Manufacturing & Distribution
FOREIGN OBJECT CONTROL

Getting a Handle on Foreign Materials

Risk assessments of raw materials, process, and finished product, and analysis of customer complaints can help identify control measures.

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The Hazard Analysis and Critical Control Points (HACCP) system classifies risks to consumers into three categories—biological, chemical, and physical—and it emphasizes preventing, reducing, or eliminating high-risk biological hazards. Food safety professionals, as a result of years of education, experience, and audits to the HACCP system, often relegate physical hazards to lower risk status, primarily controlled through the metal detector and supplier approval programs. When focusing on microorganisms, it is easy for the food safety professional to forget that the "illness" in "food borne illnesses" encompasses injuries as well as disease.

The general public, however, has a different perspective on food safety hazards. Consider a salad with fresh, crisp lettuce, crunchy cucumbers, and juicy tomatoes. Food safety professionals see a salad as a bowl potentially brimming with E. coli O157:H7, pesticides, and insects. Consumers, however, won't notice the E. coli O157:H7 and are unlikely to be concerned about chemicals, unless it's a question about the organic status of the vegetables. But they will notice a grasshopper nestled under the lettuce at the bottom of the dish. Where food safety professionals focus their actions on the intangible risks of biological and chemical hazards, consumers focus on the material risks of physical hazards.

This example illustrates the importance of foreign material control. Though Salmonella and hepatitis A may keep the food industry awake at night, consumers remember, and tell their neighbors, about the grasshopper in their salad or glass in their spaghetti sauce.

Health Hazards

Foreign material is defined as foreign bodies that may cause illness or injury to the consumer, or are perceived by the consumer to be alien to the food. While not all foreign material is harmful, it is a physical hazard and its potential to cause injury or illness must be considered. The Canadian Food Inspection Agency (CFIA) recognizes three risks to the consumer from foreign materials—physical injury to the consumer, choking, and product tampering.

Customer Complaints

Foreign material in foods (glass, plastic, metal, etc.) is the major single cause of customer complaints received by many food manufacturers, retailers, and enforcement authorities. In Canada, 42 percent of consumer food safety investigations conducted by the CFIA between April 2011 and March 2012 were the result of consumer complaints of extraneous materials, whereas only 11 percent of the 496 recalls issued in 2012 were caused by extraneous materials.

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It's not hard to understand why foreign materials account for such a high percentage of customer complaints; physical hazards are easily identified by the consumer. Physical hazards can often be seen in the food item before consumption whereas biological and chemical hazards are rarely identified by sight. Consumers can also feel the presence of a physical hazard in their food; biting into a piece of wood, chewing a tooth on a date pit, or choking on a piece of plastic are all dramatic incidents. They also have an emotional reaction to foreign material. While a grasshopper may stimulate disgust, it's not likely to be seen as hazardous. Other materials, however, such as glass, metal, or plastic, are seen as dangerous and the consumer will likely notify the manufacturer or the government.

Sources of Foreign Material

To prevent injury to the consumer, it is necessary to understand what types of foreign material can contaminate food and where this contamination occurs. Foreign materials are classified as either intrinsic (a component of the food such as bones, stems, or pits) or extrinsic (materials not normally found in food, such as stones, insects, plastic, glass, or metal). These categories indicate that physical hazards may contaminate food at any stage of production, from the farmer's field, e.g., stones in grain, to the consumer's kitchen, e.g., glassware.

Risk Assessments

Raw Materials and Process. Controlling foreign materials requires understanding three items. First, are there physical hazards intrinsic to your raw materials? Second, are there physical hazards inherent in your process? Third, are there hazards commonly associated with the food product when it's consumed? A well-documented hazard analysis can help the producer, from the field to the manufacturer, focus its resources on the highest risk sources of foreign materials. The identification of physical hazards (FSEP Form 7) associated with raw materials (FSEP Form 2) and process (FSEP Form 3) facilitates the hazard analysis (FSEP Form 8).

Once the high-risk items and processes have been identified, effective control and monitoring strategies can be developed and implemented. As a result, virtually every HACCP plan has some form of foreign material control as a critical control point.

Mitigating the risk completely, however, is impossible. Therefore, the CFIA has also developed Guidelines for the General Cleanliness of Food—an Overview, which provides maximum limits for the amount of foreign matter in some foods. Two examples include an allowance for magnetic metal particle size and presence in chocolate and pits or pit fragments in pitted dates. This is a valuable resource for determining acceptable amounts of foreign materials in food and can guide both your HACCP program and your response to customer complaints.

Finished Product and Intended Use. Hazards commonly associated with a food product are often overlooked. For example, if you are producing spaghetti sauce packaged in glass jars, your company has an elevated risk for glass complaints and should have good processes in place to control glass and respond to glass complaints. However, if your finished product is grated cheese, you are also at an elevated risk for glass complaints because your product is often served with spaghetti sauce. If the glass from the jar is eaten with the cheese, your company could receive the complaint. In this case, your company should recognize this risk and have a procedure to handle these complaints. This extra risk assessment is invaluable in determining what type of customer complaints a manufacturer may expect and how the company can direct its investigations accordingly.

