

# **GUIDE TO GOOD HYGIENE PRACTICES**

**OCTOBER 2007**

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# 1. INTRODUCTION

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Hygiene is, above all, a state of consciousness, since a large number of cases of contamination and dangers of all kinds can be avoided by simply applying a few straight forward rules and ensuring that daily actions serve to preserve the cleanliness of the products, aiming at satisfying our clients.

The purpose of this guide is to advise the manufacturers of glass packaging, intended to come into contact with food, on good hygiene practices.

This guide is a compendium of hygiene practices and prevention measures applicable to the stages of manufacturing of a glass packaging. The manufacturing stages go from the receipt of raw materials to the storage of glass packaging. The methodology to analyse and identify risks is the basis for a food risk control system. Physical, chemical and microbiological risks are taken into account in this guide.

However, it is important to emphasise that this document is complemented by other internal documents available for each glassmaker, such as guides to good practice, protocols or reaction standards, which accurately establish standards and recommendations that minimise these risks, namely:

- Manufacturing control plan
- Inspection, measurement and test plan
- Maintenance plan
- Calibration plan
- Supplier rating and assessment plan

## 2. REGULATIONS

In general terms, glass as a material is not capable of stopping or promoting the development of active bacteria or micro-organisms.

During the manufacturing process, the bottle is sterile, taking into account the moulding temperature (approximately 650° C). However, from that moment on, the possibility of contamination, either during handling or during storage, cannot be excluded.

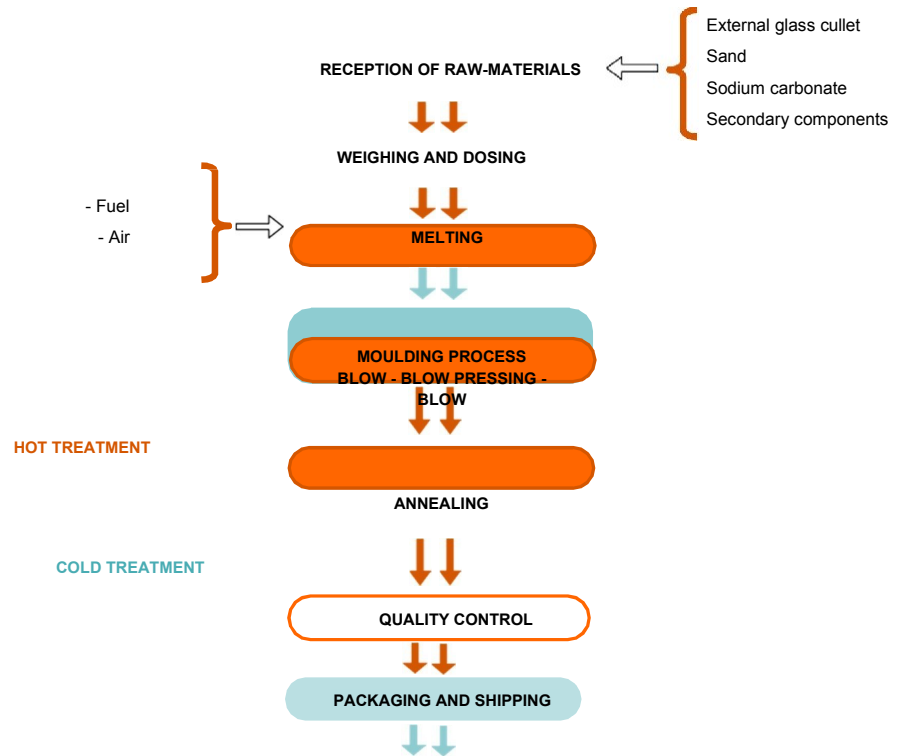
Otherwise, glass packaging could be classified as aseptic; this is not the case, although glass manufacturers take every possible precaution to limit such contamination. These precautions do not in any way exempt bottlers from compliance with the existing rules on the cleaning of packaging.

Regulations applicable to glass packaging:

- Regulation 1935/2004 on materials and articles intended to come into contact with food.
- Directive 93/43 on the hygiene of foodstuffs.
- Directive 94/62 on packaging and packaging waste.
- The "Codex Alimentarius" and ISO 9000 standards. They all recommend the use of self-monitoring systems, such as critical point analysis and good practice guides.

