ECODESIGN GUIDE FOR PACKAGING

This guide has been prepared by ECOEMBES and ITENE.

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Foreword and context

01

01
FOREWORD AND CONTEXT

The growing concern for the environment has led Europe to establish new measures to ensure a new economic model based on sustainable development.

Since the publication of the Circular Economy Action Plan in 2015, work has been done in Europe to review existing regulations, such as those published in the circular economy package which included, among others, the revisions to the waste directive and the directive on packaging and packaging waste, and to publish new directives such as the directive on the reduction of the impact of certain plastic products on the environment (SUP directive), published in 2019. Both these directives and the regulations that have been published since are focused on furthering the circular economy, including the recyclability of packaging.

In this regard, for 2030, the Plastics Strategy sets as a key objective that all plastic packaging marketed in the European Union be reusable, recyclable or compostable. Moreover, Directive 2018/852 on packaging and packaging waste set a recycling target of 70% for packaging placed on the European market by 2030.

These new European directives have been transposed into Spanish law, with the update to Act 7/2022 on waste and contaminated soils for a circular economy, and Royal Decree 1055/2022 on packaging and packaging waste. These standards incorporate new goals and measures to improve waste management, packaging and the companies that place it on the market.

In addition, consumers are increasingly aware of the importance of protecting the environment and the role played by the ecodesign of the products they acquire, as well as by waste recycling.

Packaging manufacturers and packers are aware of market expectations and legislative requirements, and are therefore making every effort to respond to these needs. This translates into a great and complex challenge for the packaging sector in general.

Packaging needs to be adapted to these requirements in order to encourage recycling as the main measure for companies and consumers. To achieve the challenges of circularity, the ecodesign methodology is being promoted, a methodology that prioritizes the environmental criterion and the basic functions of packaging. Ecodesign is the methodology par excellence, taking into account all the steps of the packaging life cycle, analysing them one by one and studying their impact, improvement and requirements in each stage of its life, from the selection of the raw materials to its end of life.

Against this backdrop, Ecoembes has developed this eco-design guide to help its member companies put on the market more sustainable packaging adapted to the recycling technologies currently available in the sector, so that it is consistent with the circular management model, as well as with the latest legislative changes in Spain.

Purpose and scope

02

02
PURPOSE AND SCOPE

The purpose of this eco-design guide, endorsed by Ecoembes, is to adapt the different types of packaging and packaging waste to the current management system for the effective recycling of packaging waste in Spain. Above all, it is focused on explaining how the different packaging components, together with the materials and additives that comprise them - barriers, labels, closures, etc. - help or hinder the recycling process. The goal is to help companies that put packaging on the Spanish market to adapt it to the system and promote its recyclability.

The scope of this guide focuses on the following aspects:

- Current management system and state of the art of collection, sorting and recycling technologies.
- General packaging design recommendations.
- Cards with specific recommendations for each fraction and packaging type.

The following table shows the cards that have been created, by material and packaging format, which can be found in point 6. Ecodesign cards:

FRACTION	CARD
PET	Bottle/carafe Tray Other
HDPE	General
FLEXIBLE	General
MIXED PLASTIC	PP PS
STEEL	General
ALUMINIUM	General
FOOD/DRINK CARTON	General
COMPOSTABLE	General
PAPER/CARDBOARD	General

Table 1. Fractions and types of packaging presented in the eco-design guide.

Aspects to consider when analysing the recyclability of packaging

03

03
ASPECTS TO CONSIDER WHEN ANALYSING THE RECYCLABILITY OF PACKAGING

To understand what makes packaging recyclable, we have to know the concept laid out in Royal Decree 1055/2022 on recyclability:

> "effective ability to recycle packaging waste, determined by considering the following criteria:
>
> 1. It can be collected separately in an effective manner, through user access to nearby collection points;
>
> 2. It does not exhibit characteristics, elements or substances that prevent its sorting, separation or recycling, or that limit the subsequent use of the recycled material;
>
> 3. It is recycled on an industrial scale using commercial processes that guarantee the sufficient quality of the recycled material for subsequent use, and in an amount greater than 50% of the mass of the waste of this type of packaging collected."

This definition is consistent with the UNE-EN 13430 standard "Packaging. Requirements for recoverable packaging by material recycling". This standard sets out criteria that are required in the relevant stages of the packaging life cycle:

- DESIGN: The design of the packaging must guarantee its compatibility with the specifications of the recycling technologies, allow a certain percentage by weight of recyclable materials, and take into account:
  - Substances or materials that may cause technical problems during the recycling process.
  - Materials, combinations of materials or packaging designs that may cause problems during collection and sorting prior to recycling.
  - The presence of sufficient substances or materials that may negatively influence the quality of the recycled material.
- PRODUCTION: The manufacture of the packaging must ensure that no materials are used (and that no changes occur during processing) that may harm the final recycling.
- USE: The application of the packaging can play an important role in the processing such as, for example, how easy it is for the final user to empty or sort the packaging.
- COLLECTION and SORTING: at the end of its life cycle, steps must be taken to ensure that the packaging can be processed correctly through the collection and sorting systems.

The suitability of industrially available recycling technology must also be taken into account. This ensures that the packaging is compatible with current recycling processes and that it is effectively and extensively transformed into secondary raw materials that can be used to manufacture new packaging or products.

State of the art in sorting and recycling technologies at the industrial level

04

04
STATE OF THE ART IN SORTING AND RECYCLING TECHNOLOGIES AT THE INDUSTRIAL LEVEL

In this section, we analyse how packaging waste is sorted and recycled in order to understand what aspects of the design can hurt or aid its recycling, since both involve different factors that can ensure both processes are carried out properly.

In general, the processing of household packaging waste begins once it reaches the end of its life and it is properly disposed of by the end consumer. The waste collection systems used vary by country and region, with the most common method in Spain being waste collection through:

- Containers.
- Recycling centres (for other household waste such as furniture or appliances).

The packaging must be in its own fraction, separate from the residual waste, depending on the material it is made of. This is the point that will determine the subsequent classification of the materials that make up the packaging, and therefore its processing treatment in the recovery or recycling plants.

This document focuses on analysing the industrial-level mechanical sorting and recycling systems for household packaging waste collected in the light packaging containers (yellow) and paper and cardboard containers (blue).

4.1 Collection system

The main goal of collection systems is to collect packaging waste by material type. The material fractions that are recovered in Spain are mainly organic matter, glass, plastic, steel, aluminium, paper and cardboard. The public usually collectively accumulate the waste in different bags depending on the type of waste, and then deposit it in containers of specific colours to assist the public with sorting and recycling:

- Brown container: bio-waste, compostable packaging.
- Green container or igloo: glass packaging.
- Yellow container: rigid or flexible plastic packaging, steel or aluminium packaging, food/drink cartons.
- Blue container: paper and cardboard packaging.

Once collected, the packaging waste is transported to the corresponding sorting plants.

4.2 Light packaging sorting plant

The plastic, metal and carton packaging collected in the yellow container must go through the light-packaging sorting plants, where it is separated by materials so it can be shipped to the corresponding recyclers. Figure 1 shows an overview of a light-packaging sorting plant.

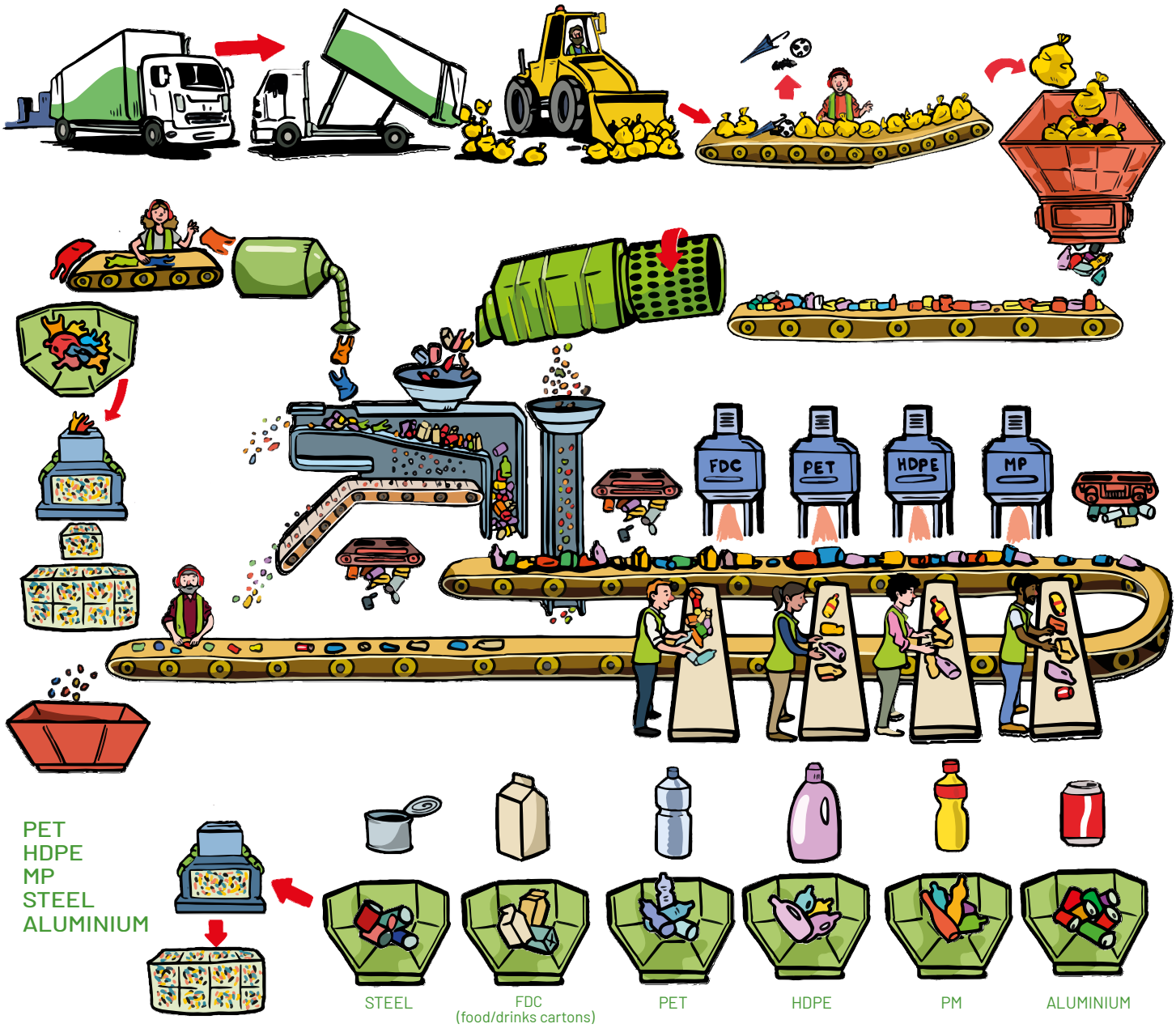


Figure 1. Diagram of a standard sorting plant.

