THE MEAT & POULTRY INDUSTRY

Foreign Material and External Inspection Guide

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Introduction

The consumption of animal protein is an essential part of our global diet, and studies show[1] that the worldwide demand for animal protein is set to increase steadily as the population grows.

For producers of beef, pork and poultry, this is good news! The future of the industry in this space is on a sound demand footing, though not without risks. To meet growing demand, meat producers need to continue to grow their ability to produce food safely and profitably.

As with any industry, challenges stand in the way of needed growth—concerns about disease, available land use, environmental impacts, feed supplies, labor shortages, landfill use and more.

As always, the chief concern for producers is the mindset of the consumer. As more conscientious consumers (Gen Y and Gen Z) grow in buying power, these concerns take on enhanced significance for meat producers. These up-and-coming generations are demonstrably more concerned than any previous generation with the impact of their purchase decisions—and prone to less brand loyalty, making them more likely to consider alternatives. While options like plant-based proteins are still in their infancy, these younger consumers have the buying power to boost demand for them if they feel the need to make other choices due to a lack of confidence in meat proteins.

While the opportunities afforded by growing demand paint a bright future for the meat industry, the challenges of maintaining market share are not insignificant. In this piece, we'll specifically address one of those challenges: **foreign material contamination.**

Last year, the North American Meat Institute produced an excellent handbook that provides guidance on designing a Foreign Material Control & Prevention Program (FMCPP). Our only comment on this piece is that it lacked any mention of third-party solutions to the problem of foreign material contamination.

A myriad of factors impacts the meat industry and public perception of the meat industry's role in keeping consumers and plants safe. A significant number of scientific articles, papers and presentations exist about the impact of microbiological controls put in place to keep the public safe, but very little has been written or discussed about the effect that foreign material contamination can have on public perception and brand trust.

One key difference between foreign material contamination and microbiological contamination: when plants encounter microbiological contamination, the entire production run is contaminated and must be disposed of. With foreign material contamination, in many instances only a small percentage of the product is affected. With a well-designed plan and a trusted partner, that foreign material contamination can be found, and **only** the contaminated product would be removed from the inventory, allowing the rest of the product to continue safely down the supply chain.

If you haven't read the NAMI Foreign Material Handbook[2], we strongly encourage you to do so. The content in this document is intended to expand upon their work and offer insight into how there are more options available to the industry that provide value to protein manufacturers by identifying, documenting and retrieving foreign material contamination from meat products of all types.

Part I: Understanding the Scope of the Problem

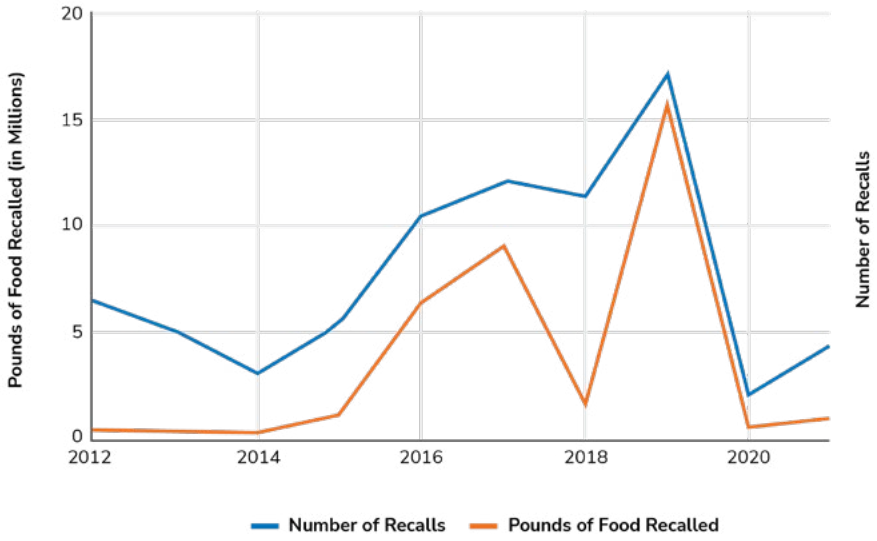
Foreign Material Contamination in Beef, Pork and Poultry

In this section, we want to clarify how we define foreign material contamination for the purposes of this guide. There is some debate about whether materials inherent to the animal are truly "foreign materials," but for the purposes of this article, we use the definition from the FDA and the USDA FSIS: *material that is not supposed to be in your product—whether that's bone fragments in boneless chicken nuggets, plastic in a chopped steak, or metal in a sausage link—is foreign material to your product.*

There's no question that foreign material is an issue throughout the food and beverage industry. Over the last five years, more than 18 million pounds of meat have been recalled specifically for foreign material contamination. This doesn't account for the volume of foreign material contaminants found during production that were caught due to an organization's established HACCP plan. That's exactly what these systems are designed to do, but they do not catch all of the issues all of the time.

