivalent atomic number of substances.

The software automatically compares the high and low energy images, analyzes whether there is a difference in atomic number of foreign bodies through hierarchical algorithm, and detects foreign bodies of different components to increase the detection rate.
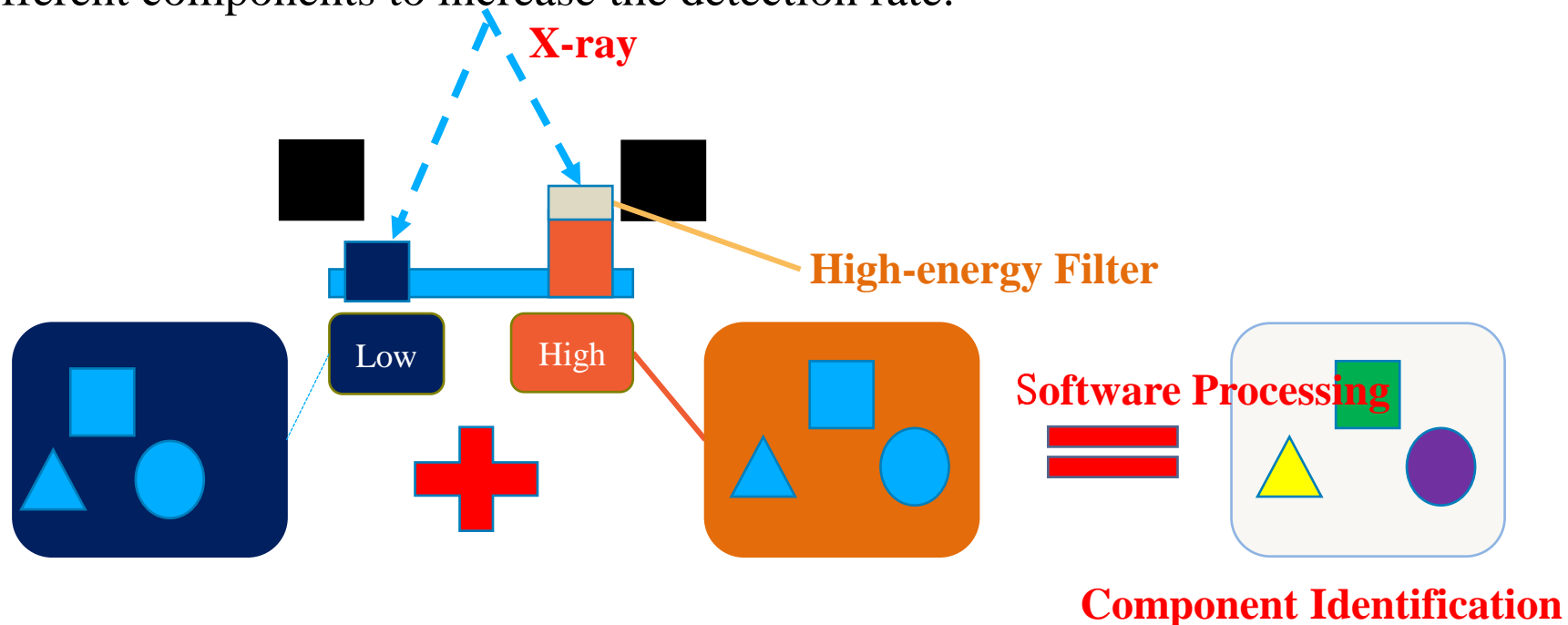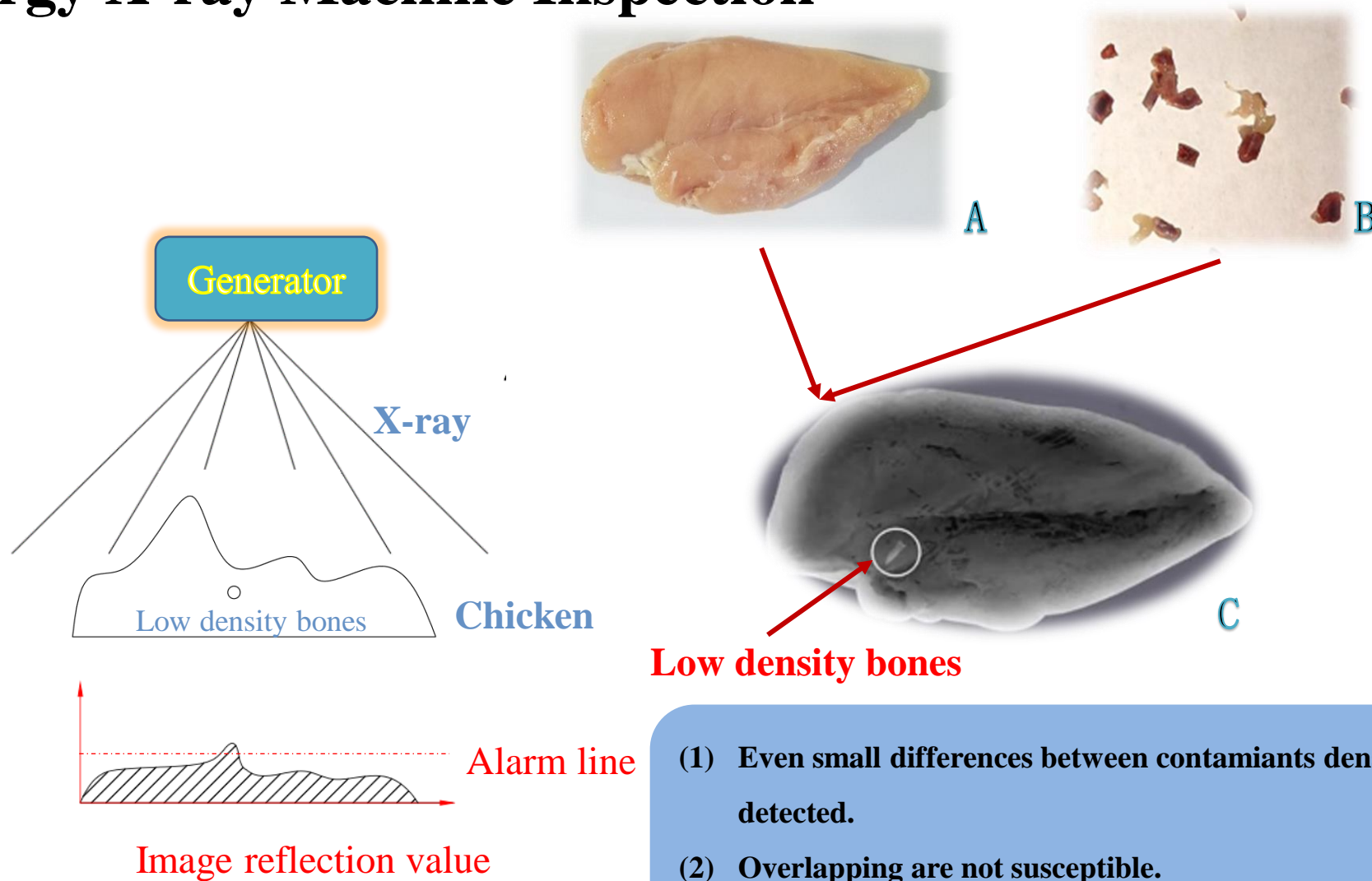
Effect of Atomic Number on X-ray Absorption

