Foreign Body Prevention & Detection

BEST PRACTICES FOR

Nestlé RAW MATERIAL & PACKAGING SUPPLIERS

3rd Edition

 May 1, 2019

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 May 1, 2019

ACKNOWLEDGEMENTS

We acknowledge the contributors, both Nestlé and our Suppliers, who collaborate throughout the year to develop the **Foreign Body Prevention & Detection Best Practices**. It is through your dedication, perseverance and teamwork that we develop this essential educational tool, always with the safety of our consumer in mind.

The Nestlé Foreign Body Guiding Team, 2019

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PREAMBLE:

A foreign body is any kind of material such as metal, glass, plastic, stones, materials of animal origin (insects, bones, hairs), materials of plant origin (wood, stalks) or by-products (burnt particles, scorched particles, etc.) the consumer does not want or expect to find in the products they purchase.

Our consumers deserve safe and wholesome products at their table and it is our responsibility as food manufacturers to provide this at every occasion. To protect the integrity of the Nestlé brand and the well-being of our consumers, we need to ensure that raw materials and packaging are produced with the highest quality standards. This means our suppliers are prepared to prevent and detect foreign bodies entering their supply chain.

Foreign Body Prevention & Detection, Best Practices for Nestlé Raw Material & Packaging Suppliers is developed in collaboration with our suppliers. It is an educational tool that explains the types of foreign bodies in the supply chain, potential points of entry and how to mitigate their occurance. Here we present the **3rd edition,** introducing new **guidance** on foreign body mitigation in **Cocoa, Meat, Flour, Flexible Film and Bulk/Big Bags (FIBC).** We've also included a section on **current equipment technologies for prevention and detection** of foreign bodies and **guidance on the use of wooden pallets.**

Foreign body prevention and detection is a critical element at Nestlé and it is through awareness, development and implementation of best practices that we continually achieve success in keeping our consumers safe.

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INTRODUCTION: THREE LINES OF DEFENSE

Foreign body management is an integrated approach encompassing a set of complementary control measures. It covers the whole value chain and be organized along the three lines of defense that include:

First Line of Defense:

- Suppliers delivering raw or packaging materials that are free from foreign bodies.
- Properly equipping our suppliers and Nestlé tipping lines to prevent, separate and/or detect any residual risks.

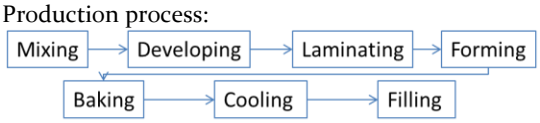
Second Line of Defense:

- Processing equipment.
- Practices during manufacture up to packaging.
- Measures for prevention, detection and removal during processing.

Third Line of Defense:

- Environment in processing areas and maintenance shops.
- Downstream steps such as warehousing and distribution.

Baked Goods

Main Foreign Body Risks: **Metal, plastic, hair, insects, fat residues**	Production process: 

Area of Vulnerability	Potential Issues	Mitigation actions
Ingredients	• Wheat flour: metal, grains, insects • Sugar: metal, plastic • Fat: metal, stones • Milk powder: metal, plastic • Water: metal and stone residues	• Sieves and magnets on all separate incoming ingredient lines. Always consider design which needs to be adapted to the product/process (fit for purpose: design, gauss, air gap) • Metal detectors on sugar line • Experience and knowledge on how to properly open bags, big bags, trailers • Destruction of insect eggs (entoleter) at mill
Cleaning operation	• Plastic fibres from manual tools • Metal from automatic pumps and brushes	• Line inspection and release • GMP of cleaning tools • Preventive maintenance • Sieves in return circuits of cleaning fluids
Wet mixing	• Poor dispersion, dough balls • Metal shavings • Hair in manual operations	• Fine sieves (1 mm) • Equipment maintenance and repair • Zoning and uniform policy
Doughing	• Foreign objects from the environment • Metal shavings • Hair in manual operations	• Closing equipment • Covering trolleys • Zoning and uniform policy • Metal detector before laminator
Laminating / Moulding	• Pieces of moulds: metal and plastics • Parts of conveyors: plastics • Foreign objects from the environment • Hard parts from rework	• Moulds and conveyors preventive maintenance and daily routine inspection • Rework procedure • Line coverage and cover cleaning policy
Baking	• Metal pieces from the oven or conveyor belt • Burnt particles stuck into the belt • Plastic coating from the conveyor belt	• Oven and conveyors preventive maintenance and daily routine inspection • Operating temperature and speed • Presence / correct orientation of metal brushes located below the oven • Running time of the oven empty to clean the belt • Color sorter at the exit of the oven • Metal detector at the exit of the oven
Conveying / storage	• Accumulation of product residues on edges and corners, which randomly stick to the biscuits • Plastics & tissues from the conveyor belts and transport/storage boxes • Dust and other foreign object from the environment	• Complete coverage of the conveyors • Box and conveyors preventive maintenance and daily routine inspection • Metal detector before the filler with < 2-mm capacity for all metal types
Filling	• Metal to metal contacts • Plastics from pouch material, easy-to-open strings or easy-to-reseal zip • Dust and other foreign object from the environment • Accumulation of product residues	• Preventive maintenance and daily routine inspection • Operator intervention protocol • Center lining of sealing jaws • Sharpness of foil/zip cutting tools • Coverage of the filler & laminate rolls
Casing	• Sharp parts damaging the laminates • Dust from cardboards • Glue and tape materials	• X-ray inspection to reduce metal, glass & stone risks • Preventive maintenance and daily routine inspection • Cleaning schedule

Baked Goods

Typical Defects:

DEFECT DESCRIPTION	EXPLANATION
Carbon Residue Defects **Light/dark/greyish deposits or black marks on the surface, bottom or inside the item**  	Caused by carbon residues of biscuit on the net of the oven, baked again and taken up by raw biscuits at the entrance of the oven Carbon residues due to ineffective cleaning of some belts (oven or transport/packaging lines)
Indigenous foreign body	Example of fat accumulation: 

Cereal – Grains and Flour

Barley, Corn, Oat, Wheat, Rye, Rice	For crop calendar (harvest/production): http://www.usda.gov/oce/weather/CropCalendars/index.htm
Main Foreign Body Risks: **Metal, plastic, insects, fiber and string**	

Area of Vulnerability	Potential Issues	Mitigation actions
Field Selection & Preparation	• Stones & Crop remains: straw, stubble, roots etc. Check for traces in the field • Insect events or contamination: Check payment records to identify rebate due to low quality • General foreign body: Farmer interview and assessment • Rubbish dumps: Short distance from roads, industry etc. Examples: highways, car parks, etc. • Weed: records, previous use of herbicides • Plastic / metal: pieces of drip tape irrigation	• Ploughing to bury old plant materials. • In the absence of ploughing, no-tilling[1] practice, ensure proper cultivation. • Avoid growing areas with lots of stones • Visit farm mechanical area & workshop to understand metal risks, level of care / organization • Select best in class farmers & support the training programs • Walk the fields to assess risk and then remove foreign objects https://www.youtube.com/watch?v=bYGNI7dNCJU • Select appropriate herbicide where necessary or mechanical weed control (chemical free)
Sow, plant and grow crop	• Foreign seeds: review seeds and their certificates • Repair conditions of machinery • Weed development: Inspect field at early stage of growth. • Weed development and history: Check previous use of herbicides • Weed development: direct sawing, no tilling • General foreign bodies: Inspect the fertilizers • Insects: Study spray records to assess history • Metal & Plastics: Inspection of irrigation equipment • Plastics: Inspection of water source	• Use only certified seeds. If using own seed, proper cleaning is needed. • Cleaning, servicing and maintenance of all machinery before use, i.e. for sowing, fertilizers application and crop protection application • Record weed development. Select appropriate herbicide where necessary or mechanical weed control (reduced chemical control methods) • Use only certified artificial fertilizers • If using organic / recycled, ensure there is a foreign body prevention program (magnets, sieves …) in the production process – (ensure fit for purpose: design, gauss, air gap) • When necessary, select appropriate insecticides and application timing • Grids to remove large foreign bodies in water
Harvest	• Conditions of machinery: inspect • Remains of previous crops & Rubbish: Define risk areas and walk the fields • General foreign body: Inspect containers / trailers • Cross-contamination: Check harvested grain at start and during harvesting process	• Service & cleaning of harvest equipment, sieves • Remove foreign objects • In case of severe weed infestation, record, remove, segregate part of the crop from the rest of the field • Cleaning instructions for personnel. • Destruction of damaged containers. • Avoid use of wooden containers. • Cover containers when transporting/waiting/empty • Ensure cleaning between different crops • Calibration of equipment at start and where necessary during the harvesting process • Control the height of the harvester
Transport & Storage	• General hygiene: Inspect trailers / conveyors and storage facilities • No segregation between crops, tools, spare equipment • Insects: Monitor activity during the whole storage period. • Insects: Check temperature and moisture gauges/ equipment	• Clean, Maintain & repair trailers / conveyors & storage facilities. • Cleaning, dusting & drying steps should be efficient, well maintained and not a source of FB • Where necessary fumigate to control for insects (non-chemicals exists such as CO_2 …). • Service the facility ensuring no leaks, no access to birds, rodents, • Efficient Magnets and Metal Detectors (ensure fit for purpose: design, gauss, air gap)

Cereal – Grains and Flour: Milling Facilities

Area of Vulnerability	Potential Issues	Mitigation actions
Reception & storage	• Metal & rubbish: Inspect the unloading bay, conveyors & storage. • Insects: Monitor insect activity during the whole storage period. • Insects: Check temperature and moisture gauges/ equipment	• Maintain & Clean the equipment and areas • Training of personnel. • Review of written recommendations (responsibilities, cleaning, sampling, release, specification limits) • Where necessary fumigate to control for insects (non-chemicals exists such as CO_2). • Service the facility ensuring no leaks, no access to birds, rodents, … • Efficient Magnets and Metal Detectors (ensure fit for purpose: design, gauss, air gap)
Pre-milling	• Absence of detection and removal equipment: • Effectiveness of detection and removal equipment: Assess calibration, validation, verification, monitoring, rejects. • Hygiene: Area cleanness. • Insects: Building/door tightness and sealing • Hair: Operator uniforms, practice	• Repair, maintain and clean • Calibration, validation, learn from the rejects • Aspiration, destoners, densimetric tables • Optical sorting • Sieving before milling • Training of personnel / uniform • Heat treat / Fumigate where necessary (non-chemicals exists such as CO_2)
Milling/Flour Production	• Metal: Equipment conditions. • Plastics & insects: Area cleanness. • Plastics: Written recommendations for operators • Insect: History of activity	• Maintain and clean • Destruction of insect eggs (entoleter) • Sieving during milling • Calibration • Training of personnel / uniform
Packing	• Metal and loss of parts from the line. • Insects and rubbish: Ability to clean, cleaning effectiveness. • Plastic and strings: Bag specifications • Insects and rubbish: Storage conditions of bags • Plastic, strings & paper: Inspection of bags at reception • Insects: Consider use of liners inside and outside • Insects and rubbish: Pallet conditions • Insects: Pallet[1] and Wrapping standards[1] [1] Nestlé Internally accessible links only	• Efficient Magnets and Metal Detectors (ensure fit for purpose: design, gauss, air gap) • Repair and maintenance • Line separation • Cleaning validation, routines, documentation • Training of personnel • No use of recycled bags • Review of packaging specifications • Inspection / Cleaning of bags before usage • Proper closure of bags • Pallet specifications • Undamaged pallets • Wrapping tightness of bags and pallets

Specific guidance: Rice

Areaof Vulnerability	Potential Issues	Mitigation actions
De-hulling (removal of outer cortex) incl. oats	• Cortex remains after de-hulling • Metal from line • Rubber parts from line	• Sieves after de-hulling step • Repair and maintenance • Cleaning
Polishing	• Black grains • Damaged grains • Cortex remains	• Optical sorting (color) • Equipment calibration, validation, monitoring • Repair, maintenance and cleaning
Parboiling	• Metal parts from autoclave / cooker / trays • Calcium carbonate agglomerates	• Repair and maintenance • Cleaning • Metal detectors / Magnets (ensure fit for purpose: design, gauss, air gap)

Cocoa Beans and Powder

Cocoa Powder Processing	**Product Information:**
Main Foreign Body Risks: **Metal, plastic, hair, stones, plants, insects, pests, fibre, string, wood**	Federation of Cocoa Commerce (FCC) requirements ISO 2451 – International Cocoa Standard Used to grade standards and classify cocoa beans, both include foreign body expecations.

Area of Vulnerability	Potential Issues	Mitigation Actions
Supplier / Trader / Farmer	• Plants / other crops • Insects / Pests ingress • Wood, string, metal, plastic from the environment • Personal effects from employees • Animals or animal remains • Debris from surrounding areas, e.g. glass, rubber, waste	• Planting and cultivation equipment is well maintained and fit for purpose, posing no additional foreign body risks • Controlled cultivation covered through approval process. • Integrated Crop and Pest Management (ICPM) implemented and maintained • Removal of rubbish through field walks and regular inspections • Protection against animals, e.g. bird scarers • Appropriate machinery cleaning before and during cultivation • Loud noises to scare away animals • Adequate training of operators involved • During the processing stages of fermentation and drying, ensure all contact surfaces are free from lose foreign material
Transport and Storage	• Remains of previous load • Metal, plastic, plaint from machinery, equipment or transport • Pest from inadequate pest control in the storage facility • Personal effects from employees	• Vehicles are approved for use and inspected prior to loading • Basic safety training in place and standards adhered to • Suitable and clean storage conditions with appropriate cover and protection • Pest prevention programme • Good hygiene practices • Adequate training of operators involved • Sieves / grids at this stage can significantly help remove some of the larger foreign bodies and reduce the cost of transporting non-bean matter
Raw Material Intake	• Stones, wood, metal, personal effects, pest remains or plastic from the cultivation stage • Metal from transit vehicles • Personal effects from employees • Pest ingress at intake point, during unloading • Metal, plastic or fibres from conveyor and sorting equipment	• Documented incoming material inspections • Foreign body library collated and feedback provided to the supplier and transport • Sorting equipment on intake to remove the larger foreign bodies, for example a heavy duty grate with large openings to help remove any large vegetable and organic material • Magnets: Heavy duty grate magnet, cleaned twice per shoft. Magnets should have a strength of at least 8,000 gauss, although 10,000 is preferred • No wooden pallets is preferred, although if essential, they should be inspected for integrity and kept a suitable distance away from any entry / sample points • Pest prevetion programmes in place • Preventative maintenance of unloading and sorting equipment • Hygiene zoning in place • Sorting equipment inspected regularly to prevent issues and detect findings • No plastic liners

Cocoa Beans and Powder

Area of Vulnerability	Potential Issues	Mitigation Actions
In Process	• Belt fibre / string from damaged conveyors • Metal from damaged bearings / screws / pumps • Metal from plant failure causing metal on metal contact • Metal or plastic from plant failure due to foreign bodies found in the raw materials, damaging the equipment • Poor conditions of cleaning equipment • Poor fabrication / inadequate cleaning • Inadequate pest proofing • Contamination from water sources / environment • New equipment as a source of foreign bodies • Magnet is saturated with too much metal • Use of damaged plastic or wooden pallets • Foreign body contamination through the water source	• Preventative maintenance programmes in place • Regular inspections / listening to the line • Correct calibration of machinary • Adequate training for operators and clear defined standards followed • Suitable work wear provided and cleaned correctly • Good manufacturing practice • Knife mill after the nibs have been roasted (<2 micron, roating at 3000rpm) Numerous sieves of various sizes throughout the process to remove material which may damage equipment. • Ensuring that the sieves / mills have the optimum size / detection capability • >200 micron sieve recommended for the coarse liquor Lehmann Stone Mill or Ball Mill • Ensure that each sieve / mill has a further detection step in the event of any failure. For example, more than 2 sets of ball mills will ensure that if a failure occurs there is no risk to the product • Regular cleaning, at least twice per shift and checks of the equipment to ensure it is functioning correctly, e.g. removal of debris from the magnets • If unusual findings occur on the magnet, then inspections should be completed hourly until normal conditions are resumed. • Magnets ensure fit for purpose: design, gauss, air gap- redundant magnets are also recommended • Clean, potable water source for potential risk of foreign bodies • Pest prevention programme in place • No wooden pallets is preferred, although if essential, they should be inspected for integrity and kept a suitable distance away from any entry / sample points • Nuts should pass through a metal detector before passing onto the grinder • The grinder presents a risk of metal contamination, therefore a magnetic liquid trap is be followed by a metal detector • New equipment should be assessed for suitability, foreign body risks, recesses allowing for build up of dirt or foreign matter and for detectability in the event of a failre or wear and tear • Cleaning equipment should be regularly inspected for integrity and replaced as necessary. It is good practice to have pictures of the required condition of equipment and when to replace, next to the shadow boards • Regular GMP / hygiene audits to ensure general cleanliness and fabrication is not posing any avoidable risks

Area of Vulnerability	Potential Issues	Mitigation Actions
Packing and transport/ shipping	Contaminantion from the vehicles Contamination from the operators Wood or plastic from damaged pallets Infestation / contamination from within the pallets Pest ingress	• Inspect vehicles on arrival before loading • Correct work wear and appropriate GMP training provided to the operators • Pallets are inspected before entry and damaged pallets are removed • Pest prevention programme maintained throughout packing and shipping, with clear responsibilities defined for the transport / shipping process • Correct storage processes in place with no part pallets / part filled containers left open or unsecure • Final detection equipment, e.g. metal detection and final sieves (4mm mesh) are checked as per the HACCP defined frequency and suitable verification activities are documented • Metal detection validation is completed by an expert and documented

