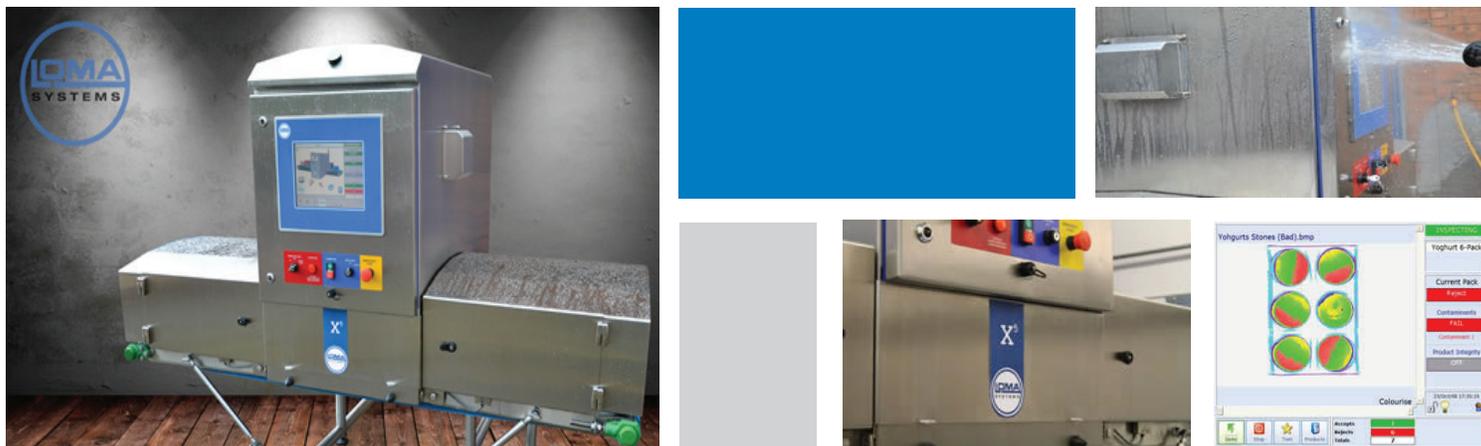


# Guide to X-ray Inspection



Loma Systems offers this guide to x-ray inspection to assist food and packaging companies in understanding this remarkable technology and establishing an effective inspection program

## EXECUTIVE SUMMARY

*X-ray inspection systems are fast becoming a common fixture in food processing and packaging plants throughout the world. The advantages that x-ray inspection has over traditional metal detection and checkweighing systems make them essential pieces of inspection equipment for many companies.*

*In order to help you learn more about this remarkable technology, read the following Loma Systems' Guide to X-ray Inspection.*

## Why X-ray Inspection

Brand recognition and HACCP programs are becoming increasingly important in the food and packaging industries. Today, consumers and retailers alike are better informed and more focused on purchasing quality products. A contamination issue can have an impact on the brand image and the long-term success of a business.

HACCP programs can help prevent contamination, provided the proper technology and processes are in place. Loma Systems is committed to providing the online contaminant detection systems required of many HACCP programs to protect your brand image and help your company win more business in the future.

There are three key reasons for investing in x-ray inspection:

- The business benefits from more dynamic inspection performance and greater confidence in achieving compliance
- Technical and marketing advantages are better than metal detection because x-ray systems can detect non-metallic contaminants
- Operational advantages lend maximum inspection performance at high line speeds with reliability and online simplicity



# Guide to X-ray Inspection

With fine grain imaging, an x-ray system can detect metallic and non-metallic contaminants such as glass, stone, flavor clumps and calcified bone, even for products packaged in foil or metallized film. It also simultaneously measures density, monitors fill levels, counts components and checks for damaged or malformed packaging.

## Business Case

Protecting consumers, brand image, integrity while ensuring quality and compliance represents a significant cost to your business. With Loma x-ray inspection systems, you can improve quality and reduce overall compliance costs. You also have the opportunity to increase market share and revenue.

- Ensure compliance with HACCP and retailer quality standards
- Accurately demonstrate due diligence
- Reduce recall costs
- Avoid litigation
- Increase your market share through customer confidence
- Improve customer satisfaction and retention
- Help you win new business where quality and compliance with the latest codes of practice is a key customer requirement

## Technical Advantages

Loma x-ray inspection systems detect metal contaminants better than metal detectors and detect non-metallic contaminants, as well as missing, underweight or broken products.

