

Technical Bulletin

Topic: Food Safety

Title: Foreign Material Contaminants in Food

Foreign Material Contaminants

Foreign material contaminants such as: glass, plastics, ceramics, wood, rubber, bone, rock, hair, paper, etc. can be a significant food safety hazard if it enters food products. These materials can cause injury to humans or animals and could lead to recalls of food and feed products. Another important and sometimes overlooked fact in food safety programs is that some of these materials such as hair and paper may not cause injury, but may adulterate the food. If those foods are sold as an ingredient to other manufacturers and incorporated into other products, those products are now adulterated and oftentimes the ingredient supplier will have to pay for the property (food) they have damaged.

U.S. food regulations require food products to be pure, or free of any foreign material. Two specific sections of the Food, Drug and Cosmetic Act address foreign material by stating: *A food shall be deemed to be adulterated if it bears or contains any poisonous or deleterious substance which may render it injurious to health; or if it has been prepared, packed, or held under insanitary conditions whereby it may become contaminated with filth, putrid, or decomposed substances, or if it is otherwise unfit for food.*

What does this mean to food and feed manufacturers? It is vitally important to ensure physical foreign materials are evaluated/addressed in incoming ingredients, in the transportation systems and within the manufacturing of those products. The following addresses some key programs to minimize and/or eliminate physical foreign materials.

Glass, Brittle Plastics, and Ceramics (GBPC)

Glass control is addressed in US Food Regulations in *21 CFR Part 117.20 Plant and Grounds, b(5), Provide adequate lighting in hand-washing areas, dressing and locker rooms, and toilet rooms and in all areas where food is examined, manufactured, processed, packed, or held and where equipment or utensils are cleaned; and provide shatter-resistant light bulbs, fixtures, skylights, or other glass suspended over exposed food in any step of preparation or otherwise protect against food contamination in case of glass breakage.* Food and feed companies should also address any brittle plastics (any plastic that is capable of shattering) as part of this program.

If GBPC are incorporated into food products, there are few foreign material detection systems, with the exception of X-rays, which can identify or remove such contaminants. For a comprehensive GBPC, the following are some key points to consider in your program.

1. Non-essential GBPC should be designed out of equipment or facilities, whenever possible. This should be addressed as part of an overall sanitary design program. Sanitary design should evaluate the design, construction and modifications made to equipment and buildings.



2. Examples of non-essential GBPC. Items such as light bulbs, windows, skylights, gauge and dial covers, plastic covers or guards, forklift lights, emergency lighting, picture frames/glass, should be designed out of the facility. When possible, approved non-brittle plastics such as polycarbonates or other soft plastics like Ultra High Molecular Weight (UHMW) should be used. Glass items such as lights and windows can include the use appropriate covers, shatter-resistant coatings or other materials to prevent the dispersal of breakage.
3. For any remaining GBPC in the facility, these items should be accounted for and listed on a registry and designated as primary (higher risk) and secondary (lower risk) areas. The primary areas should be inspected on at least a monthly frequency and secondary areas perhaps quarterly to note the condition and address any possible damage that may have occurred.
4. Procedures should be developed and documented in the event any GBPC breakage may have occurred. Employees should be trained to inform appropriate persons of glass breakage immediately. If breakage occurs, the area should be quarantined to prevent further spread of the materials. Any possible effected ingredients, products or packaging should be discarded and the inventory control system updated to account for disposed products.
5. The procedures should address appropriate clean-up strategies for the affected areas. Appropriate tools such as dust pans, brushes, brooms or trash can should be identified for the clean-up. These tools should not be used for any other purposes other than clean-up and in most scenarios, these tools should also be disposed of after clean-up is conducted.
6. Detailed post-cleanup inspections should be conducted and documented to look for any remaining materials. The use of a good flashlight would aid in this inspection to look for any shiny materials that may be glass or plastics.
7. Glass packaging – For those companies that package products into glass containers, controls must be in place to ensure glass particles or slivers are not inside of the packaging. Prior to filling, the glass containers should be inspected and inverted for cleaning with the use of water or compressed air to remove any possible foreign materials from inside of the packaging.
8. Glass packaging – Procedures must also be in place to address any possible glass breakage that may occur on the packaging line. If breakage occurs, a predetermined distance both before and after the breakage on the lines should allow for the removal of all suspect containers and possible contamination. Appropriate clean-up procedures should also be in place for the packaging line and specifically address any breakage near the filler portion of the packaging line.