Cocoa Beans and Powder

Examples of equipment used to remove / reduce foreign bodies during the Cocoa making process

Sorting stairs used to grade the beans and remove variations in sizes of material passing through

Bean cleaning stage

Further bean cleaning with inspection point grid and cover to protect entry of any further foreign bodies

Cocoa Beans and Powder

Examples of foreign bodies found during the Cocoa making process

Example of the findings found on one magnet

The collection bucket of foreign bodies removed at the cleaning stage

Dairy Powder

Dairy powder processing	**Product Information:** Federation of Cocoa Commerce (FCC) requirements ISO 2451 – International Cocoa Standard Used to grade standards and classify cocoa beans, both include foreign body expecations.
Main Foreign Body Risks: **Metal, plastic, hair, fibre, string**	

Area of vulnerability	Potential issues	Mitigation actions
Preparation of the line	• Cleaning with damaged cleaning tools (brushes, scrapers, vacuum cleaner, etc.) • No tools management available • Tools are placed in unexpected places (on cables, on electric cabinet, etc.) • Improper repaired cleaning tools (tapes, spare bolts, nuts, grinding dust left on the line after maintenance work, etc.)	• Selection of materials adapted to the purpose should be established. • Do not use sponges or similar materials which could be a source of Foreign bodies • Inspection plan and interval for change of tools should be defined • Regular visual check of the condition by operators before use should be done. Visual standard is a good practice. Sufficient utensils quantities should be available in case of need. • Dedicated places according to the tools use should be defined. • Repair should be forbidden for equipment in contact with food and minimized for non-contact places
Raw material management	• No Foreign body assessment included in RM supplier assessment • Packaging specification not designed to prevent Foreign body creation • No protection of the RM packaging • Use of RM with damaged packaging • No Foreign body prevention at the tipping station or liquid milk reception and/or downstream • No management of RM opening tools (knives, cutter, etc.) • No operator awareness during discharge operations • No zoning, no stripping area for wet or dry mix ingredients	• Have a supplier approval system in place including Foreign body prevention and detection • Recommended is the use of strippable packaging (e.g. paper bags, bags in an outer box) • Plastic big bags should not be a source of plastic and fiber strings • RM packaging should be protected during the transport and in the warehouses • Damaged packaging should be put aside and not used • Grids and/or sieves should be present at the tipping stations and/or strainers and filters at the milk reception and downstream for liquid semi-finished products. • Rules should be clearly defined (e.g.no breakable tools, visual checking, attached tools, sharp…) • Concerned operators should be trained to the foreign bodies prevention and detection • Zoning rules should be established. A stripping area should defined for all types of ingredients
Equipment state in the environment	• Use of damaged plastic pallets • Cable arrangement and binders not managed	• Plastic pallets should be regularly checked. Damaged ones should be put apart and not re-used in production area. • Cable and arrangement setup should not create a potential source of foreign bodies

Dairy Products: Powder

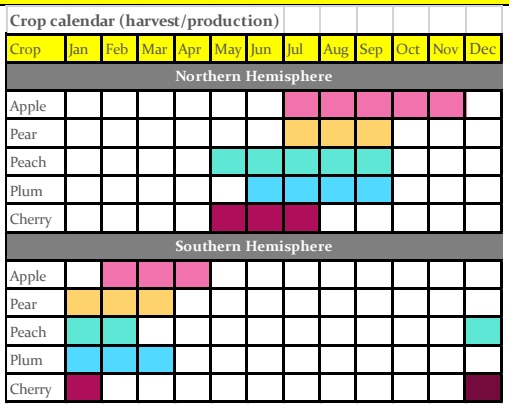
Area of vulnerability	Potential issues	Mitigation actions
Condition of equipment in contact with the product	• The product is exposed to the environment during the process. • Air filters as a potential sources of fibers • Improper repairing done in equipment in contact with food (cable binder, tape) • Use of cotton-type sleeves • Gaskets as a source of foreign bodies. • Sight glass as source of foreign bodies • Plastic sieve as source of foreign bodies • Broken Lexan©, • Glass from gauges	• Closed line (but easy to inspect) is preferred. Use flexible part to have a fool proof installation at the level of the measurement instruments. • Specifications need to be aligned with usage and need to be checked at reception. • Operators need to be trained in installing the filters. • Properly sized frames and housing should be in place. • Improper home-made repairing should be forbidden for equipment in contact with the product. • A proper procedure on managing damaged equipment in contact with product need to be in place. Use plastic flexible connections as they are less susceptible to wear and tear compare to cotton material. Preventive change plan should be in place. • Location of all gaskets in contact with food is known. Do not use materials with evidence of deterioration / damage. • Damaged gaskets should be replaced and cross contamination risk in products quickly assessed. • A preventive maintenance plan should be in place. • Only original spares should be used or validated by equipment suppliers during the change management • In case of gasket damage, can it be detected downstream i.e. on sieve, by metal detector or X-ray? • Hard plastic in contact with food and in a close environment should be mapped. Preference should be to eliminate them. If not possible, a check frequency should be defined according to the risk (e.g. in a Hard plastic check-list) • A procedure should be defined in case of hard plastic breakage. • Plastic sieves model are not recommended. • In case of use, an adapted visual check needs to be done before product release
Operator personal protective equipment (PPE)	• Ear plugs, glasses, gloves.	• Clear rules about PPE items should be in place (awareness in case of lost parts…) • Only detectable items should be used in production area.
Clothes, fibrous material and other material used on line	• Clothes, Hairnet, Pens, Personal items (security badges, etc.) • Office materials (paper clips, staples, mobile phone, etc.)	• Clothes and hairnets should not be a source of strings and fibers • Clear rules about personal items should be in place • Office material should not be used on production line excepted clear validated detectable items by your metal detector and/or X-ray.
Finished Packaging material	• Paper bags with internal plastic layer, plastic bags and big bags as sources of foreign bodies • No properly protection of the big bags and/or bags during the transport	• Use of strippable paper bags and/or bag–in-box specifications is highly recommended for dry mix ingredients. • Plastic big bags should not be a source of plastic and fiber strings • Pallets should be protected from the top until the pallets by adapted covers and plastic stretch film.
Engineering practices	• Plastic pieces coming from perforation and other technical operations in production area	• Hygienic rules to be defined for technical intervention. Technicians have to be trained concerning the rules they have to respect. • A procedure for line release after maintenance and before production should be in place (cleaning, visual checking, recording…)

Fruit: Tree Fruit

Pome and Stone Fruit
Apple, pear, peach, plum and cherry

Main Foreign Body Risks
-Animal and animal parts/excrement; soil, glass; whole/visibly intact insects, metal, hard plastic, hard/sharp wood, bone, stones; Allergens.
-Soft, brittle, round: plastic fibers, string, thread, paper, soil, sand, paint or varnish chips rubber, soft wood, hair; small insects/ insect parts, feathers, fur.
-Extraneous vegetable matter: apple carpel, seed/seed fragments, pits/pit fragment, peel/skin (black spots), stems, blossom ends, leaves and plant fibers.

Apple: wood, glass, apple carpel, seed, and seed fragments
Pear: loose seeds, peel, stems (internal and external), core material, dark spots
Peach: pit fragments, peel, dark spots; mushy, tough rubbery or hard flesh
Cherry: pits, black spots



Area of Vulnerability	Potential Issues	Mitigation actions
Farm/Field: Selection and preparation	• Lack of GAPs with FOB control, worker training • Animal remains, hair, feathers visible • Field perimeters close to roads and urban areas. • Used packaging, plastics, string, rubber, glass, metal, rubbish (e.g. from nearby dump) • Metal & plastics from equipment e.g. PRUNING tools and containers) • Poorly maintained farm machinery and equipment; lack of repair schedule • Neighboring trees with allergens	• There is a documented and verified Good Agricultural Practice (GAP) standard and foreign body control • Farm worker training on GAP - prevention of worker introduction of foreign material, sanitation. • A copy of the GAP guidelines and check list is available upon request • Internal and external audits are performed with documented corrective actions for FOB; mock recall for foreign objects • Inspect insect control records: Monitor infestation levels and react appropriately if threshold level is exceeded • Service records of farm equipment, i.e. machinery, tools containers with replacement of worn, damaged equipment
Pre-harvest: Sowing and growing season	• Allergen plants present • Insect infestation • Animal inhabitants of fields/Birds frequenting fields • Worn, damaged bins	• Inspect field at early stage of growth • Selective use of relevant insecticides based on risk assessments and forecasting & biological control • Ensure minimum insect infestation at or around the time of harvest. Take into account pesticide recommended harvest interval • Periodical inspection of fields • All boxes /bins should be checked for damage, cleaned and maintained before each harvest season • Replace damaged bins

Fruit: Tree Fruit

Area of Vulnerability	Potential Issues	Mitigation actions
Harvest: **Apples, pears, peaches and plums are hand-picked.** Cherry trees use harvesting equipment that shakes the tree and collects berries on tarp that dumps cherries on conveyor that dumps into a water tank where debris are removed.	• Harvest and transport machinery with foreign bodies (e.g. plants, stones, hairs, plastic, metal, rubbish) • Animals habitant in orchard (snakes, birds) • Insects habitant in orchards (pollinating, biological control) • Visible debris – plastics, rubbers, tubes, glass, metal, gloves, tools • Insufficient GAP of personnel in contact with harvested crop (poor sanitation, lack of training) • Damaged/worn harvest bins	• Avoid use of wooden containers and / or damaged containers • Clean and maintain equipment before/during harvest (hauling bins) • Recommended to cover the containers when transporting. • Inspection and removal of debris before harvest • Prevent extraneous getting into bins during harvesting (leaves, etc) • Proper GAP personel training/adequate hygiene for personel and facilities • Ensure glass containers are not used near fruit bins
Post Harvest: (Containers/bins and transportation)	• Crop/container contact with ground • Condition of on farm storage/staging areas • Broken/wood/plastic containers, discarded gloves, tools • Poor hygiene of transportation trucks (inspection/cleaning frequency and records) • Open trucks/containers (exposure to elements, debris) • Infestation of containers, trucks, crop • Time crop held in field • At risk transportation routes (back-hauling, weather extremes, delays) • Off load area (exposure to elements, debris) • Personnel in contact with harvested crop • Lack of hygiene/training of personnel in contact with harvested crop • Visable field dirt and FOB in storage containers/bins • Manual sorting, cleaning and trimming • Processing line (broken pieces)	• Clean on-farm storage facilities • Adequate sanitation/cleaning and inspection schedule/records for all containers, trucks before use • Cleaning and removal of foreign materials at loading / unloading • Recommend to cover open trucks during transport and parking • Minimal hold time in the transport phase • Avoid use of wooden boxes/bins • GAPs training for personnel • Ensure that no glass bottles or contaniners are stored near fruit storage bins.
Storage: (Farm and/or supplier storage)	• General hygiene of storage facilities • Damaged and rotten crop material • Transportation routes • Off load area (exposed to all elements) • Visible metal & rubbish • Infestation • Building/door tightness and sealing • Lack of controlled atmosphere storage • Uncovered lights pose potential glass FOB if broken	• Clean storage area • Inspect the unloading bay and storage for debris, rubbish • Use appropriate storage conditions based on short term or long term storage and maturity needs. (Temperature and/or controlled atmosphere storage may be necessary) • Visual inspection/sorting of apples when removed from storage • Service the facility ensuring no leaks, no access to birds, rodents • Monitor storage period (humidity, temperature, infestation, mold, senescence) • Make sure all lights properly covered • Rodent traps in place around storage area

Fruit: Tree Fruit

Specific Guidance: Diced Apple Particulates

Area of Vulnerability	Potential Issues	Mitigation actions
Harvest, Transportation and Storage	• Damaged fruit prone to mould/rot. • Wood, glass, metal, stone, plastic. • Allergens (e.g. tree nuts)	• Avoid bruising and damage during harvesting, transportation and storage • Remove severely bruised apples during pre-sorting • Visual sorting can be effective, if the level of bruising is not too high. • Clean storage containers before using • Prevent foreign material/allergens from falling into storage containers during harvesting and transportation • Size peelers/corers/slicers appropriately and maintain equipment to avoid metal shavings from peeling or cutting
Peeling, coring, dicing/cutting	• Apple carpel pieces, core and peel material. *Significant defect in apple dices - described as fingernails, plastic, insect fragments by some consumers.* • Apples are too soft, bruised, dark spots. • Apple are too small, too large and/or asymmetrically shaped/cross-cores • Metal from cutting tools • Plastics from conveyor belts	• Need crisp apples to effectively core and cleanly cut. Optimize time and conditions for controlled atmosphere (CA) storage and mellowing prior to sorting • Optimize the variety of apple for qualities essential to coring: size, apple symmetry, shape of carpel. Good coring varieties include Crispin and Rome. Poor coring varieties include Golden Delicious and Fuji, which both have odd shaped carpel that protrudes into the flesh • Pre-sort to optimum size of apples for the type of peeler/slicer/corer. Remove apples that are too small and with cross-core. Remove larger apples that can damage the peelers/corers • Separate the apples into large and med/small streams - one bank peeler/corer/slicers optimized for each • Use 1" corer rather than standard 3/4" • Slow the speed of the line to allow adequate control - especially at hand sorting
Drying and filling	• Metal from oven, grids, roller dryers, fillers and conveyors • Plastics from conveyor belts and sealing gaskets • Insects & pest	• Equip the line with magnets, sieves, metal detector and visual sorting (ensure fit for purpose: design, gauss, air gap). • The number and locations of magnets, sieves and metals detectors makes sense • The latest magnet technology have 10000+ Gauss and can attract stainless steel shavings & welding materials • Sieve size and design is state of the art • The inspection rate is frequent • The catch/reject are recorded and used for continuous improvement • All pieces of equipment are validated. • A maintenance and verification plan is in place for all pieces of equipment • Employees in all areas should contribute to Pest management • Insect control and treatment shows effectiveness through insect absence • Zoning should be fit for purpose

Meat:

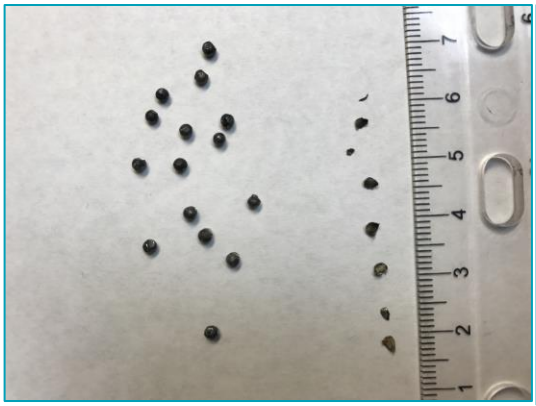
Ground Red Meat Products (Beef, Pork)	**Product Information:** Feeder plants debone and separate raw material items that supply further processing plants. The processing plants formulate raw and may perform cooking to finished products.
Main Foreign Body Risks: **Bone, metal, flexible plastic, hair**	

Area of Vulnerability	Potential Issues	Mitigation Actions
Feeder/Supplier Plant	• Bone, metal, flexible plastic, hair	• Documented finished material inspections with established control limits for defects • Plant is approved with performance targets in place for foreign body reduction • Combo storage with caps to prevent contamination during transit and storage
Raw Material Controls	• Bone, metal, flexible plastic, hair	• Documented incoming material inspections • Documentation for each foreign material found with rapid communication back to the supplier on each incident • Rating suppliers on foreign objects per million pounds • Regular performance discussions with ranking against competitors • Purchase changes based on ranking • Supplier hair control program in place • Different color plastics from Feeder Suppliers to differentiate in case of contamination
In Process	• Bone, metal, flexible plastic, hard plastic, hair, wood	• No wooden pallets are used in dumping stations – plastic only • Incoming raw meat/trim x-rayed utilizing metal and ceramic standards before grinding to prevent large foreign bodies being converted into multiple smaller pieces • All incoming raw meat/trim pass through a metal detector with 2 heads oriented 45° to the line • Inspection belt with a waterfall in the line to flip the meat with adequate visual inspection • Blade/plate checks completed on a routine, frequent basis by trained, qualified operators • Meat x-rayed after initial grind to 2 mm sensitivity • X-ray post final grind, with x-ray validated and verified on a regular basis for effectiveness • **Stuffed Products:** All raw meat blends x-rayed at stuffing process for log/stick products • **Stuffed Products:** All logs/sticks of cooked meat x-rayed prior to slicing. • **Finished cooked meat pieces**: slices x-rayed and passed through a metal detector with 2 heads oriented 45° to the line. • Run limits established for metal findings and other routinely found foreign bodies with

Area of Vulnerability	Potential Issues	Mitigation Actions
In Process	• Bone, metal, flexible plastic, hard plastic, hair, wood	corrective and preventative measures implemented when thresholds are exceeded • Belt inspection programs in place and completed during pre-op and operational periods • Hair control programs with lint rollers and checks for efficiencyPlastic liners minimum 7 mil • Retractable bottom combo dumpers used • No wooden pallets in exposed product zones • Conversion of any plastic in facility to colored, and metal detectable (i.e. pens, gaskets, zip ties, etc.) • Small part and tool accountability program • Proactive process in place to routinely evaluate line or area for foreign material potential. (line mapping exercise) • Employee engagement / awareness / incentive program for findings
Supply Chain	• Wood, plastic liners, debris from stacked storage. Stones, glass, other debris from pallets	• Mandatory pallet caps • Pallet inspection program before use