The activity of a sorting plant begins when the trucks arrive, carrying the packaging deposited by the public in the containers located on the streets. After weighing and identifying the trucks, they are directed to the packaging drop-off and feeding areas.

All the waste that reaches the intake areas is introduced into the feeder by means of a loader or claw. The feeder measures out the waste onto a conveyor belt at the same time that triage operators separate from the process those materials that, due to their size, could be problematic for the sorting equipment. The waste that is not separated by the triage operators and that remains on the belt is discharged into a bag opening device that, by means of a series of blades, is able to tear open the bags in which the packaging was deposited by the consumer, and thus extract and prepare the materials for the remaining operations.

The packaging then enters the trommel, which separates it by size, creating three different packaging streams:

- Large flow, or rejects from the screening: packaging larger than 30 cm.
- Intermediate or main flow: packaging between 5 cm and 30 cm.
- Fine flow: packaging smaller than 5 cm, high content of organic and inert materials.

The intermediate or main flow is sent to the ballistic separator, which thanks to its inclined ramp and moving spades, sorts the flow into three new streams:

- **Roller stream**. The packaging that makes up this stream is bottles, trays, cartons or metal containers that, due to their weight and shape, go down the ramp of the ballistic separator.
- **Stream of flat-light materials**. Made up of packaging that, due to its density, goes up the ramp of the ballistic separator. It contains mainly flexible plastic film packaging, bags, doypack or pouch-type packaging, etc.
- **Stream of fine materials**. All those small materials that were not classified in the trommel because they are attached to other, larger packaging, or dragged by it, are in this stream.

The stream of flat-light materials from the ballistic separator goes to the pneumatic separation equipment. An upward flow of air in this machine is able to separate out film-like materials, which, due to their density, will be attracted by the air stream. The materials selected undergo quality controls and are subsequently stored for dispatch.

The roller stream is sent to a cascade of separators that will sort out different materials. The magnetic separator selects the ferric metals (steel), the induction or Foucault separator extracts the non-ferric metals (aluminum), and finally, optical separation is used to identify the other flows: PET, HDPE, mixed plastic (MP) and food/drink cartons.

Finally, any left over unsorted materials are sent to manual screening operators. This stage is known as secondary triage. The operators are responsible for identifying any recyclable materials and sorting them into the corresponding material streams (film, HDPE, PET, food/drink cartons and mixed plastic). Any remaining non-selected materials become part of the waste stream, which will end up in a landfill or incineration plant. In addition, once these fractions are separated, they are packaged into bales to be sent to recyclers.

In conclusion, sorting plants are of utmost importance to ensure the recycling of high-quality materials. Currently, the outflows of sorting plants, as we have seen are: PET, HDPE, film, mixed plastic, food/drink cartons, steel and aluminium.

4.3 Recycling technologies

Material recycling is a basic pillar in the transition towards a Circular Economy. Therefore, since the publication of the Circular Economy Action Plan in 2015, it has become clear that the packaging sector is key for Europe's transition towards a Circular Economy. As a result, it has opted to enhance recycling processes and develop new technologies to increase the current recycling rate.

4.3.1 Recycling plastic packaging

Plastic recycling plants process the packaging waste they receive from light-packaging sorting plants, called post-consumer materials, using a series of operations that output flakes or pellets of recycled plastic that is suitable for the subsequent manufacture of new products. It is also possible to recycle materials of industrial or commercial origin. This guide refers to the type of recycling that is currently available at the industrial level, which is mechanical recycling.

Among the currently recycled plastic materials, the most abundant by mass is rigid PET, high-density polyethylene (HDPE), low-density polyethylene (LDPE), rigid polypropylene (PP) and polystyrene (PS).

To understand how the recycling process of plastic materials works, Figure 2 shows a general diagram of the operation of a mechanical recycling plant, although there are cases such as PET where the extrusion process is not necessary, and the material is marketed in the form of flakes. Each of the stages that make up the recycling process is explained below.

Figure 2. Mechanical recycling process for plastic packaging.

First, the bales of plastic arrive from the packaging sorting plants and are initially processed to **eliminate any unwanted materials** that could be harmful in the subsequent steps, and thus decrease the quality of the recycled material. Depending on the recycler, the unwanted materials may be removed manually by operators or using optical separators.

Once any unwanted items are removed, the **material is flaked** and then **washed** with a mixture of water and chemicals (surfactants or solvents) to remove contaminants such as organic matter, dirt, dust, paper, water-soluble adhesives and other unwanted materials. The washing phase can also be done before flaking.

During this washing process, the flakes are further sorted by density, depending on whether they are more or less dense than water. Polyolefins such as PP, LDPE and HDPE, are less dense than water and float, unlike PET and PS, which sink because they are denser than water. Table 2 shows the relative densities of plastic materials.

Polymer	Density (g/cm^3)
Polypropylene (PP)	0.900-0.905
Low-density polyethylene (LDPE)	0.916-0.930
High-density polyethylene (HDPE)	0.941-0.970
Nylon – (Polyamides)	1.020-1.140
Polystyrene (PS)	1.04-1.09
Polyvinyl chloride (PVC)	1.290-1.440
Polyethylene terephthalate (PET)	1.380-1.390

Table 2. Relative densities of plastic materials

A subsequent optical separation step may be added to further identify and select the flakes of the desired material.

After the material separation process, the **flakes are dried** to extract as much moisture from the material as possible so that it does not interfere in subsequent steps.

Finally, once dried, the flakes are introduced into an **extrusion** machine, which **outputs pellets** or the final recycled material. There are materials such as PET that are marketed directly as flakes, so no subsequent extrusion process is necessary.

Some polymers such as polyolefins are compatible with each other, so they can be recycled together in a mixture, although the recycled material that is obtained from this mixture has limited applications, unlike when the polyolefins are recycled individually to form monomaterials.

An alternative to mechanical recycling that has been under development in recent years is chemical recycling. Chemical recycling is a process in which the chemical structure of plastic materials is broken down to produce monomers and oligomers to generate new polymers. This would allow recycling elements, such as multilayer packaging, that are difficult to recover using conventional mechanical methods.

4.3.2 Recycling paper and cardboard packaging

Paper recycling requires technological solutions for cleaning and eliminating all the harmful substances it can contain once it becomes waste. This makes it possible to obtain recycled paper whose quality is suitable for manufacturing new paper. Good paper recycling practices rely on the UNE-EN 643 standard, which specifies the qualities of the paper recovered.

In general, this material can be recycled in paper and cardboard factories or in specialized centres. In both cases, the recycling process consists of the following stages:

Figure 3. Diagram for recycling paper and cardboard packaging.

Once the material is pre-sorted, it is fed to the **pulper** using a shovel and conveyor belts. The main purpose of this machine is to disintegrate the paper, separate the cellulose fibres and form a paste called pulp. It does this by mixing the paper with water and surfactants, like hydrogen peroxide, caustic soda and soap. The machine agitates the mixture, leading to the formation of the pulp, and it also separates out any unwanted elements like staples and plastics. Certain conditions are required within the pulper to ensure the success of the process, such as an approximate temperature of 40^0C and a neutral pH (4Evergreen, 2022).

In the second step, after the pulper, the pulp undergoes a **coarse screening** process to remove possible impurities and contaminants from the fibres. This screening makes it possible to remove any large impurities that are not fibres. The pulp obtained after the first screening step mainly consists of water and cellulose fibres.

After the initial screening step, the **deinking** process of the pulp can begin, although it is optional and not always necessary. Soap and pressurized air are normally used to remove ink. The combination of both elements results in the formation of air bubbles that remove the ink from the paper. As they rise, the bubbles are captured by air aspirators.

After deinking, a **fine screening** process is done. The goal is to clean the fibres of all possible fine particles. This second screening step minimizes the presence of impurities. In general, the materials that are eliminated in this step are wires, sand, plastic, etc.

Once the ink is removed from the pulp and all the impurities that can hinder the recycling process are removed, the **paper is manufactured**. To do this, the pulp is introduced into a paper machine. In it, the paste is placed on a belt driven by rollers, which eliminates all the water absorbed by the pulp as a result of the previous treatments. Removing the water content requires gravity, vacuum, pressure and drying processes. Finally, once the pulp is practically dry, it is wound into coils to yield large sheets of paper. At this point, the recycled paper can be used to manufacture bags, cartons, packaging, sheets, etc.

4.3.3 Recycling food and drink cartons

The process of recycling food and drink cartons yields a high recovery rate of cellulose fibres.

Figure 4. Diagram for recycling cartons

The most common recycling process for food and drink cartons is very similar to that of paper and cardboard, and begins with inserting the cartons into a **pulper**. This machine relies on agitation to separate the cellulose fibres from the polyethylene and aluminium layers of the packaging.

When the process is over, the pulper is emptied with the help of a **filter**, whose output is the cellulose fibres in suspension with water, recovering up to 80% by weight of the packaging, depending on the percentage of paper in the carton. These fibres then follow the papermaking process (see subsection 4.3.2).

Usually, once the cellulose fibres that make up the packaging are recovered, the rest of the components are discarded; however, new techniques are being developed to use the layers of plastic and aluminium.

