

FOREIGN MATERIAL CONTAMINATION:

The True Impact on Business

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Executive Summary

Foreign material contamination has a significant impact on food businesses and the larger supply chain. Companies will face unplanned downtime, delayed deliveries to customers and possibly product shortages at retail, with potential loss of premium shelf space. However, companies can reduce the risk and impact of foreign material contamination.

Most foreign material contamination originates at the manufacturer's production line or at the ingredient supplier's facility. The first case is much more frequent, as greater automation creates more opportunities for equipment fragments to end up in food, usually affecting one batch. Though less frequent, contamination of an ingredient from a supplier can affect multiple batches.

When the contamination is detected before products leave the facility, the best option is to process the whole batch and put it on hold. After that, the quality and maintenance teams can stop the line to investigate the issue.

In addition to the impacts noted above, reinspection will further prolong downtime. In many cases, companies choose to dispose of the product, requiring disposal protocols, costs and even more downtime. If a facility were able to reprocess the batch, production time and costs would double.

No prevention program is fail-proof; but, companies can lower both the risk and impact of foreign material contamination with four key practices:

- Learn from incidents and make necessary improvements
- Use a rework and inspection service
- Align quality and maintenance teams
- Reassess risk with every process change

Because companies have strong safety programs, many cases of foreign material contamination are discovered before the products enter the retail or food service supply chains. Even though these incidents don't represent a risk to consumers, they still have serious consequences.

Recalls complicate matters further:

- Brand damage from bad publicity—in cases of foreign material contamination, almost all product recalls result from consumer complaints
- Lost revenue—in some recalls, more than 50 percent of the recalled products are returned to the store for a refund
- Crisis management time, expertise and costs—companies spend additional time to liaise with retailers and health authorities and insurance payments come into play, impacting future rates

Between 2020 and 2022, the USDA's Food Safety and Inspection Service (FSIS) published 33 product recalls and health alerts due to foreign material contamination. Recalled products amounted to more than 2 million pounds, about 88,000 pounds per recall on average. You can find the FSIS recall summaries by year [here](#).

This white paper offers an overview of the main foreign material contaminants and how they can end up in food, describes their real impact on production schedules and other areas of the business and suggests four ways to minimize both the risk and impact of contaminations.



The Most Common Foreign Material Contaminants

Metal



Metal equipment contacts food the most and, unsurprisingly, is the most common physical contaminant found in food. It is also the easiest to detect; any food manufacturer with the right combination of metal detectors and in-line X-ray systems can minimize the risk of contamination from both ferrous and non-ferrous metals.

Bone



Bones are the second-most-frequent foreign material contaminant. Legally, they're not considered a physical contaminant (for the USDA, only objects of non-animal origin have the status of foreign material). However, they can become an issue in boneless meat products. Their low density and smaller pieces make detection challenging for food manufacturers.

Plastic



Plastic is a much less frequent contaminant—common sources being tools, utensils, bags and liners. Due to its low density, plastic is much more likely to escape traditional detection systems used by food businesses. For this reason, plastic, not metal, was the main cause of product recalls and health alerts due to foreign material contamination notified by the FSIS between 2020-2022.

Rubber



Rubber contamination is mostly caused by gaskets and O-rings in pipes, pumps or extruders. Like plastics, rubber can be difficult to detect, but its risk of contamination is generally lower. The exception would be pipe-based production systems, typical of liquid foods such as yogurts, where the risk of rubber fragments entering the product stream is higher. With

liquid foods, however, it's possible to reduce the risk substantially by using fine-mesh sieves.

