

Using External X-Ray Inspection To Save More Product Impacted By Foreign Material Contamination

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Key Discussion Topics

- How Foreign Material Contamination Impacts the Bottom Line
- Evaluating Solutions to Resolve FMC
- How to Work with a Third Party Inspection Company



Foreign Material Contamination

Consumer complaint of foreign object leads to recall of ground beef products

██████████ dumplings recalled over possible foreign matter contamination

██████████ **recalls over 35K pounds of turkey sausage due to foreign material concerns**

By the Numbers:

- **15 recalls** for foreign material so far in 2024
- **70 recalls** in 2023
- **73%** of companies we surveyed have an **FMC incident at least quarterly**

How does Foreign Material Enter the Supply Chain?



Examples

- Livestock eats inorganic material → stones, plastic, etc.
- Plant/organic matter can also experience contamination when harvested → metal pieces from tractor machinery, chipped plastic from containers



Examples

- Organic material from livestock → bone debris from deboning / sawing livestock parts
- Inorganic material from livestock and plant matter → stone, plastic
- Maintenance failure of production equipment → lost screw from machinery, missing thermometer, metal fragments from sawing process



Examples

- Equipment accountability issues → i.e., a missing pen that is suspected to have fallen into a production batch
- Extraneous product breakage → a broken jar during the packaging process

Common Causes of Equipment FMC

Line Extensions

- New Materials
- New Equipment
- Unknown Impacts

New Construction

- New Equipment
- Process Change
- Lack of Prior Knowledge

Equipment Wear & Tear

- Unexpected Things Happen
- Parts & Pieces Deteriorate

Routine Maintenance

- Evaluate Parts
- Update Purchasing Processes?



The costs of foreign material contamination

Cost of Destroyed Product	<p>Significant impact to food manufacturer of destroying product due to sunk cost of production in addition to lost revenue</p>	Brand Reputation	<p>Foreign material contamination events are reported on news outlets and social media platforms, exposing food manufactures to significant negative publicity, litigation costs, lost sales, lost consumer confidence, etc.</p>
Inventory Constraints	<p>A hallmark of the food industry includes complex logistical considerations and rapid delivery times to guarantee shelf space</p>	Contaminants Entering Distribution	<p>Foreign contaminants expose consumers to safety hazards and can result in death, litigation, and recall events</p>
Retailer Relationships	<p>Lost production can risk meeting retailer requirements and result in losing a sale, or even the relationship entirely, with a lasting impact on the retailer's perception of a brand</p>	Regulatory Compliance	<p>The FDA is increasingly focused, including through recent new rules on the landmark Food Safety Modernization Act, on establishing preventative controls and harsher penalties in the case of recalls</p>
Opportunity Cost of Rework	<p>Food manufacturers experience lost production capacity by running the products through a second time, where they still may not find contaminants</p>	Fines	<p>Government fines associated with recalls and food safety issues are costly and can negatively impact a food manufacturer's business operations in the form of monetary costs and increased scrutiny of the production process</p>

Downstream Impacts of FMC

Customer Dissatisfaction

- Missed Orders

Storage Challenges

- Warehouse space is at a premium

Downgraded Product

- Lost product value / margin

Landfilled Product

- Total revenue / cost lost
- Sustainability goals impact

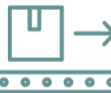


Evaluating Options for Resolving FMC



Dispose of Product

- x Loss of revenue
- x Loss of inventory stock
- x Damages retailer relationships, slotting fees, OOS Fees
- x Time and costs associated with producing replacement product, essentially double



Inspect Internally

- x Not the core competency of food manufacturers
- x Equipped to produce as much food as possible – as opposed to slowly re-inspecting
- x Cost of labor, downtime, and overtime
- x Do not have the same level of technology as FlexXray, still may face another option on top



Outsource to Third Party

- ✓ Protect brand reputation and retailer relationships
- ✓ Recapture otherwise lost revenue at an extremely compelling ROI
- ✓ Enhance manufacturing efficiency
- ✓ Uphold product & supplier quality

Is a Third-Party the Best Option?

Evaluating if a Third-Party is the Best Option

- ✓ In - Line capacity constraints
 - Line speed
 - Line time
 - Equipment
- ✓ Turnaround time needs
 - Impact to customer relationship
 - Customer specifications
- ✓ Cost of conducting internal rework
 - Labor
 - Impact to other production runs

Capabilities of Third-Party

- Detection capabilities
- Faster turnaround times
- Technology designed for inspection
- Product disposition post inspection