With foreign material contamination, policies vary. In many cases, plants prioritize other threats to their product and don't have proper mitigation plans in place to specifically address this growing issue. That's why foreign material contamination is among the top three causes of food recall. First, let's look at the data from USDA FSIS on recalls in the meat industry due to foreign material contamination over the last ten years:

Foreign Material Contamination Recalls & Pounds of Food Recalled, 2012-2021



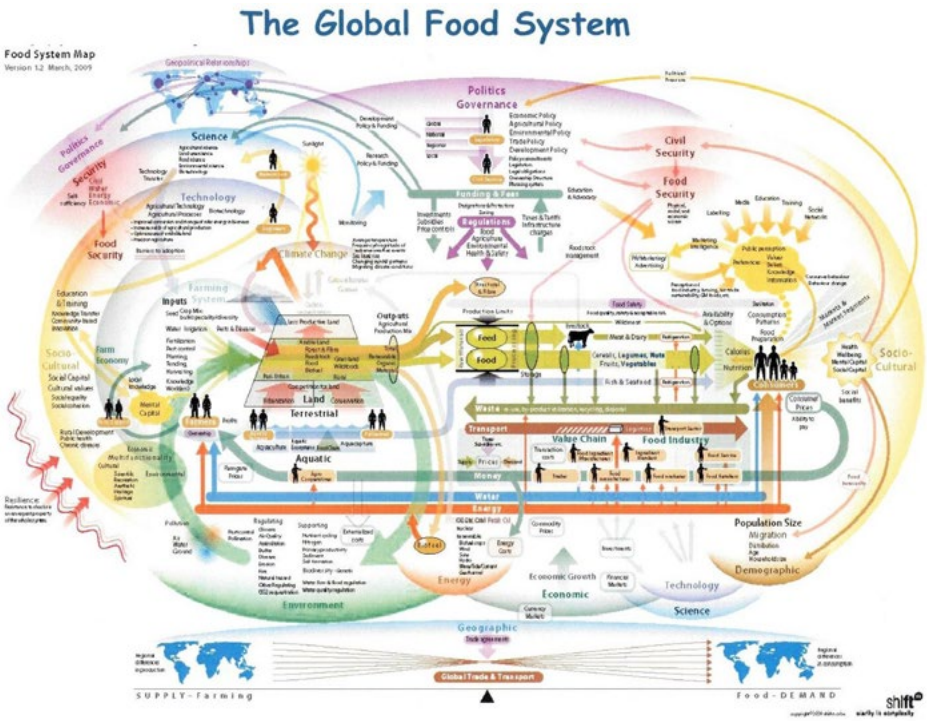
If we eliminate 2020 and 2021—which were aberrations in the food industry for many reasons—this data indicates that the problem of foreign material contamination is getting worse. Why? It's complicated.

Foreign material contamination has not been a watchword within the food production industry for all that long, particularly when compared to microbiological contamination. Over the past two decades, it's a problem that has been increasingly in focus as plants continue to modernize, our food supply continues to globalize, economics improve and consumers become more aware of the problem.[3]

As those in industry know, modernization in plants generally equates to increased automation and mechanization of processes to create cost-saving efficiencies. These innovations help food producers maintain or improve production outputs and margins by reducing manual labor costs. That said, they carry a different set of risks...particularly, the risk of foreign material contamination. One of the most common sources of foreign material contamination is in-plant machinery that has broken, eroded or failed in some fashion.

Globalization adds a different dimension to this equation, as producers source ingredients from suppliers within their home country and worldwide. Widely varying food safety standards in source countries contribute to the problem of foreign material contamination.