4.3.4 Recycling metal packaging

Metal packaging waste is recyclable through smelting processes. There are two recycling flows for metal packaging, one for steel and another for aluminium. In both cases, the recycling of these materials is fairly straightforward.

In general, the following steps are used in the metal packaging recycling process:

Figure 5. Diagram for recycling metal packaging

The steel, once sorted, is transported to a steel plant where the material is melted at a temperature between 1400 and 1500º C. The high temperatures reached by the operation facilitate the removal of impurities, such as microorganisms and pathogens or other materials such as paper, plastic, inks and even aluminium, which is incinerated. The resulting steel can be used for food applications.

Tinplate packaging (tin-coated steel) is best processed in centres specializing in steel. There, **the packaging is crushed** to separate unwanted materials such as paper labels. The resulting material is separated into steel and tin. The steel is used to manufacture new packaging such as cans, and the tin can be used in copper production.

Aluminium, like steel, once sorted, is transported to a **smelting plant**. However, its melting temperature is below 750ºC. The high temperatures will incinerate all types of impurities, including inks, paper, adhesives and plastic, resulting in the formation of **aluminium ingots** that are suitable for use in food applications.

General design aspects

05

05
GENERAL DESIGN ASPECTS

Keeping in mind the current packaging management systems and the recycling processes in use, it is important to design packaging with a view to its end of life and to ensure that it can be transformed into new packaging or products.

There are a number of considerations to take into account during the design phase of the packaging in terms of the amount of material, the colour, the separability of the components, the compatibility of the materials, the marking, and more.

Below are several general recommendations for designing sustainable packaging:

OPTIMAL MATERIAL WEIGHT AND/OR THICKNESS

- Optimize the weight per unit area and/or thickness (of the layers or walls) to improve the ratio between container and content, yielding environmental improvements in all stages of the life cycle, including the recycling stage, prioritizing the waste hierarchy (reduction) and reducing costs in the packaging value chain.
- Reduce the amount of material used in the body and in the closure system of the packaging, consistent with waste prevention criteria (top priority in the waste hierarchy). This can be achieved by reducing the body thicknesses, closing system, or resizing the body without altering the capacity of the packaging.

COMPATIBILITY OF PACKAGING MATERIALS

- Consider the recycling compatibility of the materials used to manufacture the different packaging elements, prioritizing the use of compatible materials or packaging. In the case of plastic, materials with similar characteristics should be used (for example, the combination of packaging with labels of the same material, or materials that can be easily separated during recycling).
- For packaging that requires the use of materials that are not compatible, ensure that the components can be separated easily.

PACKAGING WITH DIMENSIONS THAT AID RECYCLING

- Design paper and/or cardboard packaging so that it can be folded if it exceeds 1 m x 13 cm.
- Design packaging between 5 and 30 cm in diameter in the case of metal or plastic packaging or cartons.
- With regard to labels, make sure their size is less than two-thirds that of the packaging so they do not hinder the correct classification when they are made of a different material than the body. In the case of sleeves, make sure that the material is the same as the body of the packaging so it can be properly sorted.

PACKAGING WITH EASILY SEPARABLE COMPONENTS

- Design packaging so that components of different materials can be easily separated by consumers. To achieve this, packaging solutions can be used that require the components (labels and other elements) to be separated in order to consume the product.

EASY TO ASSEMBLE/DISASSEMBLE PACKAGING

- Apply designs that simplify the assembly of packaging and/or containers to reduce preparation times and the amount of resources for the packaging. If the design allows folding, this also optimizes the storage and logistics associated with the empty packaging.
- Use a packaging design and materials that do not rely on adhesives or that minimize the sealing surfaces.

MARKING ON THE PACKAGING

- Use symbols to identify the container in which to deposit the packaging. If it has different elements, identify each one with the appropriate symbol. Marking the packaging bodies, and their main components, with the material identification symbol helps both end consumers and operators of light-weight manual packaging sorting plants to sort the materials. From 2025, the marking of the destination fraction or container will be mandatory, as per Royal Decree 1055/2022. The marking identifying the packaging material will be voluntary, not mandatory.

Having described the main aspects of the packaging that condition its recyclability, let us now consider the specific requirements for plastic packaging, paper and cardboard packaging, composite packaging and metal packaging.

5.1 Design recommendations for plastic packaging

The essential requirements for plastic packaging are as follows:

- **AMOUNT OF MATERIAL**

  Reduce the amount of material used in the body and in the closure system of the packaging, consistent with waste prevention criteria (top priority in the waste hierarchy). This can be achieved by reducing the body thicknesses, closing system, or resizing the body without altering the capacity of the packaging, or by redesigning the closing system (ecodesign the different components).

- **COLOUR**

  The use of colour in the packaging can interfere with the mechanical recycling process in two ways, so it is best to avoid it:

  · The economic value of highly coloured plastic materials is lower than that of colourless materials. This is because uncoulored plastics can be used to manufacture a wider variety of products than coloured ones.

  · The presence of carbon black or colours containing carbon black in any percentage can negatively interfere with sorting machinery in recycling plants. This is because these devices rely on light beam sensors. Dark colours absorb more light, which causes problems when identifying the type of packaging material, which the sensors do by means of reflecting near infrared radiation. Dark colours do not reflect light, which hinders the classification.

Because of this, the use of colours should be minimized as long as this does not negatively affect any technical considerations, the characteristics of the brand or acceptance by the consumer.

Ideally, to assist with recycling, the material should be transparent or have a natural finish. Try to avoid opaque colours and dark shades.

• CLOSINGS AND TAMPER SEALS

Ideally, these components should not interfere with the recyclability of the packaging and should themselves be recyclable. To this end, consider the following aspects:

- Closures or components that do not leave residue or fragments once removed from the packaging. According to Directive 2019/904, from July 2024, the lids and caps of beverage containers with a capacity of up to 3 liters must remain attached to the container during use.
- Avoid using metal lids, since plastic packaging can end up in the wrong recycling stream.
- The use of monomaterial components improves recyclability by reducing potential sorting problems.

• LABELS AND SLEEVES

Labels and sleeves can condition how easy it is to recycle the packaging. Keep the following aspects in mind:

- Labels should not cover more than 2/3 of the visible surface of the packaging with a different material than the one on the packaging.
- Having labels and sleeves made of the same materials as the main body of the packaging ensures they will be properly identified during the steps of classification and reduction of waste contamination of recycled materials. Labels and sleeves made of other materials are acceptable if their surface area is limited to less than 2/3 of the total packaging, and if they do not hinder the sorting process.
- The sleeve should be designed to be peelable, such that it is completely removed when opening the packaging. If the sleeve remains attached to the main body, the sorting machine may identify the material of the sleeve as that of the entire body, which could be rejected.

• ADHESIVES

- Both the amount of adhesive and its area of application should be minimized.
- Water-soluble adhesives ensure that labels can be easily separated from the main body of the packaging through washing at 40ºC without the need for caustic soda. Labels that remain attached to the packaging after the washing process can contaminate and decrease the quality of the final recycled items, especially if the label is not of the same material as the packaging.

• INKS

In order to ensure that inks are not a problem when recycling plastic packaging, the following considerations are provided:

- Both inks and pigments used in packaging must comply with existing restrictions on heavy metals, health and safety. There is an *Exclusion List* drawn up by the European Printing Ink Association (EuPIA).
- Limit the use of inks to improve the quality of the recycled material. For natural (or transparent) packaging, the use of ink should be limited to laser markings and production and best-by dates.

• EMPTYING THE PACKAGING

In order to reduce the waste generated once the product is consumed, consideration should be given when designing the packaging to how easy it is to empty, by implementing measures such as:

· Modifying the design of the packaging to give it a wider neck.

· Designing it in an upright position with the cap as its base, so that the product accumulates at the neck, making it easier to extract the product.

· Designing the packaging in a way that avoids angles or bends.

· Using non-stick additives that reduce the amount of product that sticks to the inside walls of the packaging.

• SIZE OF THE PACKAGING AND ITS COMPONENTS

The waste treatment plant contains machines such as trommels, and most recyclers also have initial screening stages, which are responsible for screening all the product that arrives at the plant.

The trommel sieves the products to eliminate any organic waste that could compromise the quality of the recycling process. The trommel consists of perforated plates with 5-cm holes, such that any packaging or component (including caps) with one side or a diameter below 5 cm can potentially pass through the perforations and be lost from the recycling stream. Because of this, it is advisable to:

· Design caps attached to the packaging to keep them from being lost in the screening phases.

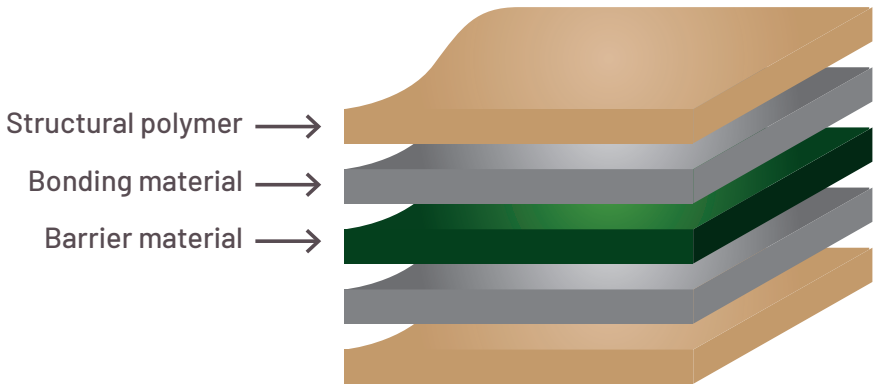
· Design packaging with sides longer than 5 cm to avoid losses in the trommel.

• MONOMATERIAL PACKAGING

Prioritize the use of packaging composed of a single material, since the higher the content of the same polymer, the more likely it is to be recycled later.

• USE OF COMPATIBLE PLASTIC MATERIALS

The barrier layers protect the contents from light, moisture or gases, but they cannot be removed during the recycling process, which directly affects recyclability. One of the most commonly used barrier materials is ethylene vinyl alcohol (EVOH); however, the high amounts of EVOH stabilized by means of specific binding layers, and even the reduced amount of EVOH without binding layers, impede the recycling process.



