



Guide

Product Inspection in the Meat Industry

Foreword



Oliver Uhrmann, Director Sales Product Inspection

Dear readers,

Nowadays, it is becoming increasingly important for food manufacturers and processors to produce with the highest value added and without wasting resources. Sesotec's technologies and services help our customers differentiate themselves through sustainability.

As one of the leading manufacturers of devices and systems for foreign body detection in food, we offer our customers a broad product portfolio in a comprehensive technology spectrum. This includes high quality metal detectors, X-ray systems, optical sorting systems and magnetic separators.

For more than 40 years we have been known as a reliable partner and are happy to share our experience when it comes to customized solutions.

On the following pages, we have compiled information for you about the production and processing of meat products, which will show you solutions for your requirements.

Yours sincerely

A handwritten signature in black ink, appearing to read 'Oliver Uhrmann', written in a cursive style.

Oliver Uhrmann

Foreign body detection in the food industry

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Facts and trends in the meat industry

In former times, meat was a rare commodity and considered a luxury by many cultures. Today, however, the demand for meat continues to grow every year. The global meat industry has more than tripled in the last 50 years. Between 2016 and 2018, the global production volume of meat raised from 317.2 to 330.51 million tons. Poultry is the most popular kind of processed meat, followed by red meat, which includes pork and beef. Metal and bone contaminations as well as plastic parts or even ceramics and wood can get into the meat during production.

High number of recalls due to foreign bodies

As production rises, recalls due to contaminations are becoming increasingly frequent. In 2017, a total of 77 recalls of food due to foreign bodies were recorded in the EU (The Rapid Alert System for Food and Feed (RASFF) – 2017 annual report). Meat products were the third most recalled food on the market this year.

Automation as an important risk factor

A reason for the growing number of recalls is partly increasing the automation of meat processing. Due to additional equipment in the production process, there is a higher risk of machine or tool damages that breakages which contaminate meat products.

The intensification of product inspection and more frequent replacements of wearing parts are a promising approach for manufacturers.

Food safety regulations get more and more stringent

At the same time, however, automation is still the best way to minimize the probability of a recall, especially for product inspection. There is no way to completely eliminate recalls but companies have a duty to minimize the likelihood of occurrence. As a manufacturer, it's therefore necessary to stay up-to-date with the latest developments in inspection technology as well as frequently changing regulations. Therefore it's advisable for every manufacturing company to work together with experts.

The role of product inspection in meat industry

Product inspection – and in particular X-ray inspection – plays a central role in compliance with food safety legislation and should, therefore, be a priority. To continuously improve the type and size of detectable foreign bodies, we are currently developing a new technology: **Dual Energy** (p. 48).



Foreign body detection in meat processing

In the meat and sausage industry, there are numerous challenges to be mastered with regard to foreign bodies. Based on the current state of knowledge, it can certainly be said that these industry sectors have the greatest risk of foreign material inclusions and are with regard to the operational environment among the most demanding.

Consumers expect safe and high quality food

Safe food has to be pure and must not endanger their health. This is one of the most important requirements for the food industry. There is a difference between biological, chemical and physical hazards. Physical hazards, such as foreign bodies, entail a wide variety of materials and can lead to injuries in mouth and throat or even suffocation.

However, the probability of foreign bodies can never be excluded during production. Machine wear and personal belongings of staff are only two of the possible sources.

Most retail chains require corresponding certification from suppliers

A decisive criterion is the detection and separation of metals, foreign bodies and quality defects. Whether HACCP analysis, food standards such as IFS and BRC or specifications from large retail chains: in order to remain competitive, meat processing companies need to obtain certifications, undergo audits, fulfill legal requirements and must at the same time comply with specific customer requirements.

What kinds of contaminants could appear in meat and sausage products?

The nature of foreign bodies in meat can be slightly different from all other types of food. Extrinsic (imported) foreign materials include substances such as all metals, glass, plastics, wood and stones. Meat products may also contain bones. Bones are classified as intrinsic (already in the product) foreign bodies in relation to the raw material used in the food and are considered undesirable and potentially dangerous if the product is sold as „boneless“. Bones, together with metals and plastics, are the most undesirable foreign substances in meat.

Contaminated raw materials, machine breakages and objects of the operating personnel are possible sources of foreign bodies. Examples are:

- Bone or cartilage
- Syringes from the fattening process that have broken off
- Stones
- Glass splinters
- Metal abrasion in conveyor lines
- Machine breakage (e.g. broken knives)
- Plastic parts (e.g. splinters from E2 boxes)
- Safety equipment parts (e.g. parts of rubber gloves or hairnets)
- Sausage clips

Especially the danger of metal contamination is always present, as almost all devices and protective equipment consist of metal parts.

The risk is high: contaminants can put production facilities out of action, injure consumers, make product recalls necessary and cause serious damage to the company's image.



Five key challenges in product inspection

1. Conformity with standards for food safety and operator safety

Our devices comply with all current international quality standards and regulations. Our data management software Insight.NET provides automated storage of electronic data and system monitoring and supports audit checks and HACCP. Protection of operators during production or maintenance is also ensured by protective covers, safety valves and protection against crushing by covers for strip rolls in the infeed and outfeed areas.

2. Optimized plant availability

Maximum productivity of our devices thanks to modular design and data management software Insight.NET for remote access and efficient product changes. Our devices are intuitive to use and efficient to clean. New products are quick and easy to teach-in. In addition, it is possible to inspect multiple products by a single metal detector without any additional adjustment. Durable components reduce wear-out and repairs.

3. Hygiene during production

Our systems conform to the strict hygiene standards of the meat industry. The systems have a hygienic, open design with IP69 protection, hygienic feet, conveyor belts with sealed edges, fully welded seams and integrated belt lifters for easy access and quick and effective cleaning. This makes them ideal for the harsh environmental conditions of a meat factory.

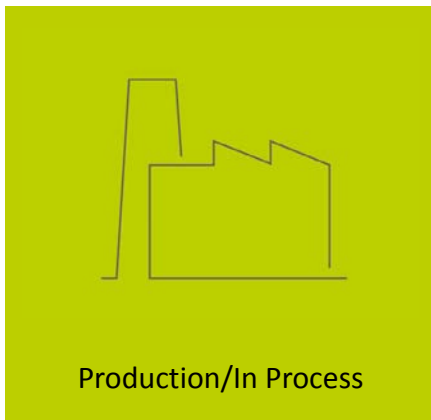
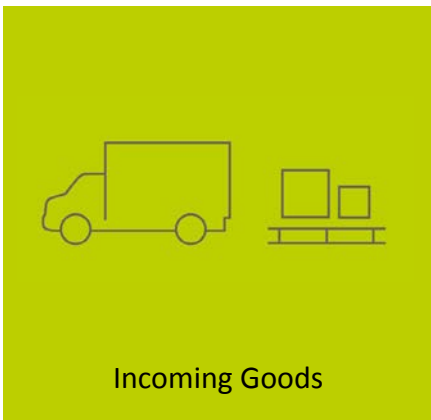
4. Reduction of waste

Our systems reduce product effects and thus minimize the probability of false ejections and unnecessary product losses while achieving optimum detection sensitivity. This is particularly relevant for meat products as the product signal can vary due to different moisture content.

5. Protection of the corporate image

Foreign bodies at end customers table can not only lead to injuries but can also cause lasting damage to your company. We offer the highest detection performance as well as various product inspection systems for all process stages. The systems not only detect metal contaminations but also other foreign bodies typical for the meat industry as well as missing products and product defects.

What can we do for you?



Detecting foreign bodies in meat and sausage production

For meat processing companies, quality assurance and especially foreign object detection is a central issue. Any contamination can damage machines or even endanger the health of consumers and can lead to recalls. We have the right systems and the necessary experience to minimize these risks.

For decades, Sesotec has specialized in systems for industrial foreign body detection. We offer a technologically leading range of metal detectors and X-ray systems that reliably detect and remove contaminants.

We support you in all steps of the process, from right after cutting up to meat processing and final inspection of the packaged products. In cooperation, we will find the best solution for your specific need.

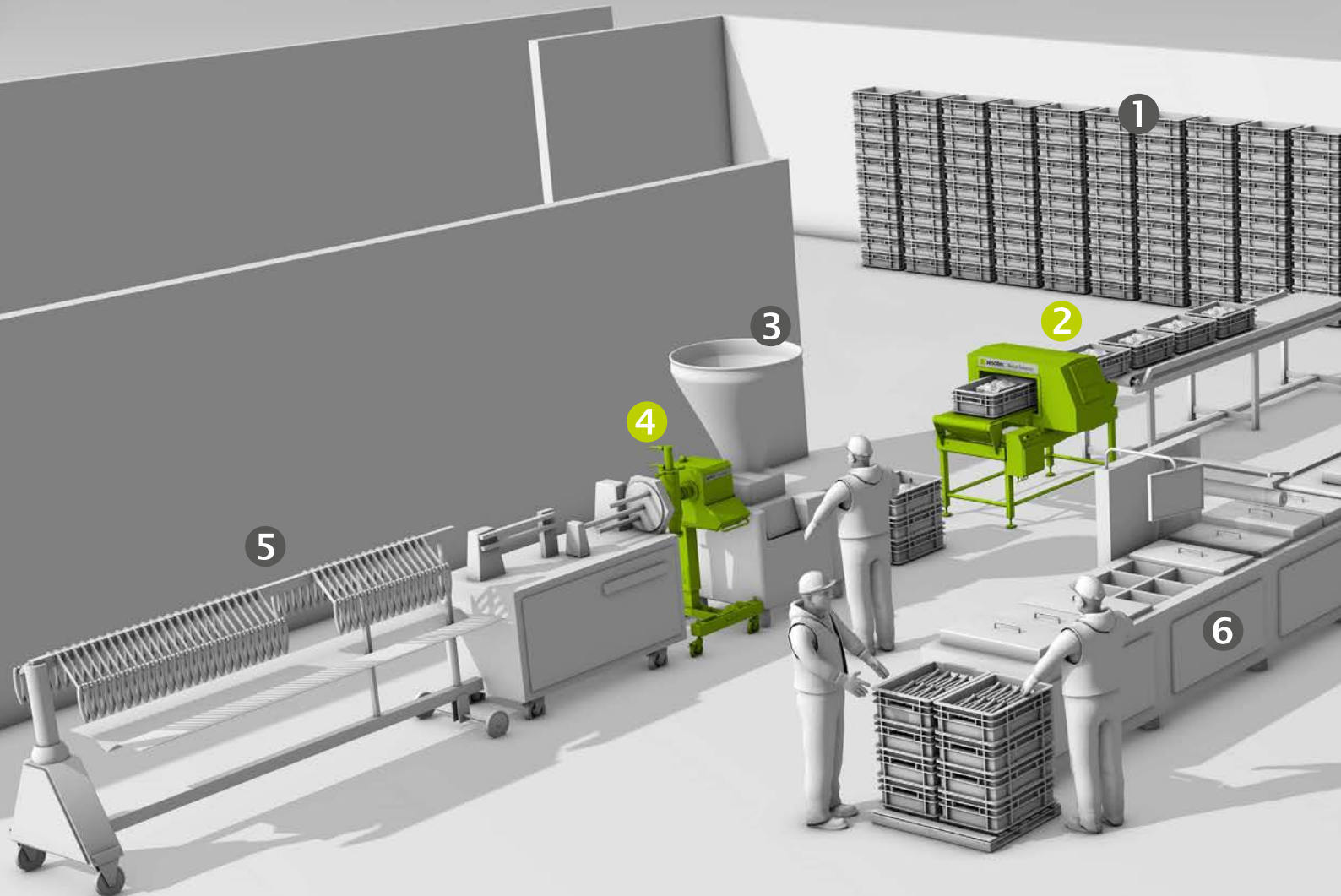
Where do meat processing plants use our machines?