Based on the chemical composition (atomic number) of the product to distinguish, respectively measure the absorption of each chemical element to two non-stop energy X-ray analysis and comparison, obtain high-precision detection results.
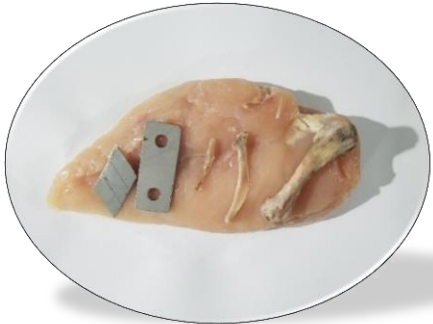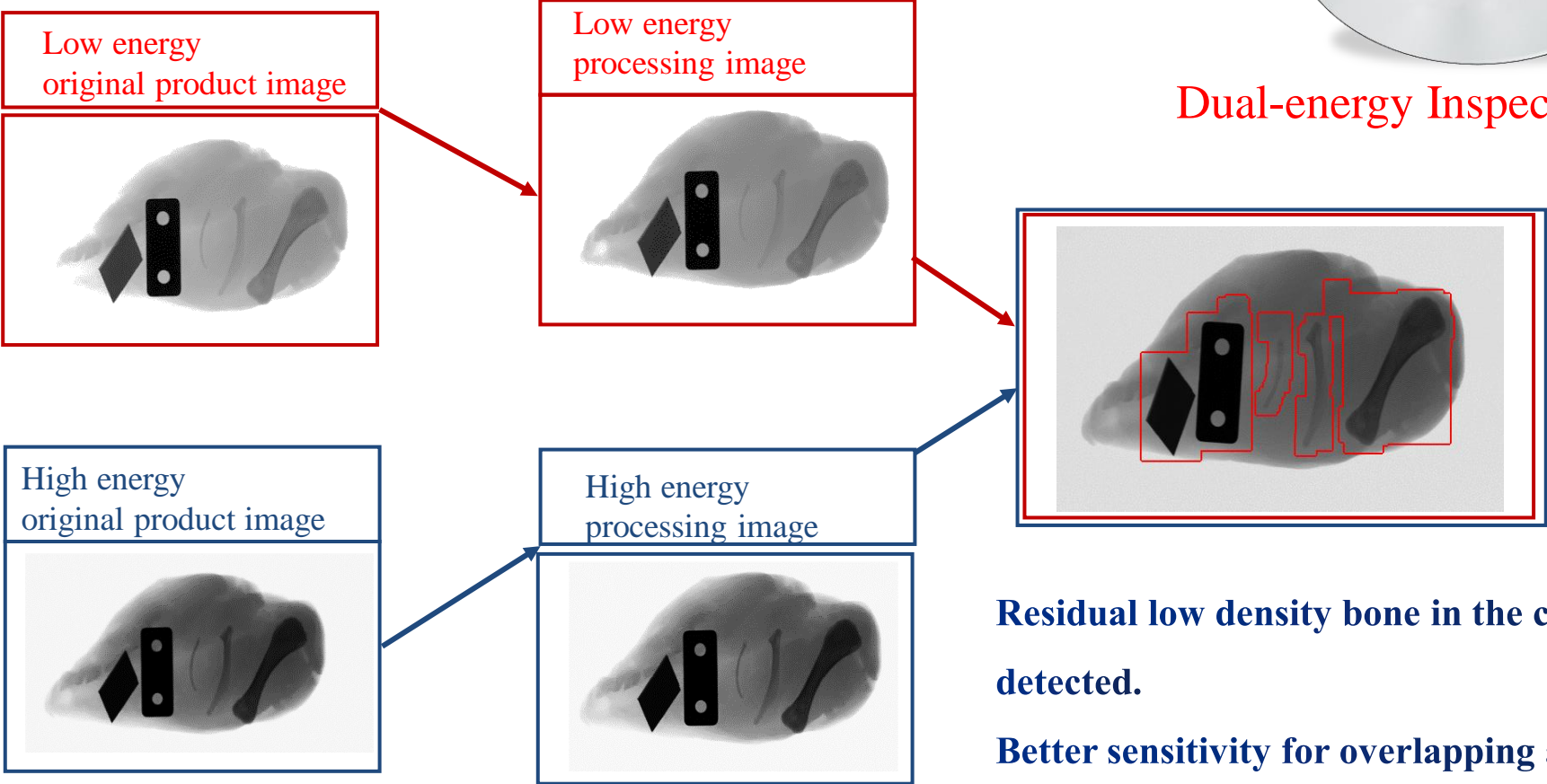
Dual Energy X-ray Machine Inspection