If, for technical reasons, a single material cannot be used, consider the use of compatible materials. These are materials that can be processed together without a significant reduction in their properties.

The use of compatible materials increases the recyclability of the packaging. However, the use of compatibilizing agents allows materials that are not compatible to be recycled together, although this makes recycling the materials more expensive.

5.2 Design recommendations for cartons

In the case of corrugated cardboard packaging, in addition to the essential design elements to properly process the packaging and minimize its environmental impact, the following aspects should be taken into account:

- **AMOUNT OF MATERIAL**

Reduce the amount of material used in the body and in the closure system of the packaging, consistent with waste prevention criteria (top priority in the waste hierarchy). This can be achieved by reducing the body thicknesses, closing system, or resizing the body without altering the capacity of the packaging, or by redesigning the closing system (ecodesign the different components).

- **SUSTAINABLY-SOURCED MATERIALS**

To reduce the environmental impact of cardboard packaging, there are alternatives, including the use of sustainably-sourced cardboard (FSC or PEFC certificates).

- **FILLERS, ADDITIVES AND AGENTS**

The combination of paper and cardboard with fillers and chemical additives should be used in a way that does not hinder recycling while ensuring the performance of the packaging. Most paper and cardboard components are fully compatible with existing recycling technologies; however, the following considerations should be kept in mind:

· Prioritize packaging materials that do not limit the future or end uses of recycled fibre. This means they do not contain substances considered by the EU as “of very high concern", which would make them unsuitable for contact with food, and/or that accumulate over several cycles.

· Use only the necessary amount of moisture-resistant additives to ensure the intended performance of the packaging.

· Use special paper and cardboard treatments only for applications where this is absolutely necessary. This keeps the amount of additives in the paper suitable for recycling purposes, as in standard recycling processes.

- **BARRIER COATINGS AND TREATMENTS**

Fibre-based packaging, including paper and cardboard, has no intrinsic barrier properties. These are necessary to adequately protect food and non-food products from external factors, such as high relative humidity, oxidation, contamination caused by mineral oils and other hazardous substances. Providing an adequate level of protection minimizes food loss and ensures the safety of the packaged product. Treatments such as coatings and lamination (polymeric barrier layers) are applied to fibre-based packaging.

The addition of barriers to fibre-based packaging can have negative effects on its recyclability. The extent of these impacts ultimately determines whether the fibre-based packaging material is compatible with a standard recycling process.

- **ADHESIVES**

Since they account for a small percentage of the weight of any packaging, adhesives are currently not subject to any recycling process, and are thus not considered "recyclable".

However, adhesives can affect the performance and quality of paper and cardboard recycling processes. As a result, adhesives must be compatible with these processes if the base materials are to be effectively recycled:

· Adhesive must be applied in a way that does not have unacceptable impacts on the recycling process, or deteriorate the materials.

· As a general principle, the amount of adhesive used in a given paper or cardboard item should be the minimum quantity necessary to fulfil its function.

· Make it easy to remove adhesives whenever technically possible.

- **INKS AND VARNISHES**

Printing inks and varnishes can undergo two recycling processes: (1) one that includes a flotation process to separate the ink particles from the paper fibres (deinking recycling process); and (2) one without a flotation process, where the ink particles remain in the pulp (standard recycling process). Therefore, the use of inks should be avoided, and if they are essential, as little as possible should be applied so as to have a minimal effect on the recycled materials.

- **METALLIC DECORATIONS**

Metal components can cause different problems during the paper sorting and recycling processes. If the surface is covered with a large amount of metallic decorations, this could cause detection problems, since the metallic effect of the decorations reflects NIR light, and the fibre product could end up in the wrong recycling flow. To mitigate this problem, you should:

· Not completely cover the fibre packaging with metal and minimize the percentage of plastic used.

· Use hot stamping or cold transfer instead of lamination.

5.3 Design recommendations for food and drink cartons

The following are the main design requirements to consider to ensure the proper recyclability of this type of composite packaging:

- **AMOUNT OF MATERIAL**

Reduce the amount of material used in the body and in the closure system of the packaging, consistent with waste prevention criteria (top priority in the waste hierarchy). This can be achieved by reducing the body thicknesses, closing system, or resizing the body without altering the capacity of the packaging, or by redesigning the closing system (ecodesign the different components).

- **SUSTAINABLY-SOURCED MATERIALS**

To reduce the environmental impact of food and drink composite carton packaging, there are currently alternatives that allow incorporating sustainably-sourced cardboard (FSC or PEFC certificates) and biobased plastic polymers (for example, PE caps from sugar cane).

- **COMPOSITION OF THE PACKAGE**

In any case, the following alternatives proposed have to be made viable for each type of product to ensure that the food quality and safety requirements are met.

· The body must consist mainly of cardboard, and the origin of the fibres must preferably be wood, limiting the use of fibres from hemp, cotton, etc. This packaging is sorted using NIR (near-infrared) sensors, which recognize the specific composition of the packaging material.

- **METALLIZED SURFACES**

Avoid metallized surfaces or coatings on the packaging body that impair NIR detection, as this causes packaging identification problems during the sorting stage.

- **ADHESIVES**

Avoid the use of hot melt, adhesives that are not soluble, that disperse in water or are resistant to moisture.

- **INKS**

To ensure high-quality recycled material that can be used for different applications, the use of printing inks should be reduced to the absolute minimum. Additionally, avoid using inks or pigments containing mineral oils and metallic inks. In any case, the inks used should comply with EuPIA recommendations.

- **ADDITIVES**

To achieve more efficiency and throughput in the process of recycling the paper fibres contained in cartons, avoid the use of additives, such as mineral fillers or binders, or limit them to the absolute minimum if they must be used. Although they do not negatively influence the paper pulp manufacturing process, they do reduce the fibre content, and thus the yield. However, if they are necessary, mineral fillers such as kaolin, talc and calcium carbonate, titanium dioxide (white pigment) or starch (filler) may be employed in the cardboard part.

- **SIZE OF THE PACKAGING**

Regarding the dimensions of the packaging, especially as it relates to sorting, to avoid losses, at least two of the three sides of the packaging body should be longer than 5 cm.

- **CLOSURE SYSTEM**

To make it easier to separate the closure systems during the recycling process and not negatively affect the final quality of the recycled material, the use of the following materials is recommended: HDPE and PP.

5.4 Design recommendations for metal packaging

In the case of metal packaging, in addition to the essential design elements to properly process the packaging and minimize its environmental impact, the following aspects should be taken into account:

- **AMOUNT OF MATERIAL**

Reduce the amount of material used in the body of the packaging, consistent with waste prevention criteria (top priority in the waste hierarchy). This can be achieved by reducing body thicknesses, or resizing the body without changing its capacity.

• COMPATIBILITY OF MATERIALS

To improve the compatibility of the materials that make up metal packaging, the same material should be used in the body as in the rest of the components, such as caps or closures (Netherlands Institute for Sustainable Packaging, 2022).

• INTERIOR COATINGS

The use of lacquered finishes or coatings or the use of paint coatings is allowed in food applications, provided they are not chlorinated, as this generates polluting emissions that must be avoided.

• SIZE OF THE PACKAGING

At least two of the three sides of the body of the packaging should be greater than 5 cm. In the case of aluminium packaging, if its dimensions are less than 5 cm, it will be lost in the fine flow and will not be recovered.

• EMPTYING THE PACKAGING

To the extent possible, metal aerosol packaging should be completely empty when discarded to avoid problems when processing and recycling the packaging, so it would be helpful to include instructions or recommendations in the body of the packaging telling the user to empty it completely before discarding it. Specifically, metal aerosols can cause explosions due to the gases they contain inside them, creating problems during the recycling process.

• VARNISHES AND COATINGS

Minimize the amount of varnishes and coatings.

• LABELS

An alternative to using labels or sleeves is to add engraving to the surface of aluminium and steel containers, which reduces the amount of material used and improves recyclability.

If a label has to be included, consider the following points:

- Plastic labels: avoid the use of PVC labels with metal packaging, since during recycling they generate polluting emissions that should be avoided.
- Sleeves: they should be completely removed when opening the packaging to avoid compatibility problems with the main material. If the sleeve is not separable, it should be micro-perforated, meaning it is pre-cut to make it easier for the user to separate it.
- To improve the recyclability of the packaging, easily separable paper labels should be used on steel cans, along with instructions on the packaging to deposit them in separate containers (metal body in the yellow container and the paper label in the blue one).
- They should be as small as possible while containing all the necessary information for the user and for marketing purposes.
- Incorporating recycled material into packaging labels and sleeves is consistent with the circular economy and improves the sustainability of the packaging.

• ADHESIVES

As for the adhesives used in this type of packaging, and especially to attach labels to its surface, the amount of adhesive should be minimized in an effort to comply with the goal of waste prevention.

- **PRINTING LACQUERS AND INKS**

  · As a first option, the use of direct printing on the surface of aluminium packaging is recommended as a way to avoid the need to incorporate labels.

  · As a second solution, minimizing the amount of ink used is consistent with waste prevention criteria (top priority in the waste hierarchy).

  · Finally, only materials that are in compliance with the EuPIA should be used, and substances and mixtures whose use entails a series of associated risks should be avoided.

- **OTHER COMPONENTS**

  · Eliminating plastic or paper components used as tamper seals is consistent with waste prevention.

5.5 Eco-labelling recommendations

Another very important aspect to promote recycling is the information on the label, especially that which seeks to raise awareness among consumers in an effort to promote more sustainable consumption by specifying which container to deposit their waste in.

The "Ecoembes Environmental Labelling Guide for Packaging" details the use, placement and meaning of every important and useful element for consumers, manufacturers and packagers, on all the possible symbols that can be found on an eco-label.

To help consumers decide which container they should deposit their packaging in, Ecoembes has developed the **Recicla symbol**. This logo is printed on the packaging, or its accompanying label, and helps identify which container it should be deposited in, especially for those packaging units that are made of different components.