We offer solutions for HACCP for incoming goods, in the production process and for outgoing goods. Whether directly after cutting, during meat processing or for the final inspection of packaged products – we support you across all process stages and work with you to find the solution that fits best to your specific application.

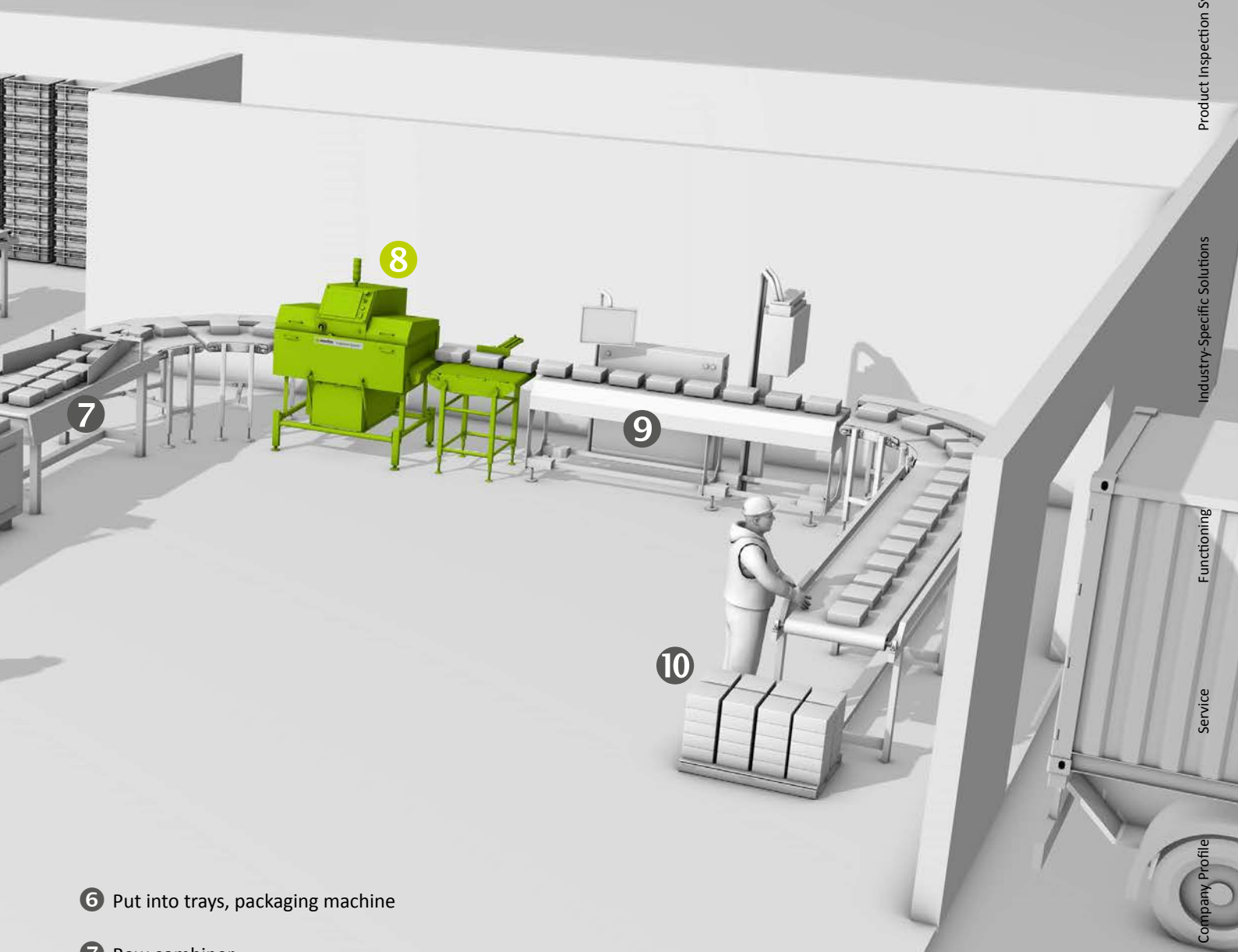
Our systems detect and remove contaminants in meat products such as:

- Raw meat in E2 boxes
- Minced meat
- Sausage meat before the stuffer
- Raw meat in its final packaging
- Cold cuts after packing
- Convenience food (e.g. in metallized packaging)

Foreign body detection in meat processing



- 1 Incoming goods
- 2 Metal Detection System for the incoming goods control of meat (frozen/unfrozen)
- 3 Vacuumfiller
- 4 Metal Separator for inspection of sausage meat
- 5 Portioning, twisting and hanging of sausages



- 6 Put into trays, packaging machine
- 7 Row combiner
- 8 X-Ray Inspection System for incoming goods control of packaged products
- 9 Checkweighing and labeling
- 10 Commission and outgoing goods

Food safety and HACCP for food products

Food safety means – as the name implies – safe food for trading because unsafe food can harm consumers. The consequences for food processing companies are very unpleasant and can have fatal consequences.

How it all started...

It is hard to believe, but the origin of the globally recognized „HACCP“ (Hazard Analysis and Critical Control Points) concept for the assurance of food quality lies in the space industry. In 1959, the National Aeronautics and Space Administration (NASA) commissioned the development of guidelines for the production, storage and processing of 100% safe space food. In 1963, the WHO (World Health Organization) and the FAO (Food and Agriculture Organization of the United Nations) created the internationally acknowledged Codex Alimentarius based on these guidelines. This includes the development of a HACCP concept.

HACCP – legally required according to the EU hygiene regulation

HACCP is the abbreviation for „Hazard Analysis and Critical Control Points“. A hazard analysis considers the probability of occurrence, the extent of damage and the probability of detection of foreign bodies at critical points in the production process. The implementation of the HACCP concept is intended to detect, prevent or reduce hazards that could have harmful effects on the health of end consumers to an acceptable level.

Determining Critical Control Points

All foods consumed by humans have to be absolutely pure and clean. This is one of the most important imperatives in the food industry. One decisive criterion is that your products leave your factory without any metal and other contaminants. The inspection of products for metal contaminations has become an indispensable element of responsible food production, an inherent part of any HACCP concept, and a prerequisite of successful IFS certification.

What are Critical Control Points?

In a comprehensive and systematic HACCP concept it is not enough to only inspect the final product for contaminations. The reason is that if contaminations in raw materials are further processed, the probability is high that the contamination is split up in such small pieces that they can no longer be reliably detected in a final inspection. To guarantee optimal food safety, inspections must, therefore, be performed at various points in the production process. The HACCP concept specifies that all points – that involve an unacceptable health risk for consumers when an inspection system is missing - must be determined. These points in the production process are referred to as CCPs (Critical Control Points).

For defining the proper CCPs and thus for achieving a safe HACCP concept the potential hazards in the production process must first be identified by way of a hazard analysis.



Hazard analysis

In a hazard analysis, all physical, chemical, and biological hazards that might possibly occur must be identified. Physical hazards, for example, include the contamination of the product with metals, glass splinters, bones and so on.

A risk assessment also must be performed, analysing, on the one hand, the probability of contamination, and on the other hand the consequences of contamination. Summarising, the following questions should thus be answered in the hazard analysis:

- What kind of contaminants may occur during production?
- What is the probability of the occurrence of these contaminants?
- What are the possible consequences of these contaminants?

✓ Proposed legislation

Food guidelines ✓

✓ Quality requirements

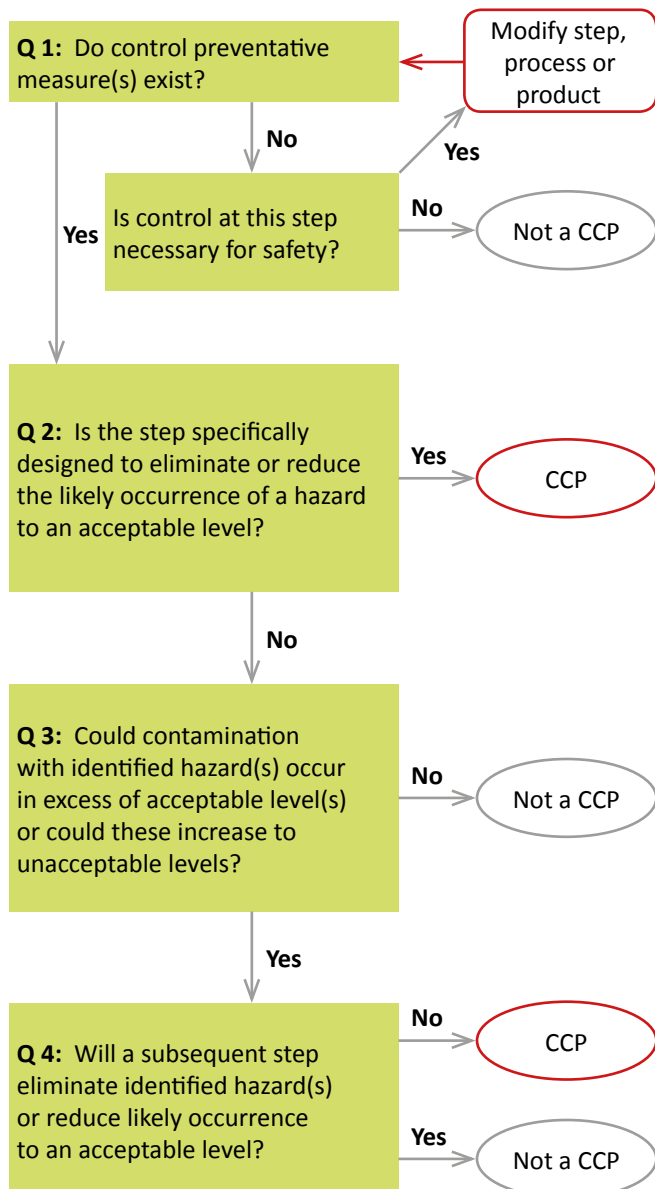
Customer complaints ✓

✓ Customer requirements

Definition of critical control points

Identification of critical control points

Using a decision tree has proven to be a useful aid for identifying Critical Control Points:



Critical limits

Once the Critical Control Points have been determined, specific limits are defined for each of these control points. Food safety is only guaranteed if these limits are observed. For the use of metal detectors or X-ray scanners these limits particularly refer to the scanning sensitivity, i.e. to the size of the detectable contamination and to the corresponding signalling or eject devices.

Establishing a monitoring system

Monitoring systems that monitor whether the defined limits are observed and indicate a possible loss of control are set up for each Critical Control Point. For metal detectors and X-ray systems this is done for example by way of test pieces that are used to check proper equipment function in regular intervals.