Generator

X-ray

Low density bones

Chicken

Alarm line

Image reflection value

A

B

C

Low density bones

(1) Even small differences between contamiants density and product can be detected.

(2) Overlapping are not susceptible.

(3) Different components can be analyzed to separate the contaminants.

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Dual-energy X-ray Machine Inspectuion Image

Dual-Energy+ Smart Algorithm = Best Performance

Low energy
original product image

Low energy
processing image

Dual-energy Inspection Image

High energy
original product image

High energy
processing image

Residual low density bone in the chicken can be detected.

Better sensitivity for overlapping and bump.

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TXR-CB2 Series—Bone Inspection Machine

Model	TXR-CB2-4010 Series
Window Width	400mm
Window Height	100mm
Best Sensitivity (Without Product)	Sus ballΦ0.3mm,Sus wire Φ0.2*2mm, Glass/Ceramic Φ1.0mm
Conveyor Speed	10-40m/min
Operation System	Windows 7
Radiation	< 1 μSv/h (CE)
Protection Level	IP66 (Inspection tunnel)
Environment	Temperature：-10~40°C Humidity: 30-90%, No condensation
Cooling System	Air Conditioner
Rejecter	Alarm and belt stop/Automatic Rejecter
Air Pressure	0.8 Mpa
Machine Power	2kVA
Main Material	SUS304
Surface Dealing	Matte handle/Sand blasted

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TXR-CB2 Series—Bone Inspection Machine

TIMA Platform

- ➢ **Hygienic design.**

- ➢ **High resolution imaging system platform.**

- ➢ **Smart algorithm.**

TIMA Platform - Hygienic Design

Hygiene Supervision

➢Fully inclined design, no sewage retention.

➢No sanitary dead corner, no bacterial breeding area.

➢Open design, easy to clean the corners.

➢Modular design,one-button quick disassembly the belt, convenient cleaning.

TIMA Platform - High Resolution Imaging System Platform

Two factors affecting image quality

Image fineness：pixel size 0.4mm
Image exposure：TDI technology
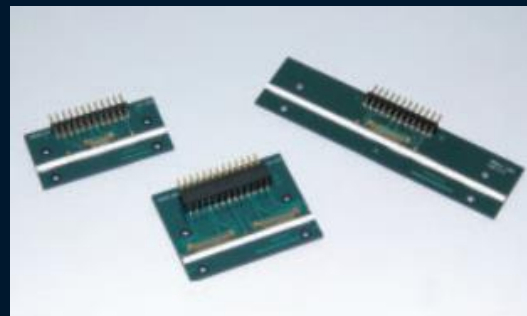
## TDI（Time Delay Integration）

TDI transforms multi row array image into single row linear array image by signal accumulation. Technology advantage: increase detector exposure level

We use 8-level detector. That is to say, under the same X-ray dose, TDI detector can obtain 8 times the exposure of a standard linear array detector.