Examples of Foreign Bodies in Meat Commodities:

Metal shot



Bone Pieces

Flexible Plastic

Wood

Nuts: Ground Nuts (example Peanuts)

Main Foreign Body Risk: Stones,plastic,rubber,wood,insects, glass, hair, metal, other plants	For crop calendar (harvest/production): http://www.usda.gov/oce/weather/CropCalendars/index.htm

Area of vulnerability	Potential issues	Mitigation actions
Field Choice & Preparation	• Stones, rocks, sand, plant material, wood • Used packaging, plastics, string, rubber, glass, metal • Rubbish from nearby dump • Stubble/plant material from previous crop Weeds including previous crop and grasses • Animal remains, hair, feathers • Metal & Plastics from cultivation machinery	• Selection of field/farmer/growing area • Soil preparation incorporating previous crop remains and other plant material. • Removal of rubbish (field walks) • Protection against animals, birds (fence, bird scarers) • Service of machinery replacement of old parts
Sowing to Pre-Harvest	• Foreign crop seeds & weeds in seed at sowing • Metal & Plastics from sowing equipment • Weeds & foreign plants • Insect infestation • Animal habitants of fields • Birds frequenting fields	• Use only certified seed. Clean sowing equipment to remove any foreign crop seeds from other crops • Service and repair sowing equipment before use • Selective use of herbicides and or mechanical weed control. Use pre and post emergence herbicides where appropriate • Selective use of relevant insecticides based on risk assessments and forecasting • Fenced and periodical inspection of fields • Removal of bolting, flowering, plants
Harvest	• Harvest and Transport Machinery with foreign bodies (plants, plastic, metal, rubbish) • Animals habitant in fields (rabbits, squirrels, snakes) • Insects habitant in fields (pollinating, biological control) • Debris – plastics, rubbers, tubes, glass, metal • Personnel in contact with harvested crop • Stones	• Machinery cleaning before and during harvest. • Loud machinery to scare way animals • Machinery height adjustments • Inspection and removal of debris before harvest (field walks) • Use of harvesting machinery that removes stones & similar foreign bodies. Ensure correct calibration of machinery. • Ensure correct dry time of peanut vines for peanut separation from plant
Shelling/Production	• Transportation trucks and Open trucks • Transportation routes • Storage silos • Off load area (exposed to all elements) • Processing line (metal, rubber, plastic) • Personnel in contact with harvested crop • Shells • Field trash (metal, stones, glass, plastic, rubber) • Rodents, snakes, insects	• Cleaning of trucks & covering open trucks • Minimal hold time in the transport phase and storage silos • Cleaning and removal of foreign bodys at loading / unloading • Good manufacturing practices • Blowers ventilators • Hand sorting • Good manufacturing practices for personnel • Sorters on line (optic & manual), gravity separators • De-stoners

Nuts: Ground Nuts (example peanuts)

Area of vulnerability	Potential issues	Mitigation actions
Storage (pre-processing (field/Farmer storage/Supplier storage	• Various debris • Rodent/pest infestation • Special attention – Rocks, stones, foreign dried plants, plastics, metal, shells	• Clean storage and transport bands • Apply first in first out principle • Use controlled atmosphere storage • Sorting of crop when removing from storage • Pest control program • Special attention – Optic and manual sorting, screeners, gravity separation for rocks/stones. Removal of stones with appropriate harvest machinery

Examples of Foreign Bodies in Nuts at Nestlé Factory:

Stones, Wood- in NUTS

Nuts: Tree Nuts (example almonds)

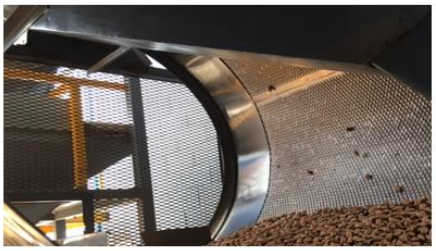
Pecans (Halves and Pieces), Almonds, Hazelnuts, etc.	Crop Calendar (harvest/production) http://www.usda.gov/oce/weather/CropCalendars/index.htm
Main Foreign Body Risks: **Shells, Sticks, Crop Related FM, Rocks, Glass, Hair, Metal, Leaves, Wood, Plastic**	

Area of Vulnerability	Potential Issues	Mitigation actions
Field preparation & Harvest	• Stones, Rocks, Dirt/Sand, Sticks, Wood, Leaves, Glass, Grass, etc. from the ground during sweeping/harvest • Metals and Plastics from Harvesting and Transport Machinery • Animals, reptiles, insects, etc. habitant in orchards at the time of harvest	• Proper maintenance and preparation of ground under tree prior to shaking and harvest • Removal of debris from orchard floor prior to harvest. • Service and repair of harvesting equipment and transport vehicles • Proper cleaning/clean out of transport bin or vessels prior to filling with pecans during harvest. • Use of proper pesticide applications during growing season (e.g herbicides to guarantee weed-free band down the trees) • Not allowing any animals to graze or held in orchards. • Proper maintenance, preparation, and inspection of ground under tree prior to harvest • Integrated Pest Management to avoid pest issues (e.g. pecan nut case-bearer)
In-shell Cleaning, Grading, Sizing	• Stones, Rocks, Dirt/Sand, Sticks, Wood, Leaves, Glass, Grass, etc. from the ground during sweeping/harvest • Loose pecan shells and fragments	• Proper aspiration/blower systems along with proper cleaning reels to remove debris from in-shell pecans as they are graded
Cracking & Shelling Production	• Stones, Rocks, Glass, Metal from the harvesting and grading processes • Metal from Processing or Harvest • Plastic from Processing or Harvest • Production Employees (Hair, etc.) • Pecan Shells, Stems, Sticks, Crop FM • Pest, insects	• Destoner/water bath used to remove foreign materials that will sink, including alcohol flotation process • Rare Earth Magnets, Metal Detection (ensure fit for purpose: design, gauss, air gap) • Aspiration equipment, Electronic color Sorting Machines, Hand Picking • Good Manufacturing Practices (hair nets, lint rollers, use of smocks/coats/uniforms) • Integrated Pest Control Program, Proper plant design and sanitation

Nuts: Tree Nuts (example almonds)

Examples of Foreign Body Removal Systems:

First cleaning (Reception of Inshell Pecans)



Tumbler (Sieve)

Pin Picker

Destoner (Removes stones)

Inshell Hand Picking

Magnet

Electronic Sorting Machines (two times)

Manual Picking and visual inspection (redundant where relevant)

Magnets on Finish Line (removes metal burr)

QA Table Inspection (inspect shell on the product according customer specs)

Oils and Fats

Oilmix, Polyunsaturated Fatty Acids (PUFA), Corn, Peanut, Rapeseed, Sunflower, Coconut, Palm.	Refer to Peanut Best Practice for mitigation of foreign bodies originating at the fields.
Main Foreign Body risk: Metal, hair, pest, plastic	

Area of vulnerability	Potential issues	Mitigation actions
Engineering practices	• Metal pieces coming from weldering, cutting, perforation and other technical operations in production area	• Hygienic rules to be defined for technical intervention in production area • Production line to be protected during operations in the environment • Technicians have to be trained concerning the rules they have to respect. • A procedure for line release after maintenance and before production should be in place (cleaning, visual checking, recording…) • Soldering should be replaced by weldering
Filling area	• Cross contamination coming from process equipment • Insects presence in the filling area • Foreign bodys present inside the containers	• The equipment should be closed during production. A fine filtration should be done • before the storage tank for bulk and filling line (at least 1mm) • Sieve integrity should be checked before release of the production • Strong implementation of the pest management should be present • A procedure should be defined to minimize Foreign bodys contamination originating with the packaging container (covered conveyors, inverter, rinsing, regular inspection)
Operator hygienic rules	• Contamination with hair during intervention by operators which need to open the equipment (cleaning, maintenance)	• See for details the general guidance document specific to prevention of hair contamination
Finished Packaging material design and transport	• Foreign bodys coming from metallic barrels • Plastic liner stuck in the solid grease not visible • Foreign bodys from environment during the transport	• Packaging should not be a source of metal • Use colored blue plastic liner • Pallets of small containers should be fully protected during transportation by covers and stretch film.
Loading of the tanker	• Introduction of Foreign bodys during the loading (tanker equipment, manhole opening)	• Dedicated food grade tanker with cleaning certificate (for tanker and equipment) with recording of validated cleaning operations to be checked for acceptance before loading • Covered premise for loading operation is preferred • Strong implementation of the pest management should be present • Loading hoses and connection parts protected from environment (e.g.: covers) • Opening of the manhole should be managed to avoid introduction of Foreign bodys from environment • Proper garment for operators and drivers (hairnet, long sleeve, beard protection…) are in place • A sieving of 1mm is recommended before loading

Oils and Fats

Plastic liners stick to solid fat blocks. Using clear liners makes it very difficult to visually detect torn plastic pieces in the block. Using colored plastic helps operators visually identify the presence of plastic pieces.

Poultry

Trim, formed, tenders, whole breast **Main Foreign Body Risk:** **Bone, fat/gristle/cartilage, hair, plastic, metal, glove, wood**	**Production Information:** Feeder plants debone and separate raw material items which supply the further processing plants which formulate and cook to finished products.

Area of vulnerability	Potential issues	Mitigation actions
De-bone process and Feederplant performance	• Bone, Fat/Gristle/Cartilage	• Manual de-bone only. Auto de-bone not authorized as it creates a higher amount of defects • Use of X-ray to detect and remove bone • Fishbone RCA completed. De-bone process and control plan has established defect rate, SPC & control limits, sampling & frequency, type and numbers of bone recorded, and CA related to adjust line speed • Bone Detection and Removal Control Plan has established defect rate and x-ray validation procedur. • Control limits established at these locations in the process: after mechanical de-bone, after manual trim, pre and post x-ray • Vertical integration. Purchase of trim or tender from open Market (not vertically sourced) is approved by Nestlé • Feeder plant performance data is shared weekly and a robust chargeback and rejection program is in place. Eliminate underperformers and use raw material from best performers • Calibration of deboner daily and validate Fat, Grisle, Cartlidge complies with specifications
Feeder plant	• Hair, Plastic, Metal, Wood, Glove	• Hair removal program to include Lint rollers and floor audits to quantify hair found on employees and facility (platforms, steps, bridges) • Robust belt inspection program and use of metal belts or metal detectable. Plastic liners 7 mil. • Tool issuance program • Blade and grinder weight collection and checks. • Plastic pallets. Tote dipping process that prevents debris on pallets from contaminating product
Further Processing plant	• Hair, Plastic, Metal, Wood, Glove	• All above • X-ray and Metal Detection. Locked reject bins. • Foreign Body Control Plan (Capability of devices x-ray and MD)
Supply Chain	• Warehouse (stacked storage) and Transportation conditions (trailer cleanliness). Debris falling into cases or totes. Pallet debris (wood, stone, glass).	• Mandatory Pallet cap/cover • Remove debris on top of pallet cover prior to use

Poultry

Area of vulnerability	Potential issues	Mitigation actions
Trim	• Bone, Fat/Gristle/Cartilage	• Dual pipeline x-ray units with 180 degree turn into second unit • Reject mechanism for each unit • Minimum two persons to inspect material rejected from pipeline x-ray units • DSI calibrated daily to adhere to spec
Tender	• Bone, Fat/Gristle/Cartilage	• Specification for tender not to exceed 1/4 inch but is inspected and clipped to 1/8” • Dual x-ray passes with re-work loop
All	• Bone	• COA requirement that all material to passed through an x-ray system to detect and eliminate bone • X-ray detection & rejection capable of detecting at 99% effectiveness to 1/8" and outgoing defect level 1 bone per 10,000 lbs. of material
X-ray	• Bone	• Validation procedure using double pass method of minimum 1,000 lbs. to be conducted once per quarter • Defect rate is recorded for pass 1 and pass 2. Pass 1 cannot exceed 20 bones per 10,000 lbs. Pass 2 cannot exceed 1 bone per 10,000 lbs. • 1/8 inch pulley bone used for daily calibration and conducted once per hour • X-ray infeed reject rate cannot exceed 95%

Sugar (Dry)

Liquid and Powder	For crop calendar (harvest/production): http://www.usda.gov/oce/weather/CropCalendars/index.htm
Main Foreign Body Risks: **Metal, Stone, Wood, Plastic, Insect/Pest, Paper, Fibre/string, Burnt Particles.**	

For all Mitigations in *Italics*, see Common Risks section below:

Area of Vulnerability	Potential Issues	Mitigation actions
Dry Sugar Production (Process steps common to Beet only)		
Delivery of beet to Sugar Manufacturer Unloading and Storage	• Remains of previous crop / other plants / weeds / soil / stones / rubbish • Pest activity • Metal, plastic, paint from machinery/ farming equipment, transport	• Washing at reception into factory with a rotating arm over a large grid to remove foreign objects • *Pest prevention program* is in place • Supplier Quality Assurance (SQA) program in place • Filters / sieve / magnets / metal detector downstream (ensure fit for purpose: design, gauss, air gap) • Random sampling of raw materials at delivery
Slicing of beet and Diffusion	• Metal from blades / rollers / shredders • Debris/burnt particles from the diffusion tank which can be percieved as foreign objects	• *Preventive maintenance program.* • Visual inspection of sliced material • Filters / sieve / magnets / metal detector downstream. (ensure fit for purpose: design, gauss, air gap) • Tank is on a *cleaning schedule* • Crystallisation step to achieve 99% purity. • Visual inspection of each batch before despatch
Filtration of juice	• Filter failure e.g. foreign bodies passing through or filter mesh contamination	• Filter in place (Range 50-75um) • *Preventive maintenance program* • Filter failure detection / inspection system in place • Filter integrity is checked for integrity and findings on a regular defined frequency determined by HACCP study
Dry Sugar Production (Process steps common to Cane only)		
Delivery of cane to Sugar Manufacturer, Unloading and Storage	• Remains of previous crop / other plants / weeds / soil / stones / rubbish • Metal, plastic, paint from machinery/ farming equipment, transport • Pest activity	• Magnet present to protect crushing equipment (ensure fit for purpose: design, gauss, air gap) • Crystallisation and purification steps downstream to remove foreign bodies • Filters / sieve / magnets / metal detector downstream. (ensure fit for purpose: design, gauss, air gap) • Supplier Quality Assurance is in place • *Pest prevention program* is in place
Slicing/crushing of cane Juice extraction	• Metal from blades and rollers	• *Preventive maintenance program* • Filters / sieve / magnets / metal detector downstream (ensure fit for purpose: design, gauss, air gap)
Delivery of raw sugar to refinery	• Pest activity • Foreign objects introduced during shipping • Metal, plastic, paint from machinery/ equipment, transport and environment / previous loads	• *Pest prevention program* • Random sampling of raw materials at delivery • Goods-in checks are completed on arrival • Supplier Quality Assurance is in place • Filters / sieves / magnets / metal detector downstream

Sugar (Dry)

Area of Vulnerability	Potential Issues	Mitigation actions
Dry Sugar Production (Process steps common to both Beet & Cane production)		
Clarification / Purification	• Calcification, lime particles. • Contamination from purification tank. (i.e. material flaking off from sides of tank, burnt sugar).	• The purpose of purification is to remove soluble and insoluble impurities • Cystalisation step to acheieve 99% purity • Time and temperature controlled • *Preventive maintenance program* • Visual inspection of each batch. Burnt sugar is monitored to ensure it is within specification (limits defined locally) • Restricted volume of milk of lime • Juice passes through filters to remove calcium carbonate • Visual inspection of each batch before despatch. • Tank is part of a *cleaning schedule*. Appropriate food safe material used to coat the internal sides of the tank
Evaporation	• Burnt sugar particles • Pan scale / rust • Product Intervention / Maintenance	• Time and temperature controlled • Cells are part of a *cleaning schedule* • Evaporation is carried out under vacuum to prevent caramelisation • Crystallisation step to achieve 99% purity • Permit required for any intervention / maintenance and sign off required • Sieve present downstream
Crystallisation	• Burnt sugar particles • Pieces of pan scale / rust	• Time and temperature controlled • Crystallisation takes place in vacuum pans to prevent burnt sugar • Pans are part of a *cleaning schedule* • Sieve present downstream
Centrifugation & Crystal Washing	• Metal from plough, cylindrical basket, spindle, wire cloth, metal sheets and other moving parts from the centrifuge • Contamination from water supply / environment / water circuit	• *Preventive maintenance program* • Sieve / magnets / metal detector downstream (ensure fit for purpose: design, gauss, air gap) • *Water is on a testing schedule*
Drying & Cooling	• Contamination from air supply. • Contamination from environment / operator post crystalisation • Burnt sugar particles • Metal from Stainless Steel Claws used in the granulator / dryer	• Filtered air is used • Additional clean Personal Protective Equipment (PPE) for food safety purpose, including hairnets and clean laundered lab coats • Permit required for any intervention / maintenance and sign off required • Dryer is time and temperature controlled and is part of a *cleaning schedule* • Visual inspections on each batch prior to dispatch. • *Preventive maintenance program* • Sieve / magnets / metal detector downstream (ensure fit for purpose: design, gauss, air gap)
Intermediate Storage (Silo)	• Pest ingress • Contamination from silo walls • Contamination from human intervention i.e cleaning / maintenance • Contamination through air supply due to filter failure	• *Pest prevention program* and enclosed route to silo • Silo is part of a planned *cleaning schedule* • Product Intervention Permit required for any intervention Food safety PPE is worn. Employees receive food safety and Good Manufacturing Practice (GMP) training • Air filters are checked as part of a *preventive maintenance program*