Our food supply is truly global, with constituencies from every corner exerting their influence on the process of getting food from the field to the table. While this has created a greater diversity of food than at any point in human history, it has also created greater supply chain risk. While suppliers to the U.S. industry are nominally subject to the same regulations as U.S.-based companies, in reality, foreign suppliers are regularly content to leave issues like



the detection of foreign material contamination up to U.S. companies with more advanced food safety systems and guidelines in place.

While the trends of modernization and globalization demonstrably add foreign material contamination risk to the equation for producers, modernization is not without upsides. The modernization of plants has introduced additional critical control point technology—like metal detection and X-ray—designed to detect commonly-encountered materials for food safety purposes. This has enabled producers to find more foreign material, but it is only one piece of the puzzle.

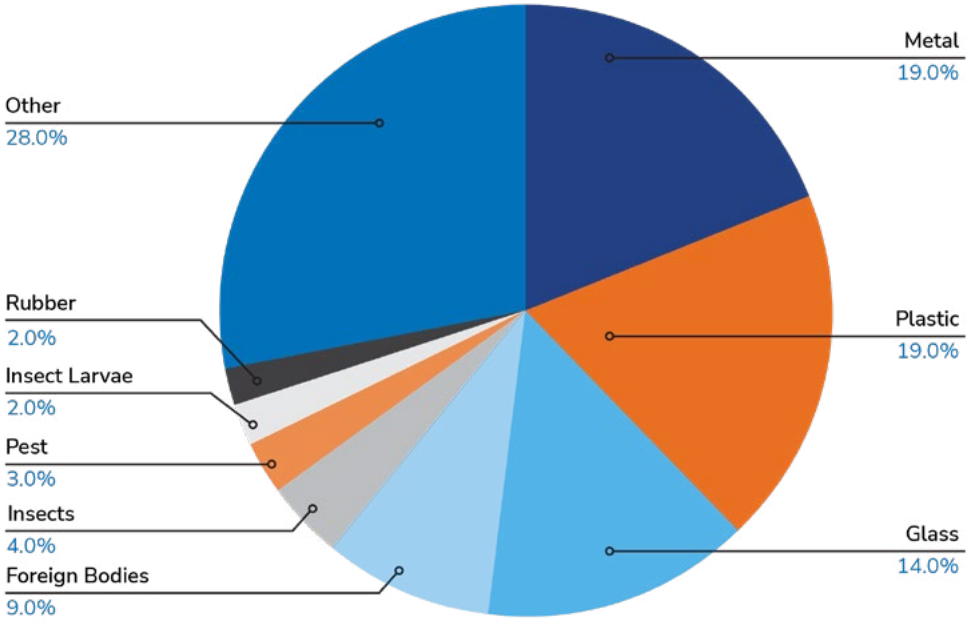
When the concept of a HACCP program was first introduced in 1960, it was specifically designed for NASA to help keep astronauts safe from microbiological issues in food. Like all great ideas, HACCP continued to grow and expand, and food manufacturers continued to evaluate their own HACCP plans to strengthen food safety. Manufacturers rely on their HACCP plan to help increase their overall capability to identify potential issues before product reaches the market. Part of that expansion utilizes other resources, such as environmental monitoring and third-party labs, to help verify and validate that their processes are working as intended.

In the case of foreign material contamination, your in-line detection technology is part of your HACCP plan, but it should not be your only control point monitoring for foreign material contamination. Expanding the foreign material component of your HACCP plan should include verification and validation steps that could entail utilizing additional processes and equipment or using qualified third-party inspection companies to help you confirm your process is working the way you want and expect it to work.

So how do these issues apply to the industries that utilize beef, pork and poultry in their products?

When we look at foreign material contaminants by type in relevant meat products, this is what we see[4]:

Specific Foreign-Body Hazards, 2011-2020



Metal

Metal is one of the most serious types of foreign material contamination we encounter at FlexXray. In meat products, this can come from a wide variety of sources, ranging from fragments of cutting blades to shotgun pellets embedded in animals before slaughter. Inline metal detection equipment can help relieve some of this threat, but in many cases, metal is non-ferrous or too small to be detected by finely-calibrated detection equipment. With the major risk that metal foreign material contamination poses to consumers, food manufacturers should be spurred to greater action based on the frequency with which we find metal in product.

Bone

One of the other most common types of foreign material contamination we deal with in the meat industry is bone. Typically these issues arise in “boneless” product where inline detection equipment may not always be capable of consistently distinguishing between product and bone of certain densities. In some cases, we’ve been contracted to help identify bone in products based on requests from downstream customers like quick-service restaurants that push suppliers into validation.