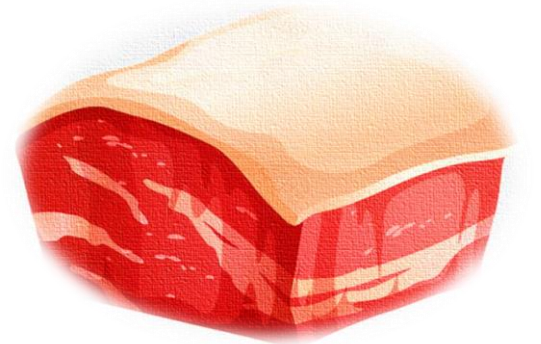TDI sensor

Signal intensity
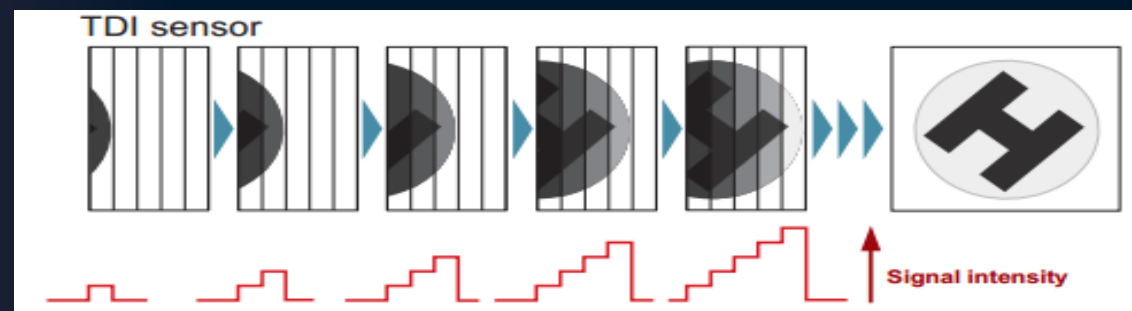
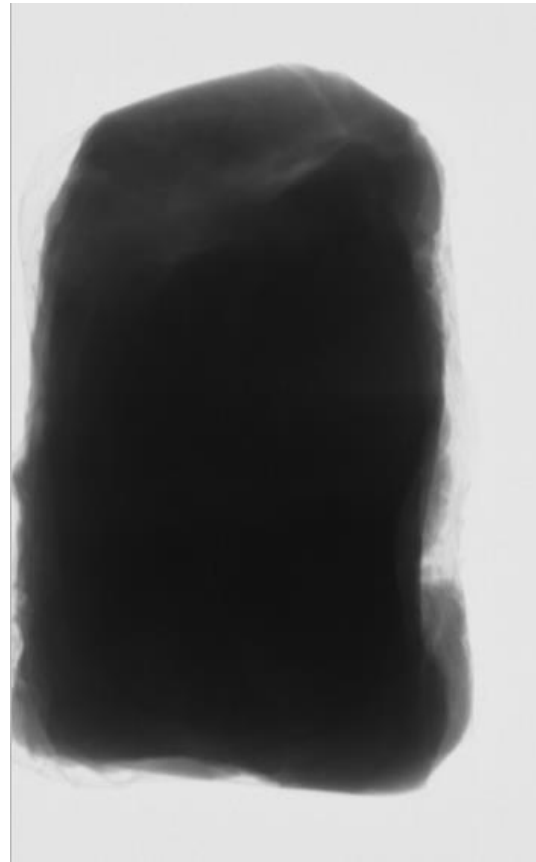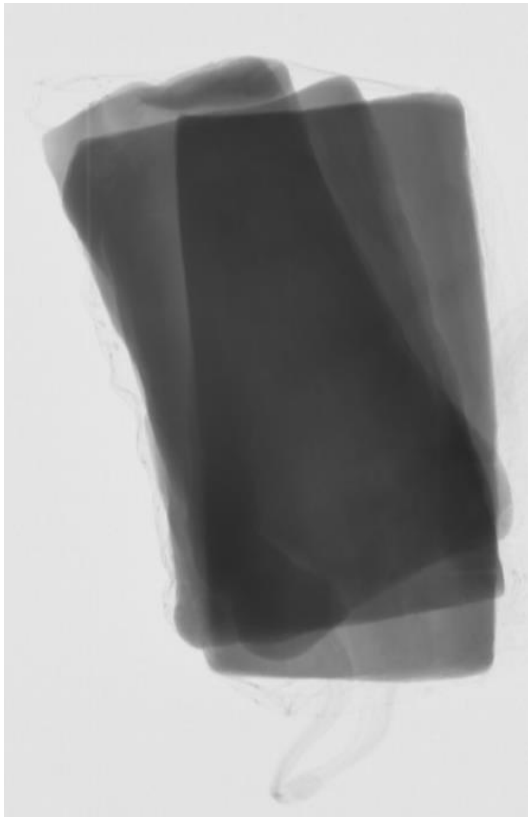# TIMA