RECICLA SYMBOL

The packaging recycling symbol launched by Ecoembes is a voluntary information system to help the public to properly sort packaging for recycling. This symbol is a type II eco-label, i.e., it is a self-declaration by the company that is printed on the packaging or its accompanying label (see Figures 6 and 7).

This logo provides information to the user on which container to deposit the packaging in. If the packaging contains multiple, incompatible materials, the logos would have to be used as shown in Figure 7, which provides additional information on each component.

Figure 6. Recicla symbol for deposit packaging in containers for sorting.

Figure 7. Recicla symbol for depositing multi-component packaging in different containers for sorting.

Ecoembes makes available to companies a manual explaining the rules for using this logo in terms of its shape, icon, message, size, colours and typography. It can be found on the following website:

www.ecoembesthecircularcampus.com/actua/moviliza/simbolo-de-reciclaje/

Ecodesign cards

06

06
ECODESIGN CARDS

This section explains the cards resulting from the ecodesign guide for each packaging fraction. The cards include general guidelines to enhance recyclability, providing an analysis of the mechanical sorting and recycling systems at the industrial level.

These recommendations are detailed for each key aspect of the packaging in terms of its different components (body, closure system, label and other aspects). They are categorized using a traffic light approach for easier interpretation:

- GREEN: helps recycling.
- YELLOW: limited compatibility. These design conditions should be avoided whenever possible. Those aspects shown in the green column (helps recycling) are always preferable.
- RED: prevents recycling.

The groups of fractions are as follows:

FRACTION	CARD
PET	Bottle/carafe Tray Other
HDPE	General
FLEXIBLE	General
MIXED PLASTIC	PP PS
STEEL	General
ALUMINIUM	General
FOOD/DRINK CARTON	General
COMPOSTABLE	General
PAPER/CARDBOARD	General

Table 3. Fractions and types of packaging presented in the eco-design guide.

Next, we consider a standard card, analysing various aspects of the material and type of packaging. The cards are then applied to each of the fractions discussed in the table above.

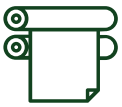
FRACTION: Specifies the type of fraction

Packaging: Packaging considered in the card

ASPECTS	HELPS RECYCLING	LIMITED COMPATIBILITY	IMPEDES RECYCLING
Body			
MATERIALS 	Aspects related to the types of materials of the packaging body so they can be recycled or that do not affect their recycling, individually or indicating possible compatibilities with other packaging materials.	Materials that could be problematic for recycling depending on their nature, proportion in the composition of the packaging, etc.	Materials or combination of materials that impede recycling of the packaging.
DIMENSIONS 	Dimensions of the packaging and/or the components so they can be recycled efficiently based on the limitations of the recycling equipment.		Dimensions of the packaging and/or the components that impede the recycling process.
ADDITIVES AND BARRIER 	Additives or barrier materials that do not affect the recycling process.	Additives or barrier materials that do not prevent recycling, but that entail some loss in performance.	Additives or barrier materials that pose a problem for recycling, affecting the quality of the final recycled material.
COLOUR 	Packaging colours that do not affect the operations of identifying and separating the materials for proper recycling.	Packaging colours that influence the process and may limit applicability.	Packaging colours that limit applicability and/or hinder identification and separation with NIR technology, and therefore cannot be recycled.
TRANSPARENCY 	Material finishes that do not affect detection with NIR technology.	Does not affect recycling processes.	Material finishes that impede detection with NIR technology.
Closure system			
MATERIALS 	The materials of the closure do not affect recycling, individually or indicating possible compatibilities with other packaging materials.	Materials that could be problematic for recycling depending on their nature, proportion in the composition of the packaging, etc.	Materials or combination of materials that make it difficult to recycle the packaging
TAMPER RESISTANCE 	Type and composition of tamper resistance that promotes recycling.	Type and composition of tamper resistance that allows recycling.	Type and composition of tamper resistance that prevents recycling.

FRACTION: **Specifies the type of fraction**

Packaging: Packaging considered in the card

ADDITIVES AND BARRIER 	Additives or barrier materials that do not affect the recycling process.	Additives or barrier materials that may affect the recycling process, limiting it or causing a loss of performance in the final material.	Additives or barrier materials that pose a problem for recycling, affect the quality of the final recycled material, make it difficult to identify or separate from the main material, etc.
Label / Decoration			
DIMENSIONS 	Recommended dimensions to properly adapt the packaging solution to the recycling system.		Dimensions not recommended to properly adapt the packaging solution to the recycling system.
If the dimensions are adequate (green column), the following additional aspects for labels will be taken into account			
MATERIALS 	Component materials that do not affect recycling, individually or indicating possible compatibilities with other packaging materials.	Materials that could be problematic for recycling depending on their nature, proportion in the composition of the packaging, etc.	Materials or combination of materials that impede recycling the packaging.
ADHESIVES 	Adhesives that, due to their composition, dissolve easily without influencing the quality of the final recycled material.	Adhesives that do not influence the recycling process, even if they do not dissolve.	Adhesives that do not dissolve due to their composition, which can hinder the recycling process.
PRINTING 	Recommended inks included in the EuPIA Recommendations.	Inks that do not influence the process or quality of the resulting material.	Inks not recommended. They influence the quality of the final recycling material or impede recycling.
Other aspects			
OTHER ASPECTS BODY 	Aspects of the packaging body recommended to facilitate the recycling operation, especially separation.	Aspects of the packaging body other than the above that do not affect recyclability.	Aspects of the packaging body that hinder recyclability.
OTHER ASPECTS OF THE CLOSURE SYSTEM  **(ATTACHED CAPS)**	Aspects of the packaging body that hinder recyclability.	Aspects of the closure different from the above that do not affect recyclability.	Aspects of the closure that may hinder recyclability.
PERCENT RECYCLED 	The percentages specified in environmental laws and actions required to be implemented as a result.		

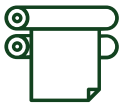
FRACTION: PET

Packaging: BOTTLE / CARAFE

ASPECTS	HELPS RECYCLING	LIMITED COMPATIBILITY	IMPEDES RECYCLING
Body			
MATERIALS 	Main material PET.		Materials not compatible with PET, such as PLA, PVC, PS, PETG, metals, silicones, paper and cardboard, etc.
DIMENSIONS 	At least two of the three sides of the body should be < 30 cm, or the packaging should be compactible. At least two of the three sides of the body should be > 5 cm.		Two of the three sides of the packaging < 5 cm (compacted) or > 5 litres of content.
ADDITIVES AND BARRIER 	BARRIER: The use of barriers and additives should be limited, but if a barrier is needed, use SiOx plasma coating.	BARRIER: Multilayer <5% EVOH by weight and multilayer with PGA.	BARRIER: ≥5% EVOH. ADDITIVES: Bio-/oxo-/photo-degradable additives, nanocomposites, UV stabilizers, acetaldehyde (AA) blockers, optical brighteners and oxygen scavengers.
COLOUR 	Light blue or non-coloured packaging.	Black colour detectable with NIR technology and colours other than light blue.	Black colour not detectable with NIR, metallics or fluorescents.
TRANSPARENCY 	Transparent.	Translucent.	Opaque.
Closure system			
MATERIALS 	Use of polyolefins such as PE and PP.		Use of multi-material dispensers (dispensing guns or pumps). Incompatible materials (PVC, PLA, PETG, PS, metals, silicones, etc.).
TAMPER RESISTANCE 	Easily separable for recycling.		Materials that leave residues or fragments once removed from the packaging.

FRACTION: PET

Packaging: BOTTLE / CARAFE

LINERS AND VALVES 	The use of liners and valves with PE, PE with EVA, PP and foamed PET is allowed.	Silicone with density <0.95 g/cm^3.	Materials with density ≥1 g/cm^3.
Label / Decoration			
DIMENSIONS 	For packaging with a volume not more than 500 ml, covering <1/2 of the surface. For packaging with a volume exceeding 500 ml covering less than 2/3 of the surface. If sleeves are used, they must be removed by the final consumer to access the content.	PET sleeve.	Labels covering more than 2/3 of the packaging and not made of the same material as the packaging.
If the dimensions are adequate (green column), the following additional aspects for labels will be taken into account:			
MATERIALS 	Polyolefins such as PE and PP.	Paper or PET labels.	Incompatible materials (PVC, PLA, PETG, PS, metals, etc.).
ADHESIVES 	Adhesives that detach in water or alkali at 60-80ºC, and minimize the amount used.	The use of self-adhesive and hot melt labels.	Adhesive not soluble in water or alkali, adhesive that does not detach at 60-80°C in water or alkali.
PRINTING 	Reduce the quantity of inks and use those that comply with EuPIA recommendations.		Use of inks that do not comply with EuPIA recommendations, metallic inks and bleeding inks.
Other aspects			
OTHER ASPECTS OF THE CLOSURE SYSTEM  **(ATTACHED CAPS)**	As of 3 July 2024, Law 7/2022 (Art.57.1) stipulates that plastic caps and stoppers on drink bottles up to 3L must remain attached to the bottle during use.		
PERCENT RECYCLED 	**2025** – PET drink bottles have 25% recycled PET. **2030** - PET drink bottles have 30% recycled material.		