Metal Detection <i>In-Line</i>	<ul style="list-style-type: none"> • Uses electric signal disruption to detect metal within a food product • Limited when food contains high moisture, salt, or sugar • Most effective for aluminum
Vision Systems <i>In-Line</i>	<ul style="list-style-type: none"> • Typically uses AI / Machine Learning to teach the system. • Used for Qualitative analysis more than for foreign material. • Surface level detection only. • Product must be in a single layer.
Hyperspectral <i>In-Line</i>	<ul style="list-style-type: none"> • Emits photons of various wavelengths, uses spectroscopy to evaluate energy reflected back to ID the material • Only works on surface level • One of the best technologies for identifying rubber and plastic
Microwave <i>In-Line</i>	<ul style="list-style-type: none"> • Food passing through microwave-emitting systems disturbs the microwave field • Excellent detection capabilities, but very limited in usage • Piping system based homogeneous products are the best use case
X-Ray <i>In-Line / Third Party</i>	<ul style="list-style-type: none"> • Some highly dense products can make use of x-ray limited in line. • Can detect FM through density evaluation, limited when the density of FM approaches the density of product. • Speed of in-line production systems limits detection capabilities. The slower the speed the better the imaging capabilities, i.e. high technology third party
CT <i>In-Line / Third Party</i>	<ul style="list-style-type: none"> • X-Ray technology but uses a gantry to create a 360-degree rotational view of the product. Rotational aspect allows for a significant improvement in evaluation conditions and overcomes location / position limits of a 2D system. • Production speeds are too fast for the gantry to work effectively and gain excellent image quality. 30 feet per minute or less is needed for best imaging.

What makes FlexXray different from in-line technology?

Detection Screens

- Medical grade imaging technology
- Operators are easily able to identify the presence of contaminants quickly on the X-ray machine screens

Detection Accuracy

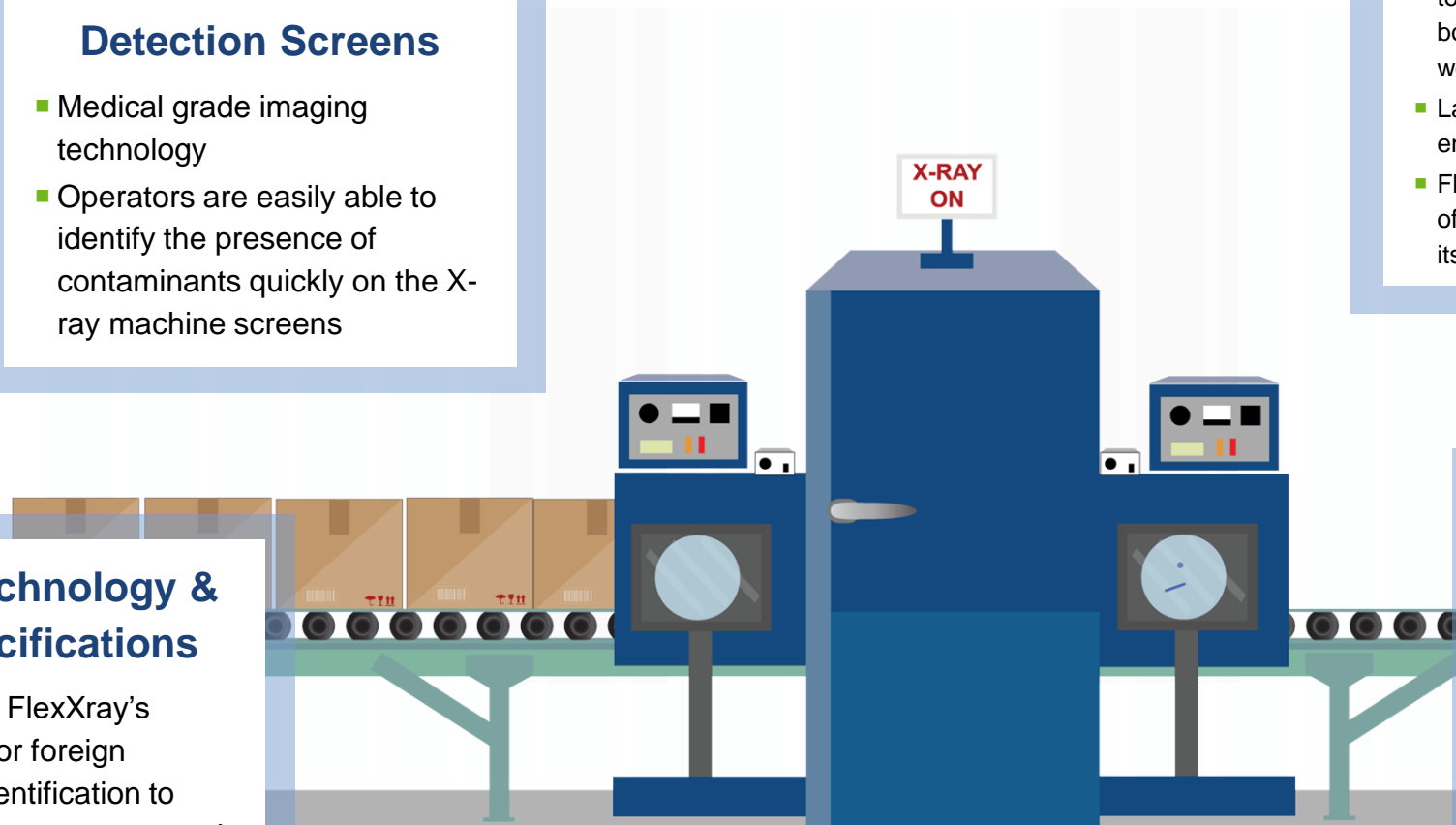
- Accuracy to pinpoint contaminants down to 0.8mm or smaller, such as metal, bone, glass, rubber, plastic, stones, wood, etc.
- Late stage R&D nearing completion to enhance detection limits to 0.1mm
- FlexXray not only detects the presence of a foreign contaminant but can pinpoint its exact location