Platform - Smart Algorithm
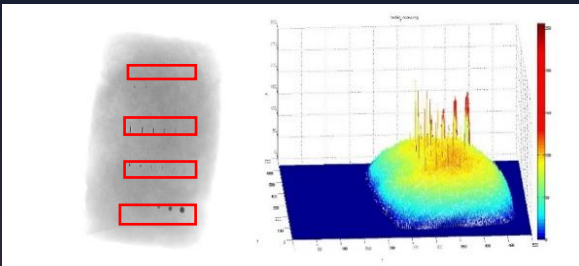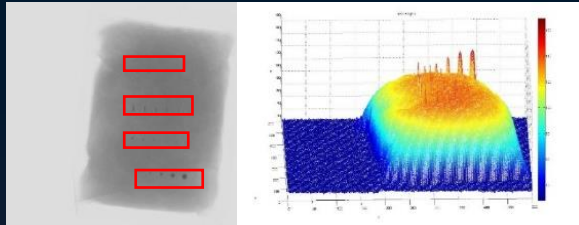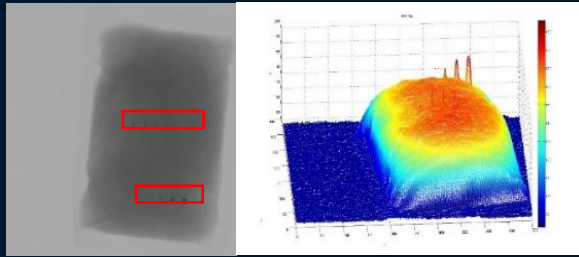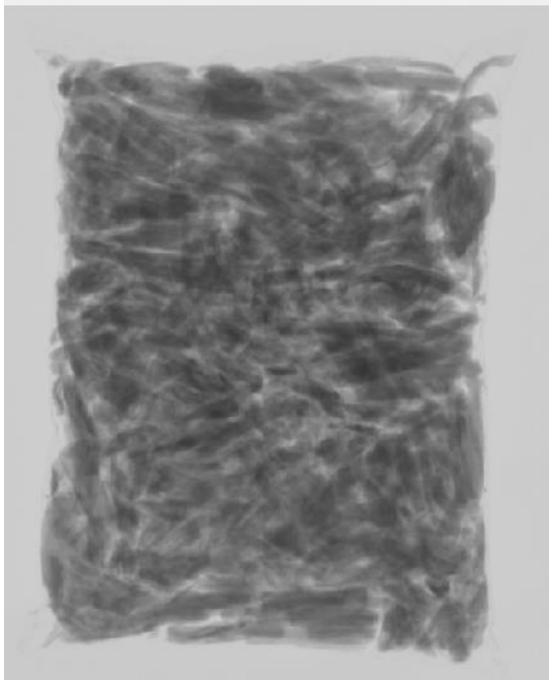