Glass



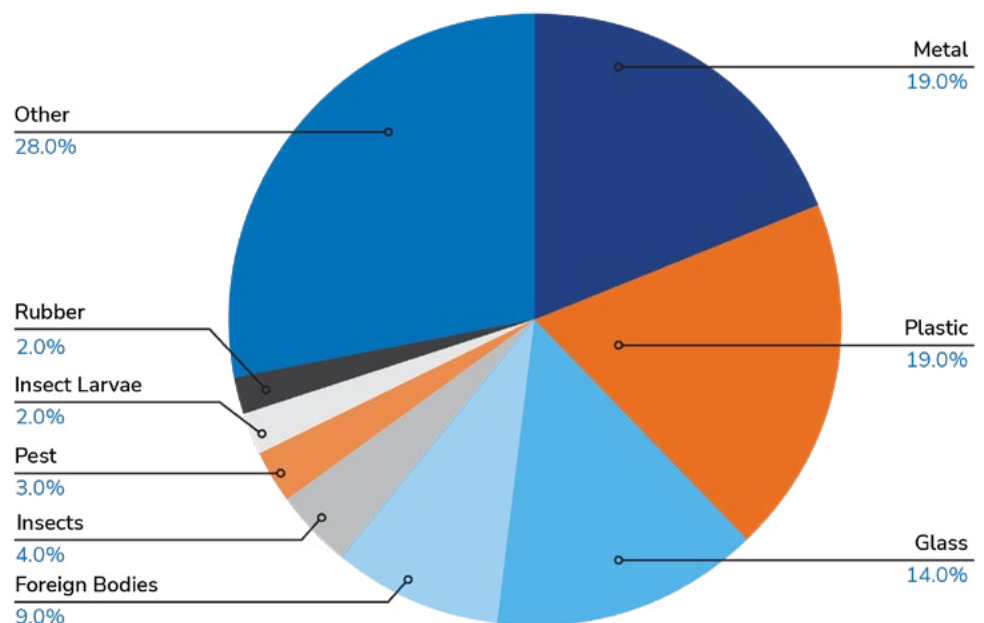
Glass can also be difficult to detect with in-line equipment, especially when broken glass fragments end up inside the container itself (also known as glass-in-glass contamination). Soda lime glass, commonly used in food containers, has a higher density than the glass used for lightbulbs and windows, and is therefore easier to detect.

Wood



Wood has essentially the same density as food, so it's virtually impossible to detect by X-rays, unless it's high-density "wet" wood. Cases of wood contamination, however, tend to be sporadic: only three recalls were notified by the FSIS in the last eight years. The risk of wood contamination mainly comes from pallets and can be minimized by making sure that they're in good condition.

Specific Foreign-Body Hazards, 2011-2020



Different Points, Different Impacts

Foreign material contamination tends to happen primarily at two points in the processing chain: the manufacturer's production line or upstream at the supplier's plant. Consequences and risks vary depending on the point of contamination.

Contamination from the **production line** is much more frequent. Although industrial automation allows food manufacturers to improve efficiency and compensate for labor shortages, it also increases the risk of contamination from equipment. Grinders, cutters, blenders, extruders and other types of machinery create many opportunities for metal-on-metal contact and fragments ending up in food. A shrinking workforce means fewer visual checks of the production line.



By contrast, foreign material contamination from **suppliers** is much less frequent, but tends to create bigger problems. Take the example of a plant producing breaded chicken nuggets. If chicken is contaminated in the processing line by metal fragments that came off the grinder, it is possible that only a single batch of product—typically 10,000 pounds, the size of an industrial food blender—is likely to be affected. However, if the culprit is the flour used for breading, a batch of the same size will be used (and potentially contaminate) multiple batches of finished product.

Cascading Impacts of Detection

Post-packaging metal detectors and X-ray systems often detect foreign material contamination before products are boxed, palletized and shipped. When that happens, the best solution is to put the whole batch through the process, package it and put it on hold. At that point, the quality and maintenance teams will stop the line to investigate what caused the contamination and remove any foreign material contaminants.

The immediate consequence of this type of incident is unplanned downtime, with a cascading impact on other parts of the business:

Impact of delays

The manufacturer won't be able to ship that batch on time and may be late with other deliveries before it has recovered from the delay; this may hurt relationships with customers.

Loss of retail slot

If the delay causes shortages at retail, retailers may fill the manufacturer's designated shelf space with other brands, potentially opening the door to a permanent loss of premium shelf space for the manufacturer, creating long-term sales consequences.

Rework

Rework requires additional labor, equipment usage, packaging supplies and ingredients, effectively doubling the production costs.

Batch on hold

It's likely that only a fraction of the batch on hold is contaminated, so ideally, it should be reinspected to recover the product that can be sold; few manufacturers do this because a reinspection would further prolong downtime.

Disposal issues

Unless the company hires an inspection service, the only solution is to dispose of the whole batch, which has its own costs; a large quantity of food can't be sent to a landfill or discharged into the sewer, it must be disposed of in special facilities, creating additional fees.