Plastic and Rubber

These two types of contamination can be very difficult for internal technology or internal rework to find. Because of these materials’ varying densities and non-ferrous nature, we’ve found plastic materials from production machinery, packaging and more in meat products of all types and rubber materials ranging from PPE to gaskets.

Other

Glass, wood, and other animal matter can end up in your product, and your in-house resources aren’t equipped to find it. These materials come from various sources, from pest infestations to human sabotage or accidents.

Part II: Changing the Approach

How You Can Plan Differently For Foreign Material Contamination

Think about your HACCP plan for food safety controls.

It contains a myriad of verification and validation steps where you check for biological and chemical contaminants throughout your production process. You have sanitation standard operating procedures (SSOPs) for every component in your production process. It's highly likely that you have a third-party service that works with your facility to routinely validate and verify the systems you have in place are working correctly.

Over the years, foodborne pathogens have been one of the largest reasons for food recalls, but when you look at the causes for recalls, foreign material issues have always been at the top of the reasons as well. Food manufacturers have focused a lot of their attention on foodborne issues to reduce the risk to consumers—and rightfully so. Now that there are more controls in place to detect and prevent foodborne issues, it is time for food producers to turn their focus to another leading cause of food recalls.

Foreign material contamination can be easily found and controlled—and yet very few (if any) food producers have a plan for validation of product for foreign material contamination like they do for microbiological contaminants. If you're an ingredient producer, you likely know what issues you have with foreign material contamination, but what you might not know is that your downstream channel partners know it too. They know if your product is more unreliable than your competitor.

We addressed this earlier in this piece, but we're seeing a growing trend of downstream customers (quick-service restaurants and finished goods producers) that are turning to FlexXray to validate their suppliers. Some of our customers are even making validation from **FlexXray** part of their contractual agreements.

In a disproportionate number of cases, the product being validated... is meat.

The purpose of this guide is to supplement NAMI's material on preparing for Foreign Material Contamination. The purpose of their guide was to help producers like you build a system geared to mitigate foreign material contamination at your plant. We believe we can help you take that a step further.

Recently, NAMI released a supplement to their piece specifically addressing pet food—a common destination for product that encounters foreign material contamination problems—where they specifically listed X-ray services as a tool for addressing foreign material issues. We're counting that as a win because one of the authorities in the beef, pork and poultry space acknowledges that x-ray is a viable technology for resolving foreign materials of all types, at least in pet food.

We would like to add that this solution is not only good for pet food but that it is a good practice for any food that is being sent out for human consumption.

If you're looking for guidance on how to build a better FSMS for foreign material contamination, we strongly encourage you (again) to read through NAMI's resource, but we also encourage you to add both a third-party contingency **and** a third-party validation plan to your standard practices.

The bottom line on contingency use is simple: outside, third-party inspection nearly always brings the best available ROI to the table. We've done our homework on the costs of disposal, internal rework, and risking product sent to market, and it doesn't stack up to what we do. If you repurpose contaminated product—say, to pet food—you're giving up ROI. In the meat industry, that's an even bigger sacrifice than in other verticals. Pound for pound, you make some of the most valuable products in industry. If you're reworking product, you're putting bad money (costs of equipment and people not purposed for the job) after good (the cost of producing product in the first place), which kills your margin and hurts your bottom line.

If you're not currently using a third-party service or don't have a contingency plan for using a third-party service, you should find a partner—like FlexXray—and build a valuable relationship **today.** The problem of foreign material contamination is not going away, and working with an outside resource can give you a major competitive advantage. Ultimately, we see the market headed in an even **more** focused direction.

Overcoming a Common Objection

> *Foreign materials are non-animal objects, such as metal, plastic, rubber, glass, wood, steel or lead shot. Only wholesome, unadulterated product is eligible to bear the mark of inspection and to enter commerce. If an incident occurs in which product may have become contaminated with a foreign material, the establishment is to examine the suspect product and to sort out and properly decontaminate or dispose of any adulterated product.*
>
> *FSIS Directive 7310.5, May 2003*

There you have it—the law of the land, at least in the United States. We want to turn your attention to a key phrase:

"The establishment is to examine the suspect product..."