Taking corrective measures

If the limits of a Critical Control Point are not observed, previously defined corrective measures must be taken.

Inspection systems, e.g. metal detectors or X-ray systems, that detect or automatically separate possible contaminations, are used at the identified CCPs.

Food Safety Standards

BRC

Global Standard for Food Safety / Commonwealth (GB)

- Founded in 1998 of BRC (British Retail Consortium)
- Since then, continuous advancement and adaptation to requirements of the food industry
- The currently valid version, BRC Global Standard for Food Safety Issue 8', was published on 1st of August 2018
- BRC is a trade association of British retailers established in 1992



FSSC

Safety System Certification 22000 / global

- Founded in 2009 by a group of multinational companies
- Linkage of ISO 22000:2005 and PAS 220:2008
- Global standard to ensure food safety in food production (Food Safety Management)
- Advantage: not owned by an interest representation and therefore an independent practice due to ISO standard



IFS

International Featured Standard Food / Western and Eastern Europe, North America

- Founded in 2004: Development by member companies of HDE (Hauptverband des Deutschen Einzelhandels) and FCD (Fédération des Entreprises du Commerce et de la Distribution)
- Quality and food safety standards for commercial own-label brands



SQF 2000 Code

Safe Quality Food / USA

- Founded in 1995: introduction of the certification program Safe Quality Food (SQF) after a decade of food crisis to improve the quality and safety of the food industry and regain consumer confidence
- Since 2004: Administration by SQF Institute (SQFI) and worldwide recognition
- Reduction of food risks and guarantee of continuous security throughout the supply chain



IFS – Detection requirements

Material	Typical contamination sizes (ball diameter) in various types of packaging			
	Plastic/Paper	Metallized film	Tins	Glasses
Metal	0,8 mm	0,8 mm	1,2 mm	1,2 mm
Aluminium	2,0 mm	2,0 mm	2,5 mm	2,5 mm
Glass	2,0 mm	2,0 mm	3,0 mm	3,0 mm
Stone	2,0 mm	2,0 mm	3,0 mm	3,0 mm
Bone	3,5 mm	3,5 mm	5,0 mm	5,0 mm
Density Plastic	3,5 mm	3,5 mm	5,0 mm	5,0 mm

Risk of foreign materials, metal, broken glass and wood

Based on hazard analysis and assessment of the associated risks, procedures are in place to prevent contamination with foreign materials as far as possible.

Contaminated products must be treated as defective products. If metal and foreign object detectors are required, they are installed in such a way that maximum detection effectiveness is ensured in order to avoid subsequent contamination. Detectors are subject to regular maintenance to prevent malfunctions.



Validation, verification and monitoring of product inspection systems

According to the latest standards, requirements and legislation, it is the responsibility of every retailer and manufacturer to ensure food safety. That's why it's the task of a quality and production manager to check the proper performance of the applied product inspection systems: validation, verification and route monitoring are intended to ensure that the product inspection system operates within the sensitivity standards. For you as meat processor, it is important to understand the

underlying process to ensure that testing is carried out in accordance with legal requirements and audit requirements. Especially when a system is installed at a critical control point (CCP) in the process. Device manufacturers can provide important support to companies in this regard.

1. Validation

„Does the system meet the specified targets?“

Validation takes place at the beginning of the life cycle of a product inspection system after initial installation but before release for commercial production and can be seen as an initial qualification of a system based on the previously specified functional descriptions. A validation provides proof that the selected device, when used correctly, is capable of meeting the defined specifications in any case. Such specifications can refer to the detection accuracy but also to other functions such as the correct functioning of the ejection device unit.

According to International Featured Standards (IFS), validation is a confirmation that requirements for the specific intended use or application are met - based on objective evidence. The Codex Alimentarius Commission defines validation as providing evidence that a (or combination of) control measure(s), when properly implemented, can control the hazard and achieve a specified result.

If significant modifications have been implemented to the product, device or process at any time after initial validation, a new validation (re-validation) is necessary. Reasons for a re-validation may be:

- New Products
- Significant changes to the product, e.g. size, viscosity, ...
- Changes to the packaging material
- Changing machine settings
- Longer lasting production downtime, e.g. due to conversion work
- Changes in the process, e.g. speed changes, ...
- New foreign bodies

Implementation: in case of significant changes before re-commissioning

Practical experience:

The intensity of the validation activities depends on the defined objectives. Specifications must be developed and documented which determine which foreign bodies (shape, size, material, ...) or which test bodies must be reliably detected and ejected. It is recommended to document the foreign bodies and test bodies as well as the position on or in the product with photos.

- Number of products to be tested
 - depending on the output quantity
 - to be determined individually by each manufacturer
 - e.g. 10, 50, 100 or more products
- Consideration of given process fluctuations, e.g. position of the product as it passes through the detection system
- Implementation: before production starts

2. Verification

„Is the system under control and working as expected?“

Verification begins after completion of the validation and is a regular measure to determine whether a system is still working properly and proving its effectiveness. Verification is an assessment carried out at regular intervals throughout the life cycle of a product inspection system.

The IFS defines verification as confirmation based on objective evidence that the specified requirements have been met. According to the Codex Alimentarius Commission, verification is the use of methods, procedures, tests and other assessments, in addition to monitoring, to determine whether a control measure is working within the demanded requirements. Monitoring provides the objective evidence necessary for proper verification.

Practical experience:

- Depending on requirements, verification may be performed internally or by an independent external representative.
- All relevant records to the specified goals have to be considered, for example:
 - Were monitoring and monitoring activities carried out as specified?
 - Were follow-up processes carried out as planned when deviations occurred?
 - How were rejected products handled and analyzed?
 - Which foreign bodies were detected and ejected?
 - Were there any other foreign object complaints relevant to the inspection system during the observation period?
- If it is possible to derive appropriate measures from the evaluations, these have to be incorporated into the documentation.

Implementation: at least once a year

3. Monitoring

“Is the CCP under control or have limits been exceeded and corrective action is required?”

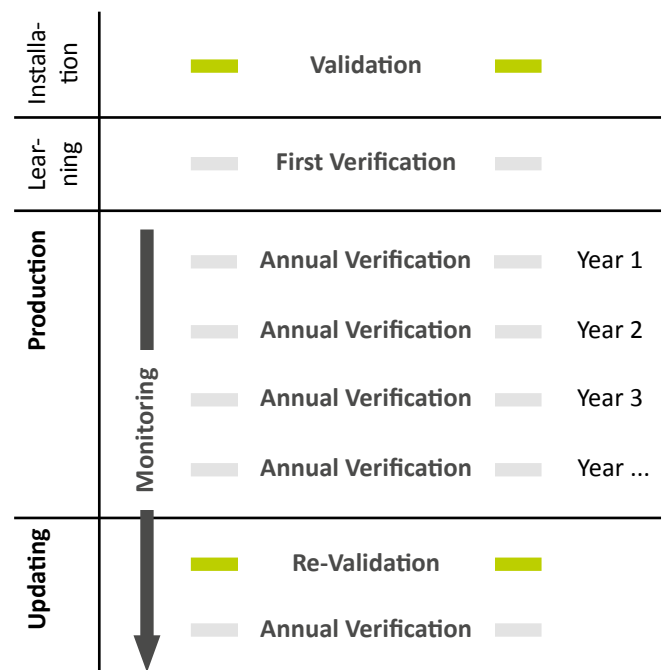
Performance monitoring of product inspection systems should be performed regularly. This verifies whether a particular system is functioning as expected. In contrast to validation and verification, monitoring involves a series of performance verification tests performed at frequent and regular intervals. Monitoring is used to determine whether the respective processes are under control.

IFS defines performance monitoring as a planned sequence of observations or measurements of control parameters to determine whether a CCP is under control. Based on objective evidence, employees can determine whether the equipment is operating within the specified limits or whether

a critical limit has been exceeded and corrective action is required.

Practical experience:

The number of products to be tested depends on the individual requirements and is to be determined by the manufacturer himself. It is advisable to carry out regular tests, especially before and after product changes, batch changes and several times per shift (e.g. at shift change or at the beginning, during and at the end of daily production).



Dates of validation, verification and routine monitoring throughout the life cycle of a product inspection system

Test procedure



Performing the test

Tests should always be performed with the highest demands for the detector (worst-case scenario). This includes:

- Using contaminant types that are expected or that are most difficult to identify
- Placing the contaminant at a position inside the product where it is most difficult to identify
- Placing the contaminated product at the position of the detector where sensitivity is lowest (typically at the center of the detector)
- Testing the separation mechanism/signal device with several contaminated products directly one after another

Using test bodies

As a rule ferrous (FE), non-ferrous (NFE), and non-magnetic stainless steel (V2A) test bodies are used for performing verification tests of contaminant detectors. The test bodies are ball-shaped and thus allow to be tested independently of position and shape.

Sesotec provides various types of test bodies with moulded-in test balls:

- **Test MiniStick** 10 x 10 x 20 mm
- **Test Stick** 10 x 10 x 100 mm
- **Test Cube** 20 x 20 x 20 mm
- **Test FlexStick** l = 250 mm
- **Test Ball** Ø 25 mm

Basically, tests can be performed with test bodies alone, i.e. without the product. However, for reliable test results the detector test always should be performed with the product. For this purpose a test body is inserted in the product or attached to the product at a position where it is most difficult to be detected by the detector.