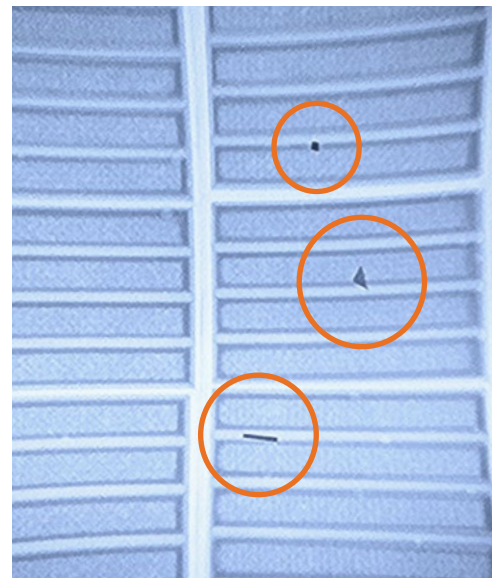
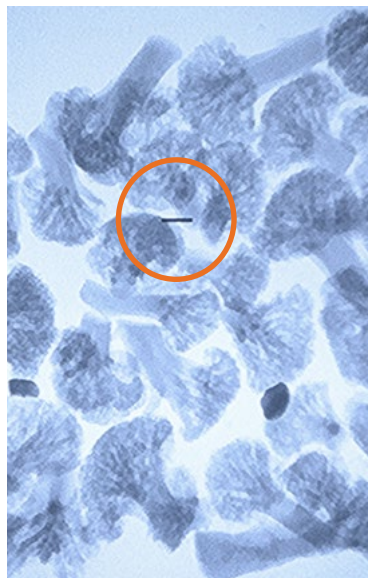
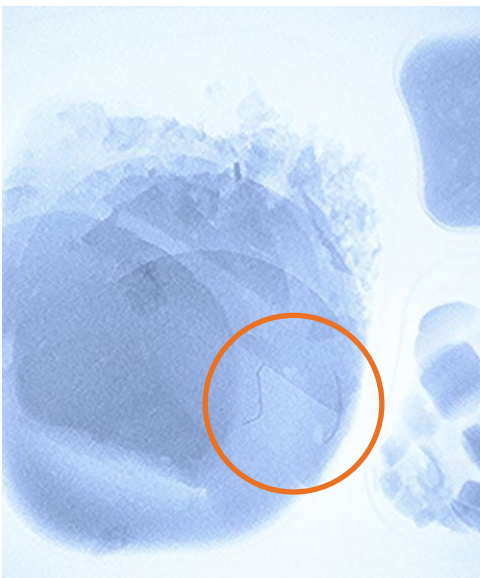
Food waste

Sending products to the landfill also means creating a huge amount of food waste, which can have a negative impact on the manufacturer's sustainability scores and metrics.

Additional Recall Implications

A product recall spurs additional issues:

- **Publicity impacts sales and reputation.** Beyond the sales loss of the recalled product, publicity can hurt long-term sales. When companies recall product because of foreign material contamination, in almost all cases, the problem is discovered through consumer complaints. Furthermore, each recall or health alert is widely shared by news outlets and individuals on social media.
- **Lost revenue from a recall far exceeds losses if some product can be saved.** The lost revenue caused by the recalled product can be much higher compared to what the manufacturer would lose if they reinspected the affected batch to salvage as much product as possible. With a recall, consumers are usually instructed to dispose of the product or return it to the store for a refund; data from the USDA's archive of product recalls shows that, in some cases, consumers get refunds for more than 50 percent of the recalled product.
- **Labor costs outside production rise.** Extra labor costs will be higher, as the crisis management team will have to work longer hours to liaise with retailers and health authorities. Departments beyond the plant will be involved, including senior management, legal, PR, etc.
- **Insurance rates increase.** Often, if the recall is big enough, it might involve the payment of insurance claims, which will cause rates to increase.



Four Ways to Minimize the Risk and Impact of Foreign Material Contamination

Like all contaminations, the risk of foreign objects ending up in food can be minimized with a robust food safety management system that combines preventative measures with effective third-party detection technology.

Although no prevention program against foreign material contamination will be fail-proof, there are ways to reduce the risk and impacts of foreign material contamination.



WAY 1

Use incidents as opportunities to improve. Is there something wrong with the preventative maintenance system? Is it time to change that ingredient supplier or co-packer?



WAY 2

Use a rework and inspection service to salvage safe product, save on costs, reduce food waste and meet customer demand. If a company put 10,000 pounds of product on hold, a reinspection service might help it save a significant amount of product to be shipped to customers.



WAY 3

Make sure your quality and maintenance teams are aligned. When the two teams don't work together, any equipment breakdown that causes physical contamination results in larger product holds, longer unplanned downtime and a lot of finger-pointing.



WAY 4

Reassess risk every time you make any change to the process. A new ingredient, a different processing step or a different piece of equipment might increase risk of foreign material contamination.

About FlexXray

FlexXray is pleased to provide this white paper on foreign material contamination and ways to reduce risk and mitigate loss. Our inspection and rework service can recover up to 95-97 percent of a batch on hold and eliminate the need for a recall. When your internal systems signal a problem, make your first call to FlexXray.





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