- Metal detection is not affected by foil or metallic packaging
- Excellent stainless steel detection
- Immune to environmental effects
- Detects non-metallic components such as glass, stone, calcified bone, plastics, rubber, ceramic, cement, pvc, etc.
- Identifies missing product, low fill and broken product

## Operational Advantages

Loma x-ray inspection systems ensure 100% confidence in compliance, without stopping the production line. The systems are simple to use and support high production line speeds.

- Production line speeds in excess of 600 packs per minute or 90m/min (300 ft/min)
- Dynamic analysis maximizes performance and virtually eliminates false rejects
- High speed computer maximizes throughput
- Simple touch screen Windows interface designed for ease of use
- Minimal training and product learn requirement
- Increased operational flexibility with minimal set-up and changeover times
- Ability to deal with product density variations and inspect randomly, produced products on a production run



The Loma Systems X5 x-ray inspection system is designed to withstand the rigors of harsh washdown environments.



# Guide to X-ray Inspection

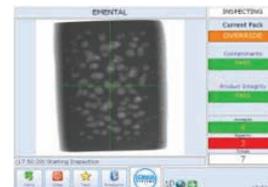
Loma x-ray systems utilize an extremely robust x-ray tube and detector array. The digitally-controlled, wide-angle, self-cooled x-ray tank is rated for high performance and the tube life is 7 to 10 years which is more than triple the life of other x-ray tubes on the market.

## X-ray Inspection Performance

### Detection Capability

X-ray systems can detect the following non-exhaustive list of contaminants:

- Metal
- Non-ferrous metals in foil, including stainless steel
- Glass
- Stones
- Bones (alcified)
- PVC plastic
- TFE (Teflon) plastic
- Ceramic or concrete
- Flavor/sugar clumps
- Missing product



### Limitations

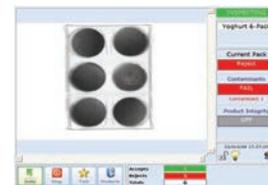
In most food-based products x-ray systems cannot detect the following materials:

- Low-density plastics
- Thin glass, such as fluorescent tubes
- Low-density stones
- Insects
- Wood
- Hair
- Cardboard
- Paper

### Applications

X-ray systems are particularly suitable for quality control in the following sectors:

- Ready meals
- Prepared foods
- Meat
- Bakery products
- Cereals
- Dairy foods
- Confectionery
- Vegetables
- Fruit
- Cosmetics



The new quick release belt feature enables you to easily pull out the conveyor belt for easy cleaning, maintaining hygiene in any production environment.



# Guide to X-ray Inspection

## Loma Systems and X-ray Inspection

### Global Food Inspection Capability

- Loma Systems is a world leader in the manufacture of metal detectors, checkweighers and x-ray inspection systems
- 95% of Loma's x-ray inspection systems are sold to the food and packaging industries
- Loma has more than 30 years of experience in food and packaging industry inspection
- Loma x-ray inspection systems are used by 35 / 40 of the world's largest food companies
- Loma x-ray inspection systems are installed in over 100 countries around the world

### Advanced Technology

- Utilize the same design concepts that make our metal detectors the choice of the world's largest food companies
- Highly sensitive to both metallic and non-metallic contaminants
- Features advanced image processing
- Incorporates sophisticated sensor technology and detection software

### Comprehensive Support

- Loma's international service and support network offers high-quality service and rapid response anywhere in the world
- Remote diagnostics are available via a modem connection
- Dedicated x-ray specialists provide guidance to help you meet compliance requirements
- We offer a systems integration service to help you link x-ray inspection systems, processing equipment and management information systems into a single integrated solution
- A range of flexible support packages can be tailored to your operating requirements, reducing downtime and ensuring systems operate at maximum efficiency

## Principles of X-ray inspection

### How X-rays Inspection Systems Work

An x-ray inspection system has three main components: a device to generate x-rays, a sensor to detect contaminants and a high-speed computer to process sensor data

### The Process

X-rays are generated by a special glass tube that is cooled. When high voltage is applied to that tube, electrons are generated. The electrons then strike a target which emits a stream of x-rays that are focused and reduced to a fan beam. The fan beam passes through the product before entering a sensor. The sensor then converts the x-ray signal into a form where it can be passed to a computer for processing and detection.