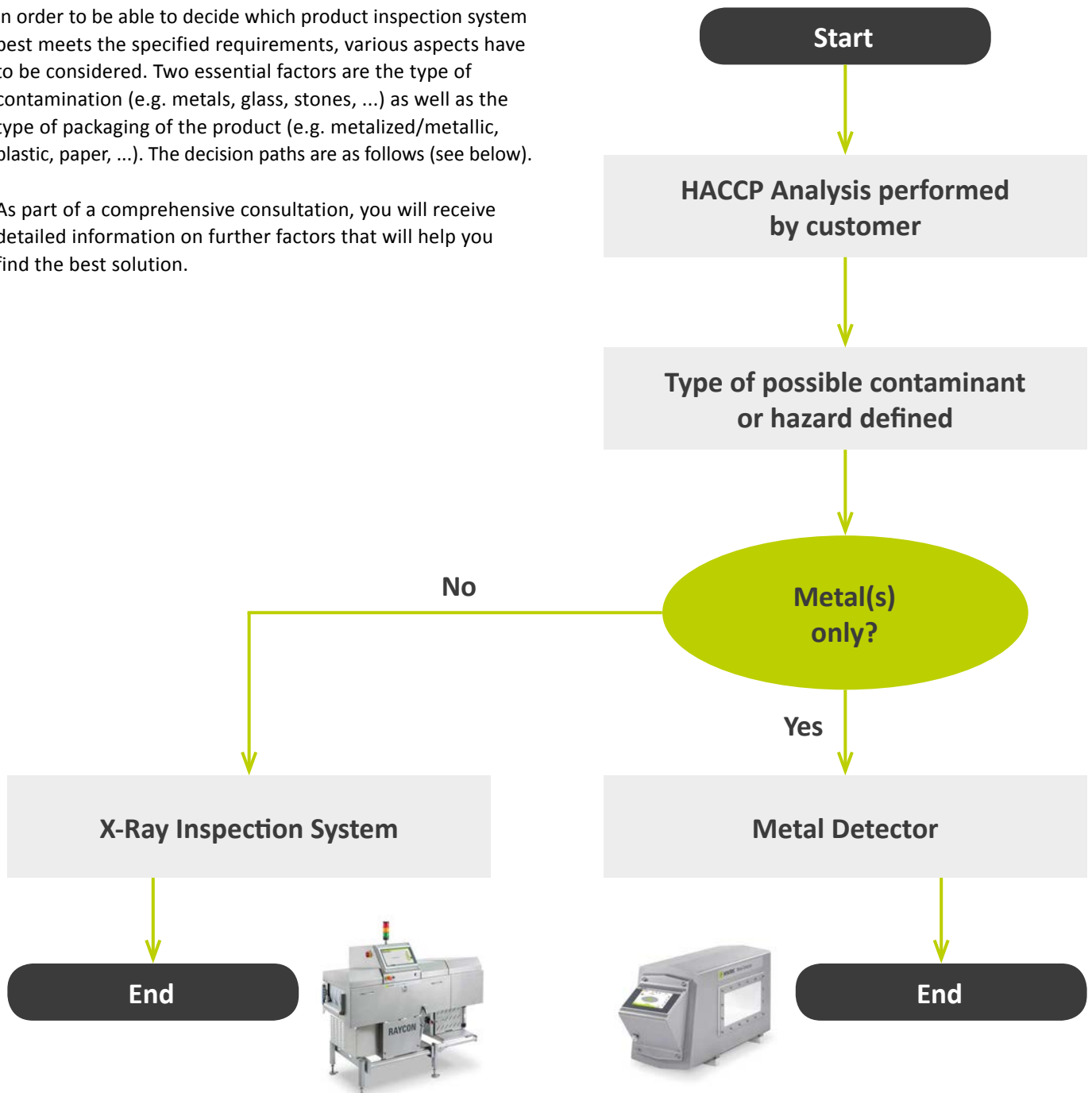
If the test is performed with test packages (test body in or at the inspected product), the following has to be determined before the test:

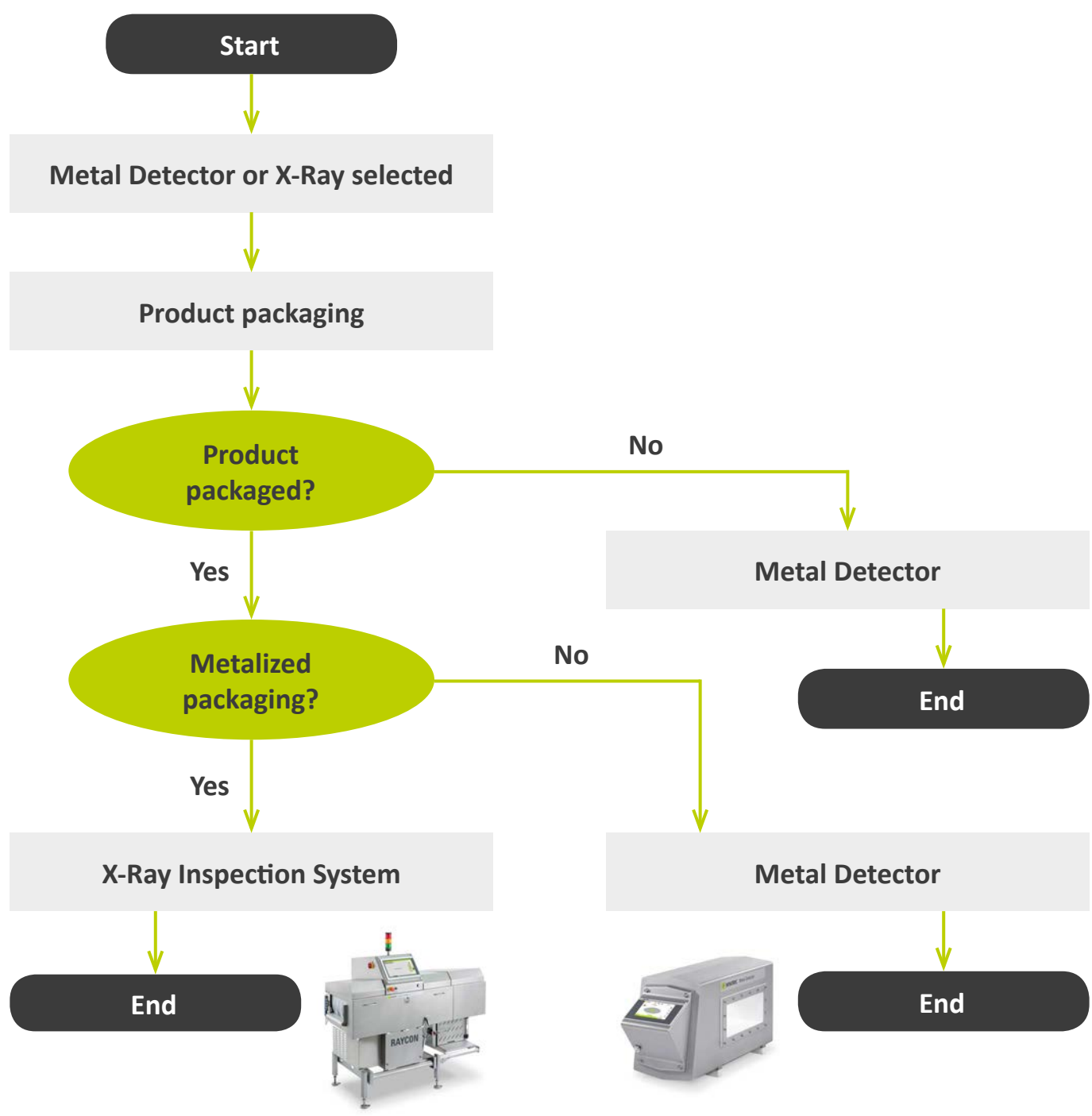
- How to ensure that the employed product is free of contaminations before the test body is attached
- At which position of the product the test body has to be attached
- After which period of time new test packages should be used (product ageing causes incorrect detections)
- How to ensure that the test package will not get into the supply chain (e.g. by color marking)

Metal Detector or X-Ray Inspection System?

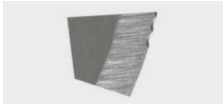











In order to be able to decide which product inspection system best meets the specified requirements, various aspects have to be considered. Two essential factors are the type of contamination (e.g. metals, glass, stones, ...) as well as the type of packaging of the product (e.g. metalized/metallic, plastic, paper, ...). The decision paths are as follows (see below).

As part of a comprehensive consultation, you will receive detailed information on further factors that will help you find the best solution.





Technology comparison of our systems

		Chicken filet (boneless)		Chicken (with bone)		Ham (whole)		Sausage pole (with clip)	
		MD*	X-Ray	MD*	X-Ray	MD*	X-Ray	MD*	X-Ray
Stainless Steel e.g. broken blades		✓ 3,5	✓ 1,0	—	✓ 1,0	✓ 4,0	✓ 1,59	✗	✓ 1,0
Wire e.g. injection needle		—	—	—	—	—	—	✗	—
Glass		✗	✓ 3,5	✗	✓ 4,0	✗	✓ 3,5	✗	✓ 3,0
Stone		✗	✓ 3,5	✗	✓ 4,0	✗	✓ 3,5	✗	✓ 3,0
Ceramic / Teflon		✗	—	✗	—	✗	—	✗	—
Bone / Cartilage		✗	—	✗	—	✗	—	✗	—
Hairnet		✗	✗	✗	✗	✗	✗	✗	✗
Plastic glove		✗	✗	✗	✗	✗	✗	✗	✗
Plastic		✗	✗	✗	✗	✗	✗	✗	✗
Wood		✗	✗	✗	✗	✗	✗	✗	✗
Insects		✗	✗	✗	✗	✗	✗	✗	✗
Plaster		✗	✗	✗	✗	✗	✗	✗	✗