Sugar (Dry)

Area of Vulnerability	Potential Issues	Mitigation actions
Dry Sugar Production (Process steps common to both Beet & Cane production)		
Packing into bags	• Metal or plastic from bagging machines. • Contamination from equipment/environment upstream. • Failure to clean magnet leading to blinding • Screen mesh wire / ball from locker screen as a source of foreign body (metal). • Sealing equipment (i.e Needle, string) • Operator physical contamination (i.e hair, belongings) • Pieces of packaging contaminating product • Contamination from the environment • Pest ingress • Conveyor material (fibre, string)	• *Preventive maintenance program* • Foreign body detection equipment present (type determined in HACCP study according to risk/line type i.e Sieve / Grading / Locker / Scalping Screen (Max aperture 2mm) Magnets (ensure fit for purpose: design, gauss, air gap) Metal Detector (Minimum 2mm FE, NFE, SS) • Verification frequency is determined based on the risk and history as determined in HACCP study • Operators are trained to ensure magnet checks are performed correctly • Visual change in particle size to indicate sieve failure. Sieves are inspected for integrity • Process alarms / operator inspection / automatic line safety stop following failure • Food safety PPE is worn. Hygiene zoning is in place. • Supplier Quality Assurance program in place • Operators over-seeing the filling process • No wooden pallets is preferred, although if essential, they should be inspected for integrity and kept a suitable distance away from any entry / sample points • Pre requisites are in place, such as *tool control*, *cleaning* and *Pest prevention program* • *Preventive maintenance program* and conveyor alarms
Transportation bulk (Tanker / Ship)	• Contamination from equipment/environment upstream • Screen mesh wire / ball from locker screen as a source of foreign body (metal) • Contamination from the wagon ship container (i.e. previous product, pieces of pallet or environment) • Pest ingress • Contamination from operator (hair, clothing) • Contamination from upstream process / burnt sugar	• Foreign body detection equipment present (type determined in HACCP study according to risk/line type i.e Sieve / Grading / Locker Screen (Max aperture 2mm) Magnets (ensure fit for purpose: design, gauss, air gap) Metal Detector (Minimum 2mm FE, NFE, SS). • Verification frequency is determined based on the risk and history as determined in HACCP study.Visual change in particle size to indicate sieve failure. Sieves are inspected for integrity. • Wagon / Ship is only used for transportation of food, is fully inspected, and is compliant with the permitted prior loads list • !Cleaning schedule and certificate is present for all tankers inspection for presence and integrity of seals. • Approved Distribution Company • *Pest prevention program* • End caps fitted to hoses when not in use • Food safety PPE and GMP operator training • Samples taken and tested for each load before release

Sugar (Liquid)

Area of Vulnerability	Potential Issues	Mitigation actions
Liquid Sugar Manufacture		
Re-melt / Dissolver	• Contamination from dissolvers (burnt sugar particles, material from sides of the pan, product build up) • Contamination from water supply	• *Preventive maintenance program* • Filters downstream. • Equipment is part of a *cleaning schedule* • *Water is on a testing schedule*
Filtration	• Filter failure e.g. foreign bodies passing through or filter mesh contamination	• Recommended filter size at this step: 8um • *Preventive maintenance program* • Filter failure detection / inspection system in place • Filter integrity is checked for integrity and findings on a regular defined frequency as determined in the HACCP study • Further filters / magnets are present downstream (ensure fit for purpose: design, gauss, air gap)
Heat exchange	• Metal from equipment • Product build up, risk of burnt sugar	• *Preventive maintenance program* • Filters present downstream • Heat exchange system is part of a *cleaning schedule*
Sterilisation & filtration steps	• Metal from sterilisation columns and pumps • Metal from filter mesh • UV Sterilisation lamp failure – Glass	• *Preventive maintenance program* • Recommended filter size at this step: 50um • Mesh integrity is checked on a regular defined frequency and corrective action taken in case of failure • Filters present downstream • Audited glass and hard plastic register to be in place • High temperature shrouded shatter proof glass • Glass breakage procedure in place
Production Plant & Storage Tanks	• Pest ingress • Contamination from silo walls	• *Pest prevention program* and enclosed route to silo • Storage tanks are part of a *cleaning schedule*
Transportation - Bulk	• Contamination from equipment/environment upstream • Contamination from the wagon (i.e previous product, pieces of pallet) • Pest ingress • Contamination from operator (hair, clothing) • Any remain foreign bodies / burnt sugar	• Foreign body detection equipment present (type determined in HACCP study according to risk/line type i.e filters (recommended 50um). • Verification frequency is determined based on the risk and history as determined in the HACCP study • Wagon is only used for transportation of food is fully inspected and complies with permitted prior loads list • Cleaning plan and certificate is present for all tankers. • Inspection for presence and integrity of seals • Approved distribution company • *Pest prevention program* • Correct storage and end caps fitted to hoses when not in use • Correct PPE and operators are given GMP training • Samples taken and tested for each load before release

!Note on Bulk Tanker Deliveries: Tanker checks include history of deliveries, seal integrity, seal numbers, cleanliness of the tank, loading valve and hose. Hauliers provide seal numbers in advance of the tanker arriving and are validated and recorded at delivery. A valid cleaning certificate is provided and checked for each tanker prior to loading and cleaning is validated and verified to demonstrate no residual material, allergens or chemicals. The contract held with the haulier defines expectations and previous delivery allowances, cleaning method and suitable validation.

Sugar (all)

Area of Vulnerability	Potential Issues	Mitigation actions
Risks common to multiple process steps in sugar manufacture		
Water	• Contamination from water source / environment / water circuits	• The quality and safety of water at point of use is ensured through pre-requisite programs i.e preventive maintenance, cleaning, security, circuit mapping. The source and origin of water is taken into consideration in the HACCP study and an appropriate monitoring and verification program is in place
Environment	• Building is not pest proof • Poor fabrication / inadequate cleaning • Contamination from the environment through air transmission	• A *Pest prevention program* is in place and corrective actions are taken • Buildings must provide reliable barriers to pest access from the external areas • High level cleaning plan in place. Good Manufacturing Practice (GMP) audits are carried out • Air filters are routinely inspected and replaced as part of *preventive maintenance program.* • Plant is enclosed where possible
Machinery parts / all conveying / material moving steps i.e. pumps / valves	• Belt fibre / string from damaged conveyors • Metal from damaged bearings / screws / pumps • • Metal from plant failure causing metal on metal contact	• Suitable material is used for product type. Conveyors are inspected for integrity and corrective actions taken • Belt tracking / alarm system is recommended. • All equipment including bearings / pumps / screws are part of a maintenance schedule • Audio and visual inspections are carried out routinely. • Process shut down in the event of a failure and adequate investigation / correction • *Preventive maintenance program* is defined with frequency determined according to risk • Operators are trained to recognise unusual sounds / conditions which could indicate plant failure • Appropriate metal detection device(s) present as determined by HACCP study
Equipment / tools	• Poor condition of tools / cleaning equipment (plastic) • Contamination from equipment (metal, plastic, cable ties, signage material) • Magnet is blinded (metal). • Use of sleeves/gaskets (plastic, gortex). • New equipment as a source of foreign bodies. • Use of damaged plastic / wooden pallets	• Presence and integrity of tools should be checked regularly • Wooden or sponge material should not be used. • Replacements are available in the event of damage. • Shadow boards and visual standards are recommended • Operator GMP training • Cables are away from product, and are metal detectable • All equipment is part of a Preventive Maintenance Program which is risk assessed. Improper 'home-made' repairing i.e using cardboard or tape should be forbidden. A procedure on managing damaged equipment should be in place • A HACCP study is in place for all process steps. • A sign off procedure after maintenance is in place • Use materials less susceptible to wear and tear inspected regularly • Magnets are validated and cleaned frequently. Critical limits are defined. Operators are trained to perform magnet checks (ensure fit for purpose: design, gauss, air gap) • Appropriate material is used and is risk assessed to include inspection frequency • Change management system is in place

Sugar (all)

Area of Vulnerability	Potential Issues	Mitigation actions
Risks common to multiple process steps in sugar manufacture		
	• Uncovered equipment / conveyors / silos • Equipment/transportation is not kept clean resulting in contamination to the product.	• Wooden pallets should be avoided or segregated. Damaged pallets should quarantined for return/disposal. • Closed line (but easy to inspect) is preferred. • A cleaning schedule is in place and signed off. Dry cleaning if possible. Wet cleaning should be controlled and all areas are dried down and inspected for water residue after the clean is complete. • Hygiene zones are defined.
Human Intervention	• Sampling / inspection intervention • Failure to report foreign body incidents. • Incorrect method used for checks / operating the machine. • Physical contamination (i.e hair, belongings, clothing etc).	• All personel receive frequent and role specific food safety training including foreign body control, Critical Control Points (CCP), Operational Pre-Requisitites and all relevant SOP's, including: • Management of rejected products to ensure that rejected product is handled correctly and not accidentally reintroduced into the good product stream. • Inspection of rejected product during production. • Root cause investigation methodologies. • Non conforming product procedure is in place. • Appropriate food safety protective clothing procedure is in place i.e laundering, hygienic design, personal hygiene practices, belongings, metal detectable stationary.

Examples of Foreign Bodies in Sugar at Nestlé Factories i.e Stones, wood, string, burnt particles.

Vegetables: Fruit Vegetables

Tomatoes, Peppers, Eggplant	For crop calendar (harvest/production): http://www.usda.gov/oce/weather/CropCalendars/index.htm
Main Foreign Body Risk: Stones, plastic, rubber, wood, insects, glass, hair, other plants	

Area of vulnerability	Potential issues	Mitigation actions
Field Choice & Preparation	• Stones, rocks, sand, glass • Used packaging, plastics, string, rubber, glass, metal, rubbish (e.g. from nearby dump) • Stubble/plant material from previous crop • Weeds including previous crop and grass • Animal remains, hair, feathers • Metal & Plastics from cultivation machinery	• Selection of most optimal field/farmer/growing area • Removal of rubbish (field walks) • Soil preparation by incorporating previous crop remains and other plant material • Protection against animals, birds (scarers) • Service of machinery - Replacement of old parts
Sowing to Pre-Harvest	• Foreign crop seeds & weeds in seed at sowing • Metal & Plastics from sowing equipment • Weeds & foreign plants • Insect infestation • Animal habitants of fields/Birds frequenting fields	• Use only certified seed. Clean sowing equipment to remove any foreign crop seeds from other crops • Service and repair sowing equipment before use • Selective use of herbicides and or mechanical weed control. Use pre- and post emergence herbicides where appropriate • Selective use of relevant insecticides based on risk assessments and forecasting & biological control • Periodical inspection of fields, bird scarers
Irrigation	• Metal, rubber and plastics coming from irrigation equipment	• Maintain and repair irrigation equipment • Ensure complete removal of all parts when removing sprinkler and drip irrigation pipes from field • Check water source for potential risk for foreign bodies
Harvest	• Harvest and transport machinery with foreign bodies (plants, hairs, plastic, metal, rubbish) • Animals habitant in fields (rabbits, squirrels) • Insects habitant in fields (pollinating, biological control) • Debris – plastics, rubbers, tubes, glass, metal • Personnel in contact with harvested crop • Stones	• Machinery cleaning before/during harvest. • Metal detectors on machinery where possible • Blowers on machinery to remove hairs, insects • Loud machinery to scare away animals • Machinery height adjustments • Inspection and removal of debris before harvest (field walks) • Manual sorting of debris after harvest of freshly picked produce. • Use of harvesting machinery that removes stones & similar foreign bodies. Ensure correct calibration of machinery • Proper training and providing adequate personal hygiene facilities • correct calibration of machinery

Vegetables: Fruit Vegetables

Area of vulnerability	Potential issues	Mitigation actions
Post-Harvest	• Transportation trucks & Open trucks • Time crop held in the field • Transportation routes • Off load area (exposed to all elements) • Processing line (broken pieces) • Personnel in contact with harvested crop	• Cleaning of trucks & covering open trucks at all times during transport and parking • Minimal hold time in the transport phase • Cleaning and removal of foreign bodies at loading / unloading • Blowers ventilators • Hand sorting • Good manufacturing practices for personnel, sorters on line (optic & manual), gravity separators
Storage (pre-processing (field/Farmer storage/Supplier storage	• Various debris • Damaged and rotten crop material	• Clean storage and transport bands • Apply FIFO principle • Use controlled atmosphere storage • Sorting of crop when removing from storage

Specific Raw Material Guidance

Crop	Potential issues	Mitigation actions
	Special attention – Rocks, stones, glass, foreign dried plants, plastics, tubes, dried stalks	Special attention – Optic and manual sorting, screeners, gravity separation for rocks/stones

Vegetables: Herbs

Parsley, Coriander, Bay leaf, Oregano	For crop calendar (harvest/production): http://www.usda.gov/oce/weather/CropCalendars/index.htm
Main Foreign Body Risk: Stones, Metal, Plastic, Rubber, Wood, Insects, Glass, Hair, other plants.	

Area of vulnerability	Potential issues	Mitigation actions
Field Choice & Preparation	• Stones, rocks, sand, glass • Used packaging, plastics, string, rubber, glass, metal, rubbish (e.g. from nearby dump) • Stubble/plant material from previous crop • Weeds including previous crop and grass • Animal remains, hair, feathers • Metal & Plastics from cultivation machinery	• Selection of most optimal field/farmer/growing area • Removal of rubbish (field walks) • Soil preparation by incorporating previous crop remains and other plant material • Protection against animals, birds (scarers) • Service of machinery - Replacement of old parts
Sowing to Pre-Harvest	• Foreign crop seeds & weeds in seed at sowing • Metal & Plastics from sowing equipment • Weeds & foreign plants • Insect infestation • Animal habitants of fields/Birds frequenting fields	• Use only certified seed. Clean sowing equipment to remove any foreign crop seeds from other crops • Service and repair sowing equipment before use • Selective use of herbicides and or mechanical weed control. Use pre- and post emergence herbicides where appropriate • Selective use of relevant insecticides based on risk assessments and forecasting & biological control • Periodical inspection of fields, bird scarers
Irrigation	• Metal, rubber and plastics coming from irrigation equipment	• Maintain and repair irrigation equipment • Ensure complete removal of all parts when removing sprinkler and drip irrigation pipes from field • Check water source for potential risk for foreign bodies

Vegetables: Herbs

Area of vulnerability	Potential issues	Mitigation actions
Harvest	• Harvest and transport machinery with foreign bodies (plants, hairs, plastic, metal, rubbish) • Animals habitant in fields (rabbits, squirrels) • Insects habitant in fields (pollinating, biological control) • Debris – plastics, rubbers, tubes, glass, metal • Personnel in contact with harvested crop • Stones	• Machinery cleaning before and during harvest. • Metal detectors on machinery where possible • Blowers on machinery to remove hairs, insects • Loud machinery to scare away animals • Machinery height adjustments • Inspection and removal of debris before harvest (field walks) • Manual sorting of debris after harvest of freshly picked produce. • Use of harvesting machinery that removes stones & similar foreign bodies. Ensure correct calibration of machinery • Proper training and providing adequate personal hygiene facilities
Post-Harvest	• Transportation trucks & Open trucks • Time crop held in the field • Transportation routes • Off load area (exposed to all elements) • Processing line (broken pieces) • Personnel in contact with harvested crop	• Cleaning of trucks & covering open trucks at all times during transport and parking • Minimal hold time in the transport phase • Cleaning and removal of foreign bodies at loading / unloading • Blowers ventilators • Hand sorting • Good manufacturing practices for personnel, sorters on line (optic & manual), gravity separators
Storage (pre-processing (field/Farmer storage/Supplier storage	• Various debris • Damaged and rotten crop material	• Clean storage and transport bands • Apply FIFO principle • Use controlled atmosphere storage • Sorting of crop when removing from storage

Specific Raw Material Guidance

Crop	Potential issues	Mitigation actions
	• All of the above apply • Special attention – Rocks, stones, foreign dried plants, plastics, tubes, glass. • Insects, foreign leaves, stalks, weeds, plastic, dried leaves of other plants	• All of the above apply • Special attention – Optic and manual sorting, screeners, air blowing for light particles such as insects, stalks

Vegetables: Leafy Greens

Raw material concerned: **Spinach, Kale, Cabbage, Broccoli**	For crop calendar (harvest/production): http://www.usda.gov/oce/weather/CropCalendars/index.htm
Main Foreign Body Risk: **Stones, plastic, rubber, wood, insects, glass, hair, other plants**	

Area of vulnerability	Potential issues	Mitigation actions
Field Choice & Preparation	• Stones, rocks, sand • Used packaging, plastics, string, rubber, glass, metal, rubbish (e.g. from nearby dump) • Stubble/plant material from previous crop • Weeds including previous crop and grass • Animal remains, hair, feathers • Metal & Plastics from cultivation machinery	• Selection of most optimal field/farmer/growing area • Removal of rubbish (field walks) • Soil preparation by incorporating previous crop remains and other plant material • Protection against animals, birds (scarers) • Service of machinery - Replacement of old parts
Sowing to Pre-Harvest	• Foreign crop seeds & weeds in seed at sowing • Metal & Plastics from sowing equipment • Weeds & foreign plants • Insect infestation • Animal habitants of fields/Birds frequenting fields	• Use only certified seed. Clean sowing equipment to remove any foreign crop seeds from other crops • Service and repair sowing equipment before use • Leave a buffer area between the side of the field and the sown area • Selective use of herbicides and or mechanical weed control. Use pre- and post emergence herbicides where appropriate • Selective use of relevant insecticides based on risk assessments and forecasting & biological control • Periodical inspection of fields, bird scarers
Irrigation	• Metal, rubber and plastics coming from irrigation equipment	• Maintain and repair irrigation equipment • Ensure complete removal of all parts when removing sprinkler and drip irrigation pipes from field • Check water source for potential risk for foreign bodies
Harvest	• Harvest and transport machinery with foreign bodies (plants, hairs, plastic, metal, rubbish) • Animals habitant in fields (rabbits, squirrels) • Insects habitant in fields (pollinating, biological control) • Debris – plastics, rubbers, tubes, glass, metal • Personnel in contact with harvested crop • Stones	• Machinery cleaning before and during harvest. • Metal detectors on machinery where possible. • Blowers on machinery to remove hairs, insects • Loud machinery to scare away animals • Machinery height adjustments • Inspection and removal of debris before harvest (field walks) • Manual sorting of debris after harvest of freshly picked produce. • Use of harvesting machinery that removes stones & similar foreign bodies. Ensure correct calibration of machinery • Proper training and providing adequate personal hygiene facilities

Vegetables: Leafy Greens

Area of vulnerability	Potential issues	Mitigation actions
Post-Harvest	• Transportation trucks & Open trucks • Time crop held in the field • Transportation routes • Off load area (exposed to all elements) • Processing line (broken pieces) • Personnel in contact with harvested crop	• Cleaning of trucks & covering open trucks at all times during transport and parking • Minimal hold time in the transport phase • Cleaning and removal of foreign bodiess at loading / unloading • Blowers ventilators • Hand sorting • Good manufacturing practices for personnel, sorters on line (optic & manual), gravity separators
Storage (pre-processing (field/Farmer storage/Supplier storage	• Various debris • Damaged and rotten crop material	• Clean storage and transport bands • Apply FIFO principle • Use controlled atmosphere storage • Sorting of crop when removing from storage

Specific Raw Material Guidance

Crop	Potential issues	Mitigation actions
	Special attention – Rocks, stones, foreign dried plants, plastics, tubes, insects, regrowth of other plants, dried leaves, extraneous dirty	Special attention – Optic and manual sorting, screeners, gravity separation of heavy materials, calibration of harvest machinery.