### 3. PROCESS FLOWCHART PHASES

For a better understanding of the process, the process flowchart below shows the respective phases.



The process of producing glass packaging begins when the raw materials (sand, soda, limestone, secondary components and cullet) are melted in furnaces at a temperature of approximately 1,500° C. When the components are melted together, the glass produced is refined and homogenised until a mass of conditioned glass is obtained, ready for the manufacture of the packaging. The longevity of the furnaces is approximately 10 years; at the end of this period they are replaced by a new one, incorporating the latest technological advances that have appeared on the market.

The glass obtained, in a fluid state and at a high temperature (about 900° C), is distributed into moulds that will give shape to the original container. Once the packaging is finished, it is transferred to an annealing chamber where, through the treatment, internal tensions are eliminated and

the glass acquires its final degree of resistance.

Special mention should be made to surface treatments. To improve the behaviour of packaging, especially on the filling lines, a treatment is applied to them to prevent micro-cracks from occurring when the containers are rubbed against each other or against external elements, thus avoiding the possibility of future breakage. These surface treatments are applied in two different phases: one hot, when they come out of the furnace, and one cold, when they come out of the chamber. Enormous progress has been made with regard to the method of application, as well as with the substances applied with the aim of increasing the resistance of packaging.

Next, to verify correct manufacturing, both in terms of geometric configuration and technical characteristics, exhaustive quality controls are carried out using machines, whose efficiency is continuously improving, and each unit is electronically checked, in order to fully guarantee the suitability of the packaging to market requirements.

After the quality controls have been carried out, the packaging is automatically packed in "pallets", wrapped in shrink film, and transferred to the finished goods warehouse for later distribution.

It is important to note that the above described process is continuous, which means that the furnace runs continuously 24 hours a day, 365 days a year.

As in any process, there are two types of technologies: one that is industry-specific and another applied to the broad spectrum general technology process, such as cybernetics, robotics, computing, electronics, hydraulics, laser, ultrasound, computer design and simulation, the so-called "expert" systems, as well as the ultimate goal: to provide a solution to market requirements.

We will now review the most notable technological advances:

## **RAW MATERIALS AND COMPOSITION**

The glass packaging industry is distinguished by the fact that it is not based on a semi-finished raw material. This is a field in which few changes have occurred, developing within what we could call historical coordinates. Two points should be highlighted:

- pre-heating of the mixture with the heat generated by the very furnace gases;
- the increased quantity of cullet from recycling. This fact has required significant efforts in terms of quality.

## **MELTING**

Use of perfectly studied furnace geometries, refractory materials of the latest generation, lighters and fuels that optimise energy efficiency and reduce emission levels. Development of the adjustment zones. Progress was also made in the use of electrical reinforcements.

## **CONDITIONING**

Modern moulding technologies have led to a more dynamic development in this field, with significant advances in viscosity and homogeneity conditions.

## **MOULDING**

Along with quality, this is the star of development. The application of new technologies has contributed to this, as well as the moulding processes themselves: blow - blow or press - blow, single drop, double drop, triple drop or quadruple drop, which also contribute to increased productivity.

## **ANNEALING**

The elimination of tensions is a fully resolved matter.

## **QUALITY CONTROL**

More than controlling quality, the current developments aim at assuring quality through the unit and automatic control of all manufactured packaging. A high percentage of the investments made by the glass industry were allocated to continuous electronic means of quality control, which verify the correct manufacturing, internal and external shaping, as well as the adaptation of packaging to the requirements of bottlers and consumers.

A control by sampling is also carried out, which allows the statistical distribution of that variable which may be considered of interest to be known at any time.

## **DESIGN**

One of the advantages that makes glass packaging stand out is its versatility. Since it allows the combination of creative and original shapes that are both strong and lightweight, it was necessary to adopt the latest advances in computer-aided design technology.

## **PACKAGING**

The process ends with the packaging of the bottles, which is done automatically on pallets wrapped with shrink film, and then distributed to the bottling/filling companies.

We cannot forget the influence that all these improvements have had on two fundamental aspects: the labour aspect, with less hard work and less risk of accidents; and the environmental aspect, with much less specific energy consumption and low environmental impact, thanks to the advances made in lighting and recycling.