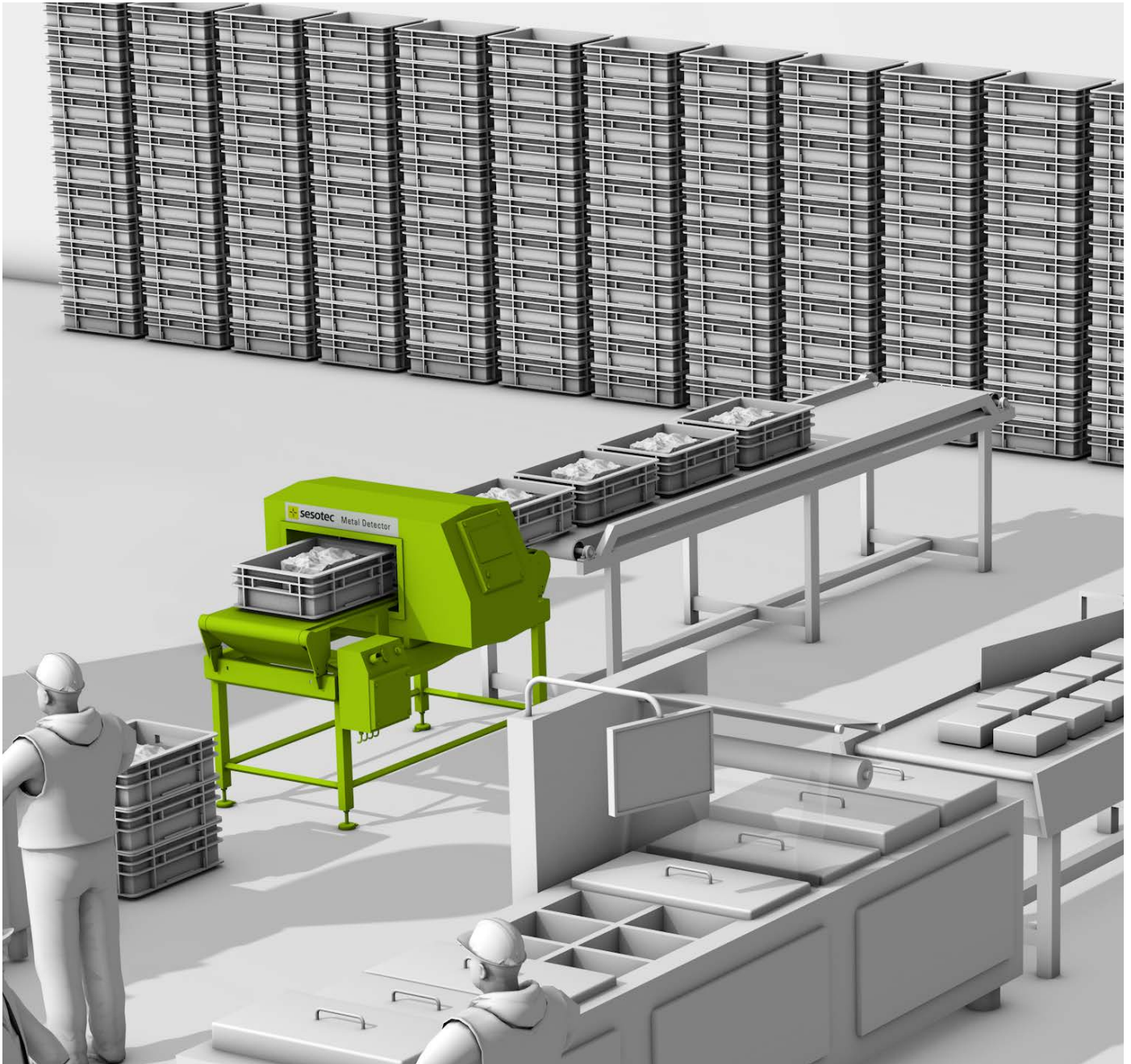
✓ Detectable contaminants in mm

— No data available

Sausage meat (pasty)		Minced meat		Cold cuts		Sausages		Product in metal packaging	
MD*	X-Ray	MD*	X-Ray	MD*	X-Ray	MD*	X-Ray	MD*	X-Ray
✓ 3,0	✗	✓ 3,0	✓ 1,0	✓ 3,0	✓ 0,6	✓ 2,0	✓ 1,0	✗	✓ 0,8
—	✗	—	—	—	—	—	—	✗	—
✗	✗	✗	✓ 3,5	✗	✓ 1,5	✗	✓ 2,5	✗	✓ 2,0
✗	✗	✗	✓ 3,5	✗	✓ 1,5	✗	✓ 2,5	✗	✓ 2,0
✗	✗	✗	—	✗	✓ 1,5 / 3,5	✗	—	✗	—
✗	✗	✗	—	✗	—	✗	—	✗	—
✗	✗	✗	✗	✗	✗	✗	✗	✗	✗
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✗	✗	✗	✗	✗	✗	✗	✗	✗	✗
✗	✗	✗	✗	✗	✗	✗	✗	✗	✗
✗	✗	✗	✗	✗	✗	✗	✗	✗	✗
✗	✗	✗	✗	✗	✗	✗	✗	✗	✗

Detection precision of Dual Energy Technology for foreign bodies with low density (page 48)

✗ No detection possible *Metal Detector



Foreign body detection in meat processing

Step 1: Inspection of raw material at the beginning of the process

Every type of meat has its own requirements. If we look at the three most common animal species used in meat production, beef, pork and poultry each has its own specific risks of foreign material within their individual processes. The primary production of meat products is really a disassembly process since the animal is separated into many components and used in many ways. The majority of other food production processes can be considered analogous to assembly lines. Contaminant inspection systems used in protein processing should be installed in three following areas of the process; front-end primary, mid-process and end-of-line inspection.



The primary production of meat products is a disassembly process since the animal is separated into many components and used in many ways. The inspection of raw material protects downstream equipment and is used to detect foreign bodies before the products add value.

Metal detection ② for protection of processing machines

The front-end primary contaminant inspection is generally a metal detection system. These are often used for protecting machinery and are a secondary aspect of detecting foreign materials but are nevertheless essential. Metal detectors are the main inspection technology that is placed in front of grinders, meat recovery systems, hammer mills at the start of further processing primal cuts or offal materials. If trim is being produced from a boning line, metal detection is important to ensure the trim does not contain any metal from the cutting process or before it is shipped to a further processing line or facility.

These systems remove metal before it is reduced in size making it harder to detect at the end of the line and before the foreign material propagated throughout the process.

X-ray inspection ⑧ is the safest method to find bones

X-ray is used for bone detection in different species of protein but has the highest demand in poultry at the front-end primary processing to eliminate as much bone as possible before further processing. Removing the bone early, when the bones are larger, reduces the risk of small undetectable fragments in consumer packages.

On the following pages, you will find successfully completed projects with some of our satisfied customers. Interested? Ask for more!



Inspection of raw meat in E2 boxes as part of incoming goods inspection

INTUITY for optimum detection of products with high moisture
content in larger quantities.

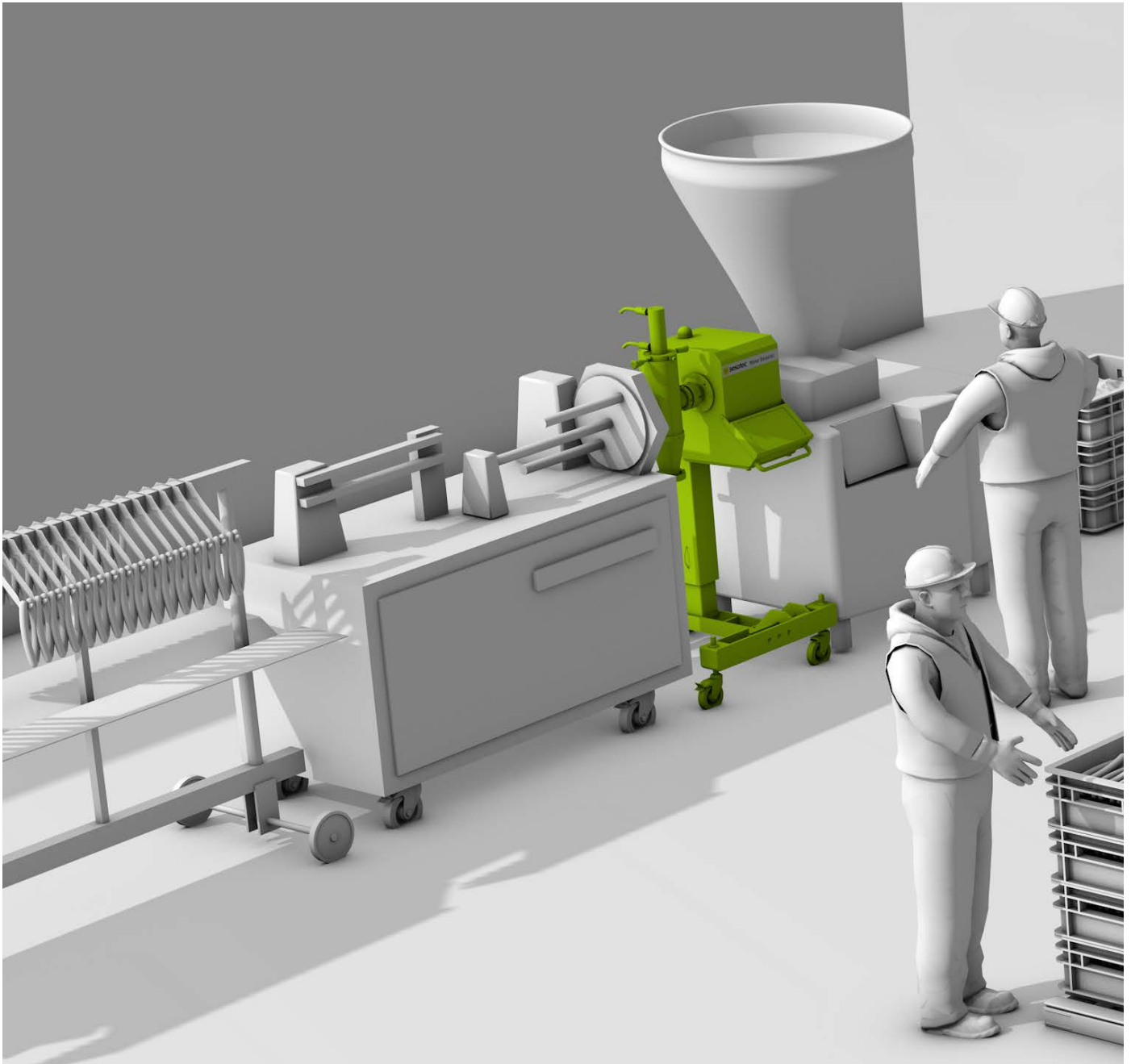


A sausage maker does not accept any errors in terms of quality and that's why he only uses the best ingredients. To ensure the quality of the raw materials, incoming goods inspections are compulsory. This fulfills the requirements for compliance with the IFS standard and HACCP certification.

INTUITY was able to convince in the incoming goods inspection for raw meat in E2 boxes because injection needles were reliably detected. Needle detection depends on how they pass through the metal detector. The large amounts of meat that fit in an E2 box (about 15 kg) make detection difficult as well.

The so-called product effect depends on the salt or moisture content, the consistency of the product, temperature fluctuations, packaging material, orientation on the belt and size or shape of the product and has an influence on the performance of a metal detector.

The metal detector INTUITY offers the possibility to keep meat products free from metals of all kinds. Whether packed or unpackaged, frozen or thawed, it does not matter. INTUITY detects metals, the influence of the products (product effect) on metal detection is suppressed. This is why INTUITY achieves the best needle detection results even under difficult conditions, thus ensuring the quality of the sausages and customer satisfaction. At the same time, false ejections are minimized and waste is avoided.



Foreign body detection in meat processing

Step 2: Inspection during the running process

Inspection during production minimizes product loss and lowers costs by enabling rework before further value is added.

Metal detection in piping systems 4

Mid process inspection can include pipeline systems on products that are pumped such as sausage emulsions or chicken trim. Pipeline metal detection systems are quite effective when located on the inlet pipe to a sausage linker or between a stuffer/clipper or stuffer/linker arrangement. In order to



avoid communication problems, our metal separators are compatible with filling machines from different manufacturers and thus prevent faulty production.

The small apertures and good product presentation allow for higher frequencies and better detection performance, especially stainless steel, as compared to many conveyor systems. Chubs being clipped with aluminum clips cannot be inspected by a metal detector conveyor because of the clips are detected, so the pipeline metal detector is a good alternative. Pipeline metal detectors are available with water-jacket pipes for applications where the product texture is fragile and pro-

ne to smear, such as ground beef, beef sausage or salami. The water jacket allows for warm water to be circulated, warming the pipe enough such that the fat does not stick there by reducing the amount of particle definition loss. They can also be configured to fit in line with automatic linking systems, to provide the mid-process detection that otherwise would not have been possible.

Using pipeline X-ray systems for poultry was a trend a few years ago. However, when combined with a pump, the complete system can over work the product resulting in damage to the look and texture of the chicken, particularly if the product is re-inspected more than once.

Conveyor belt applications with metal detectors **2** and X-ray systems **8**

Mid Process contaminant detection can include X-ray systems that perform the same function as above. This inspection can be considered a crossover between primary and mid process detection. Bones of young poultry, which are slaughtered at an age of 5-6 weeks, are less developed and have a lower amount of calcification. In comparison, beef or pork bones are more developed because of the higher slaughter age. Therefore, the detection of young poultry bones is quite more difficult.

Poultry inspection these days tends to be completed on a conveyor belt with the product presented in a single layer for best performance.

Bone detection with X-ray is best done when the product is raw because the process of cooking causes density convergence between the meat and the bone and potentially some leaching of the calcium within the bone, which provides a marker for X-ray detection.

On the following pages, you will find successfully completed projects with some of our satisfied customers. Interested? Ask for more!



Inspecting sausage meat in the pipe line

Metal separator LIQUISCAN VF+ from Sesotec guarantees constant quality

This customer from Sesotec, located at the coast of the Gulf of Thailand, started to produce German style sausages of the highest quality more than 50 years ago. 20 years ago he joined forces with a German meat processing company and expanded his capacities with a high-tech factory for meat processing with mainly German machinery.