Vegetables: Underground Bulbs and Root Crops

Raw materials concerned: Beetroot, Carrots, Celeriac roots, Onions, Potatoes, incl. Garlic	For crop calendar (harvest/production): http://www.usda.gov/oce/weather/CropCalendars/index.htm
Main Foreign Body Risk: Stones, metal, plastic, rubber, wood, insects, glass, hair, other plants.	

Area of vulnerability	Potential issues	Mitigation actions
Field Choice & Preparation	• Stones, rocks, sand/Plant material, wood • Used packaging, plastics, string, rubber, glass, metal, rubbish (e.g. from nearby dump) • Stubble/plant material from previous crop • Weeds including previous crop and grass • Animal remains, hair, feathers • Metal & Plastics from cultivation machinery	• Selection of most optimal field/farmer/growing area • Removal of rubbish (field walks) • Soil preparation by incorporating previous crop remains and other plant material • Protection against animals, birds (scarers) • Service of machinery - Replacement of old parts
Sowing to Pre-Harvest	• Foreign crop seeds & weeds in seed at sowing • Metal & Plastics from sowing equipment • Weeds & foreign plants • Insect infestation • Animal habitants of fields/Birds frequenting fields • Crop type (carrots & parsnips bolting)	• Use only certified seed. Clean sowing equipment to remove any foreign crop seeds from other crops • Service and repair sowing equipment before use • Selective use of herbicides and or mechanical weed control. Use pre- and post emergence herbicides where appropriate • Selective use of relevant insecticides based on risk assessments and forecasting & biological control • Periodical inspection of fields, bird scarers • Removal of bolting, flowering, plants
Irrigation	• Metal, rubber and plastics coming from irrigation equipment	• Maintain and repair irrigation equipment • Ensure complete removal of all parts when removing sprinkler and drip irrigation pipes from field • Check water source for potential risk for foreign bodies

Vegetables: Underground Bulbs and Root Crops

Area of vulnerability	Potential issues	Mitigation actions
Harvest	• Harvest and transport machinery with foreign bodies (plants, hairs, plastic. Metal, rubbish) • Animals habitant in fields (rabbits, squirrels) • Insects habitant in fields (pollinating, biological control) • Debris – plastics, rubbers, tubes, glass, metal • Personnel in contact with harvested crop • Stones	• Machinery cleaning before and during harvest. • Metal detectors on machinery where possible • Blowers on machinery to remove hairs, insects • Loud machinery to scare away animals • Machinery height adjustments • Inspection and removal of debris before harvest (field walks) • Manual sorting of debris after harvest of freshly picked produce. • Use of harvesting machinery that removes stones & similar foreign bodies. Ensure correct calibration of machinery • Proper training and providing adequate personal hygiene facilities • Use of harvesting machinery that removes stones & similar foreign bodies. Ensure correct calibration of machinery
Post-Harvest	• Transportation trucks & Open trucks • Time crop held in the field • Transportation routes • Off load area (exposed to all elements) • Processing line (broken pieces) • Personnel in contact with harvested crop	• Cleaning of trucks & covering open trucks at all times during transport and parking • Minimal hold time in the transport phase • Cleaning and removal of foreign bodiess at loading / unloading • Blowers ventilators • Hand sorting • Good manufacturing practices for personnel, sorters on line (optic & manual), gravity separators
Storage (pre-processing, field/farmer storage/supplier storage)	• Various debris • Damaged and rotten crop material	• Clean storage area and transport conveyors • Apply FIFO principle • Use controlled atmosphere storage • Sorting of crop when removing from storage

Specific Raw Material Guidance

Crop	Potential issues	Mitigation actions
	Carrots • Special attention – Rocks, stones, plastics, tubes, bolting plants, woody carrots/parsnips	• Bolting plants to be removed manually on a regular basis in the fields. • Use varieties with reduced bolting risk • Avoid sowing during cold period
	Potatoes and sweet potatoes • Necrosis or simply inefficient peeling can cause dark specs, which are causing significant consumer dissatisfaction.	• Variety selection • Selection of growing region / climate • Agreement on quality grade (A, B ...) • Sufficient sorting processes • Sufficient peeling depth

Vegetables: Stalks

Leek, Chives, Asparagus	For crop calendar (harvest/production): http://www.usda.gov/oce/weather/CropCalendars/index.htm
Main Foreign Body Risk: Stones, plastic, rubber, wood, insects, glass, hair, other plants	

Area of vulnerability	Potential issues	Mitigation actions
Field Choice & Preparation	• Stones, rocks, sand • Used packaging, plastics, string, rubber, glass, metal, rubbish (e.g. from nearby dump) • Stubble/plant material from previous crop • Weeds including previous crop and grass • Animal remains, hair, feathers • Metal & Plastics from cultivation machinery	• Selection of most optimal field/farmer/growing area • Removal of rubbish (field walks) • Soil preparation by incorporating previous crop remains and other plant material • Protection against animals, birds (scarers) • Service of machinery - Replacement of old parts
Sowing to Pre-Harvest	• Foreign crop seeds & weeds in seed at sowing • Metal & Plastics from sowing equipment • Weeds & foreign plants • Insect infestation • Animal habitants of fields/Birds frequenting fields	• Use only certified seed. Clean sowing equipment to remove any foreign crop seeds from other crops • Service and repair sowing equipment before use • Selective use of herbicides and or mechanical weed control. Use pre- and post emergence herbicides where appropriate • Selective use of relevant insecticides based on risk assessments and forecasting & biological control • Periodical inspection of fields, bird scarers
Irrigation	• Metal, rubber and plastics coming from irrigation equipment	• Maintain and repair irrigation equipment • Ensure complete removal of all parts when removing sprinkler and drip irrigation pipes from field • Check water source for potential risk for foreign bodies
Harvest	• Harvest and transport machinery with foreign bodies (plants, hairs, plastic, metal, rubbish) • Animals habitant in fields (rabbits, squirrels) • Insects habitant in fields (pollinating, biological control) • Debris – plastics, rubbers, tubes, glass, metal • Personnel in contact with harvested crop • Stones	• Machinery cleaning before and during harvest. • Metal detectors on machinery where possible • Blowers on machinery to remove hairs, insects • Loud machinery to scare away animals • Machinery height adjustments • Inspection and removal of debris before harvest (field walks) • Manual sorting of debris after harvest of freshly picked produce. • Use of harvesting machinery that removes stones & similar foreign bodies. Ensure correct calibration of machinery • Proper training and providing adequate personal hygiene facilities

Vegetables: Stalks

Area of vulnerability	Potential issues	Mitigation actions
Post-Harvest	• Transportation trucks & Open trucks • Time crop held in the field • Transportation routes • Off load area (exposed to all elements) • Processing line (broken pieces) • Personnel in contact with harvested crop	• Cleaning of trucks & covering open trucks at all times during transport and parking • Minimal hold time in the transport phase • Cleaning and removal of foreign bodiess at loading / unloading • Blowers ventilators • Hand sorting • Good manufacturing practices for personnel, sorters on line (optical & manual), gravity separators
Storage (pre-processing (field/Farmer storage/Supplier storage	• Various debris • Damaged and rotten crop material	• Clean storage and transport bands • Apply FIFO principle • Use controlled atmosphere storage • Sorting of crop when removing from storage

Specific Raw Material Guidance

Crop	Potential issues	Mitigation actions
	All of the above apply Special attention – Rocks, stones, foreign dried plants, plastics, tubes, dried stalks	All of the above apply Special attention – Optic and manual sorting, screeners, gravity separation for rocks/stones, blowers for light materials

Packaging: Bulk Bags/Big Bags/Super Sacks/FIBC

Bulk Bags/Big Bags/Super Sacks/FIBC – assumes new, virgin material (not used)	Guidance on measures to ensure the quality and safety of supersacks can be obtained from the FIBC Association: https://fibca.com/wp-content/uploads/2015/10/FIBC_Food_Safety_Guide.pdf
Main Foreign Body risks: **Fibres, plastic other extraneous material through cross contamination such as metal, plastic and wood. Additonally, these materials can tagle with process equipment especially if strings are excessively long.**	

Area of Vulnerability	Potential Issues	Mitigation actions
Raw Material	• Hair • Dust • Fibres • String • Plastic • Wood • Metal • Insects and/or Rodents	• Must not have a loose liner and should be a form-fit PE liner adhered by food grade adhesive or sewn to heavy duty tabs at corners such as from approved supplier TransPac USA • Liner should be of contrasting color to product and can include EVOH layer if moisture barrier properties are needed. • The EFIBCA (European Flexible Intermediate Bulk Container Association) standard is required: •
Processing :Weaving		• Must not be loosely woven, but rather tightly knit with precise weaving machines • Should include goose necking inner liner and appropriate closure (knotted, tie wraps, colored metal detectable zip tie) • Must not have frayed or loose fibers, but rather the seam edges rolled, sewn, and ultrasonic cut. • Cutting of threads should be made with a hot knife or ultrasonic cut to ensure the edges are sealed • Tying rope for the emptying and filling of spouts should be a good quality PP tape.
Filling (where applicable)		• Multi use sacks may be dry (vacuum) or wet cleaned before filling and thoroughly examined for damage to stitching, gluing, welding and for surface abrasion, cuts, tears and any other damage to the sack • Before filling, all super sacks need to undergo a thorough quality inspection. This may include but not limited to running the sacks through metal detectors. All threads and loose materials need to be removed and checked for defects and damages..
Palletizing		• Pallets also need to undergo a quality inspection. The use of a cardboard pad (e.g. slip sheet) between the pallet and the sack is needed • Must fit on standard 40"x48" pallet with no overhang to prevent damage during transport. It is preferable that the dimensions of the pallet are about 100mm larger than the length and width of the Big Bag. • Should be stretch wrapped to mitigate product settling over time and causing bag to overhang • Should have a 3-ply min. solid fiber pad between pallet and supersack with appropriate gauge • Plastic is preferable to wood for pallet material
Shipping/Storage	• Assurance of load safety and stability • Disintegration due to UV light • Dust • Hair • Insects and/or Rodents	• Must have the correct certification and safe working load (SWL) with safety of 5:1 for single use and 6:1 for multi-use • Must meet all regulatory requirements for use with food products • Bags should be stored protected from sunlight, pests, dust, etc. and should be segretated according to robust GMP policies.

Pass/Fail Criteria of FIBC:

Excessive Supersack Overhang over Pallet

Supersack, Liner, and Zip Tie in contrasting color & Metal Detectable

Frayed Supersack Material

Pallet & Sack Stretch Wrapped with Solid Board Pad

Packaging Material: Glass

Generic Glass Containers	Generic production process: Batching – Furnace – Forehearth and Feeder – Forming – Annealing (surface coating) – Cold End Inspection – Packing – Warehouse/Distribution
Main Foreign Body risks: **Glass fragments, extraneous foreign matter**	

Area of Vulnerability	Potential Issues	Mitigation actions
Forehearth <u>or</u> Forming	• Internal tear: glass surface rupture on inside of container, can vary in length and width and is open. • Blister soft Inside: blister next to internal surface already burst or capable of burst/broken • Blister Sealing Surface: soft blister on the sealing surface that can breakin normal use • Blister Soft Outside: blister next to outside surface already burst or capable of burst • Sugary top/crizzled sealing surface/crushed sleeve (defect related to thermal conditions and/or mechanical conditions) • **Non Glass Inclusions**; metallic/non-metallic FB in the glass that can contribute to breakage • **Overpress/wire edge finish**: Fin of glass on inside of finish protruding upwards above top. Wire press same except does not protrude above	• Follow Forehearth temperature and mechanical control and monitoring procedures; machine timing, alignment; mold/blank cooling procedures; gob forming and delivery temperature controls in forming • Investigate furnace interior, review batch and cullet materials to conform to spec. Check flame. • Also forehearth temperature controls; monitor of gob shape and weight • Control furnace and forehearth temps., control gob weight, control gob shape, control guide ring.
Forming step	• **Mold fins**: raised fin of glass on moulded joint • **Over-pressed bottom**: sharp edge that could break off and add to tramp glass • **Ultra thin bottom**: thickness out of spec.	• Mold equipment alignment, requalification procedures, forming equipment controls • Follow forming housekeeping procedures, folow jam procedures, follow machine alignment procedures • Control forehearth temp., control gob weight, maintain machine settings for timing, blank cooling, final blow
Forming	• **Bird swing**: General defect description: filament connecting two "sides" of container. • **Internal stuck/fused glass**: fragment adhering to inside of container • **Plunger pull/hot plunger**: internal projection, sharp, base or neck area • **Stuck plug**: similar to plunger pull projecting inside bore • **Choked bore** • **Sugary bore/top** (aka crushed sealing surface, crushed sleeve, surgary top, crizzled sealing surface) • **Ring Finish Damage**: small fragment on sealing surface • **Flange Finish**: horizontal fin extending from external ring • **Internal Tear**: open, internal rupture; can insert fingernail • **Loose glass fragment** • **Cracks/fractures**	• Control forehearth temperature, control gob temp., review machine settings: timing, blank cooling, final blow, invert settings • Follow housekeeping procedures, follow machine jam procedures, follow requalification procedures, maintain covers over take outs • Control forehearth temperature, control gob temp., review machine settings. • Control forehearth temperature, control gob temp., review machine settings. • Control forehearth temperature, control gob temp./shape, adhere to machine settings for timing, blank, cooling, final blow • Control forehearth temperature, control gob temp., adhere to machine settings for timing, blank, cooling • Foaming machinhe alignment and timing, follow forming housekeeping procedures, manage reject controls • Mold equipment alignment, forming controls

Packaging Material: Glass

Area of Vulnerability	Potential Issues	Mitigation actions
Forming		• Control forehearth temperature, control gob temp. Adjust plunger temperture • Forming housekeeping procedures, maitain covers over machines/conveyors • Control glass temp., follow forming, annealing, conveying and handling procedures
Forming	**Not as common:** • **Glass membrane**: complete or partial membrane of glass obstructing mouth or located just above base • **Uneven Glass distribution: can lead to tramp glass**	• Control forehearth tem., gob temp., machine settings of timing, blank cooling, final blow, invert settings nd mechanical alignment • Reduce glass temperature/stabilize glass temp; decrease gob shape; adjust gob positioning; adjust hardness of parison
Packing, distribution or any point in process or distribution	**Physical/internal contamination**	Follow housekeeping procedures hot end to palletizing, Full protection of stacked containers during shipment; Inversion on slip sheets w/full stretch film application; Finished containers inverted in cases with interim sheet on top and bottom between glass and case; Use of clean/new pallets; pallet inspection to cull damaged pallets.