### Detection

- X-ray systems detect contaminants by density difference
- As an x-ray penetrates a product, it loses some of its energy
- A dense area such as a contaminant will reduce the energy even further
- As the x-ray exits the product, it reaches the sensor - an array of photo-diodes that precisely measure the x-ray energy that reaches them
- The sensor converts the energy signal into a grey-scale image
- A high-speed computer scans the sensor at thousands of times per second and stores the individual signals
- It compares them to a dynamic value that delivers the maximum level of sensitivity and minimum level of false readings
- A contaminant is highlighted as a darker shade of grey than the product
- Effective x-ray inspection depends on the sophistication of data analysis



# Guide to X-ray Inspection

## Frequently Asked Questions

### Technology Adoption

**Q.** Is x-ray inspection a commercially acceptable solution?

**A.** Early x-ray systems had reliability problems and were expensive. However, the involvement of mainstream inspection specialists like Loma ensures that new-generation x-ray systems are as robust and reliable as conventional metal detectors.

### Financial

**Q.** X-ray systems cost more than metal detectors. Why should I pay more to do the same job?

**A.** In terms of contaminant detection, x-ray systems do a better job. They can detect a wide range of non-metallic contaminants, as well as metal. However, there are other financial considerations which should be taken into account. An x-ray system reduces recall costs and minimizes the risk of lost customers. It also gives you the opportunity to win new business and increase market share in applications where quality is critical.

### Technical

**Q.** Can an x-ray system detect any contaminant?

**A.** There are limitations. If you select an x-ray, you can find out what can and cannot be detected.

### Product-related

**Q.** Are x-ray systems suitable for products with a variable density, such as a wedge of cheese or chicken fillets?

**A.** Loma's image processing software is designed to adapt to differences in product density, while maximizing sensitivity. This overcomes the problems associated with conventional systems.

### Production Line

**Q.** If I introduce x-ray inspection, will I have to run my line at a slower speed?

**A.** Loma x-ray inspection systems are designed to operate continuously at speeds in excess of 600ppm or 90m/min (300ft/min)

**Q.** Will I need to employ specially-trained operators?

**A.** No, Loma x-ray inspection systems require minimal training.

### Health and Safety

**Q.** Do I need to take special precautions to protect my staff against radiation?

**A.** No, emission levels are less than one third of naturally-occurring background radiation.

**Q.** Do I have to keep documentation regarding emissions?

**A.** All Loma machines comply with national emission and safety regulations. When the machine is first installed a documented examination takes place. However, for peace of mind, a periodic examination is advised. As this is a relatively simple process it can be done each day without the need to stop the production line.

**Q.** Will my products be contaminated by x-ray systems?

**A.** No, the dosage a food product can be subjected to is governed by controls. Loma x-ray inspection systems operate at around one millionth of the current limit.



# Guide to X-ray Inspection

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## Contact Us

United Kingdom  
 Southwood, Farnborough  
 Hampshire, GU14 0NY  
 +44 1252 893300 | [sales@loma.co.uk](mailto:sales@loma.co.uk)

United States  
 283 East Lies Road  
 Carol Stream, IL 60188  
 800 872 LOMA | [sales@loma.com](mailto:sales@loma.com)

Canada  
 333 Wycroft Road, Unit 11  
 Oakville, ON L6K 2H2  
 800 872 LOMA | [sales@loma.com](mailto:sales@loma.com)

China  
 Room 101, Block E  
 No. 168 Luo Yang Road  
 Minhang District  
 Shanghai 201104, P R China  
 +86 021 543 07218 | [asia.sales@loma.com](mailto:asia.sales@loma.com)

Czech Republic  
 U Lomy 1069  
 334 41  
 Dobruška  
 +420 377 183811 | [cz.sales@loma.com](mailto:cz.sales@loma.com)

France  
 12 Avenue du Quebec Silic 620  
 Villebon sur Yvette  
 Courtaboeuf Cx  
 91945 France  
 +33 169591620 | [fr.sales@loma.com](mailto:fr.sales@loma.com)

Germany  
 Vahrenwalder Strabe  
 269 A  
 30179 Hannover  
 +49 511 9666 811 | [de.sales@loma.com](mailto:de.sales@loma.com)

Netherlands  
 Daalderweg 17  
 Etten-Leur  
 4879AX The Netherlands  
 +31 765030212 | [bnl.sales@loma.com](mailto:bnl.sales@loma.com)

## About Loma Systems

Loma Systems is the world's leading engineering and manufacturing company specializing in metal detection, checkweighing and x-ray inspection systems. Our products are uniquely engineered for consistent quality with a low cost of ownership. We have successfully partnered with the world's largest food and packaging companies, located in over 100 countries, to comply with product safety standards and retailer codes of conduct.

Loma has over 120,000 metal detection systems installed worldwide and the IQ3 technology is the premier inspection system on the market today.

## For More Information

To learn more about the x-ray inspection technology featured in this guide, please visit: [www.loma.com](http://www.loma.com)