Controlling Foreign Material

A HACCP plan is the foundation of effective foreign material control as it identifies the raw materials and process steps where contamination is likely to occur. Using the HACCP risk assessment, as well as industry standards, guidelines, regulations, and scientific studies, the facility can identify the steps in the process where foreign material control is needed. At the manufacturing level, devices commonly used to control foreign material include metal detection, X-ray, optical sorting equipment, mechanical sorting equipment (screens, screens, filters, and magnets), bone separators, and visual inspection.

Farm processing may include destiners, gravity tables, air separation, and visual inspection. This list is not exhaustive, and the devices needed in each facility will de-

Importance of Foreign Material Expertise

The appearance of unexpected particulate in foods raises questions about their origin and evokes safety concerns. Foreign particulate may be introduced via raw materials, or during the manufacturing process. Quality control laboratories can catch problems before products ship, but they do not always have the facilities to identify foreign material—a critical task in determining the problem's origin. Working in partnership with quality control groups, contract analytical laboratories can help establish the source of the problem by identifying the nature of foreign material.

For instance, particulate floating in one beverage had been identified by a lab as erucamide, a common slip agent, while particulate in another beverage was identified as amorphous carbon, similar to activated charcoal. Both of these foreign materials are used in manufacturing environments, do not represent a health hazard, and can often be traced to a particular plant location.

Metal particles are common contaminants. Scientists at contract analytical labs can identify a variety of metal particles in products, most commonly aluminum, galvanized steel, and 316 and 304 stainless steels. Because these metals are found in multiple manufacturing areas, their exact source may be difficult to trace. Less common metals, such as nickel phosphide—a type of electroless nickel plating, or specialty steels associated with tools or moving parts, may be easier to trace to a specific source. Aggregated ingredients can be mistaken for foreign material. In a documented instance, brown particulate in one sample were identified as poorly-dispersed cocoa, which resulted in an unacceptably grainy texture, but no foreign materials were found.

In any case, effective communication between quality labs and contract analytical labs is critical to satisfactory resolution of the problem and helps to minimize recurrences.

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pend on the product being made and the manufacturing process.

Once you have identified the required devices, a strong program to control foreign material is necessary. Components of this program include standard operating procedures for activities, corrective action procedures for any deviations that occur, and employee training. Also essential for critical control points is the validation of the system.

Customer Complaints
When possible, customer complaints should be handled through the customer service department of the organization. These professionals will mitigate the risk from an upset customer, particularly if the consumer was harmed by the foreign material. First, determine if there has been an injury or illness associated with the incident. In this case, advise the consumer to contact a physician or seek medical treatment immediately. The usual consumer and product information should be documented, e.g., lot code or best before date, brand, package size, etc. Second, if the consumer mentions contacting the local or federal public health authority, encourage doing so. This transparency on your part will help to alleviate the consumer’s fears and provide an independent, credible authority to supply information to the consumer. If the customer is particularly difficult, provide this information directly so that a recognized authority can be involved as quickly as possible.

Also, request the object from the customer. While consumers may not want to release it directly to the facility, they will likely release it to a government authority for testing, which is another benefit of involving the government as soon as possible. Once the object has been retrieved from the customer, the investigation can continue. Access to a forensic laboratory is useful to help determine if the material was from your process (e.g., glass baked into bread) or from the consumer’s kitchen (e.g., rock salt that looks like glass).

Next, the production facility should be notified of the complaint details and begin the investigation. It is important that a thorough inspection be conducted because it’s easy for the facility to believe it does not have that source of foreign material in the plant. For example, if the complaint is a piece of metal, the investigation may conclude that the plant was not responsible because of its metal detector. This equipment, however, is not infallible and there are many factors that could allow a contaminated product to not be detected or rejected. As a result, the facility should presume that the food was contaminated by their process. Factors affecting the metal detector can include vibrations from the floor, position near other equipment, or the size, shape, or location of the metal piece in the product. Furthermore, this investigation should begin as soon as the complaint is received, whether or not the object is available. Root cause analysis is critical to determining both where the foreign material entered the process and what caused the system failure that resulted in the contamination.

An investigation should also consider an unpleasant alternative—tampering. This is particularly important if the complaint is serious, such as a needle or blade in the product, or if the incidents are numerous and sudden. Tampering is unusual, but possible, and it is a criminal activity so consider involving the police early in the investigation.

When the root cause is determined, a corrective action should be implemented and documented. Follow up is necessary to ensure the corrective action is effective and, finally, the consumer should be contacted to close the complaint. Consumers are looking for transparency and honesty; letting them know what went wrong and what corrective actions were taken to prevent the issue from occurring again will build good will with the community.

Using Complaints Effectively
To begin, assemble and analyze your customer complaints and your supplier non-conformance reports using a Pareto chart. A Pareto chart is used to prioritize problems, providing information for the 80/20 rule. In most situations, a few problem categories (20 percent) will present the most opportunity for improvement (80 percent). This valuable quality tool will provide you with data to focus your efforts, both internally and externally.

Despite the best efforts of food safety professionals, foreign materials can enter the food supply at a variety of stages. A comprehensive risk assessment of the raw materials, process, and finished product, as well as a thorough analysis of customer complaints and supplier non-conformances, can assist the facility with identifying and implementing control measures for foreign materials. These preventative measures will reduce the risk of injury and illness to the consumers of their product.