As expected, the process has been, is and will always be the true protagonist of development. This is where the major efforts are concentrated. In an industry characterised by the production of millions of units, through a continuous process, the key to success lies first of all in knowledge and

then in mastering it. The fact is that the combination of research with the application of modern technologies has yielded extraordinary results. Currently, all the variables are perfectly parametrised and the computer systems provide information in real time, making it possible to guarantee absolute consistency and repeatability of the process.

## 4. DEFINITIONS

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The term "plant" refers to the entire set of buildings in the production centre.

The term "manufacturing area" refers to the areas of the centre where the products are manufactured, i.e. where various processes take place, from the mixing raw materials to the delivery of the final product to the storage areas.

The term "hot area" refers to the manufacturing area that is located before the exit of the annealing tunnel; while the term "cold area" refers to the area that goes from that exit to the point where the pallets are wrapped in shrink film, before being sent to storage.

The term "must" clearly refers to a fundamental provision. If a company does not comply with such a provision, it must ensure that the hygienic quality of the products is satisfactory.

The terms "should" or "ensure that" designate provisions of desirable compliance.

## **5. LOCATION AND ACCESS TO THE HALLS**

### **5.1. General location of the plant**

The plant should be located as far as possible from any external source of contamination.

Stagnant water is prohibited in manufacturing and storage areas.

Water reserves for firefighting systems should be maintained in the best possible conditions.

### **5.2. Fences**

The plant compound must be fenced and the fence must be maintained in good condition.

Access to the centre must be controlled.

### **5.3. Vegetation**

The existence of lush vegetation must be avoided. Wooded areas, lawn and all green spaces must be regularly maintained as required.

### **5.4. Roadways**

The roadway must be paved or covered in asphalt.

The rainwater drainage system must be well planned and maintained in good working order to avoid water stagnation. Walkways adjacent to buildings must be kept in good condition.

## **5.5.**

## **Animals**

Loose domestic animals are not allowed in the plant compound.

In compliance with the current applicable legislation on animal protection, it is recommended that appropriate measures be taken to prevent and/or eliminate their presence in the plant.

## **6. PRODUCTION AND DISPLAY HALLS**

### **6.1. General building principles**

Ensure that corners and blind spots are avoided.

Walls must be built and maintained in conditions that prevent condensation and mould growth, and facilitate cleaning.

Floors must be covered with an easy-to-clean, abrasion-resistant surface and, if possible, light-coloured and non-slip.

Ceilings and suspended ceilings must be designed to avoid the risk of contamination and facilitate cleaning and maintenance.

Repairs to buildings should be carried out whenever necessary.

The roof, exterior and interior walls and ceilings must be regularly checked and kept in good condition.

Roof support structures, exposed beams, lighting fixtures, insect traps and other accessories that are not hidden must be accessible for maintenance purposes.

Walls and roofs must be subject to the maintenance and repair operations necessary to keep the building watertight in the event of adverse weather conditions.

Changing rooms and sanitary facilities must not lead directly to the manufacturing areas, but must allow access to them without having to leave the premises.

The sewage and rainwater drainage systems must not run over the articles in the manufacturing process.

The sewage pipelines must be watertight and clearly identified so that they can be cleaned.

## 6.2. Manufacturing area

The electrical cables running over the articles must be cleanable and, if possible, be installed in an upright position.

Cables running over the articles in the cold zone must be protected.

Passages, platforms and ladders made of perforated sheet metal must be avoided in risk areas.

The boundaries of the manufacturing area and all accesses to it must be identified.

The manufacturing process, in the hot area, requires permanent air circulation, by exchanging it with outside air, to remove heat.

The manufacturing area in the cold area must not be open to the outside and all accesses must be kept closed or protected by mosquito nets. Doors leading to the cold area must be fitted with devices to ensure their closure.

Whenever possible, air flows must avoid the contamination of the products.

Lighting in the manufacturing area must be sufficient to allow good observation of the products.

In risk areas, the windows must be cleaned and kept closed. If windows are open, they should be fitted with mosquito nets.

Information panels and workstations must be designed to avoid the risks that may be caused by foreign objects (staples, pins, small magnets, etc.).

## **6.3. Fluids**

Fixed installations for the production, treatment and distribution of water intended for human consumption must be made in accordance with the legal provisions in force.