Specific Guidance:

Practice	Process location
Line Spacers	Annealing and cold end
InGaAs* SWIR* Camera/3D scanners/other optical scanning equipment Manual/visual container inspection	Hot/Cold End defect inspection
Thermal Inspection	Hot End
Visual monitoring of plunger temp	Hot End
Manual End of Lehr inspection	Annealing
Cross breaking resistance	Cold End
Bore gauge	Cold End
dielectric inspection	Cold End
Automated finish inspection: chipped finish, crizzled finish	Cold End
Non-contact & covered conveyors	Cold End to palletizing
Container inversion	Before palletizing

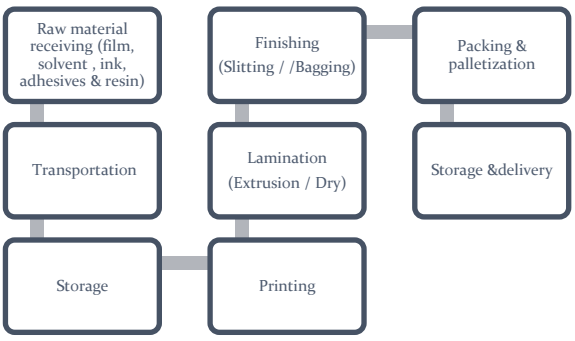
*InGaAs: Indium gallium arsenide

*SWIR cameras can image through glass, allowing operators to inspect both the interior and exterior walls of the bottle, as well as monitor the temperature uniformity and cooling rate of the material.

Packaging Material: Flexible Packaging Film, Laminates, Bags

Flexible Packaging Film, Laminates, Bags, etc.

Main Foreign Body risks:
Dust, particles, hair, insect, plastic/ film residues, sticker, undeclared splice joints.



Production process

Area of Vulnerability	Potential Issues	Mitigation actions
Raw material receiving (such as film, solvent, ink, adhesives, resin, paper core and etc)	• Foreign material introduced to the material during the supplier's manufacturing process such as insect, dust, unannounced tape, hardened foreign material. • • Use of damaged plastic pallets • Wooden pieces and dust from the tear film or not well wrapped.	• Define raw material specification and seek declaration from suppliers (COC, COA). • Supplier audit program with supplier evaluation (ex.GFSI) • Ensure IPM program is robustly managed and all points of entry are sealed. Install air curtains and auto doors • Plastic pallets should be regularly checked. Damaged ones should be eliminated. • Protect material during in-plant transportation by covers and stretch film. • Walls in areas of heavy traffic are protected by stainless coverings
Transportation	• Dirt, dust particles : packaging damage during transportation • Mouldy pallet • Foreign materials introduced due to unhygienic conditions of transport used	• Strong implementation of the GMP and pest management • Inspection the container at reception at per defined checks • Supplier to follow 'Transport hygiene policy' • Vehicle inspection check before goods unloaded
Storage	• Foreign objects from the environment such as dust, dirt, insect and etc. • Bird nesting (droppings, feathers, etc.)	• Dedicated storage area for different type of materials • Warehouse cleaning program • Enclosed warehouse with netting installed. • Pest control program including monthly inspection
Printing	• Dirt, Dust, • Wood chips (from pallet) • Glass and hard plastic • Broken blade • Insect • Hair • Ink residues • Tapes.splice tape • Sticker	• Pallet inspection program • Pallet top is covered with slip sheet (corrugated board/ single facer) • Glass and hard plastic management program (identification , monitoring and systematic incident management) • Cutter Blade daily inspection and management program (identification, monitoring and systematic incident management) • Pest control program. • Personal hygiene policy including jewellery policy, hair net and etc. • Ink supply system which include ink filtering process at two stages- initial ink preparation and during process

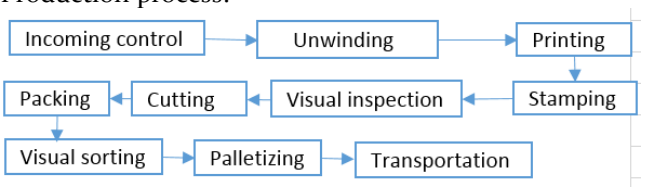
Packaging Material: Flexible Packaging Film, Laminates, Bags

Area of Vulnerability	Potential Issues	Mitigation actions
Printing	• Dirt, Dust, • Wood chips (from pallet) • Glass and hard plastic • Broken blade • Insect • Hair • Ink residues • Tapes.splice tape • Sticker	• Printing and laminator machines are equipped with on line camera detection system • On line web scanner that capable of detecting foreign object such as splice tape and insects • Each printed roll shall go through an edit process which foreign material such as sticker/ insect can be filtered out. Rolls wrapping procedure. Every single roll process before and after should be wrapped • Poly E melted peices: resin filters and magnetic metal hopper grates to contain foreign bodies.
Lamination (Extrusion/ Adhesive)	• Splice joint tape from supplier's film • Insects • Hair • Dust, dirt • Wood chips (from pallet) • Glass and hard plastic • Broken blade • Foreign body (such as wax, dust and etc.) from resin used • Hardened adhesive residues • Film residues stick on splicing knife (Unwinder/Rewinder) • PE lump, carbon deposit • Side trim • Over dose set off powder • "Corrugated board", tape, sticker	• On line web inspection scanner to detect • Printing and laminator machines are equipped with on line camera detection system • Pest management program including monthly inspection • Insect proofing facilities such as 'double door', curtain strip, netting and etc. • Personal hygiene program including jewellery policy, hairnet policy and etc. • On line web inspection scanner is capable to detect and tag any of the FB detected. NCR issued (with defect image provided) and follow by NCR close out at finishing process • Rolls wrapping procedure. Every single roll process before and after should be wrapped • Pallet management program • Pallet top should cover with slip sheet (corrugated board/ single facer) • Glass and hard plastic management program (identification , monitoring and systematic incident management) • Blade management program (identification, monitoring and systematic incident management) • Resin hopper with filter to filter out any dust or foreign particles in the resin • Adhesive supply c/w adhesive filtering process • Weekly cleaning program • Preventive maintenance program • Weekly machine cleaning • Periodical die cleaning program • On line web inspection scanner is capable to detect and tag each of the FB detected. NCR issued (with defect image provided) and follow by NCR close out at finishing process • Web width to include suitable provision for side trim allowance • Every roll identified with unsmooth side trimming process (side trim embedded) shall be tagged; NCR reported and sent for another special rewinding process. Follow by NCR close out at finishing process • Food grade powder • Equipment periodical maintenance • On line web inspection scanner is capable to detect and tag each of the FB detected. NCR issued (with defect image provided) and follow by NCR close out at finishing process • " Internal corrective action request' system triggered for corrective action

Packaging Material: Flexible Packaging Film, Laminates, Bags

Area of Vulnerability	Potential Issues	Mitigation actions
Finishing (Slitting, Rework & Bagging processes)	• Dirt, dust	• Rolls wrapping procedure. Every single roll process before and after should be WRAPPED • Every roll send for finishing process must go through a special designed 'air shower room' or decontamination steps • Finishing area is identified as critical hygiene area with additional personal hygiene program (such as dedicated shoes), quarterly air monitoring program and etc
	• Hair	• Personal hygiene program such as hair net • Operator to go thru a 'air shower' room before entering to the finishing process
	• Wood chips (from pallet)	• Pallet management program – dedicated pallet use for finishing process area only • Pallet top should cover with slip sheet (corrugated board/ single facer). The slip sheet is free from any foot prints and wear & tear
	• Broken blade	• Blade management program (identification, monitoring and systematic incident management) • In line sensors to detect tape splices
	• Glass and hard plastics	• Glass and hard plastic management program (identification , monitoring and systematic incident management)
	• Insects	• Pest management program including monthly inspection • Insect proofing facilities (such as air shower room, auto shuttle door and etc.)
	• Side trim (for slitting process)	• Proper side trim design and travelling path • Web width to include suitable provision for side trim allowance
	• Bags' side trim	• Static removal device • Cleaning program
Packing& palletisation	• Foreign material due to warehouse environment such as bird dropping, insects, dusts and etc.	• Rolls wrapping procedure. Every single roll process before and after should be wrapped • Enclosed warehouse with pest proofing infrastructure such as netting, curtain strip, double door, • Pest control management program. • Personal hygiene procedure
	• Packing materials or tools drop on the products / pallet packed such as tapes, glue bottle, label and etc.	• All packing materials/ tools are kept on a specify containers
	• Glass and hard plastic	• Glass and hard plastic management program (identification , monitoring and systematic incident management)
Storage & Delivery	• Dirt/ dust particles.	• Rolls wrapping procedure. Every single roll process before and after should be wrapped • IPM and rigorous master cleaning program
	• Possibility of unhygienic conditions of transport / container used	• Transportation specific hygiene policy. • Vehicles inspection • For export containers- third party surveyor program

Packaging Material: Paper

Paper	Production process:
Paper, Cup, Solid Board, Micro Flute Board	
Paper for packaging for confectionery or ice cream <u>with direct food contact!</u>	
Main Foreign Body Risks: Pieces of paper (fiber), hair, wood, metal (Aluminum foil)	

Area of Vulnerability	Potential Issues	Mitigation actions
Ingredients: **Metal, wood, foreign paper, film**	• Metal from grinding & transport • Colorants & additives are manually dosed: metal, wood, foreign paper • Parts of packing film	• Inspection at reception. • Incoming control should include control of FB and evaluate in Hazard analysis. • Note: Most foreign bodies introduced at this point will be welded into the parts • Remove external packing in basic hygiene areas
Keeping & internal transportation: **Paper, wood**	• Foreign paper • Metal from transport • Insects, hair • Wood from broken pallets	• Mold preventive maintenance and clean-up frequencies (flakes and angel hairs) • GWP and GMP in place • Pest control management on high level
Unwinding/Cutting: **Hair**	• Hair and dust attracted by static electricity • Hard plastic from broken equipment • Remains of paper after cutting operation • Parts of knife	• Full coverage of unwinding/cutting process (top and sides, no gaps) • GMP of unwinding/cutting • Using only knife with integral blade
Printing: **Hard plastics, hair**	• Broken or deformed hard parts of equipment • Metal parts of equipment • Foreign objects from the environment • Handling dosing of colorant & additives	• Right maintenance • GMP at dosing point • Ensure operator hygiene and GMP rules • Dosing station SOP and set up
Stamping: **Metal, plastic**	• Shaving of metal against metal moving parts • Part to sharp metal contacts • Excessive conveyor pressure • Part break due to hit or mis-assembly • Dust and other foreign object from the environment and compressed air. • Part of foil after stamping • Plastic covered due to improper design Remains of paper after carving operation	• Preventive maintenance and daily routine inspection • Operator intervention protocol • Center lining of moving parts, esp. star wheels • Full coverage of the carving process • In case of risks for hard plastic due to breaking parts, apply a glass and hard plastic break procedure (see prevention and control of glass breakage) • Right filters on compressors • Visual inspection of after foil stamping
Moulding/Gluing & packing: (where applicable) **Hair, paper, fiber confetti**	• Plastics, paper & tape from transport/storage boxes • Dust and other foreign object from the operator pockets or the environment	• Ensure operator hygiene and GMP rules • Box handling practices • Tape usage • Using of OPL standards for packing of FG
Palletizing: **Hair, paper, wood**	• Sharp parts damaging the liner • Broken or deformed hard parts due to case handling, sticker application or shrink wrapping • Transport conditions (temperature, humidity or shocks) • Parts of blade	• Pallet integrity simulation tests • Transport test involving full truck load • Careful operation when in manufacturer control • "Fragile" stickers, if applicable • Use only special knife with solid blade • Liner integrity, liner color ≠ part color • Tape usage • Cardboard headspace and thickness

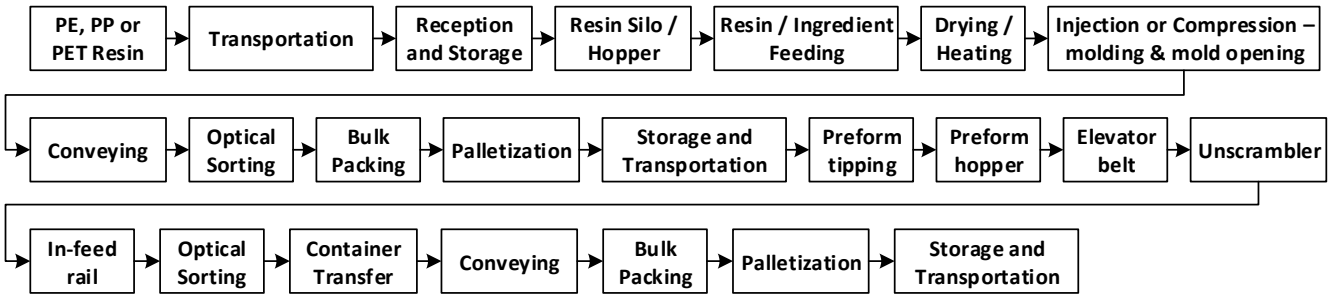
Packaging Material: Paper

Area of Vulnerability	Potential Issues	Mitigation actions
HACCP study **Pieces of paper, hair, wood, metal (Al foil)**	• No assessment of foreign bodies risk	• Identification of all sources of foreign bodies at each step of the process (metal-to-metal contact, fibers / strings, rubber, pest, glass…) • Implementation of pre-requisite programs and control measures to mitigate the risk

Packaging Material: Plastic

Plastic Products:	Caps, PET Preforms and Containers / Bottles
Production Process	Injection or Compression molded PE, PP Caps & Injected PET Preforms & Bottle / Container Blowing
Main Foreign Body Risks	Hard Plastics, Metal Pieces, Dirt / Dust Particles, Angel Hair

Production process (General Flow Diagram):



* Note: The actual flow may have less or additional steps so please adapt to the actual conditions. And keep focus on the requirements mentioned in the pre-requisites.

General Guidance

Pre-requisites Processing Equipment & Parts Design	• All items coming into contact with resins, preforms, caps or containers / bottles should be easily accessible for inspection and cleaning. Protections and carters shall be rigid and transparent wherever possible, easily removable by hand (with appropriate safety guarding) and hinged from one side. • All items coming into contact with resins, preforms, caps or containers / bottles should not have sharp edges, nuts, bolts (or similar) on their surfaces which can create hindress along material movement. In case of resin momenvement, it can generate foreign bodies; in case of caps, preforms and bottles, it will generate foreign bodies, sharp edges and cause altration of the final finish. • Parts in movement having direct contact with the resins, preforms, caps or containers / bottles, or that could have indirectly contact with the product should not be greased. Hygienic mechanical sealing solutions should be provided. • Greasing of parts in movement having direct contact with the resins, preforms, caps or containers / bottles, or that could have indirectly contact with the resins, preforms, caps or containers / bottles is protected by double sealing and visible leakage chamber. • On equipment, drip trays under lubricated parts must prevent from any leakage on the packaging and on the floor. In fact, the machine is protected at any place where grease or lubricants could migrate towards resins, preforms, caps or containers / bottles • Manual cleaning of any parts of the equipment in contact with the resins, preforms, caps or containers / bottles is possible • Good welding practices must avoid any leakages, any retention areas and cracks that are difficult to clean, and any corrosion of welding joints, which could create cracks and generate foreign bodies.

Packaging Material: Plastic

Area of Vulnerability	Potential Issues	Mitigation actions
PE, PP or PET Resin **Metal, Foreign Plastics**	• Metal, Foreign Plastics for the manufacturing process, packing and storage at manufacturer.	• Define your raw material specifications and agree with your suppliers
Transportation **Dirt / Dust Particles**	• Dirt / Dust Particles; Packaging damage during transportation	• Define and agree transportation conditions
Reception and Storage **Metal, Wood, Foreign plastics, Dirt / Dust particles**	• Plastic pellets: metal from grinding & transport • Colorants & additives are manually dosed: metal, wood, foreign hard plastics • Dirt / Dust Particles; Packaging damage during transportation	• Inspect the container at reception as per pre-defined checks • Inspect the packages in the received lot as per pre-defined checks
Resin Silo / Hopper **Metal, Wood, Foreign plastics, Dirt / Dust particles**	• Nuts / bolts from top cover or associated assembly • Plastic pieces from breakage of top cover or associated assembly • Dirt/Dust Particles accumulated on the outer packaging	• Tipping design must ensure that no wood particles or dirt from the pallet can be transferred into the hopper with the resin • Properly covered and hinged • Preferably do not joined with nuts and bolts on the top which could fall into preforms • Regularly inspected for breakage
Resin / Ingredient Feeding **Foreign plastics**	• Colorants & additives are manually dosed: metal, wood, foreign hard plastics	• Controlled operation
Drying / Heating **Foreign plastics, Dust Particles**	• Particles detached from ducts/pipes, etc. • The circulating air carrying dust particles.	• All ducts, pipes for PET resin and regeneration air have to be food contact grade • The circulating air is properly filtered
Injection or Compression – molding & mold opening **Plastic Particles**	• Hard plastics from start-up operation and from fall on conveyors • Angel hairs from cooling/de-molding process • Plastic flakes from mold mis-adjustment • Soft plastics from guiding curtains and conveyors • Metal and paint flakes if the machine is not covered	• Inclined plane or speed slow down device to prevent part break and loose hard plastic • Mold preventive maintenance and clean-up frequencies (flakes and angel hairs) • Line start-up inspection and release (hard plastics) • GMP guide curtains (soft plastics) • Mold coverage and roof repair
Conveying **Plastic Particles, Hair, Dust**	• Hair and dust attracted by static electricity • Hard plastic from broken conveyors	• The conveyor must comply with food contact grade material and is covered. • Top cover made of rigid transparent plastic, all along the conveyors path
Optical Sorting **Plastic Particles, Hair, Dust**	• Broken or deformed hard parts • Parts of conveyors: plastics • Foreign objects from the environment	• The optical sorter is equipped with camera(s) and reject system to remove any defective part • The pieces are best controlled if they have the same orientation and spacing at the entrance into the equipment • The sorter is calibrated, validated and monitored
Bulk Packing **Plastic Particles, Foil**	• Broken or deformed hard parts • Plastic from the conveyor belt • Plastic foil from the packaging liner	• Liner integrity, liner color ≠ part color • Tape usage • Cardboard headspace • Cardboard thickness • Box handling practices
Palletization **Plastic Particles**	• Sharp parts damaging the liner • Broken or deformed hard parts due to case handling, sticker application or shrink wrapping • Transport conditions (temperature, humidity or shocks)	• Pallet integrity simulation tests • Transport test involving full truck load • Careful operation when in manufacturer control • "Fragile" stickers, if applicable