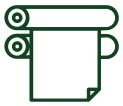
FRACTION: PET

Packaging: TRAY

ASPECTS	HELPS RECYCLING	LIMITED COMPATIBILITY	IMPEDES RECYCLING
Body			
MATERIALS 	PET and multi-material combinations with plastics that do not impede recycling (PP, PE, EVOH, etc.) separable by density.		Materials not compatible with PET, such as PLA, PVC, PS, PETG, metals, silicones, paper and cardboard, etc. Multilayer trays with PU-based lamination adhesive.
ADHESIVES 	Acrylic lamination adhesives.		PU adhesives.
DIMENSIONS 	At least two of the three sides of the body should be <30 cm or the packaging can be compacted. At least two of the three sides of the body should be > 5 cm.		Two of the three sides of the packaging <5 cm.
ADDITIVES AND BARRIER 	BARRIER: The use of barriers and additives should be limited, but if a barrier is needed, use a PET-based oxygen scavenger that does not yellow the material after heating. ADDITIVES: If additives are needed, use silicone surface coatings; anti-blocking masterbatch <3% by weight.	BARRIER: PET-based oxygen scavenger with limited yellowing effect. Anti-blocking agents; anti-fogging agents (in the coating area). ADDITIVES: UV stabilizers; AA blockers; optical whiteners; antiblock masterbatch; antistatic agents.	ADDITIVES: Bio-/oxo-/photo-degradable additives and nanocomposites.
COLOUR 	Not coloured.		Coloured.
TRANSPARENCY 	Transparent		Opaque and translucent.
Closure system			
MATERIALS 	Non-printed PET, PE or PP.		Incompatible materials (PVC, PLA, PETG, PS, metals, etc.).

FRACTION: PET

Packaging: TRAY

TAMPER RESISTANCE 	Easily separable for recycling.		Materials that leave residues or fragments once removed from the packaging.
Label / Decoration			
DIMENSIONS 	Limit size of labels and sleeves attached to the packaging and covering <2/3 of the surface.		Labels covering more than 2/3 of the packaging and not made of the same material as the packaging.
If the dimensions are adequate (green column), the following additional aspects for labels will be taken into account:			
MATERIALS 	Polyolefins such as PE and PP or cardboard sleeve removable from the tray.	Paper or PET labels.	Plastic with density >1 g/cm^3 (also in the area with most printing and glue) or with BPA and paper with fibre loss during washing or non-floating.
ADHESIVES 	Removable adhesives with no flake residue at 70°C or resealable adhesives.	Removable adhesives with no flake residue at 85°C.	Other types of adhesives.
PRINTING 	Reduce the quantity of inks and use those that comply with EuPIA recommendations.		Use of inks that do not comply with EuPIA recommendations, metallic inks and bleeding inks.
Other aspects			
OTHER ASPECTS BODY 	If absorbent pads are used to collect exudates, they should be PE, PP and fully removable.		
PERCENT RECYCLED 	**2025** – Goal is for packaging to have 25% recycled PET. **2030** – Goal is for packaging to have 30% recycled PET.		

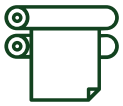
FRACTION: PET

Packaging: OTHER

ASPECTS	HELPS RECYCLING	LIMITED COMPATIBILITY	IMPEDES RECYCLING
Body			
MATERIALS 	Main material PET.		Materials not compatible with PET, such as PLA, PVC, PS, PETG, metals, silicones, paper and cardboard, etc.
DIMENSIONS 	At least two of the three sides of the body should be < 30 cm, or the packaging should be compactible. At least two of the three sides of the body should be > 5 cm.		Two of the three sides of the packaging <5 cm (compacted).
ADDITIVES AND BARRIER 	BARRIER: The use of barriers and additives should be limited, but if a barrier is needed, use SiOx plasma coating.	BARRIER: multilayer <5% EVOH.	BARRIER: ≥5% EVOH. ADDITIVES: UV stabilizers, oxygen scavengers, nanocomposites and bio-/oxo-/photodegradable additives.
COLOUR 	Light blue or non-coloured packaging.	Black colour detectable with NIR technology and colours other than light blue.	Black colour not detectable with NIR, metallics or fluorescents.
TRANSPARENCY 	Transparent.	Translucent.	Opaque.
Closure system			
MATERIALS 	PET or polyolefins with density <1 g/cm^3. BLISTER PACK: Prioritize the use of mono-material (PET) or easily separable components.		Incompatible materials (PVC, PLA, PETG, PS, metals, etc.).
TAMPER RESISTANCE 	Easily separable for recycling.		Materials that leave residues or fragments once removed from the packaging.

FRACTION: PET

Packaging: OTHER

ADDITIVES AND BARRIER 	Limit the use of additives and barrier, if barrier needed, AlOx and SiOx can be used.	CAPS: <5% EVOH and PVOH by weight.	BARRIER: ≥5% EVOH.
Label / Decoration			
DIMENSIONS 	Labels that cover less than 2/3 of the packaging and that are of a different material than the main body. BLISTER PACK: Limit the size of labels and sleeves attached to the packaging that cover <1/3 of the surface.		Labels covering more than 2/3 of the packaging and not made of the same material as the packaging. The use of sleeves that are not separable by the final consumer.
If the dimensions are adequate (green column), the following additional aspects for labels will be taken into account:			
MATERIALS 	Polyolefins such as PE and PP with densities <1 g/cm^3.	Paper or PET labels.	Incompatible materials (PVC, PLA, PETG, PS, metals, etc.).
ADHESIVES 	Adhesives soluble in water or alkali at 60-80ºC, and minimize the amount used.		Self-adhesive and hot melt labels.
PRINTING 	Reduce the quantity of inks and use those that comply with EuPIA recommendations.		Use of inks that do not comply with EuPIA recommendations, metallic inks and bleeding inks.
Other aspects			
OTHER ASPECTS BODY 	If pads are used to collect exudates, or bubbles to protect the product, they should be made of PE, PP and completely removable.		
PERCENT RECYCLED 	**2025** – Goal is for packaging to have 25% recycled PET. **2030** – Goal is for packaging to have 30% recycled PET.		

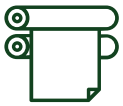
FRACTION: HDPE

Packaging: GENERAL

ASPECTS	HELPS RECYCLING	LIMITED COMPATIBILITY	IMPEDES RECYCLING
Body			
MATERIALS	Main material HDPE.		Incompatible materials (PLA, PVC, PS, PETG, PP >10%).
DIMENSIONS	At least two of the three sides of the body should be > 5 cm.		Two of the three sides of the packaging <5 cm.
ADDITIVES AND BARRIER	BARRIER: If barrier is needed, use plasma coating <5% EVOH. ADDITIVES: Processing additives if density remains <0.97 g/cm^3.	BARRIER: Barrier with ≥5% EVOH. ADDITIVES: Mineral fillers that do not increase density above 0.97 g/cm^3.	BARRIER: PA (>1% total), PVdC and Aluminium. ADDITIVES: Additives such as talc/Ca - CO3 or others that modify the density of the material.
COLOUR	Not coloured.	Other colours detectable with NIR technology.	Black not detectable with NIR technology.
TRANSPARENCY	Translucent and opaque.		
Closure system			
MATERIALS	Compatible with HDPE body (HDPE, HDPE or derivatives).	PP, PET, PETG, PLA, PS or removable aluminium caps.	Incompatible (PVC, aluminium, metal, polyolefins with density ≥ 1 g/cm^3).
TAMPER RESISTANCE	Easily separable for recycling.		Materials that leave residues or fragments once removed from the packaging.

FRACTION: HDPE

Packaging: GENERAL

LINERS AND VALVES 	The use of PE liners and valves is allowed.	Use of PP, TPO, TPS, PET, PETG, PLA, PS liners and valves.	Incompatible materials PVC, aluminium, metal, polyolefins with density ≥1 g/cm^3.
Label / Decoration			
DIMENSIONS 	Limit the size of labels and sleeves attached to the packaging that cover <2/3 of the surface. TUBES: The labels should take up a surface area of less than 50% of the packaging (for packaging with a capacity no greater than 500 ml), or use labels easily separable from the body.		Labels covering more than 2/3 of the packaging and not made of the same material as the packaging. TUBES: Use of pressure labels.
If the dimensions are adequate (green column), the following additional aspects for labels will be taken into account:			
MATERIALS 	Compatible materials: PE or IML labels.	Labels made of PP, PO (with density <1 g/cm^3), PET, PETG, PLA, PS, paper with no fibre loss; foamed PO. If sleeve used, it should be easily detachable via micro-perforated.	Avoid the use of incompatible materials, metallized, aluminium, PVC, paper, etc.
ADHESIVES 	Water-soluble adhesives at < 400C and minimize their amount.		Non-soluble or non-releasable adhesives in water at <40ºC.
PRINTING 	Reduce the quantity of inks and use those that comply with EuPIA recommendations. Direct printing with laser marking allowed.		Use of inks that do not comply with EuPIA recommendations, metallic inks and bleeding inks.
Other aspects			
OTHER ASPECTS OF THE CLOSURE SYSTEM 	As of 3 July 2024, Law 7/2022 (Art. 57.1) stipulates that plastic caps and stoppers on drink bottles up to 3L must remain attached to the bottle during use.		
PERCENT RECYCLED 	**2025** – Goal is for packaging to have 20% recycled plastic. **2030** – HDPE drink bottles must contain 30% recycled plastic. All other plastic packaging should have 30% recycled plastic.		

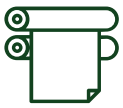
FRACTION: FLEXIBLE

Packaging: GENERAL

ASPECTS	HELPS RECYCLING	LIMITED COMPATIBILITY	IMPEDES RECYCLING
Body			
MATERIALS	Use of PE, PP or PP/PE as the main material.		The use of contaminating materials (PET laminates, PVC, foamed polymers other than PE and PP that alter the density, paper, aluminium, compostable and biodegradable materials).
DIMENSIONS	Two of the three sides should be >5 cm.		
ADDITIVES AND BARRIER	Avoid the use of barriers and additives. If a barrier is needed, use coatings or layers of AlOx and SiOx.	EVOH, PVOH <5% total weight. Aluminized (spraying).	Laminated and printed metal layer <5% by total weight. BARRIER: ≥5% EVOH
COLOUR	Not coloured.	Other colours detectable with NIR technology.	Black not detectable with NIR technology.
TRANSPARENCY	Prioritize the use of transparent packaging.		
Closure system			
MATERIALS	Same material as body (PE, PP, PP/PE).	Closures with different materials than the body should be easily separable.	