Compressed air in contact with the articles must be filtered, oil-free and dry.

In the cold area, lubrication circuits must be sealed and kept in perfect condition.

They must not be placed on top of unprotected products.

## **6.4. Social areas**

Any worker in direct contact with the final (unpackaged) product must have a double compartment locker, including interns, temporary workers and trainees.

Lockers should be emptied, cleaned and disinfected at the previously defined intervals.

Sanitary facilities must be sufficient in number and regularly cleaned.

Taps should preferably be automatic; hand washing is compulsory when leaving the sanitary facilities. Soap must be bactericidal and be in single-use dispensers. Soap dispensers must be cleaned regularly.

Water in the washbasins must be drinkable.

Hand dryers must be sufficient in number, and preferably with disposable towels.

Rubbish bins must have lid and be sufficient in number. There must be specific areas for drinking and eating.

Smoking areas must be identified; they must be located outside the circuit used for the passage of the articles.

Smoking and eating are prohibited in the manufacturing lines.

## **6.5. Maintenance and cleaning**

All facilities must be kept in good condition and repairs must be carried out as necessary.

A cleaning plan must be drawn up for the premises, including the cleaning of equipment and buildings. This plan must be adapted to each area.

It must be prepared by employees with adequate information on the hygiene rules in force. The correct implementation of this cleaning plan and its effectiveness must be controlled by a designated responsible person.

## **7. MACHINERY AND EQUIPMENT**

### **7.1. Conditions for cleaning**

The workstation and its access must be clean and organised.

Free access to the workstation must be guaranteed with spaces of sufficient size to facilitate cleaning.

Materials or products falling on the ground must be placed in the appropriate waste containers.

The installation of the machines must facilitate cleaning.

The use of air valves must comply with the relevant handling standards to avoid potential contamination of the articles.

If vacuum cleaners are used, the filters should be checked for cleanliness; if necessary, they should be replaced.

Consumables used for cleaning must be placed in suitable containers after use.

### **7.2. First degree maintenance**

During maintenance work in the manufacturing area, workers must comply with the hygiene rules in force in that area, and are subject to the same obligations that apply to production workers. During the intervention they must ensure the protection of the products.

At the end of any maintenance work, the machinery and equipment must be clean and free from any contamination hazard that may result from the intervention.

Workers carrying out maintenance work must comply with the provisions laid down in chapters 10 and 11.

In the cold area, equipment coming into contact with the articles must be cleaned regularly. Cleaning products and, in general, all products that are not part of the packaging must be subject to internal procedures to ensure that their existence and limits of use are known.

In risk areas, any water or oil leaks that are detected must be repaired.

### **7.3. Fixing systems**

Fixing elements (screws, bolts, pins, etc.) that could fall into the manufactured products must always be identified and checked to avoid the risk of a foreign object affecting the product.

## 8. WORKERS AND VISITORS

Personal hygiene is the responsibility of each individual. Any person who is in the manufacturing area, near the articles, or handling them, must have good personal hygiene.

### 8.1. Personal hygiene

Wounds should be treated and protected with a dressing.

Workers should wash their hands at least each time they report to their workstation and before leaving the toilet and before leaving the canteen. Workers must have their hands clean when handling the articles and must wash their hands after any work that leaves stains on them.

A rule on the type of dressing to be applied and the mandatory use of gloves has not yet been defined.

### 8.2. Work clothing

Work clothing is mandatory and must not be worn outside the plant. Closing systems must prevent the risk of objects falling.

The use of safety footwear is compulsory and it must be exclusively worn inside the plant.

The provision of clean work clothing must be foreseen.

At the cold area: Work clothing must be washed at regular intervals to ensure that it is satisfactory clean whenever the worker reports to his/her workstation.

At the hot area: After any intervention that may soil the clothes, workers must be careful not to contaminate the product with the soiled clothing.

It may be necessary to consider the possibility of wearing disposable clothing when carrying out works that involve some soiling.

### **8.3. Jewellery and personal items**

It is not advisable to wear jewellery in the manufacturing area.

Personal items should not be brought into the manufacturing area.

### **8.4. Drinks, food and tobacco**

The consumption of tobacco, food and drinks (except for drinkable water) is forbidden in the manufacturing lines.