We've talked to a number of producers who look at this wording and draw a hard line. Only the producer is supposed to examine product under a strict reading of this regulation, right? We'd buy that as a valid interpretation... if we weren't registered with the USDA, FDA and FSIS. They know what we're doing here. They inspect us the same way they inspect you, and they understand the capabilities that we bring to the table are over and above what you can do in your plant.

You don't have to resolve foreign material alone. FlexXray can help.

USDA

USDA Food Safety and Inspection Service

FDA

Part III: How FlexXray Addresses Foreign Material Contamination

Showing Our Work in Beef, Pork and Poultry

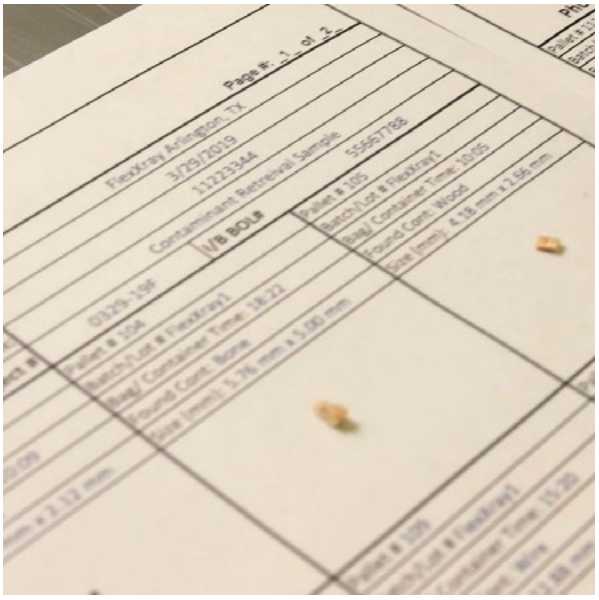
Over our history, we've worked on thousands of projects and saved millions of pounds of food and billions of dollars for the food industry—but as good as those numbers sound, they're no substitute for proving our work. We're bound by confidentiality, but in as much detail as we can provide, here are a few examples of how FlexXray has brought value to producers like you.

Case #1: Fleshing Out Bone

What They Asked Us To Find: Bone and bone fragments

Producer: Supplier for Quick-Service Restaurant Chain

What We Found: Lots of bone in varying sizes



This customer was faced with a **huge** QA hold due to bone foreign material contamination that was impacting one of their biggest customer relationships. After we inspected and cleared more than one million pounds of their product, they took aggressive action within their plant. They installed new equipment to help better detect bone and bone fragments, and then they used FlexXray **again** to audit their updated equipment. Not only did FlexXray help resolve foreign material in existing product, we became a trusted partner for this producer to validate their updated technology and procedures for foreign material contamination in the future.

Case #2: Exceeding Expectations

What They Asked Us To Find: Metal

Producer: Frozen Food Products Containing Beef, Pork, Poultry

What We Found: Steel, brass, ferrous metal, ceramic, glass, rubber

This case is an example of something that happens more than one might expect—a producer asked us to inspect their product looking for one material, and we found significantly more than they were looking for. The variety of contaminants in this particular scenario was diverse (even by our standards), but we were able to reveal to the producer the extent of their foreign material contamination problem—we even found a piece of bone bigger than 7 mm. This producer supplies a variety of downstream restaurant customers, and this type of problem has the potential to affect **all** of those business relationships.

Fortunately, when they couldn't find it, FlexXray could.