FRACTION: FLEXIBLE

Packaging: GENERAL

Label / Decoration			
DIMENSIONS 	Labels of materials other than polyolefins should cover <2/3 of the surface.		
If the dimensions are adequate (green column), the following additional aspects for labels will be taken into account:			
MATERIALS 	Use the same material as the body of the flexible packaging (PE, PP, PP/PE).		
ADHESIVES 	Use of polyurethane, natural rubber or acrylic latex and bonding layers without PE or PP at a maximum of 5% by total weight.		
PRINTING 	Reduce the quantity of inks and lacquers and use those that comply with EuPIA recommendations.		Use of inks that do not comply with EuPIA recommendations, metallic inks and bleeding inks.
Other aspects			
OTHER ASPECTS OF THE CLOSURE SYSTEM  **(ATTACHED CAPS)**	As of 3 July 2024, Law 7/2022 (Article 57.1) stipulates that plastic lids and caps for flexible drink packaging (pouch or doypack) of up to 3L must remain attached to the packaging during use.		
PERCENT RECYCLED 	**2025** – Goal is for packaging to have 20% recycled plastic. **2030** – Goal is for packaging to have 30% recycled plastic		

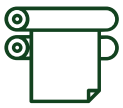
FRACTION: MIXED PLASTIC

Packaging: POLYPROPYLENE (PP)

ASPECTS	HELPS RECYCLING	LIMITED COMPATIBILITY	IMPEDES RECYCLING
Body			
MATERIALS 	Use of PP as the main material.	Use of multilayer structures (including different types of PP), especially in the case of TRAYS.	Use of incompatible materials such as PLA, PVC, PS, PET or PETG.
DIMENSIONS 	At least two of the three sides of the body should be < 30 cm, or the packaging should be compactible. At least two of the three sides of the body should be ≥ 5 cm.		Two of the three sides of the packaging <5 cm.
ADDITIVES AND BARRIER 	The use of barriers and additives should be limited, but if a barrier is needed, EVOH < 5% by weight can be used.	BARRIER: The use of EVOH ≥5% by weight.	ADDITIVES: Additives that increase the density of the material, flame retardants, plasticizers, biodegradable, oxo-degradable or photodegradable additives.
COLOUR 	Not coloured.	Other colours detectable with NIR technology.	Black not detectable with NIR technology.
Closure system			
MATERIALS 	PP closures, caps and valves compatible with the body.	PE, PET, TPE-PE/PET, PETG, PLA, PS (all with a density >1 g/cm^3) removable aluminium or silicone cap with a density >1 g/cm^3.	The use of materials with densities similar to PP and not detachable. The use of PVC or made from foamed materials such as EPS.
TAMPER RESISTANCE 	Prioritize the use of PP.	PE. PET, TPE-PE/PET, PETG, PLA, PS (all with a density >1 g/cm^3).	Avoid materials that leave residue or fragments once removed from the packaging.
LINERS AND VALVES 	**TRAY**: If a barrier is needed, use EVOH, PVOH or plasma coatings of SiOx and AlOx <5% total.		

FRACTION: MIXED PLASTIC

Packaging: POLYPROPYLENE (PP)

Label / Decoration			
DIMENSIONS 	Labels covering <2/3 of the packaging.	When a sleeve has to be used, it should have to be forcibly removed.	Labels covering more than 2/3 of the packaging and not made of the same material as the packaging.
If the dimensions are adequate (green column), the following additional aspects for labels will be taken into account:			
MATERIALS 	Prioritize the use of PP.	Limit the use of PE or PO with densities <1 g/cm^3, and PET, PETG, PLA and PS with densities >1 g/cm^3.	Avoid the use of incompatible materials: aluminium, PVC, glass or elements other than PE or PP and/or foams with densities <1 g/cm^3. Pet, PETG, PLA and PS with densities <1 g/cm^3.
ADHESIVES 	Use of adhesives soluble in water at least at 40ºC and minimize their amount.		Non-soluble or non-releasable adhesives in water.
PRINTING 	Reduce the quantity of inks and use those that comply with EuPIA recommendations. Use of laser marking for expiration or best-by dates.		Use of inks that do not comply with EuPIA recommendations, metallic inks and bleeding inks. Any other direct printing.
Other aspects			
OTHER ASPECTS BODY 	If absorbent pads are used to collect exudates, or bubbles to protect the product, they should be made of PE, PP and completely removable.		
PERCENT RECYCLED 	**2025** – Goal is for packaging to have 20% recycled plastic. **2030** – Goal is for packaging to have 30% recycled plastic.		

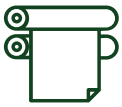
FRACTION: MIXED PLASTIC

Packaging: POLYSTYRENE (PS)

ASPECTS	HELPS RECYCLING	LIMITED COMPATIBILITY	IMPEDES RECYCLING
Body			
MATERIALS	The body should consist mainly of PS.		PS foams with a density <1 g/cm^3 or multilayer.
DIMENSIONS	At least two of the three sides of the body should be ≥ 5 cm.		Two of the three sides of the packaging <5 cm.
ADDITIVES AND BARRIER	**BARRIER**: Do not use barrier. **ADDITIVES**: Additives can be used in the processing as long as the density remains between 1 and 1.07 g/cm^3.	**BARRIER**: The use of EVOH barriers should be limited to <5% by weight. **ADDITIVES**: The use of mineral fillers that increase density to more than 1.07 g/cm^3, and of biodegradable, oxo-degradable or photodegradable additives, should be limited.	**BARRIER**: The use of EVOH ≥5% by weight. PA and PVDC barriers. **ADDITIVES**: Additives that increase the density to more than 1.07 g/cm^3, biodegradable, oxo-degradable or photodegradable additives.
COLOUR	Not coloured.	Other colours detectable with NIR technology.	Black not detectable with NIR technology.
TRANSPARENCY	Transparent or opaque.		
Closure system			
MATERIALS	The use of PS is recommended.	The use of removable PP and/or PE or paper with no fibre loss should be limited. Separable aluminium caps/lids.	The use of certain materials in the closures of PS packaging (PET, PETG, PVC, PLA, or any other material with a density >1 g/cm^3, multilayer).
TAMPER RESISTANCE	Easily separated for recycling.		Avoid materials that leave residue or fragments once removed from the packaging.

FRACTION: MIXED PLASTIC

Packaging: POLYSTYRENE (PS)

Label / Decoration			
DIMENSIONS 	Labels covering less than 2/3 of the packaging.		Labels covering more than 2/3 of the packaging and not made of the same material as the packaging.
If the dimensions are adequate (green column), the following additional aspects for labels will be taken into account:			
MATERIALS 	Prioritize the use of PS.	The use of PP, PE (with density <1 g/cm^3) or paper with no fibre loss should be limited.	Incompatible materials (PET, PETG, PVC, PLA, paper, metallized, aluminium or IML).
ADHESIVES 	Soluble adhesives or releasable in water at <40ºC, and minimize their amount.		Non-soluble or non-releasable adhesives in water at <40ºC.
PRINTING 	Reduce the quantity of direct-printed inks and use those that comply with EuPIA recommendations. Use of laser marking for expiration or best-by dates.		Use of inks that do not comply with EuPIA recommendations, metallic inks and bleeding inks.
Other aspects			
PERCENT RECYCLED 	**2025** – Goal is for packaging to have 20% recycled plastic. **2030** – Goal is for packaging to have 30% recycled plastic.		

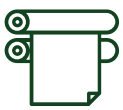
FRACTION: STEEL

Packaging: GENERAL

ASPECTS	HELPS RECYCLING	LIMITED COMPATIBILITY	IMPEDES RECYCLING
Body			
MATERIALS	Use of steel as the main material.	Use of aluminium.	Metals such as Cu, Pb, Ni, Cd, etc.
Closure system			
MATERIALS	Use of easily detachable steel or plastic closures.	Use of non-separable plastic closures.	Use of closures made of other metals such as Cu, Pb, Ni, Cd, etc.
TAMPER RESISTANCE	Use of seals that are easily detachable from the body.	Use of plastic or paper components attached to the body used as security seals.	
Label / Decoration			
MATERIALS	Use of easily separable paper or plastic labels. Sleeves should be micro-perforated.	Use of PVC labels.	
ADHESIVES	Use the absolute minimum quantity of lacquers and printing inks, which should be compatible with the EuPIA recommendations.		Use of inks not compatible with EuPIA recommendations, metallic inks and bleeding inks.
PRINTING	Use as little adhesive as necessary.		
Other aspects			
OTHER ASPECTS BODY		**AEROSOLS:** Use of propellants other than hydrocarbons.	**AEROSOLS:** Use of hydrocarbon propellants.

FRACTION: ALUMINIUM

Packaging: GENERAL

ASPECTS	HELPS RECYCLING	LIMITED COMPATIBILITY	IMPEDES RECYCLING
Body			
MATERIALS 	Use of aluminium as the main material. Use of mutually compatible materials.	The use of different alloys of different types of aluminium in the same packaging.	Use ferric materials (iron, steel, etc.), PVC, heavy metals (Cu, Ni, Cd, etc.).
DIMENSIONS 	At least two of the three sides of the packaging should be > 5 cm.		Avoid having at least two of the three sides of the packaging be <5 cm.
Closure system			
MATERIALS 	Use of easily detachable aluminium or plastic closures. **AEROSOLS:** Incorporate easily separable dispensing valves or aerosols.	Non-separable plastic closures. **AEROSOLS:** Use of multi-material dispensing valves.	Use of ferric metal closures.
TAMPER RESISTANCE 	Use of seals that are easily detachable from the body.	Use of plastic or paper components attached to the body used as security seals.	
Label / Decoration			
MATERIALS 	Direct printing on the packaging. If necessary, use easily detachable paper or plastic labels.	Use of PVC labels.	
ADHESIVES 	Use as little adhesive as necessary.		
PRINTING 	Use the absolute minimum quantity of lacquers and printing inks, which should be compatible with the EuPIA recommendations. Direct printing on the packaging is allowed.		Use of inks that do not comply with EuPIA recommendations, metallic inks and bleeding inks.

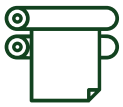
FRACTION: **ALUMINIUM**

Packaging: GENERAL

Other aspects			
OTHER ASPECTS BODY		**AEROSOLS:** Use of propellants other than hydrocarbons.	**AEROSOLS:** Use of hydrocarbon propellants.