### **8.5. Visitors**

In order for visitors to the company to enter the manufacturing area, they must be accompanied and informed of the rules to be observed in terms of safety, hygiene and cleanliness, and they must not touch the products without permission.

### **8.6. Subcontractors**

People from outside the company who have to work in the centre, particularly in the manufacturing area, must observe the same hygiene rules as the plant's workers.

### **8.7. Training**

People handling the product should have the necessary qualifications regarding compliance with good hygiene practices, based on initial training or adequate and

documented experience, appropriate for all personnel working in the manufacturing area.

Records of such training must be kept.

# MANAGEMENT OF RAW MATERIALS, MELTING AND MOULDING

## 9.1. Raw materials

There are no chemical (toxicological) risks in the usual compositions of container glass that meet the requirements of Regulation EC 1935/2004. All risks of microbiological contamination can be excluded with respect to the raw materials, since no micro-organisms or parasites can survive the temperatures reached in the furnace during melting and in the work tray.

Therefore, storage and transport of raw materials to the furnace are not subject to specific measures regarding microbiological risks.

## 9.2. Melting and moulding

The melting process must be closely monitored and controlled in order to decrease the lack of homogeneity in the glass that may cause physical risks associated to breakage.

Physical hazards such as critical glass defects and glass fragments must be avoided through a supervised and controlled moulding procedure.

Work instructions must be defined, to minimise the amount of lubricant product residues on the articles.

## **10. PROTECTION OF THE PRODUCTS DURING MANUFACTURE**

### **10.1. Manufacture machinery**

In order to prevent broken glass from spreading, machines must be cleaned by using suction systems; the use of pressurised air hoses must be restricted as much as possible. If pressurised air hoses are needed, they must only be used after the packaging has been ejected.

Ejection nozzles or other recirculation systems must be designed to avoid the risk of projection of glass fragments.

The use of appropriate protection must be recommended to avoid physical contamination of the products after moulding.

### **10.2. Hot surface treatments**

The application of hot surface treatments allows for mechanical strengthening of the glass surface while respecting the standards in force, in particular regarding the criteria applicable to the food sector.

The design and maintenance of hot surface treatment hoods or tunnels must prevent contamination with foreign objects. Traceability of the products used must be ensured.

### **10.3. Cold surface treatments**

The application of the cold treatment, either in conjunction with the hot surface treatment or individually, allows for belt transport and protects against abrasion.

The products used are compatible with the criteria applicable to the food sector.

The water used to dilute the products has drinking water characteristics.

The equipment of the treatment system must be checked. The design and maintenance of cold treatment devices must prevent the accidental fall of foreign objects.

Access to the storage of cold treatment products is limited to specialised workers. Traceability of the products used must be ensured.

## **10.4. Annealing oven**

The tunnel ventilators and, in particular, those located at the exit, must be kept clean in order to prevent the products from being contaminated with dusts.

Temperature curves must be controlled in order to avoid breakages inside the annealing tunnel.

In case of breakage in the tunnel, the products that may have a risk of contamination with glass fragments must be eliminated; provisions on this matter must be documented.

## **10.5. Belt transport in the cold area**

The design and operation of the lines in the cold area must ensure the flow of articles being conveyed by belt and avoid mechanical shocks (risk of breakage).

Depending on the families of manufactured articles (shape, weight, size, etc.) and the equipment installed, measures must be taken to avoid possible contamination inside.

The fluids and accessories used in belt transport in the cold zone must not be a source of contamination for the articles.

In case of breakage or rejection of products in belt conveyor lines in the cold area, the documented rules and instructions for the disposal of glass fragments or rejected articles must be applied.

Passages located above product conveyor belt lines must be designed and maintained in order to prevent contamination with foreign objects.

In case of overlapping of conveyor belt lines or return lines of powdered glass, adequate devices must be installed to protect the articles.

## **10.6. Flipper**

This equipment allows the elimination of possible loose particles or foreign objects, by flipping the bottles over. It is particularly recommended depending on the type of manufactured articles.

## **10.7. Inspection system**

In order to ensure maximum safety of all manufactured products, before being placed on the market, the lines should be equipped with machines for inspection and control of all the variables considered to be critical. In particular, they must be equipped with a system to inspect the bottoms, to avoid loose pieces of glass in the packaging.