Other Physical Foreign Materials

There are several programs, systems and equipment that can help address other physical foreign materials and should be included within Food/Feed Safety and/or HACCP Plans. Here is a brief introduction to some of these programs and systems and should be further evaluated as to what is relevant to your operation.

1. Incoming material inspections and sampling – All ingredients, packaging and other materials arriving at the facility should undergo visual inspections and sampling to try



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and detect possible physical foreign materials. Highly trained food safety personnel should be conducting these inspections and sampling.

- a. Trailer or railcar inspections**
 - i. What is the condition of the arriving vehicle? Is there damage to the vehicle or foreign materials within the vehicle?
 - ii. What is the condition of the incoming goods? For packaged materials, is there damage to the bags or boxes?
- b. Sampling and Examination of materials**
 - i. Ingredients such as flour, sugar, salt or other finely ground products should be sampled. An appropriate statistical sampling plan should be devised for bulk ingredients to determine a proper amount. These samples should then be passed through appropriately sized screens to look for possible foreign materials.
 - ii. Liquid ingredients such as oils, milk, liquid syrups, etc. should be sampled following a similar statistical sampling plan as listed above. These materials can be passed through a strainer to look for possible foreign materials.
 - iii. Large particle ingredients such as nuts, fruit pieces, candies, etc. should also be sampled. These materials will be more challenging as they are not easily passed through sifters or the foreign materials may pass through with the products. This means that more time and effort will be needed to visually sort and inspect the samples to look for possible foreign materials.

2. Metal to Metal program – much equipment in food and feed facilities is metal based. There is potential on some of this equipment to incur metal to metal contact and create contaminants. Here are some key points to consider.

- a. Sanitary Design**
 - i. When purchasing new or used equipment or when modifications are made, sanitary design considerations should be part of the process. A written set of criteria should be in place to specify items such as types of metal, construction of equipment, conditions of the welds, etc.
- b. Detection Equipment**
 - i. When evaluating the process of making the product, what key areas can detection equipment be installed to help detect or remove possible metal contaminants. Such equipment to be considered would be magnets, screeners, electronic metal detection, x-ray systems, etc.
- c. Equipment Inspection**
 - i. Regular equipment inspections should be conducted of areas where metal to metal contact may occur. These areas should be listed on an inspection form, frequency of inspection identified, and results of the inspections documented. Appropriate corrective action should be initiated, if issues are noted, to eliminate the cause, repair the damaged, and address effected products.

3. Wood Control – the use of wood within food and feed companies should be restricted as much as possible. There is still some equipment that may contain wood and wood pallets are commonly used. Here are some key points to consider.

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a. Wood Reduction

- i. Evaluate equipment, tools, utensils, pallets, etc. and determine where wood can be replaced with a more suitable material. Such examples may be the use of soft-plastic handles on tools vs. wood, purchasing non-wood containing equipment, and transferring ingredients from wood pallets to plastic before they are taken into production areas.

b. Pallet Inspection

- i. Detailed pallet inspections should be conducted at the time of receipt to identify damaged or dirty pallets to prevent entry of foreign materials into the facility.

4. Bag/Box Opening – Opening procedures should be developed to minimize the potential for foreign materials to be generated and incorporated into the ingredients.

a. Dedicated Knives

- i. A knife accountability program should be in place for all knives used in the facility. These knives should be of a hygienic design, numbered, issued to employees and logged, and knives accounted for at the end of a shift and properly cleaned. Personal knives, such as pocket knives should never be allowed.

b. Bag/Box Cleaning

- i. Before opening and dumping bags/boxes of ingredients, the containers should be inspected and cleaned. Cleaning may consist of brushing the outside of the bags/boxes with a dedicated brush or stripping the outer layer of multi-layered paper bags. Some facilities also use a dedicated hepa-filter vacuum at dump stations to vacuum off the outside of the containers prior to opening and dumping.

c. Screens

- i. If possible, dump the bags and boxes over a screen prior to entering the production equipment. This will help capture possible foreign materials that may fall from the bag or box and prevent a knife from accidentally falling into equipment.

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