FRACTION: FOOD/DRINK CARTON

Packaging: GENERAL

ASPECTS	HELPS RECYCLING	LIMITED COMPATIBILITY	IMPEDES RECYCLING
Body			
MATERIALS 	Use of paper from wood fibres as the main material. Use of polyethylene (PE) for external and internal laminations. Where possible, the outer layer of PE should be eliminated for fresh or chilled product packaging.	Use of paper with fibres from hemp, cotton, etc.	Metallic surfaces or decorative coatings on the outer layer that impair detection with NIR technology.
DIMENSIONS 	At least two of the three sides of the body should be < 30 cm, or the packaging should be compactible At least two of the three sides of the body should be ≥ 5 cm.		Two of the three sides of the packaging are <5 cm.
COLOUR 	The use of pigments is permitted.		
Closure system			
MATERIALS 	Use of HDPE or PP caps.		
TAMPER RESISTANCE 	Prioritize the use of PP or HDPE.		Avoid materials that leave residue or fragments once removed from the packaging.
Label / Decoration			
ADHESIVES 	Use of adhesives soluble in water at least at 40ºC and minimize their amount.		The use of hot melt, adhesives that are not soluble, that disperse in water or are resistant to moisture.
PRINTING 	Reduce the quantity of inks and use those that comply with EuPIA recommendations.		Use of inks that do not comply with EuPIA recommendations, metallic inks and bleeding inks.

FRACTION: **FOOD/DRINK CARTON**

Packaging: GENERAL

Other aspects			
OTHER ASPECTS BODY 	**STRAWS:** They can only be marketed if they are not made of plastic.		
OTHER ASPECTS OF THE CLOSURE SYSTEM  **(ATTACHED CAPS)**	As of 3 July 2024, Law 7/2022 (Art.57.1) stipulates that plastic caps and stoppers on drink bottles up to 3L must remain attached to the bottle during use.		

FRACTION: COMPOSTABLE

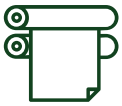
Packaging: GENERAL

This type of compostable packaging must be deposited in the separate bio-waste collection container (BROWN CONTAINER) for proper processing.

ASPECTS	HELPS RECYCLING	LIMITED COMPATIBILITY	IMPEDES RECYCLING
Body			
MATERIALS 	Compostable material as per EN13432 or equivalent. Organic constituents with an undetermined biodegradability are allowed as long as each of them does not exceed 1% of the weight, 5% total. The material should contain >50% volatile solids.		Presence of heavy metals (Zn, Cu, Ni, Cd, Pb, Hg, Cr, Mo, Se, As, etc.) and hazardous substances. Use of materials that do not have a compostability certificate. Use materials that are incompatible with composting.
DIMENSIONS 	The thickness of the sheet or wall must be within the range marked by the certification.		Use of sheet or wall thicker than that marked by the material certification.
ADDITIVES AND BARRIER 	Inorganic additives and pigments, such as calcium carbonate, gypsum, mica, graphite, kaolin, sodium carbonate, etc., are allowed up to 49%. Use of unmodified organic additives, such as vegetable fibres (cellulose or ligno-cellulose) or starch, is allowed. Certain process additives are allowed up to 10% (benzoic acid, glycerol monostearate, natural waxes, polyethylene glycol, etc.) or up to 49% (glycerin, sorbitol, xylite,		Use of materials that do not have a certificate of compostability (EN 13432).
COLOUR 	Not coloured.		Tones that cause visual contamination of the compost.

FRACTION: **COMPOSTABLE**

Packaging: GENERAL

Closure system			
MATERIALS 	Use of mainly compostable materials as per EN 13432. Compostable materials are: PLA, PHB, PBS, PBAT, TPS, PLA-PBS/PHB (80/20), PLA-PBS (50/50). Organic constituents with an undetermined biodegradability cannot make up more than 5%. The material should contain >50% volatile solids.		Use of mainly compostable materials as per EN 13432. Compostable materials are: PLA, PHB, PBS, PBAT, TPS, PLA-PBS/PHB (80/20), PLA-PBS (50/50).
Label / Decoration			
ADHESIVES 	Use of adhesives with a compostability certification.		Use of adhesives not certified as compostable.
PRINTING 	Use of inks with compostability certification <5% by total weight and <1% for each colour.		Use of non-compostable inks or >1% per colour.
Other aspects			
PERCENT RECYCLED 	Only compostable elements are allowed in its composition.		Use of non-compostable components that cannot be separated from the packaging.

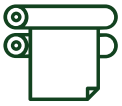
FRACTION: PAPER AND CARDBOARD

Packaging: GENERAL

ASPECTS	HELPS RECYCLING	LIMITED COMPATIBILITY	IMPEDES RECYCLING
Body			
MATERIALS 	Use of paper or cardboard as the main material with ≥50% from wood fibres.	Use of paper or cardboard with fibres from hemp, cotton, etc.	Use >50% non-cellulose materials.
ADDITIVES AND BARRIER 	BARRIER: Use of plastic laminate designed to be easily removed by the consumer, waterborne or water-soluble coatings or dispersions. ADDITIVES: The absolute minimum amount. Filler additives and pigments of mineral origin such as kaolin, talc and CaCO3, TiO2 (white pigment) or starch are allowed. Sizing, reinforcing and other functional additives are also allowed.	BARRIER: The limited use of direct metallization or aluminium laminate, coatings or plastic laminates on one side is allowed, only inside the packaging.	BARRIER: Use double-sided plastic coating or laminate, wax or silicone coating, additives that provide resistance to moisture, waxes, latex or sheets of high thickness, antigrease and silicones. ADDITIVES: Use cured UV varnishes, varnishes that decompose into microplastics or metallized films.
COLOUR 	The use of pigments is permitted.		
Closure system			
MATERIALS 	Use paper or cardboard in closures. TRAYS: Paper and cardboard lids or PE or PP plastic lids that can be easily separated from the packaging body.	Use of PE or PP plastic closures easily detachable from the packaging body, and paper/cardboard lids laminated on one side.	Plastic closures that are not easily detachable from the packaging body and paper/cardboard lids laminated on two sides.
TAMPER RESISTANCE 	If necessary, the tamper resistance can be included as long as it is of the same material or 100% removable.	TRAYS: If necessary, tamper resistance can be included.	
LINERS AND VALVES 	TRAYS: Avoid using liners.		TRAYS: Use liners.
ADDITIVES AND BARRIER 	TRAY - BARRIER: Use of PO covers, coatings or layers of AlOx, SiOx, EVOH, PVOH <5% by total weight.	TRAYS: Use of barriers or coatings ≥5%.	

FRACTION: **PAPER AND CARDBOARD**

Packaging: GENERAL

Label / Decoration			
DIMENSIONS 	Use of paper/cardboard labels or adhesive tapes or easily detachable plastic labels.	Use of plastic labels.	
ADHESIVES 	Use of water-based adhesives, hot melt or reagents and minimize their amount.	Limit the use of pressure-sensitive adhesives (PSA).	Avoid labels and adhesives that plasticize with a rise in temperature, and the use of staples.
PRINTING 	Reduce the quantity of inks and use those that comply with EuPIA recommendations. The use of varnishes and metallization by stamping is allowed.		Use of inks that do not comply with EuPIA recommendations, metallic inks and bleeding inks.
Other aspects			
OTHER ASPECTS BODY 		Limit windows and other plastic components that are not easily separable.	Other components: PP/PET-metallic laminates, PET film and-metallic.

Glossary

07

07
GLOSSARY

Below is a glossary with the terminology used in the report, the acronyms and their description:

- ABS: Poli (Acrylonitrile butadiene styrene)
- BPA: Bisphenol A
- EVA: Ethylene Vinyl Acetate Copolymer
- EVOH: Poly (Ethylene Vinyl Alcohol)
- FDC: Food/Drinks carton
- TPE: Thermoplastic Elastomer
- MASTERBATCH: Concentrated mixture of pigments or additives within a carrier resin in pellet form.
- NIR: Near infrared spectroscopy
- PA: Polyamide (nylon)
- PC: Polycarbonate
- PE: Polyethylene
- HDPE: High-density polyethylene
- LDPE: Low-density polyethylene
- PET: Polyethylene terephthalate
- PETG: pet with glycol, polyethylene terephthalate with glycol
- PGA: Polyglycolic acid
- MP: Mixed plastic, fraction of plastics other than PET or HDPE, such as PP, PS, PVC, PA, etc.
- PMMA: Polymethylmethacrylate (also known as acrylic, plexiglass)
- PO: Polyolefin
- POLYOLEFIN: any polymer obtained by the polymerization of olefins, such as polyethylene or polypropylene.
- POM: Polyoxymethylene (Acetal)
- PP: Polypropylene
- BOPP: Biaxially oriented polypropylene
- OPP: Oriented Polypropylene
- TAMPER EVIDENCE: safety seal that acts as a deterrent against attempts to tamper with the packaging
- PS: Polystyrene
- EPS: Expanded polystyrene
- PU: Polyurethane
- PVC: Polyvinyl chloride

- PVdC: Polyvinylidene polychloride
- RECYCLING: Reprocessing in a production process of the waste materials for the original purpose or for other purposes including organic recycling but excluding energy recovery (94/62/EC)
- RECYCLABLE: Ability to effectively recycle packaging waste, according to its ability to be collected separately efficiently through collection points, with the waste not exhibiting characteristics, elements or substances that prevent its classification, sorting, or recycling, or that limit the subsequent use of the recycled material, and that is recycled on an industrial scale in an amount greater than 50% of the mass of the collected waste.
- RPE: recycled PET, recycled polyethylene terephthalate
- SAN: Poly (Styrene acrylonitrile)
- BLEEDING (inks): Bleeding is when the ink causes blurring of the image. It can occur in any direction, and usually appears in barcodes or fine lettering where a water-based ink is used. Looking at the bleeding area under a microscope shows a coloured halo in the outline of the text or barcode.
- TPO: Thermoplastic olefin
- TPS: Elastomer Thermoplastic styrene

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