## **10.8. Packer/Palletiser**

The equipment must be designed and adjusted to prevent articles (jars or bottles) from falling during transfer phases.

Surveillance measures are recommended to detect falling articles.

The fluids and accessories in the packaging must not be a source of contamination for the articles.

If a breakage or malfunction is detected, the documented instructions should be applied; any residues must be cleaned to avoid risks.

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*Note: palletising operations can be performed automatically, semi-automatically or manually.*

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## **10.9. Packaging materials**

These are outer packaging products, which are not in direct contact with foodstuffs. Packaging materials must be stored in a place that prevents external contamination (water, dust, harmful elements, etc.).

The same conditions must be fulfilled for open packaging batches that are stored again.

Whenever possible, the design of the food packaging must avoid the use of staples.

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*Note: fire safety requirements may impose certain storage conditions.*

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## **11. STORAGE, TRANSPORT AND TRACEABILITY OF THE FINAL**

### **11.1. Packaging with shrink film**

The procedure for applying shrink film to pallets must be controlled in order to ensure maximum sealing of the final product.

### **11.2. Storage**

Storage should preferably take place in closed buildings, in good order and in conditions that ensure the protection of the products. The floor of the storage areas should be paved in asphalt.

### **11.3. Handling and transport means**

In the manufacturing area, the use of electric or gas-powered forklifts is recommended. Alternatively, forklifts fitted with tested exhaust filters that are replaced regularly may be used.

During handling, drivers should take special care to avoid tearing the shrink film or causing bumps against the pallets during transport.

When pallets are loaded, they should be visually checked to detect any discrepancy with the recommendations (wet or dirty pallets, broken bottles, etc.). If any discrepancy is identified, the appropriate measures must be adopted taking into account how serious the problem is.

Transport to the customer must be carried out in accordance with the recommendations applicable to freight (wedges, lashing with ropes, clean trucks, etc.).

## **11.4. Traceability**

The company will implement the traceability system best suited to its operation and that complies with the regulations in force.

The glass industry must ensure traceability by batch.

## **12.CONDITIONS RELATING TO PHYSICAL RISKS**

### **12.1. Lighting**

Lighting above articles and insecticide devices must be protected against the risk of residues dispersion.

### **12.2. Sharp objects**

The use of cutting blades is limited in the manufacturing area, and preference is given to any other cutting system.

### **12.3. Greases and oils used in the cold area**

Products for lubricating equipment in contact with articles must be used in the correct and necessary quantity. They must be compatible with the specifications of packaging intended to come into contact with foodstuffs. Lubricated parts, oil tanks or hydraulic lines in the vicinity of the products must be protected, as far as possible, by a box which is checked and cleaned regularly.

Products or packages with lubricant stains must be rejected.

### **12.4. Harmful elements**

Compliance with the general hygiene provisions applicable to the exterior and buildings helps to avoid the dangers associated to harmful elements.

Flying insect traps must be installed in the manufacturing area and their effectiveness must be regularly checked; regular maintenance must be carried out;

they must be avoided in places that could contaminate the product.

To eliminate harmful elements (rodents, reptiles, etc.), the necessary means must be applied to ensure the effectiveness of the measures adopted, in strict compliance with the applicable regulations on animal protection.

## **13. PROVISIONS RELATING TO MICROBIOLOGICAL RISKS**

### **13.1. Contamination by contact**

The possibility of microbiological contamination of articles by contact is very low.

As a preventive measure, hygiene rules must be applied to all workers and equipment in contact with the articles (hand washing, cleaning of control equipment, etc.)

### **13.2. Storage of finished products pallets**

Storage is controlled to reduce the risk of wet pallets.

Stock rotation should avoid the ageing of the pallets where this could lead to a risk of degradation of the final product. Priority should be given to stock management using the FIFO principle.

### **13.2. Reusable packaging**

The sorting and washing circuit of the plastic interlayers is subject to a contract that specifies the provisions regarding the cleaning control.

The ANIFE II wooden pallets must comply with the requirements of the respective standard.

The articles must be protected on the wooden pallet by a plastic mat.