Smart Algotithm

➢ Self-organizing.

➢ Self-adaption.

➢ Self-learning.
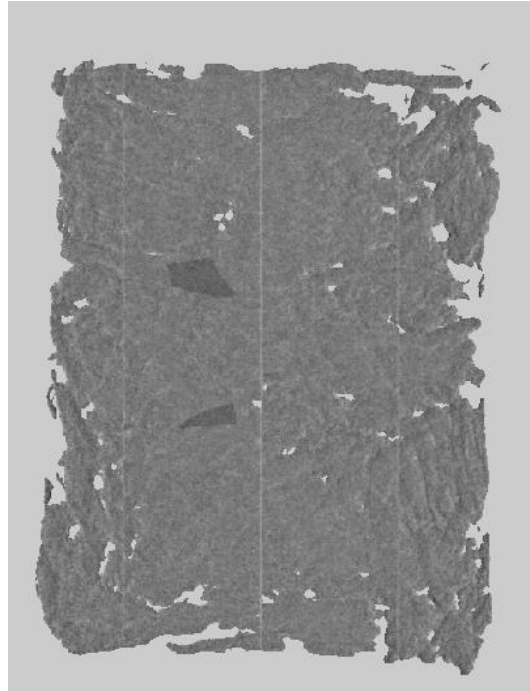
➢ Good robustness.