Custom Technology & Build Specifications

- Custom built to FlexXray's specifications for foreign contaminant identification to address diverse customer needs

Multiple X-ray Machine Types

- Dual beam systems utilize twin X-ray heads located side-by-side to inspect larger products, including full cases and bulk items
- FlexXray's single beam systems are designed for smaller, individually packaged, or loose products and contaminant removal



Comparing detection capability



Best practices when working with a third party

When an Issue Occurs:

- Schedule inspection times that works for your turnaround time and needs
- Make decisions regarding contaminant retrieval
- Make decisions on additional forensic/identification work

Evaluation of Data

- If there are widespread findings
- High number of findings isolating in smaller time frame of product hold
- Low number of findings across the hold
- Low number of findings, but isolated
- No findings during inspection

Sample FlexXray Inspection Report

Report Summary	Product Description	Product Number	Cases Rec'd	Pallets	Pkgs Rec'd	Contam.	Total Rejects	Good Cases Ready to ship	Pkgs per case	Wgt per pkg	Wgt per case				
	57 oz FlexXray Product	1100419	1346	29	8,076	25	37	1,339	6	57 oz	21.375 lbs				
Product Information			Packaging Information			Inspection Status									
FlexXray Product						Start Date: 3/2/16		To: 3/2/16							
DISSECT & SEND BACK CONTAMINANTS TO YOUR NAME			C= Contaminated, RD= Rec'd Damaged, T= Trashed, RS= Case Rec'd Short												
Batch/Lot	Product Description	Product Number	Pallet # (LPN)	Case #	Packs #	Pass #	Fall #	C	RD	T	RS	Start Time	Fin Time	Start Temp	Fin Temp
5307587811	57 oz FlexXray Product	1100419	4439745520	47	282	270	12	12				1628	1752	2	4
5307587811	57 oz FlexXray Product	1100419	4439740570	48	288	279	9	2	7			1052	1205	4	6
5307587811	57 oz FlexXray Product	1100419	4439766518	48	288	286	2	2				1250	1400	3	5
5307587811	57 oz FlexXray Product	1100419	4439723542	48	288	287	1	1				1402	1525	4	6
5307587811	57 oz FlexXray Product	1100419	4439757806	48	288	285	3		3			1526	1627	3	5
5307587811	57 oz FlexXray Product	1100419	4439701106	48	288	288	0					1630	1738	4	6
5307587811	57 oz FlexXray Product	1100419	4439699502	30	180	180	0					1740	1845	3	4
5307587811	57 oz FlexXray Product	1100419	4439766228	48	288	287	1	1				1138	1218	3	4
5307587811	57 oz FlexXray Product	1100419	4439801776	48	288	287	1	1				1251	1356	4	5
5307587811	57 oz FlexXray Product	1100419	4439802070	48	288	288	0					1358	1520	3	4
5307587811	57 oz FlexXray Product	1100419	4439700321	48	288	288	0					1643	1742	4	5
5307587811	57 oz FlexXray Product	1100419	4439740822	48	288	287	1	1				1100	1215	3	5
5307587811	57 oz FlexXray Product	1100419	4439775213	48	288	285	3	3				1245	1352	5	7
5307587811	57 oz FlexXray Product	1100419	4439723726	48	288	288	0					1353	1458	3	5
5307587811	57 oz FlexXray Product	1100419	4439746428	47	282	282	0					1645	1753	5	7

Helping Prevent Foreign Material “Events”

- **Supplier Monitoring Programs**
 - Upfront inspection of new and challenging suppliers
- **Co-Packer Risk Management Programs**
 - Upfront inspection of new co-packers and/or new products
- **Portfolio Builds Based on Known Challenges**
 - Determine detectability upfront and prevent just-in-time delays



FlexRay is the leader in foreign material inspection services

Nationwide network of facilities

- 5 locations across the US

Track record in the food industry

- 1000+ customer facilities including 15 of top 20 food manufacturers

Operations to turn product around quickly

- 24 hr/day capabilities



Let's start the conversation



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