## 14. TABLE “RISK ANALYSIS AND CONTROL POINTS”

| PHASE                       | RISK                               | TYPE | CAUSES   | MEASURES                                 |                                 | STANDARD                               |
|-----------------------------|------------------------------------|------|--|--|---------------------------------|--|
|                             |                                    |      |  | PREVENTIVE                               | CORRECTIVE                      |  |
| Reception of raw materials  | Defective packaging                | F    | Off-specification raw materials                        | Supplier approval                        | Inspection and rejection system | Ledger of raw materials loads          |
|                             |                                    |      | External cullet: porcelain, metal, special glass, etc. | Reception control                        |                                 | Quality standards applicable to cullet |
| Weighing, dosing and mixing | Non-homogeneous glass              | F    | Error in the process                                   | Manufacturing control plan               | Inspection and rejection system | Internal document                      |
| Feeders and machine feeding | Inclusions and infusions           | F    | Inadequate granulometry                                | Proper operation of furnaces and feeders | Inspection and rejection system | Inspection and control plan            |
|                             |                                    |      | Contamination of raw materials                         |  |                                 | Refractory pieces                      |
|                             | Incorrect forming of the packaging | F    | Bubbles on the surface and neck                        | Adequate conditioning of the glass       |                                 |  |

| PHASE                                  | RISK  | TYPE  | CAUSES   | MEASURES  |   | STANDARD   |
|--|---|---|--|---|---|--|
|  |   |   |  | PREVENTIVE  | CORRECTIVES   |  |
| Moulding                               | Glass fragments                             | F   | Scissor cutting<br>Disorganised or dirty machines  | Maintenance of the scissors<br>Adjustment and lubrication of the lines<br>Machine maintenance plan  | Installation of flippers<br>Inspection (especially of the bottoms) and rejection system | Using vacuum cleaning systems<br>Good practice guide |
|  | Foreign elements (water spray, cutting oil) | Q   | Spraying problems  | Controlling spraying<br>Monitoring water and oil concentrations   |   |  |
|  | Moulding defect: sharp edges or burrs       | F   | Disorganised or dirty machines<br>Forming defects<br>Extraction problems<br>Problems with the tool set<br>Bottom plate ventilation problems<br>Uncoordinated lines<br>Unsynchronised transfers | Workers training<br>Control plan in the cold area and in the hot area<br>Adjustment of the lines<br>Tool maintenance and replacement<br>Monitoring of moulds<br>Monitoring of the manufacturing process | Inspection and rejection system<br>Reaction standards                                   | Internal document                                    |
|  |   |   |  |   |   | Inspection and control plan                          |
| Internal contamination Foreign objects | Q   | Problems of extraction with the clamps<br>Lubrication problems<br>Lubrication tools in bad conditions<br>Inadequate work clothing of the worker | Controlling the extraction elements<br>Controlling the lubrication elements, including oil composition<br>Workers training, awareness raising and work clothing                                | Inspection and rejection system   | Good practice guide   |  |

| PHASE                            | RISK   | TYPE | CAUSES  | MEASURES  |                   | STANDARD          |
|----------------------------------|--|------|---|---|-------------------|-------------------|
|                                  |  |      |   | PREVENTIVE  | CORRECTIVE        |                   |
| Machine output and hot treatment | Coupled packages                                     | F    | Problems with the extractors<br>Problems in the transfer route<br>Malfunction in the inlet pushers to the chamber | Suitability and preventive maintenance of the material<br>Laser detection Output control<br>Control plan<br>Designing an adequate transfer route                | Reaction standard | Internal document |
|                                  | Free or adhering fragments of glass                  | F    | Malfunctioning of the inlet pushers to the chamber<br>Falls on conveyors<br>Output problems (ejection)            | Design, maintenance and adjustment of pushers<br>Protected conveyors and output channels<br>Procedures for the use of suitable ejectors                         | Reaction standard | Internal document |
|                                  | Foreign objects inside (residues from hot treatment) | Q    | Lubrication of the extractors<br>Excessive treatment  | Maintenance of the tunnels at predetermined intervals<br>CTU Control<br>Visual iridescence control<br>Alarm system for problems in the application of treatment | Reaction standard | Internal document |
|                                  | Contaminated packaging                               | Q    | Oil leaks<br>Defects in the treatment products  | Identification of the canisters on reception, secure opening and closing systems<br>Avoid contact between the lubrication systems and the products              | Reaction standard | Internal document |