Fat Content Inspection

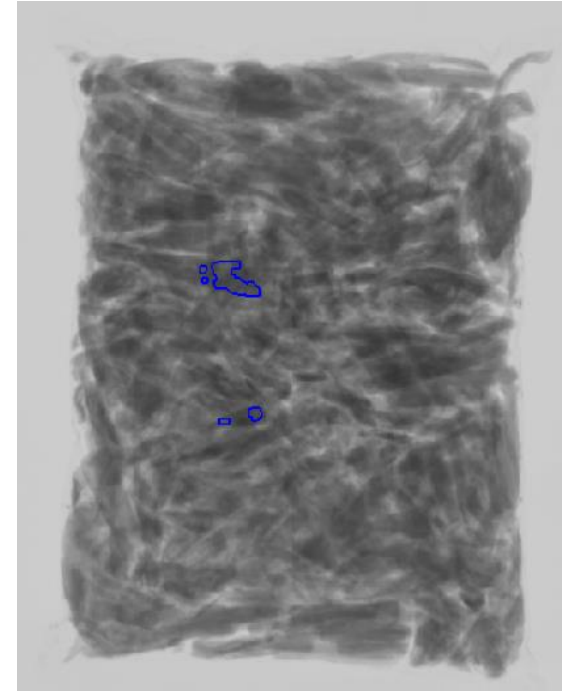Weight ratio = fat weight: lean weight

Dual-energy X-ray for Low Density Contaminants

| Low Energy | Dual-energy Material Properties Image | Inspection Result |

1mm Thickness Glass Pieces

Content

- Meat Industry Current Situation
- Traditional X-ray Inspection
- Dual-energy X-ray Solution
- Machine Performance
- Our Suggestion

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Promoting Suggestion

Dual-energy X-ray Advantages

Configuration: dual-energy detector +350w berylium window generator + smart algorithm

● Best solution for bone inspection.

● Higher sensitivity for metal contaminants.

● Fat content inspection.

● Can find out some low density contaminants.
(PVC, thin glass pieces etc)
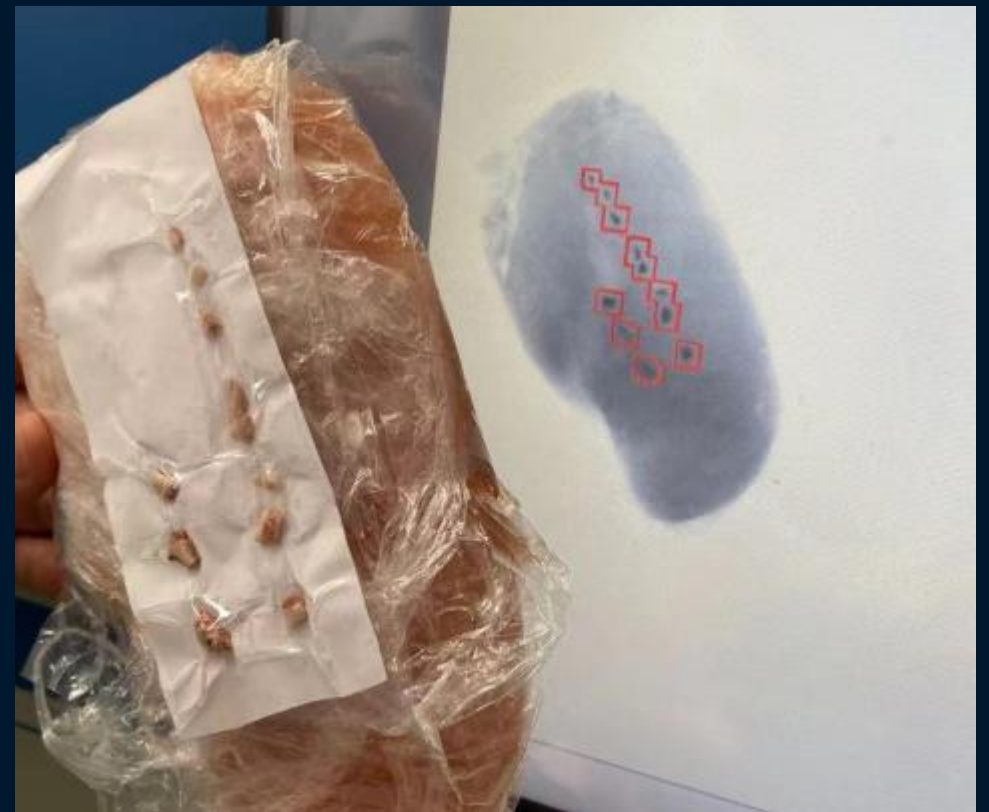
Dual-energy X-ray Performance --50mm Chicken （Without Smart Algorithm)