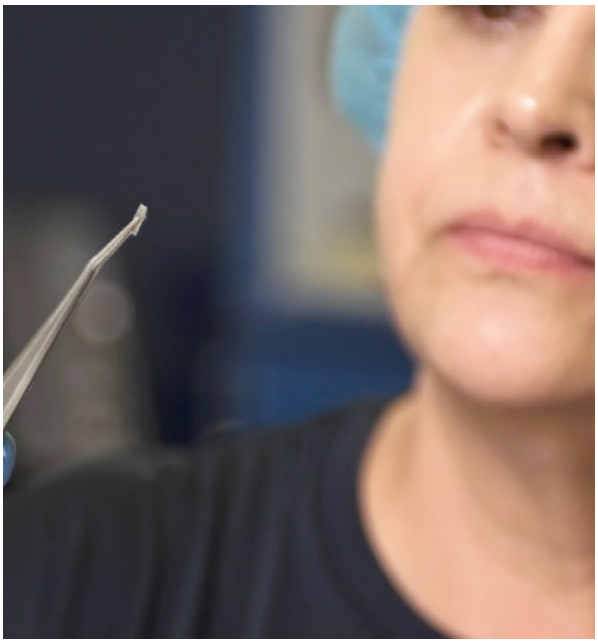
Case #3: Continuous Improvement

What They Asked Us To Find: Metal, some smaller than 1.0mm

Producer: Pork Product Manufacturer

What We Found: Metal, alloy, bone

One of the largest jobs FlexXray has ever done, this project utilized inspection services from three of our inspection facilities. This is not uncommon when we have inspection jobs where product needs to be delivered from inspection to distribution across a wide geographic area and the customer needs a high level of throughput. As a result, the customer could not only avoid product destruction but meet their supply chain expectations nationally. The customer's feedback to FlexXray was that our process "simplified the process" of clearing product on QA hold due to foreign material contamination. Ultimately, we helped this client save 96% of their product from destruction, which had a major impact on their bottom line.

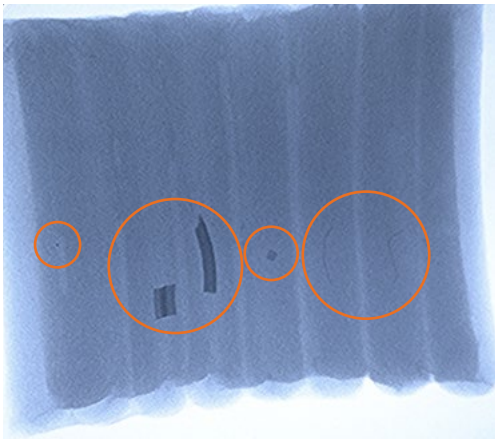


Case #4: Unleaded Jerky

What They Asked Us To Find: Metal

Producer: Multi-national Producer of Products, including beef jerky

What We Found: Lead from buckshot, brass bullet fragments



Sustainability is a growing concern for consumers and manufacturers alike. This repeat FlexXray customer has a standing policy against product destruction (except as a last resort), but their internal systems could only detect metal 3 mm or larger. We inspected over 3,000 cases of product and salvaged 98.6%—which was roughly $1 million dollars in product value. FlexXray's ability to find metal and other foreign contaminants to at least 0.8 mm made the difference between a huge quantity of destroyed product and a seven-figure revenue bump.

Case #5: Dropping the Spatula

What They Asked Us To Find: Plastic Spatula Pieces

Producer: Canned products containing animal protein

What We Found: Plastic Spatula Pieces

Many of our inspections result from mechanical failure—but sometimes, it's simple human error. In this case, a customer contacted us because an employee dropped a hand-held spatula near a mixing line. When they recovered they recovered the spatula, they discovered that several large pieces were missing. They sent us 745 cases of product for inspection, and we cleared 741 of them, representing a 99.4% salvage rate.

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Part IV: Key Concerns in Foreign Material Contamination

The Impacts of Foreign Material Contamination

In the previous sections, we've discussed some of the issues and problems that arise around foreign material contamination. We've given examples of how we have been able to assist the industry when plants do not have the time and/or tools to rework product internally. The impacts on your company can be every bit as huge as your foreign material is small. In this final section, we'll cover some of the impacts of foreign material using terms that likely keep you awake at night.

Brand Damage

Trust is hard to win and easy to lose—and that's one of the biggest impacts foreign material contamination can have on your brand.

Brand damage is an impact of unchecked foreign material contamination that cuts two ways:

1. Loss of brand reputation from ***consumers*** that find and report FMC in your product(s).

2. Loss of brand reputation from ***business customers*** that buy your product to serve consumers.

News stories across the nation have reported consumer reactions from finding foreign material on their dinner plate. On our website, we have a few video compilations of news stories that we collected from local media around the nation. These stories represent the handful that we could use where the producers' name wasn't immediately mentioned at the top of the story. There were hundreds of stories we couldn't use. The brand damage from these types of events is difficult to measure—but it **does** have an impact. Losing customers is an expensive proposition. It's not about one or two sales; it's about the lifetime customer who might buy your product 100+ times over the next decade that switches to your competitor. That's hundreds, if not thousands, of dollars, lost.