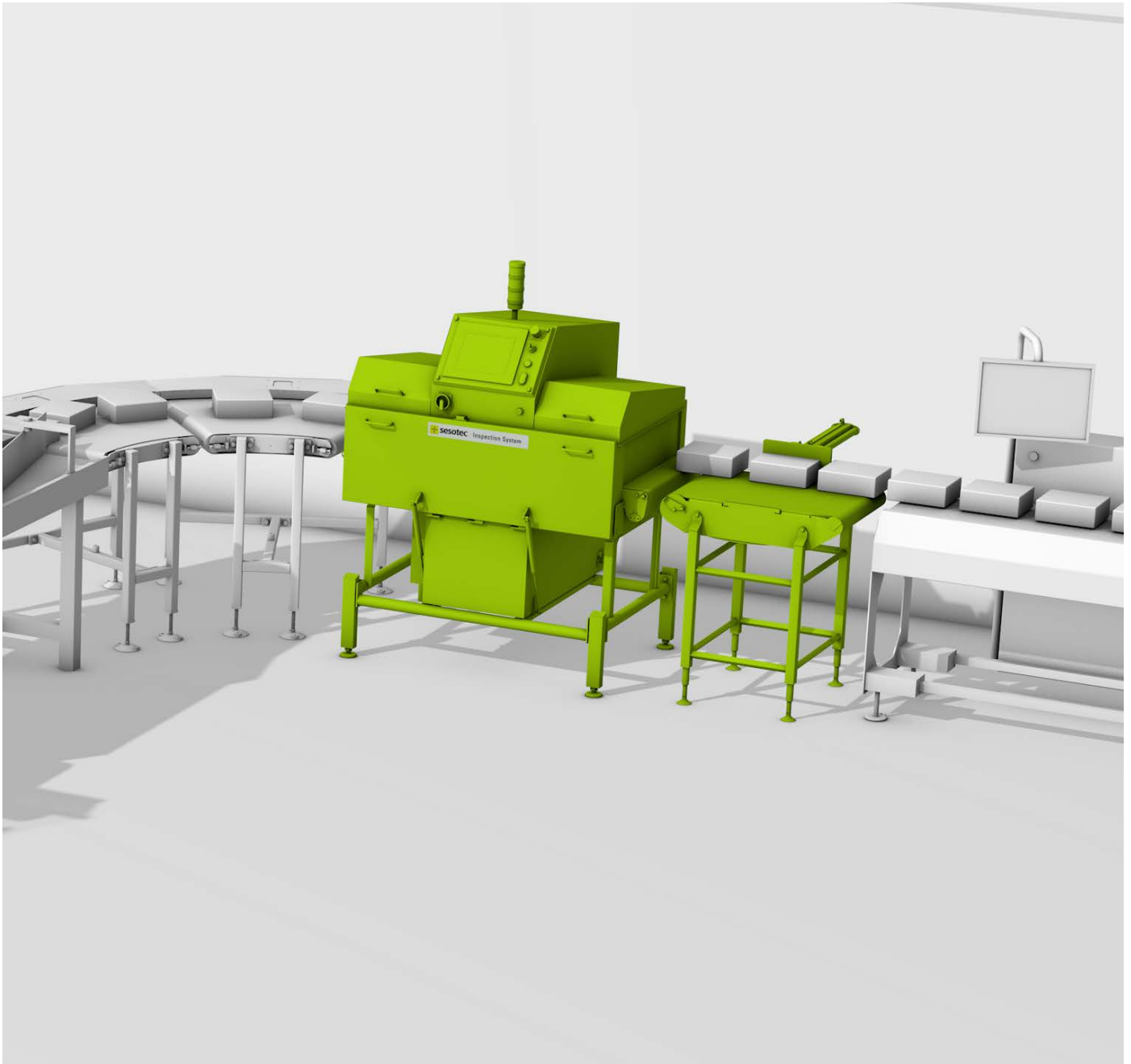
One of the greatest concerns of this customer was that the consistency of the meat for his sausages could lose quality when passing through the metal detector.

With regard to technical aspects, it was important for the customer that the metal detector could be easily connected to various vacuum fillers.

Although Sesotec's LIQUISCAN VF+ with its hygienic design in stainless steel meets these requirements, there was only one way to convince the customer: performing a series of tests with the LIQUISCAN VF+. After one week in which a Sesotec's engineer tested product by product with the Sesotec metal detector, it was proof that the various meat materials – as expected – passed through the LIQUISCAN without any influence on their quality.

The efforts of our engineer at the customer's plant not only convinced the customer with their results but also because

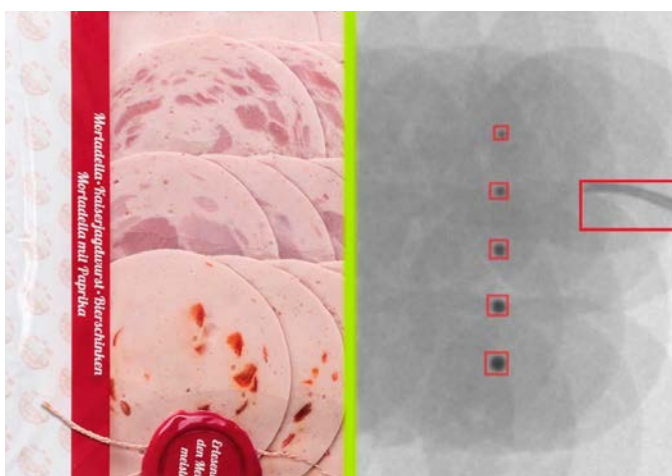
we thus could demonstrate our unconditional ambition to achieve customer satisfaction long before a possible business deal. „Tangible results prior to a purchase are an important argument for the purchase decision. We are highly satisfied that Sesotec provided their capacities for this purpose,“ says our customer's quality manager.



Foreign body detection in meat processing

Step 3: Inspection at the end of the line

Reliable end-of-line inspection is still the most common type of foreign object detection. It ensures that further contamination is eliminated and only flawless products leave the factory. The inspection at the end of the line serves to fulfil the requirements of laws, regulations according to BRC and IFS, and procedural rules of many retail chains.



X-ray inspection is new territory for you?

X-ray inspection is the safest method to find a wide range of foreign bodies and is even required by law for some process steps. We are your competent partner regarding X-ray systems.

We provide support in the selection of the correct systems, in the prescribed commissioning, in fulfilling radiation protection regulations as well as in the operational phase. This includes registration of your X-ray system, acquisition of expertise, expert examination and much more besides! Find out more on page 52.



Food safety is paramount

The principle is that once the product is in its final packaging the risk of an extrinsic contaminant entering the food product is significantly reduced. To determine the installation of a metal detector **2** or X-ray system **8** at the end of the line should be based on selecting which technology addresses the food safety hazards; balancing cost, risk and performance best. The probability of foreign bodies in the product at the end of the line can be significantly reduced by upstream systems. Therefore, in the context of food safety, the development of a consistent process along the entire production process for product inspection is becoming more and more important.

On the following pages, you will find successfully completed projects with some of our satisfied customers. Interested? Ask for more!



Serious about food safety in the demanding meat industry

RAYCON as an essential part of food safety systems

The Sausage Guys operate a relatively small sausage processing plant company. Based in Quebec and currently catering to the local market, it is making impressive inroads in establishing a wider following by going well and beyond the common perception of what a sausage is for the average Canadian consumer.



In doing so, the high-aiming company is keen on becoming a true market leader, with national distribution to match, in a very competitive meat industry segment with high demands regarding ingredients and product purity.

This family business began making good-quality sausages about 20 years ago in a local area butcher shop. After determining that the small butcher shop was not well-suited to producing the volume of sausage products demanded by its customers, Bryce Patriquin, president and co-owner, sold the shop and acquired a nearby bakery. Already in compliance with the provincial food safety standards, the 2,500-square-foot facility was modified and equipped with some newly-purchased sausage-making equipment to fulfill his vision of making gourmet-quality sausage products. Processing roughly 350,000 kilograms of sausages in 2016, still a small company, compared to some of the big national processors who produce some 200,000 kilograms of sausages per week.

To help accomplish the SQF (Safe Quality Food Institute) certification initiative, in late 2016 the plant purchased a RAYCON 300-150 X-ray inspection system manufactured from Sesotec GmbH. After a short period of time, Mr. Patriquin has already realized how beneficial it has been to the company. Featuring a large 300x150 mm inspection window, the highspeed RAYCON can inspect packaged goods at rates

of up to 300 pieces per minute, depending on the object's length, detecting and rejecting all magnetic and nonmagnetic materials such as glass, ceramic, stone, bone, PVC etc., even when contained within metallic or metal-coated foil.

Along with performing its primary task of detecting foreign particles in the product flow, the RAYCON can also provide visual detection of misshaped products, as well as check for incorrect product weight.

The RAYCON can inspect different sized and shaped products on the same production line by utilizing its unique multiline and multiproduct software. The RAYCON X-ray system can learn specific packaged product shapes, thereby allowing for different products to be handled on the same production line without triggering false positives and optimizing detection performance. The real time operating system with a touchscreen provides the operator with a clear view of each packaged sausage being inspected.

There were initially concerns that installing a RAYCON X-ray system would be an unnecessary extravagance for this small company but talking to Sesotec's inspection systems sales manager Doug Pedersen eased the concerns. „Not only was Doug Pedersen able to answer all of our questions without hesitation“, relates the company's president. And he adds „The RAYCON model X-ray product inspection system from Sesotec is an essential part of our food safety system and I continue to be impressed by the level of service provided us by Sesotec.“



Metal detection for the safety and purity of meat products

INTUITY – Highest metal detection performance, easy operation, least false rejects.

Fleischmanufaktur Haspel e.K. with over 25 years of experience in purchasing, processing and selling meat, relies on quality and innovative technology. At the company headquarters in Dombühl, the company employs more than 200 people and give great importance to compliance with national and international quality standards such as the QS seal and IFS. In addition, individual customer requirements are met. Haspel is not only driven about achieving quality standards but also by the good conscience that the goods are free from contaminants.



The metal detector INTUITY with multi-simultaneous-frequency technology in the inspection of very different products.

A wide range of fresh and frozen pork and beef meat as well as meat preparations in various packaging variants from 200 grams to six kilograms and very high product effects require metal detection with top technology. An outgoing goods inspection of up to 130 tons of meat and meat preparations processed every day is necessary.

The conveyor belt system UNICON+ from Sesotec with integrated metal detector INTUITY ensures stability and hygiene in combination with maximum metal detection performance and easy operation. The multi-simultaneous-frequency technology allows Haspel to inspect products from three different packaging lines with the same metal detector. "Fast changing of different programs via external control our own management system represents a very important and useful function for us due to the already mentioned three packaging lines," says Florian Stadelmann, Production Manager of the Haspel Fleischmanufaktur.

In multi-simultaneous-frequency technology, two frequencies between 0 and 900 Kilohertz work in parallel. The selection of the two frequencies that best suit the product takes place during the learning process. Afterwards, INTUITY will simulta-

neously use these two frequencies to achieve the best metal detection results.

The customer's goal is to be able to inspect the most diverse meat products and packaging sizes with the best possible sensitivities. Although Sesotec units are already known, tests were made with devices from different manufacturers to compare the performance of the new multi-simultaneous-frequency technology. INTUITY from Sesotec convinced with the highest detection performance and very simple operation. In addition to this comes an impeccable and stable operation without rejection faults and the best sensitivity to stainless steel, which leads to full satisfaction of the customer. The cooperation between Haspel and Sesotec is once again confirmed.