Bone Inspection

Sus0.4mm
Glass 1.0mm

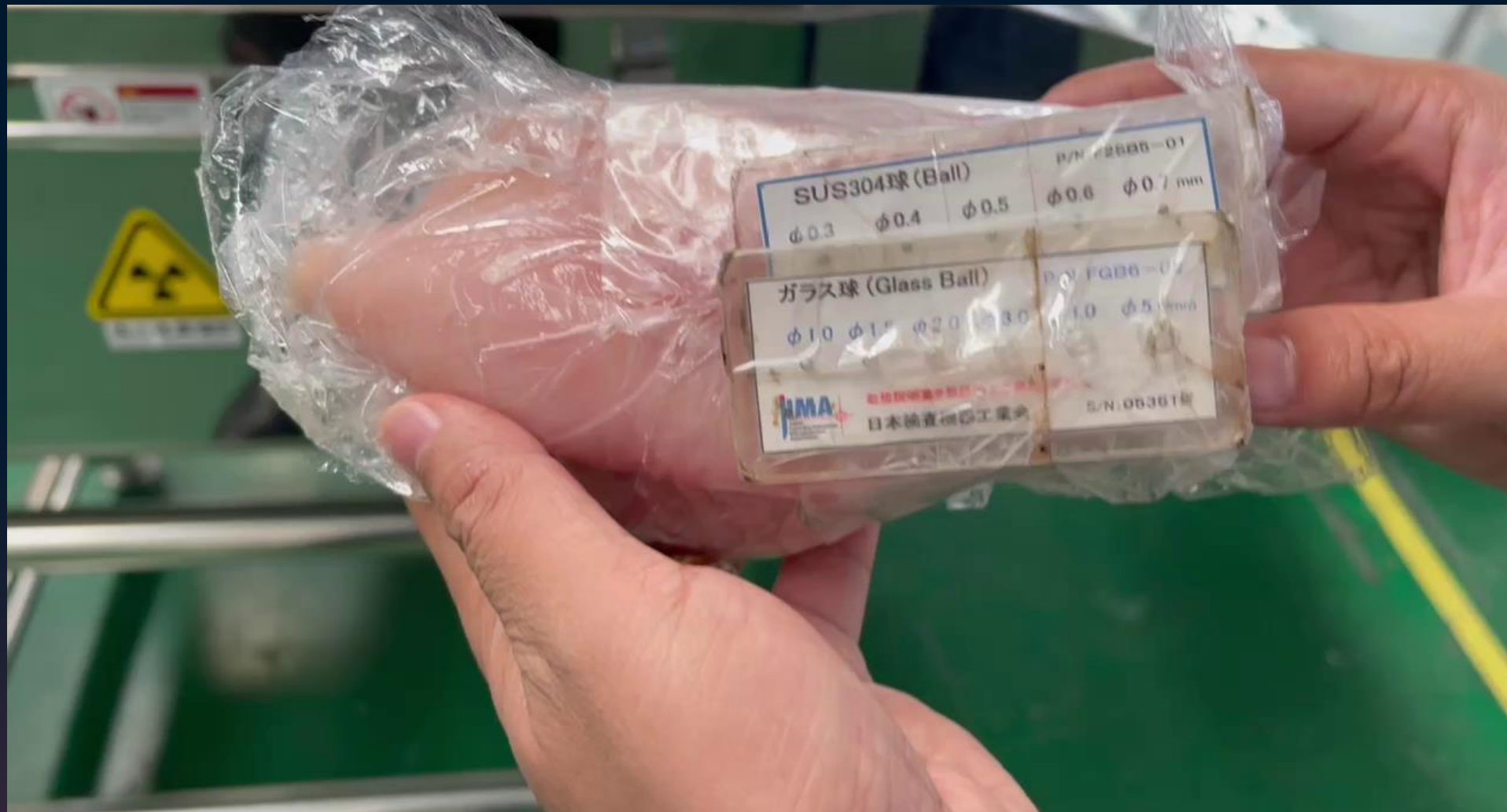# Dual-energy X-ray Performance --50mm Chicken （Without Smart Algorithm)

Thin glass

+

PVC

Bone

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Dual-energy X-ray Performance --80mm Chicken （Without Smart Algorithm)

Sus0.5mm Glass 1.0mm