Packaging Material: Plastic

Area of Vulnerability	Potential Issues	Mitigation actions
Storage and Transportation **Metal, Wood, Foreign plastics, Dirt / Dust particles**	• Dirt / Dust Particles; • During storage in warehouse • Packaging damage during transportation	• Define and agree storage and transportation conditions
Preform tipping **Metal, Wood, Foreign plastics, Dirt / Dust particles**	• Nuts / bolts from feeding / tipping equipment • Plastic or metal pieces from breakage of feeding / tipping equipment • Dirt/Dust Particles accumulated on the outer packaging	• Tipping design must ensure that no wood particles or dirt from the pallet can be transferred into the hopper with the preforms
Preform hopper **Metal, Foreign plastics**	• Nuts / bolts from top cover or associated assembly • Plastic pieces from breakage of top cover or associated assembly	• Properly covered and hinged • Preferably do not joined with nuts and bolts on the top which could fall into preforms • Regularly inspected for breakage
Elevator belt **Metal, Foreign plastics**	• Nuts / bolts from elevator belt • Metal shaving, plastic pieces from conveyer belt • Foreign objects from the environment	• The preform path is smooth and free of obstructions such as bolt heads, nuts or rivets that are likely to damage the preform, or that could accidentally fall into a perform and generate foreign bodies in the product. • Elevators and belts are designed in a way that wearing parts are not generating particles to avoid foreign body contamination. • The elevator belt is covered.
Unscrambler **Dust Particles**	• Foreign objects from the environment	• Design in such a way as to prevent preforms from remaining inside the equipment without being sorted. • During normal operation unscrambler is covered
In-feed rail **Metal, Foreign plastics, Dust Particles**	• Nuts / bolts from in-feed rail • Foreign objects from the environment	• Screws and bolts maintaining the sensor is positioned in a way that they cannot accidentally fall inside the preforms. • Infeed rail top covered. Side access is guaranteed.
Optical Sorting **Metal, Foreign plastics, Dust Particles**	• Broken or deformed hard parts • Parts of conveyors: plastics • Foreign objects from the environment	• The optical sorter is equipped with camera(s) and reject system to remove any defective part • The pieces are best controlled if they have the same orientation and spacing at the entrance into the equipment • The sorter is calibrated, validated and monitored
Container / Bottle Transfer **Plastic pieces** **Foreign plastics, Hair, Dust Particles**	• Hair and dust attracted by static electricity • Hard plastic from broken conveyors • Foreign objects from the environment	• The bottle transfer shall not affect the integrity or the quality of the package: it shall not scuff, scratch, crease or otherwise damage bottles during normal operation • Top cover made of rigid transparent plastic, all along the conveyors path
Conveying **Dust Particles**	• Dust Particles	• Neck Conveyers: • The neck conveyers are regularly cleaned and inspected - both from inside and outside • Air (meant for transferring) is properly filtered • Filters are regularly inspected and maintained • Bottle / container neck guide is realized in plastic material and run without any lubrication

Packaging Material: Plastic

Area of Vulnerability	Potential Issues	Mitigation actions
Bulk Packing **Plastic Particles, Foil**	• Broken or deformed hard parts • Plastic from the conveyor belt • Plastic foil from the packaging liner	• Liner integrity, liner color ≠ part color • Tape usage • Cardboard headspace • Cardboard thickness • Box handling practices
Palletization **Plastic Particles**	• Sharp parts damaging the liner • Broken or deformed hard parts due to case handling, sticker application or shrink wrapping • Transport conditions (temperature, humidity or shocks)	• Pallet integrity simulation tests • Transport test involving full truck load • Careful operation when in manufacturer control • "Fragile" stickers, if applicable
Storage and Transportation **Metal, Wood, Foreign plastics, Dirt / Dust particles**	• Dirt / Dust Particles; • During storage in warehouse • Packaging damage during transportation	• Define and agree storage and transportation conditions

Prevention of Hair Contamination

Main Origins:

- Animals
- Human
- Packaging

Known Origin of Hair contamination:

Origin	Field	Slaughtering	Cleaning /washing	Transforming	Packaging	Environment
Meat & poultry		X	X	X		X
Ingredients	X		X			X
Employees	X	X	X	X		X
Packaging					X	X

Area of vulnerability	Potential issues	Mitigation actions
Animal fur and feather	• Incoming animals: hair and feather remains • Other ingredients with hair on pack, inside • Lack of standard / specification • Specification not mutually agreed • Lack of internal & external awareness for the specification	• Have a clear & agreed specification addressing absence of hair and feather • Have it trained internally and externally • Have this as visual reminders for operators • All ingredient processing lines have a hair removal step (see below)
Human hair	• Absence of hair prevention policy • Non respect of the hair policy (zone, frequency) • Hair nets not covering all hairs, incl. beard, sideburns • Improper hair net quality • Conflicting interpretation of the hair policy • People traffic close to open products • Forklifts traffic close to open products	• Traffic takes place away from open products • Zoning and uniform policies are clear and communicated broadly • The uniform includes long sleeves and pants with tight ends • Mirrors are available to verify the uniform • In open product areas, the hair net covers head, neck, shoulders and sideburns • Hair nets should be worn prior to the uniform • The tissue density of the hair net should be ≥ 20 gram per square meter (med. surgery grade)
Hair-like fiber from plastics	• Lack of prevention program against fiber generation • Opening of ingredient packaging • Sealing of packaging materials • Sealing control is not a release parameter	• Work with the supplier of the packaging material • Define the optimal packaging specifications • Define the optimal sealing conditions • Define the optimal machine settings • Define the best manner to open bags without fiber generation • Train your clients on how to safely open ingredient bags
Handling dry ingredients	• The open parts of the line past **the dust aspirators and last sifting steps** • Hair, wood or dust visible on the floor • Outer surface of the bags • Lack of specific area to strip the bags	Zoning: • Define the areas with open products as high risk • Restrict traffic to the minimum in those areas and make visible on floors / walls • Collect hair on the floor & plastic surfaces • Communicate / Train employees • Revise cleaning frequencies based on findings • Review wall & door tightness
Handling wet ingredients	• The open part of the line past the **last washing and rinsing steps** • Packaging or pipes with electrostatic surfaces • Hair, wood or dust visible on the floor • Lack of specific area to strip the pallets	

Prevention of Hair Contamination

Manufacturing Practice	Basics	Best Practice (on top of basics)
People 	• Caps completely cover hair and ear-lobes with no exposed parts, single use • Beard masks completely cover beard and moustache • Long sleeve uniform in locations where products or materials are exposed • Shirts always underneath pants • Mirror at each hairnet delivery station • Hairs sticking out of hairnet with low tissue density: 	• In medium and high care areas: • Hair net covers all hair with no exposed hair on head, neck, shoulders and sideburns • The tissue density of the hair net is ≥ 20 gram per square meter (med. surgery grade) • Detailed descriptions in place establishing sequence of wearing uniforms, correct use during production and intervals • Lint sticky rollers at all entries with visual training
Methods	• Prevention training included in the site induction plan and yearly repetition • Training includes at least production, quality, maintenance, engineering staff, and contractors. • Behavior monitoring organized on the shop floor, including correct use of caps and uniforms as part of the routine GMP hygiene verifications	• Training includes all facility staff. • Visual reminders on the shop floor connected with the training given (picture) • Training methods actively adapted based on findings on the floor and claims from clients • Training effectiveness verified on the floor by testing for the presence of hairs on uniforms and surfaces
The Environment	• Compressed air is not in use in areas with open products • Ventilation is not directed towards open products • Open food and primary packaging are covered • Restricted traffic in open product areas	• Air pressure control, tight doors & windows, filtration of recirculated air. Air showers. • Collect and record dust & hair on floor and surfaces • Optimum frequency for environmental cleaning • Trend analysis communicated to all employees • Check if air circulation is not a source for hair contamination (are there filters?)
Materials	• In basic areas: • External liner always covering bags and big bags • Flexible package and auxiliary material always protected in the warehouse	• Vacuum or antistatic systems for bags, big bags and their protection • Procedure to inspect bags and big bags for dust, fiber and hair before use
Management of Complaints	• Each client information and claim triggers a specific root cause analysis, followed by corrective actions • A specific reply to the client is made within 2 weeks • All programs for managing of foreign bodies are incorporated into the management system of the factory	• Client information and claim shown to all employees and reviewed by management • Yearly objectives set for client information and claims • Yearly objectives set for internal findings • Yearly technical improvement visits organized with selected clients • Outcome of activities and trends are input to management reviews

Hair Risk Zones

Equipment Technology for Prevention and Detection

Type of Foreign Bodies: Stones, Plastic, Rubber, Wood, Glass, Metal, Bone

Topic	Metal Detection	X-Ray	Optical Sorting
Principle of Detection	Contaminants are magnetizeable or electrically conductive	Contaminants are high-density or have a a high atomic mass number relative to the product	Varies by light source and sensor technology options (can be combined for specific applications): • Laser • Pulsed LED • Hyper & Multispectral imagining • Interactance spectroscopy • Shortwave Infrared • Camera Characteristics that can be profiled: • Color • Blemishes • Bio-Luminescence • Structure • Water / Oil Concenration • Toxins Shape / Size / Geometry
Average Lifespan	Coil lifespan 10+ years. Unit is replace when coil fails.	X-ray tube for high voltage 4-6 years X-ray tube for low voltage 8-10 years Tube are replaced without whole unit replacement	Minimum of 10+ years
Line foot print (not including rejection device)	Inline Application Approx 1 meter/3.28 feet or less	Inline Application Approx 1.7 meter/5.57 feet or less	Bulk Inspection Application Approx 1.8 meter to 4.2 meters 1.8 meters to 6 meters - including infeed conyenance
Unit Types	Bulk flow, gravity fed, descrete package inspection, pipeline	Vertical beam, bulk flow machine, pipeline, horizontal beam (side shooter)	Free-fall (chute) On-Belt Off-Belt
FB Type Detection and Approximate size	Detection of all metal contaminants, including ferrous, non-ferrous (including aluminum) and magnetic and non magnetic stainless steels	Detection of dense contaminants like ferrous, non ferrous and stainless steel, as well as other contaminants like glass, stone, bone, high density plastics, and some rubbers.	Broad range detection – Food Safety and Quality attribute detection (Grading and extraneous matter) Free flowing or attached defects Excluding embedded/concealed defects

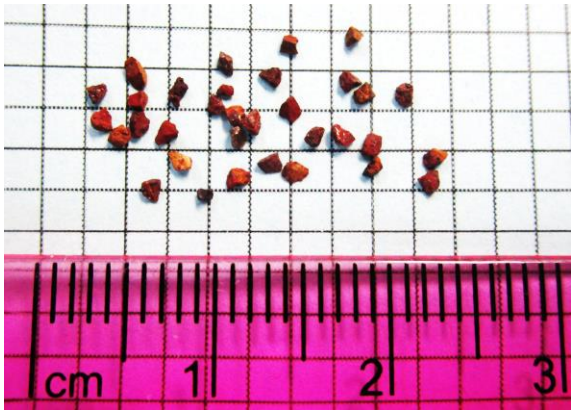
Equipment Technology for Prevention and Detection

Type of Foreign Bodies: Stones, Plastic, Rubber, Wood, Glass, Metal, Bone

Topic	Metal Detection	X-Ray	Optical Sorting
FRR Rate	0.05% for a stable metal detector should be able to consistently function without false reejcts, and minimal periodic adjustments.	0.05% when correctly adjusted. Might take periodic adjustments if product composition changes slightly.	User controlled and balanced based on capabilities of the technology and varying quality of inputs and the targeted end specification. Location of implementation in supply chain (harvest, mid-process, finished material)
Throughput	Speed-400m/min	Speed-120m/min	Speed-180m/min (.5-2m inspection width) 300-36,000 lb/hr (dehydrated – IQF application)
Product Format	Packaged, conveyed products, loose, bulk products, free-falling and vertifcally-packages products (including powder and granular products), pumped liquids, pastes and slurries, continous web products	Packaged, conveyed products, loose, bulk products, pumped liquids, pastes and slurries, continous web products	Bulk - wet, dry, frozen, roasted, raw, fresh, blanched, shelled and un-shelled
Factors influencing reliable detection	Type of metal, shape and orientation of metal, aperture size/metal position in aperture, environmental conditions (electrical interferences near unit, plant vibration, and temperature fluctuations), inspection speeds product characteristic and operating frequency, product uniformity (ie air bubles in pipeline)	Contaminant density, diode size, product density and depth, chemical compostion (atomic mass number) product texture or uniformity (ie air bubble in pipeline), contaminat position, environmental vibration, cleanliness of equipment	Presentation of the material in a mono-layer: Ensuring defect is visible or exposed to sensors Cleanliness of equipment
Types of rejection	Air, push arm, drop, divert, reverse, end flap, belt/process stop	Air, push arm, drop, divert	Small pitch air rejection valves Intelligent finger (paddle) rejection
Handling of rejected materials	Increased rejection quantity for bulk flow products, including pipeline metal detectors Should not be re-run through and reintroduced into prime product due to oritentation effect	Increased rejection quanity for pipeline x-ray Should not be re-run through and reintroduced into prime product due to position of contaminants over diodes.	The nature of the defects rejected and the type of process control will determine the ability to or suitability for re-inspection of rejected materials or re-purposing of rejected materials into alternate product streams. Should not be re-run through and reintroduced into prime product due position of contaminants over diodes.

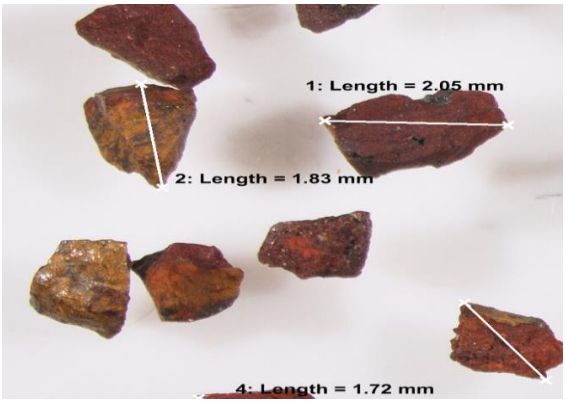
Examples of Foreign Material detected from Metal Detection, X-ray, or Optical Sorter:

X-ray: Stones from cereal / grains

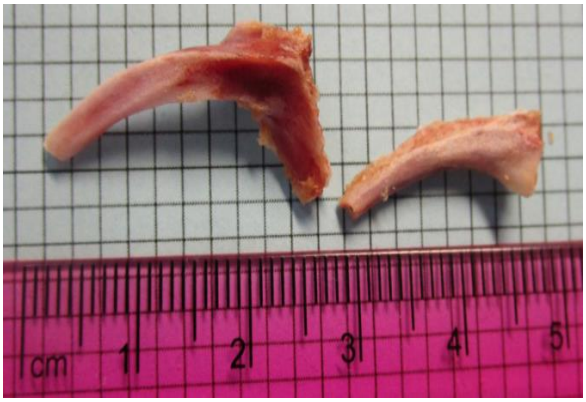


X-ray: Stones from cereal / grains

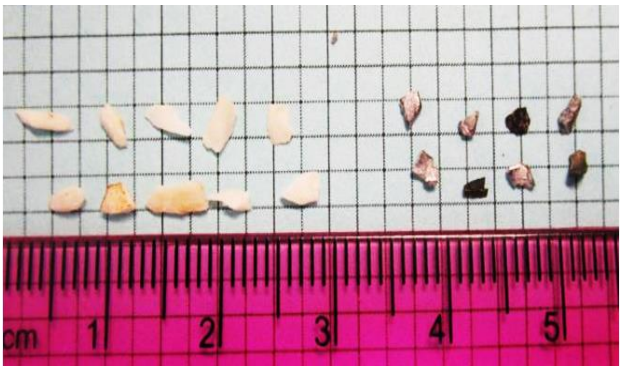
X-Ray: Stones from cereal / grains



X-ray: Bones from Poultry



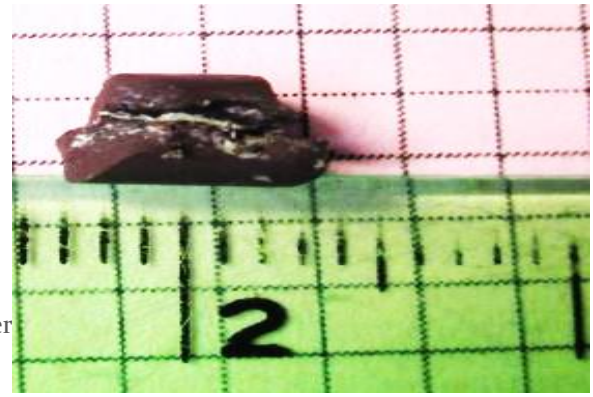
X-Ray: Beef Bones and Metal Fragments



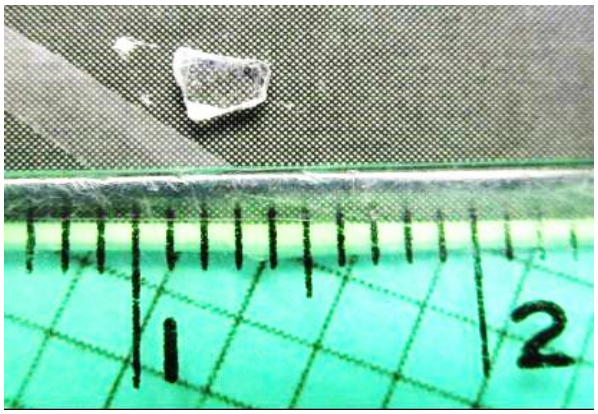
Metal Detector: Metal Fragments

X-ray: Grease / Carbon Char

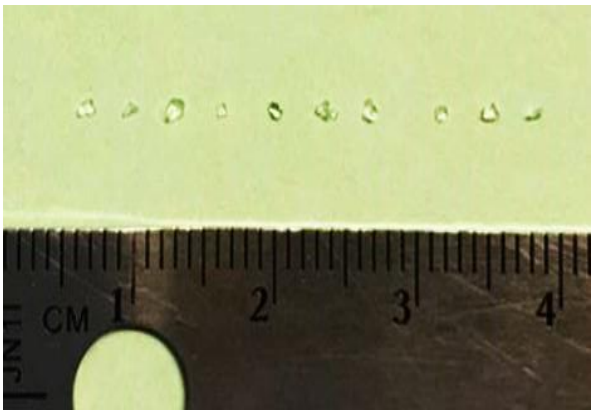
X-ray: Rubber



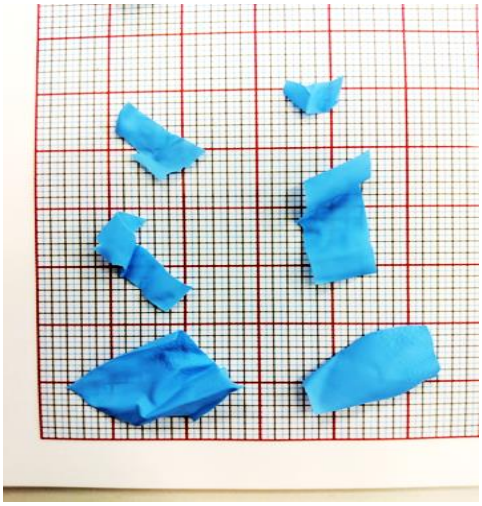
X-ray: Glass / Ceramic



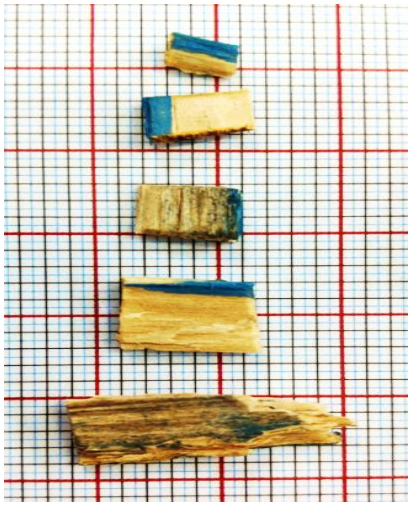
X-ray: Glass / Ceramic



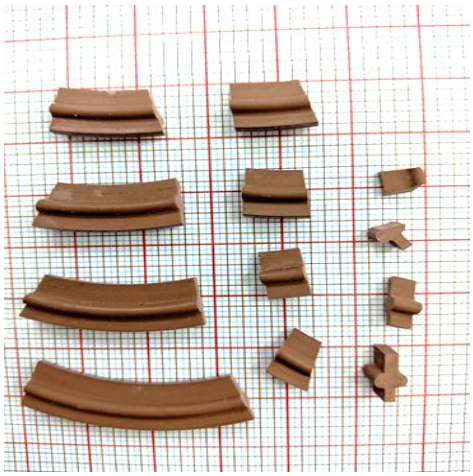
Optical Sorter : Blue Rubber



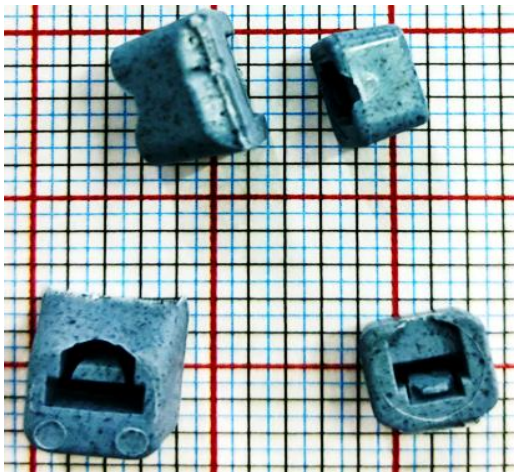
Optical Sorter: Wood



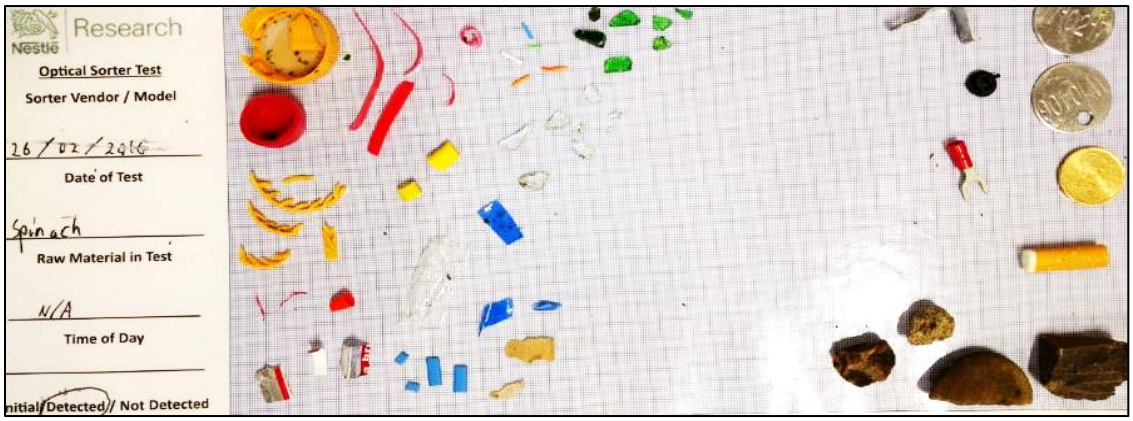
Optical Sorter : Rubber Gasket



Optical Sorter : Plastic

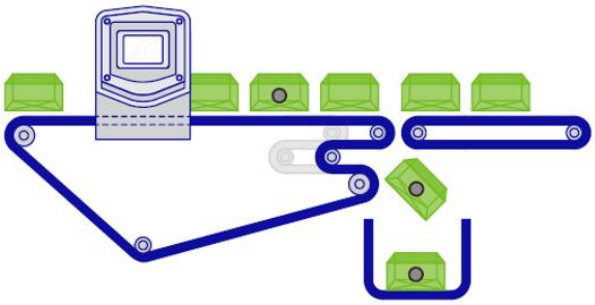


Additional Foreign Bodies detected from Optical Sorting

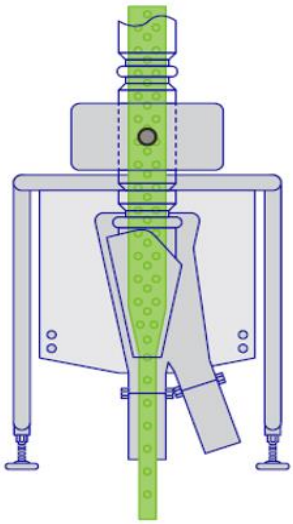


Examples of Foreign Body Detection / Rejection Devices:

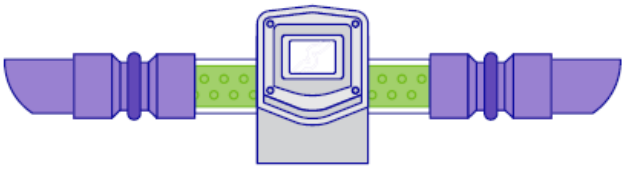
Descrete Package Metal Detector



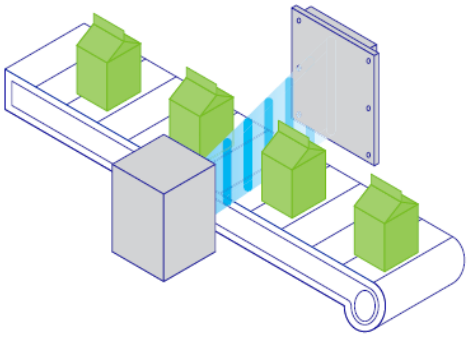
Gravity Fed Bulk Metal Detector



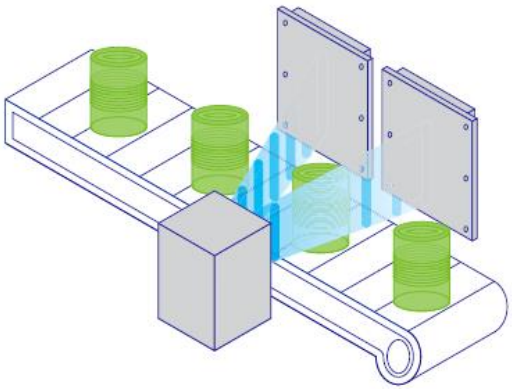
Bulk Metal Detector



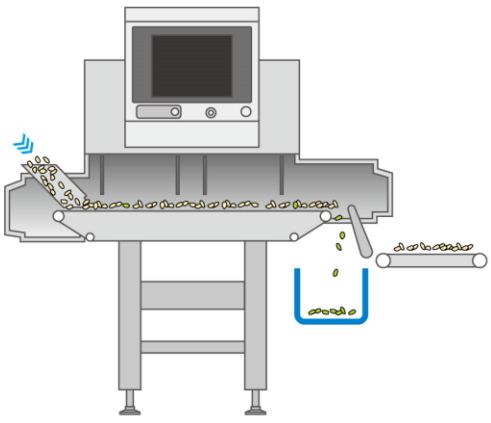
Horizontal Beam X-Ray



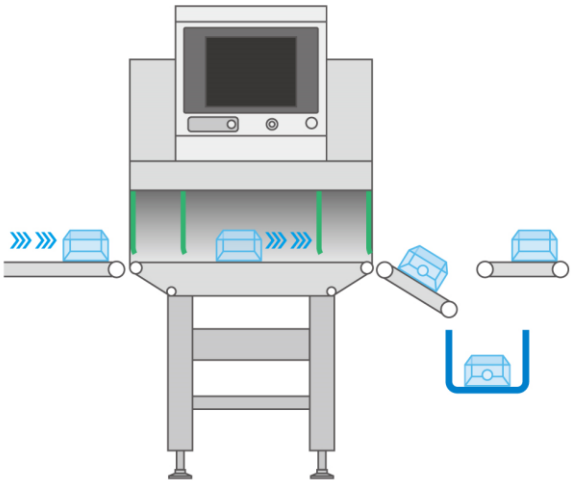
Dual Beam Horizontal X-Ray



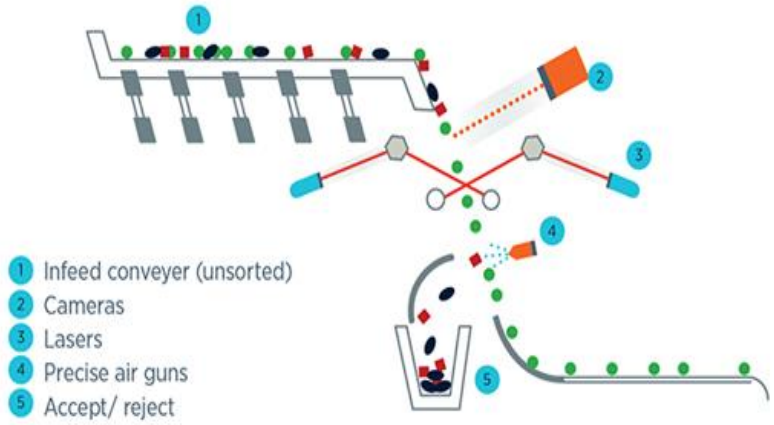
Bulk Flow X-Ray



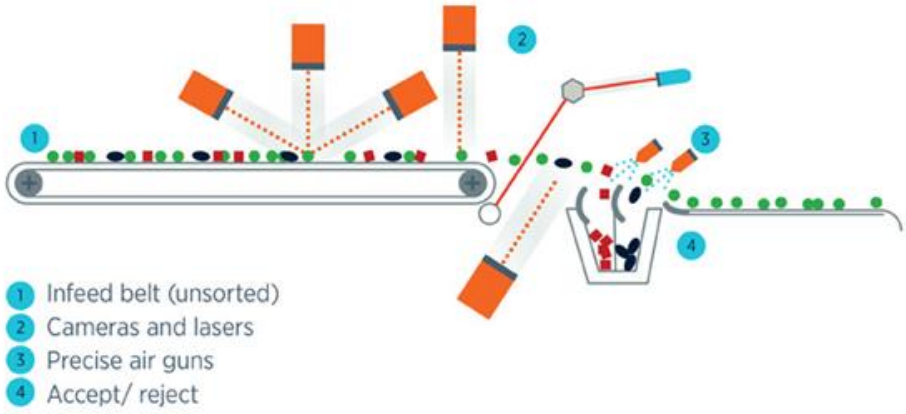
Descrete Package X-Ray



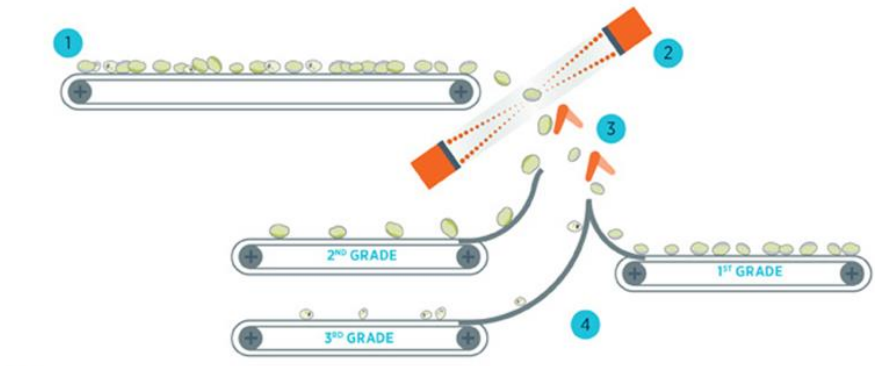
Bulk Optical Sorting – Chute



Bulk Optical Sorting – Belt



Bulk Optical Sorting – Grading



Contaminant detection-X-ray

Contaminant	Typical Detection sizes in Various Packaging Types (Sphere Diameters)			
	Plastic or Paper	Metalized Film or Foil	Metal Can	Glass Jar
Metal*	0.8mm	0.8mm	1.2mm	1.2mm
Aluminum	2.0mm	2.0mm	2.5mm	2.5mm
Glass	2.0mm	2.0mm	3.0mm	3.0mm
Stone	2.0mm	2.0mm	3.0mm	3.0mm
Bone	3.5mm	3.5mm	5.0mm	5.0mm
Dense Plastic	3.5mm	3.5mm	5.0mm	5.0mm

*Ferrous, Non-Ferrous and Stainless Steel

Contaminant Detection-Metal Detection

Product Height	Ferrous	Non-Ferrous (Brass)	Stainless Steel (316)
Up to 25 mm	1.5 mm	2.0 mm	2.5 mm
25 mm to 75 mm	2.0 mm	2.5 mm	3.5 mm
75 mm to 125 mm	2.5 mm	3.0 mm	4.0 mm
125mm to 175mm	3.0mm	3.5mm	4.5mm

Wooden Pallets:

The use of wooden pallets in the supply chain is necessary to transport food products in a safe way. Unfortunately, wooden pallets are often a source of contamination – microbiolgical and foreign bodies. **Therefore, it is necessary to use clean plastic pallets where exposed food product is found especially in hygiene-sensitive applications.** For these areas, clean, well maintained **plastic pallets** are used because of their non-porous, non-odour absorption, and cleanable surface.

Where wooden pallets are permitted, they should be inspected for integrity and kept a suitable distance away from any entry / sample points.

All wooden pallets (rented or purchased) and the material they are made from should have the following characteristics:

- A known food-grade material and a traceable supply chain
- Be clean, dry and in good repair
    - Are free of mold, dirt, dust, rodent droppings, insects
    - Are not broken or cracked (boards or bearers) which could weaken the structure or create a dangerous condition
- Have a maximum moisture content of no more than 28%. For ocean freight, pallets must have a maximum moisture content of no more than 22%.
- Have no protruding screws, nails, splinters or odors from wood treatment
- Are removed from inventory and not used when damaged or contaminated
- Are protected during storage from contamination (including pests)
- Are not placed or stored outside

Examples of pallets that must not be used:



Examples of pallets in good condition:



Annex I:

Glossary of terms:

COA: Certificate of Analysis

COC: Certificate of Compliance

FIBC: Flexible Intermediate Bulk Container

FB: Foreign Body (same as FOB – Foreign Object)

FOB: Foreign Object

FIFO: First In/First Out

GMP: Good Manufacturing Practice

GWP: Good Working Practice

HACCP: Hazard Analysis Critical Control Point

IPM: Integrated Pest Management

NCR: Non-conformance Report

OPL: One Point Lesson

PPE: Personal Protective Equipment (example: safety glasses)

QRC: Quick Reference Card

RCA: Root Cause Analysis

SOP: Standard Operating Procedure/Practice

SPC: Standard Plate Count