High performance in the detection of different sausage products

INTUITY with multi-simultaneous frequency for optimum detection and integrated control unit for ergonomic and intuitive operation.

A family-owned company that has been on the market for over 70 years, with a focus on the production of cooked cured meats and boiled sausages is characterized by a high quality standard. Qualified employees, selected raw materials and the best machinery support these efforts.

With the introduction of the new INTUITY metal detector in early 2017, Sesotec has set a new standard in metal detection. The multi-simultaneous frequency technology ensures product purity with up to 50 % better detection accuracy.



The sausages are packed in commercial packages for the retail market. Metal detectors in the outgoing control of sausages in 1 kg packaging and package size of 20 x 20 x 6.5 cm provide important information for quality management. Since sausages behave very differently depending on the orientation (longitudinal or transverse conveying), the metal detector's multi-simultaneous frequency technology with system-supporting selection of the metal detection frequencies, offers the best performance.

At the same time, the metal detector INTUITY convinces with simple and intuitive operation. Designed for best ergonomics and ease-of-use, the system features an intuitive user interface with real-time metal detection graphs, comfortable operating logic and guided operations.

Several systems have already been integrated into ongoing production in 2017, with more systems to follow. „This shows us that our new metal detector is well received!“, says Sesotec's Sales Manager Oliver Uhrmann.

In terms of quality assurance, INTUITY achieves the best performance. The audit check, simplified by guided procedures and test sample forecast, in addition to the comfortable

logbook contribute to the fulfillment of international quality standards such as IFS or BRC.

The metal detector INTUITY convinces in practice. In comparison tests with two competitor's machines inspecting frozen and thawed products, it achieves the best metal detection values. The right price-performance ratio and the self-explanatory operation, make the customer's decision in favor of INTUITY.



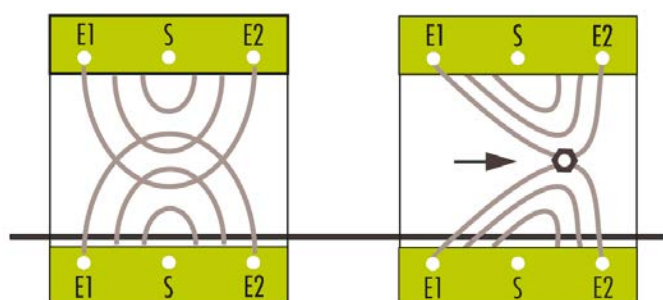
The functioning of a Metal Detection System

Metal detection by induction technology

Our metal detection systems detect all metallic foreign bodies: whether the contamination consists of iron, steel, stainless steel or non-ferrous metals such as aluminium, copper and brass, whether it is exposed or enclosed in the product. For this purpose, they work according to the transmitter receiver

process, which is based on electrical induction:

Metal detectors are equipped with one transmitter coil and two receiver coils. The transmitter coil generates a permanent electromagnetic alternating field. As soon as a metal part passes the detector, a disturbance of the alternating field occurs, which is detected by the receiver coils.



Digital signal analysis

The software in the control module analyses the recorded signals. It must be able to reliably distinguish metallic contaminants from interference from the environment or the product itself, since a product – depending on its intrinsic conductivity – can alter the signal.

Our control systems, therefore, use sophisticated algorithms to analyse signals with reference values that either come pre-set or which are established during ongoing operations. This approach prevents them from triggering false alarms while enabling them to reliably identify metallic contaminants. If a foreign body is detected, the module (depending on the configuration) sends a signal to the process controls, activates

the downstream separation unit notifies the operating staff and enters the incident into the integrated logbook.

Low-loss separation

As a rule, detection systems in the food industry are additionally equipped with automatic reject mechanisms. If a metal part is detected, the metal detector ejects with integrated separation unit the contamination safely and with low loss directly from the production line.



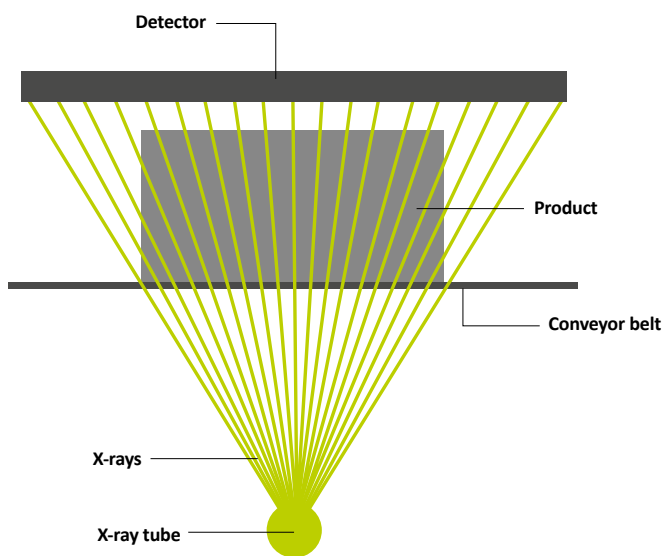
The functioning of an X-ray system and its decisive advantage

Use of X-ray inspection systems in the food industry

Product inspection has become an indispensable element of responsible food production, an inherent part of any HACCP concept, and an absolute prerequisite of successful IFS certification. Any contamination of food with impurities of any kind may have the most serious consequences for a company

because according to the product liability law, every food producer is liable for contaminations of his products in case a consumer gets harmed by such contaminants.

Systems for contaminant inspection are used to prevent such problems. Metal detectors are most useful for the detection



How does an X-ray system work?

The X-rays for „radiographing“ are generated by an electric X-ray tube. A line-shaped detector that measures the arriving radiation is positioned above the conveyor belt (see picture). X-rays have a very high energy and are thus able to penetrate solid bodies. Depending on the density of the inspected object the X-rays are attenuated to a higher (high density) or lower (low density) degree when passing through the product. The detector converts the remaining radiation into an electrical signal, differentiating the density of the inspected object in an image. The higher the density of a material, the darker its representation on the X-ray image, and vice versa. The image processing software detects the contrast differences in the image, highlights the contaminants or the missing products, and outputs a corresponding signal.

Every food producer or processor is obliged to deliver only „safe“ products to the market.

This is required by international and national laws. We offer individual advice and guide you through the purchasing process with sample documents and checklists and provide support in the operational phase.

of magnetic and non-magnetic metals, but they reach their limits for example in the inspection of aluminium-coated packing materials. Contaminations with glass, ceramics, stones, and similar materials also constitute a serious problem.

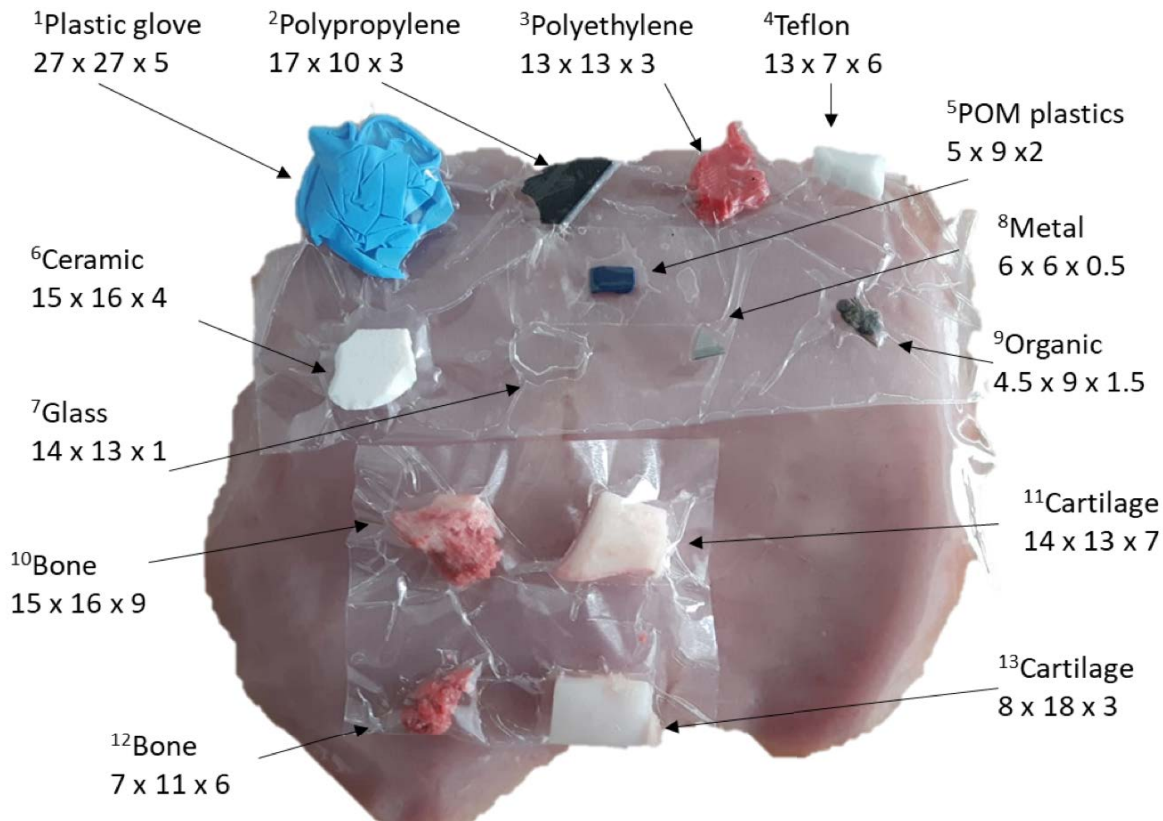
X-ray detection systems for food are therefore used for such applications. Sesotec RAYCON systems furthermore offer additional advantages compared to conventional metal detectors and other X-ray systems available on the market. For example, RAYCON allows the parallel inspection of two different products. Also incorrectly placed or overlapping products are no problem at all. Apart from contaminations, other product defects such as missing product components can be detected also.

Innovative Technology: Dual Energy

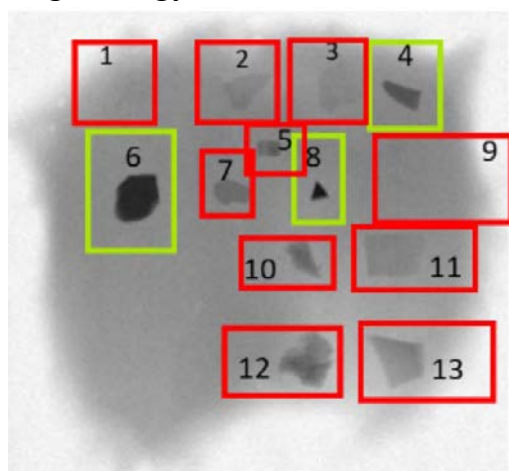
Dual Energy vs. Single Energy Technology

According to the current state of technology, it is not possible to detect plastic parts or cartilage, for example. However, there is already one technology that will make even contamination that is difficult to detect visible in the future: Dual Energy Technology.