| PHASE                        | RISK                                     | TYPE   | CAUSES   | MEASURES   |                                 | STANDARD                                |
|------------------------------|--|--------|--|--|---------------------------------|---|
|                              |  |        |  | PREVENTIVES  | CORRECTIVE                      |   |
| Annealing and cold treatment | Projected glass particles                | F      | Inadequate temperature curve in the chamber<br>Thermal shock<br>Maintenance problems | Proper calculation of the temperature curves<br>Temperature alarm system<br>Specific annealing controls                      | Inspection and rejection system | Good practice guide<br>Maintenance plan |
|                              | Contamination by cold treatment products | Q      | Overdosing   | Slip control<br>Visual control<br>Certificate of suitability of the products used  |                                 | Control and inspection plan             |
|                              | Weakening of the packaging               | F      | Error in the product used  | Adjustment in the concentration of the cold treatment<br>Identification of the canisters on reception and at the time of use |                                 |   |
|                              | Treatment water                          | M<br>B | Bacteria prevention  | Applying the product above 80° C<br>Analysis of the characteristics of the water used  |                                 | Maintenance plan                        |
|                              | Oil, greases                             | Q      | Leakages in the treatment lane<br>Dirty treatment lanes                              | Design of the lanes<br>Maintenance and cleaning  |                                 | Maintenance plan                        |

| PHASE     | RISK  | TYPE | CAUSES   | MEASURES   |                   | STANDARD          |
|-----------|---|------|--|--|-------------------|-------------------|
|           |   |      |  | PREVENTIVES  | CORRECTIVE        |                   |
| Cold area | Projection of loose pieces of glass               | F    | Existence of loose pieces of glass along the packaging route: exit from the chamber, lines, conveyors, passages, bridges and inspection machines and surrounding areas | Design, inspection and cleaning of the set of elements<br>Removing loose glass<br>Protection during maintenance interventions  | Reaction standard | Internal document |
|           | Foreign objects and insects                       | F    | Openings to the outside not properly secured<br>Lamps or other items placed above the packaging without adequate protection  | Protections at the entrance of the inspection machines<br>Protection of light fixtures and other elements<br><br>Installation of insect killers<br>External doors locking systems<br>Mosquito nets on windows in the cold area | Reaction standard | Internal document |
|           | Contaminations by solvents, greases or lubricants | Q    | Non/compliant paints and marking products<br>Lubricated conveyors and palletisers  | Check that the products used are intended for use with foodstuffs<br>Checking the equipment<br>Appropriate application and disposal procedures   | Reaction standard | Internal document |

| PHASE                       | RISK   | TYPE   | CAUSES   | MEASURES  |                   | STANDARD                            |
|-----------------------------|--|--------|--|---|-------------------|-------------------------------------|
|                             |  |        |  | PREVENTIVES   | CORRECTIVE        |                                     |
| Palletising                 | Projection of loose pieces of glass or other objects | F      | Poor palletising practices<br><br>Deficient packaging    | Maintenance of the palletiser<br>Design, maintenance and adjustment of the different elements involved: pushers, guides and palletiser<br>Detection systems of broken or fallen packages<br>Adequate packaging material<br>Adequate storage of the packages<br>Pallet forming systems | Reaction standard | Internal document                   |
|                             | Yeasts and moulds                                    | M<br>B | Contaminated inlayers                                    | Reception control   |                   | Supplier's technical specifications |
| Storage of finished product | Finished product pallet in poor condition            | F      | Inadequate handling and storage of pallets               | Synchronisation between plant and warehouse<br>Adequate handling procedures   | Reaction standard | Internal document                   |
|                             | Loose pieces of glass                                | F      |  | Maintenance and cleaning<br>Visual inspection   |                   |                                     |
|                             | Microbiological contamination                        | M<br>B | Rodents or other harmful animals<br>Wet pallets          | General pest control/insect killers plan<br>Closed warehouses<br>Control of pallet welding and water tightness<br>Audits and maintenance of the warehouse   | Reaction standard | Internal document                   |
| Transport                   | Loose pieces of glass                                | F      | Breakage of packages due to deterioration of the pallets | Proper loading and transport  |                   | Supplier's technical specifications |
|                             | Microbiological contamination                        | M<br>B | Dirty vehicle  | Check   |                   | Supplier's technical specifications |