While losing consumers is a scary proposition, losing customers—defined here as other businesses that buy your product—is downright terrifying. Over the last few years, as supply chains have struggled, we've seen more and more quick-service restaurants turn to us for supplier validation. These customers have discovered a problem they're not willing to bear the brunt of, and they've directed their suppliers to FlexXray to ensure foreign material doesn't reach consumers. While losing individual consumers is costly, losing supply relationships can be devastating. Millions of dollars are at stake, all tied to your brand's reputation within yourbusiness relationships.

Food Waste

This topic is an important one for 21st-century industry. Not only is addressing food waste an ethical cause—after all, our purpose as an industry is to feed people—it's also a smart one for business. Across industries, businesses are adopting "ESG" or Environmental, Social, and Governance goals as consumers increasingly favor businesses with a "higher purpose."

While ESG goals are broadly important for market and brand perception, these issues are largely addressed on a corporate level.

The main issue at play is the bottom-line impact of food waste caused by foreign material contamination. Despite the presence of better options (like using FlexXray), many producers still default to disposal of product when faced with a foreign material contamination issue. In some other cases, producers lack the technology to detect some types of foreign material, like plastic. With no capability to detect this foreign material, disposal is safer than ignoring the issue... but it's still not the best option. At FlexXray, we've built our business specifically to address these two issues. We can find foreign materials your equipment can't and help you avoid costly disposal.

Cost of Rework

While disposal is still an all-too-common "resolution" to foreign material contamination, our market research indicates that it holds second place to another resolution technique: internal rework. While internal rework can be a valid option in limited cases, it still carries consequences to your bottom line that too often go ignored.

First, internal rework carries significant costs. When you have a foreign material contamination issue, rework can result in shutting down active production in order to rework product. It can mean pulling in labor resources that would otherwise be tasked with important production, maintenance or sanitation work—or incurring overtime costs to rework product during off-hours. These costs add up. Our bottom line at FlexXray is to help protect yours, and we price our inspection services accordingly.

Second, your labor force has the expertise to produce product, but they don't have the skills needed to rework product internally. The core competency and technology isn't there for your team to find foreign material contamination effectively, since that's not what they're trained to do. At FlexXray, our labor force is trained to find foreign material contamination all day, every day.

Lastly, the equipment in your plant is designed to serve a specific purpose in your production line. This is one of the key areas where the NAMI guide mentioned earlier spends a good deal of time—your inline equipment can

be an incredible tool for finding foreign material contamination throughout your production process. This same equipment, while useful at critical control points, can be extremely limited when used for rework. Metal detectors are only useful for finding metal, while X-ray detectors are typically calibrated for one specific type of foreign material. Few plants have equipment separate from a production line, and your finished product may not be capable of reentering your critical control points without labor-intensive depackaging.

Internal rework may seem like a good option—and in certain cases, it can be—but more often than not, it's more costly than sending product to FlexXray.

Recall

Last but certainly not least, there's the most feared consequence of foreign material contamination: a recall. Recalls hit on nearly every one of the consequences outlined above:

- Your brand reputation takes damage
- You dispose of a large quantity of product
- You incur costs and potential fines associated with recall

That's a terrible trifecta.

We don't need to tell you what a big deal a recall is. As an expert in the food industry, you know. What you may not know is that when you have an issue with foreign material contamination, there's a better way, with FlexXray.

Closing Thoughts

The food and beverage industry is changing. Addressing foreign material contamination through third-party inspection with FlexXray is critical to how your firm can stay profitable, competitive, and on the leading edge of food quality and safety in the 21st century.

Here are some action steps you can take right now:

1. Make sure you're talking about foreign material contamination in the context of your HACCP planning, as **much** as you talk about biological and chemical contaminants.

2. Understand the key sources of foreign material contamination in the meat industry—metal, bone, plastic, and rubber—and how to mitigate them.

3. Do the math on the process of internal rework, repurposing or disposal so that you know the comparative value of third-party inspection for your product.

4. Get to know FlexXray. We're the best-equipped, most knowledgeable and successful third-party foreign material inspection provider in the world, and we'd love to help you resolve your foreign material contamination issues.

Appendix

1. Meat and Dairy Production, Our World in Data
2. The Meat & Poultry Industry Foreign Material Manual
3. Food Safety News, Stericycle Report Shows 'Foreign Material' Top Cause of Recall
4. Food Safety Magazine, How a Mature Food Safety Culture Can Prevent Foreign-Body Contamination

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