A part of a ham that has been mixed with various foreign bodies shows how Single Energy Technology (up to now) and Dual Energy Technology differ in their detection accuracy and efficiency. While Single Energy (upper picture) only detects Teflon, ceramics and metal, Dual Energy reliably detects different types of plastics as well as bone and cartilage.

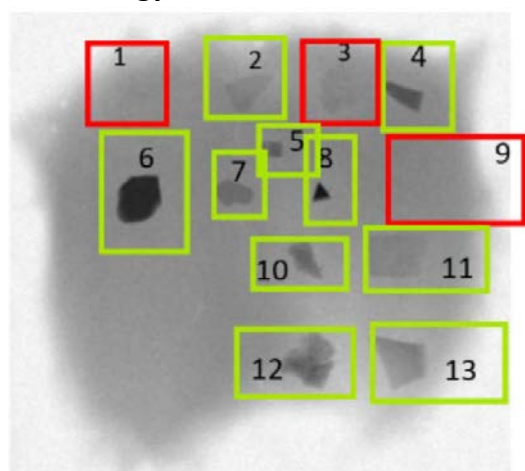


Single Energy



X-ray image with Single Energy

Dual Energy



X-ray image with Dual Energy

1	Plastic glove 27 x 27 x 5
2	Polypropylene 17 x 10 x 3
3	Polyethylene 13 x 13 x 3
4	Teflon 13 x 7 x 6
5	POM 5 x 9 x 2
6	Ceramic 15 x 16 x 4
7	Glass 14 x 13 x 1
8	Metal 6 x 6 x 0,5
9	Organic (fly) 4,5 x 9 x 1,5
10	Bone 15 x 16 x 9
11	Cartilage 14 x 13 x 7
12	Bone 7 x 11 x 6
13	Cartilage 8 x 18 x 3

Technology

Dual Energy uses two signals at the same time for material discrimination. Foreign bodies react differently to those two energy levels. Low dense contaminants absorb the low energy level better than the high energy. This difference could be measured by the software. For each product, a signal curve could be recorded. Foreign bodies drift from the common signal – that's why they can be detected.

X-Ray Safety and Commissioning

Why radiation protection? — Because we have to protect our consumers and ourselves. X-rays are among the ionizing types of radiation. If used improperly, these can pose a risk to life and health of staff or third parties involved as well as their environment. Therefore, proper use is required, taking all necessary technical and organizational measures into account, in order to be allowed to operate an X-ray system. In addition, the hazard potential also depends on the energy and dose of the radiation. Therefore prevention of unnecessary radiation exposure, minimization of unavoidable radiation exposure and compliance with the legally prescribed limit values for radiation exposure are paramount.

X-Ray inspection system RAYCON complies with legally required limit value

RAYCON complies with the German limit value of 1 mSv/a according to the X-ray Ordinance (RöV) (this corresponds to 1 millisievert per calendar year).

- Our RAYCONs work with a maximum of 100 kV and are therefore even suitable for organic products without separate declaration.
- RAYCON D+ automatically adjusts the X-ray voltage and power for each product, i.e. for products with a low density only a fraction of the available power is retrieved. This means in turn that the limit value is never exceeded for either operators or products at any time.
- The X-ray tube is safely shielded.
- All radiation protection covers are monitored by security switches.
- X-rays can only be turned on if the system is functioning properly.

Certainly you will have already asked yourself the following questions in the context of X-ray systems:

✓ **„Is such an X-ray system safe?“**

„Can I expect my staff to work with such a machine without concerns?“ ✓

✓ **„Does such a system contaminate my products?“**

„What do I have to consider before, during and after the purchase?“ ✓

✓ **„And why does all this always sound that complicated?“**

These four factors apply to the acquisition of an X-ray system:

- A written application for approval shall be submitted to the responsible authority. The X-ray system shall be inspected by an independent expert.
- A radiation protection supervisor (SSV) shall be appointed. In many cases, this is, the company owner or managing director for instance. The SSV has the following areas of responsibility: He is responsible for compliance with all radiation protection regulations but does not have to have the specialist knowledge himself. In case of several company owners/managing directors, the respective SSV must be notified to the responsible authority.
- A radiation protection commissioner (SSB) must be appointed. It is the responsibility of the SSV to order the required number of SSBs. The application for an order must be submitted to the responsible authority.
- The SSB has the following areas of responsibility: He has to complete an 8-hour training course of the radiation protection course R3 (e.g. by TÜV). In contrast to the SSV, the SSB must have specialist knowledge in radiation protection for safe and proper operation of the X-ray system. The specialist knowledge has to be requested to the responsible authority.



Sounds like a lot of effort? It's not!

What seems complicated at first glance is necessary to guarantee maximum protection with maximum detection accuracy at once. With our radiation protection package, we offer you individual advice and guide through the purchase process with sample documents and checklists and accompany you in the operational phase.

Insight.NET

Insight.NET – Central data management for Sesotec systems

Every product inspection system records operational data such as the detection of foreign objects, product changes, audit checks and error messages in a log. Each data entry is timed and dated and all X-ray images are recorded by the RAYCON system.

Insight.NET is a central data management software for monitoring and controlling all RAYCON inspection systems and metal detectors from a central control desk (e.g. smartphone or laptop). For you this means you can read, save, load, delete and print all logged operating data (e.g. logbook or X-ray images) and simultaneously access and fully operate all devices remotely – at any time and anywhere.

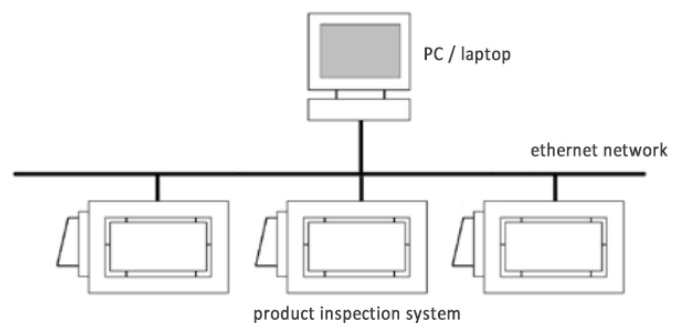
Your must-have for smooth Audit Check, HACCP and optimized production

- Panic due to Audit Check? Especially if your device is installed at a difficult position to reach or the required product data isn't at the expected place? With Insight.Net this is a matter of the past due to remote insight to all logs and view of operating data with a single click.
- Insight.NET improves your quality management. Your products are traceable at any time. All quality and process-relevant events are available to the quality management for further inspection and processing. Evaluating such operational data is an important component of HACCP processes. They are the basis for monitoring critical control points in the production and assist the traceability of events in foreign body detection.
- You can fast and easily switch products during normal production remotely. In other words: no downtime and increased output.
- Efficient working instead of wasting valuable staff due to remote access and full operability of your devices. This saves time – and money.

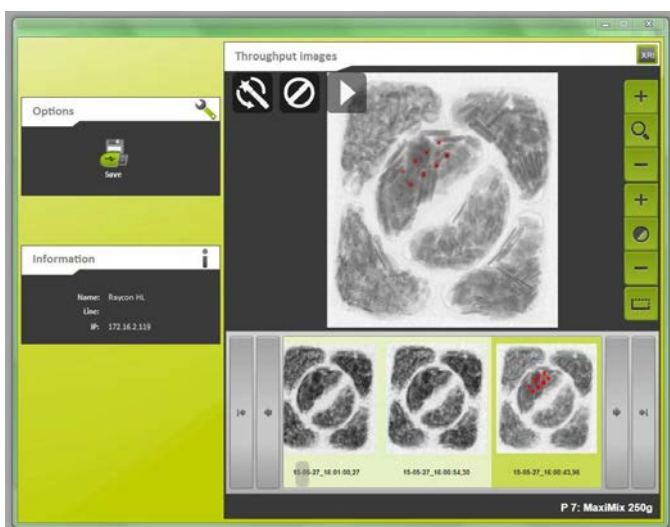
Your advantages

- Filter all required errors, warnings, information and more
- Create required reports (in html or .csv) with a single click by our integrated Report Generator
- Show product data of the connected devices, e.g. name of the product, sensitivity, product angle and more
- Backup and restore product data to be 100% sure these important information can't get lost
- Show metal signal in a diagram (long-term or current)

We offer you Support with remote service via Team Viewer and automatically inform you via email in case limit values are exceeded.



Connection to a central PC or laptop via serial interface (RS232 or RS485) or in a network (Ethernet or WLAN).



Download from the stored x-ray images of good and rejected products on RAYCON inspection system.

Insight.NET handling could not be easier

- No additional expense or extra cost due to easy and quick installation
- Immediate setup without training of staff thanks to user friendly design
- Intuitive operation by Windows® environment
- Suitable for all new RAYCON inspection systems and all metal detectors and separators with Control Unit GENIUS+ and GENIUS+ Touch controllers
- Up to 50 devices can be integrated into in the monitoring and operating system
- Insight.NET is available in multiple languages (German, English, Slovenian, Polish, Czech, Dutch, French)

Try Insight.NET for free and convince yourself

We want to make sure that you have convinced yourself of the usefulness and simplicity of Insight.NET. That's why you are free to enjoy the full advantages of Insight.NET for 4 weeks.

Just give us a call, get your software key and keep on optimizing your production in the future!



You can reach us 365 days a year

Our service is available 365 days a year and guarantees fast response times and short distances, thanks to service centers located all over the world.

Sesotec Worldwide





-  Sesotec HQ (Germany) and Subsidiaries
-  Sesotec Sales partners

Headquarter

Schönberg, Germany

Subsidiaries

Singapore, China, USA, Italy, India, Canada, Thailand

Factories

Germany, USA, Italy

Service – Spare Parts

Germany, USA, China, Thailand, Singapore, India, Taiwan, Italy, Canada

Test labs

Germany, Singapore, China, USA, Italy, India

Sales partners in 60 countries

Our strengths



Over 40 years of experience and reliability



Personal support in the after-sales area



Service-Hotline



Long-term reliability for spare part supply

Our goal: Pure products for our customers

- To protect consumers from harm
- To protect the brand from loss of image
- To protect the machines and tools from damage
- To protect the environment from raw material waste and pollution

Industry-specific solutions for meat processing



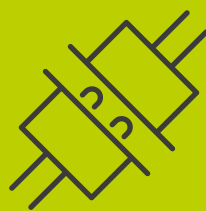
Easy to use



Highest detection accuracy



Easy cleaning and maintenance



Easy installation

Here at Sesotec, our speciality is contaminant detection and sorting on an industrial scale. We have been pursuing this focus for decades. In terms of versatility and quality, there is little that can compare to our range of products. We supply systems from a single stop for all process steps, product types and kinds of conveyance, as well as for all critical checkpoints (CCP) in the production process.

Your advantages

- Protection of the brand and corporate reputation through reliability in function and performance
- Increased customer satisfaction
- Consumer protection through highest detection accuracy
- Higher up-time and output due to easy cleaning and maintenance
- Fast amortisation due to avoidance of downtimes, repair costs and rejects
- Cost reduction through easy installation and operation
- Development of new markets
- Safeguarding competitiveness
- High-quality workmanship for maximum safety and function
- Longevity and thus investment security
- Guaranteed certifications for compliance with food safety requirements (quality assurance, HACCP)
- Engineered and Made in Germany

Exclusion of liability

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