

## General Notice

### Impact of labels and sleeves during the sorting and recycling of PET bottles and dispenser bottles and rigid PE and PP packaging

#### Summary



Study scope

This general notice is a summary of the results of the sorting and recycling potential of PET bottles and dispenser bottles (excluding PET trays) and rigid PE and PP packaging items featuring a sleeve or label.

Sleeves have already been studied by COTREP and been the subject of a number of publications. This notice is a summary of the knowledge available to date and the recommendations on the following combinations which are the most representative of the market:

- PET bottles and dispenser bottles with a PP/OPP or paper label
- PET bottles and dispenser bottles with a sleeve made of PETG, PS, PE, PO PET of  $d < 1$ , crystallised PET or PVC
- Rigid PE with a PP/OPP or paper label
- Rigid PE with a sleeve made of PE, PETG, PS or PVC
- Rigid PP with a PP/OPP or paper label

#### 1/ LABELS AND SLEEVES USED ON PLASTIC PACKAGING

Labels and sleeves, also known as “designs”, are essential components of plastic packaging items for household use. They enable manufacturers to meet their obligations regarding consumer information, giving details relating to the brand, product composition, use-by date, usage precautions where applicable and the procedure to follow for recycling the packaging after use.

SPECIFIC PROPERTIES OF LABELS AND SLEEVES	
LABELS	SLEEVES
Labels may be made of paper or plastic. Some labels are aluminised.	Sleeves are always made of plastic.
The label is known as "dry" if adhesive has to be applied before it is stuck to the product, or "self-adhesive" if it is supplied pre-coated with adhesive.	There are two types of sleeve: stretch or heat-shrink.
Some labels are fixed to the packaging in the mould and therefore do not require adhesive (IML technology).	The distinguishing feature of sleeves is that they do not require adhesive to attach them to the bottle.

The plastic resins currently used for labels and sleeves are as follows: OPP, PP, LDPE, PS, PVC, PETG, etc. It should be noted that labels and sleeves vary in size, and may cover a greater or smaller part of the bottle.

In the manufacture of packaging components, there are several factors that influence the choice of decision-makers between labels and sleeves and between the various materials and technologies on offer.

Marketing requirements in terms of communication or product visibility influence the size of the label or sleeve. For example, a full sleeve may be used for promotional actions, being generally favoured for its large surface area, which enables enhanced packaging decoration and message content.

A full sleeve may also be used to perform a particular function (e.g., a light barrier sleeve to improve product preservation) or to develop clear PET rather than coloured PET packaging items.

## 2/ DESIGN PARAMETERS AFFECTING POTENTIAL AT SORTING CENTRES

In the majority of cases, the designs (labels or sleeves) remain on the packaging items when they arrive at the sorting centre. As they are on the surface of the packaging body, they affect detection by optical sorting systems and the machine's interpretation of them. The factors that determine channelling of these items vary: material/appearance of the label or sleeve, position of the bottle when detected by the optical sorting system, thickness of the label or sleeve, printing, etc.

The section below provides the key parameters to consider for designs to facilitate the sorting of packaging at sorting centres.

### a. Coverage rate

The size of the design will affect efficiency during optical sorting of the packaging item. There are two sizes to consider:

- **"Partial" designs** which cover less than 70% of the packaging body in the case of packaging with contents of more than 500ml, or 50% of the body for contents less than or equal to 500ml.

Packaging items with partial designs are easier to recognise and channel to recycling streams; alternatively, they are processed as rejects if the packaging body is composed of a non-recyclable plastic resin. The type of label or partial sleeve, adhesive or ink have little effect on packaging potential at sorting centres.

- **"Full" designs** which cover more than 70% of the packaging body in the case of packaging with contents of more than 500ml, or 50% of the body for contents less than or equal to 500ml.

Packaging items with full designs are more difficult to recognise and channel to recycling streams. Their capture rate is lower and/or they are channelled to the wrong stream or processed as sorting rejects. COTREP is also conducting research on the sorting and recycling of bottles and dispenser bottles with full sleeves in view of their potential for removing adhesive and developing packaging items that are not mass-coloured.

Given the current state of techniques and knowledge, **COTREP recommends using labels and partial sleeves** to facilitate channelling end-of-life plastic packaging to recycling streams.

#### **b. Thickness**

In theory, the thicker the design, the more difficult it will be to identify the material of the packaging beneath it during optical sorting. The sleeves tested by COTREP have a thickness of between 40 and 60 microns (representative of the market) and these thicknesses enabled the plastic resins to be identified beneath the sleeves. These thicknesses are not a limiting factor for sorting.

#### **c. Printing**

**Metallised labels or sleeves** for design purposes render the packaging undetectable by optical sorting systems, as the NIR radiation will not be able to identify it. **A large solid black fill** on the inner or outer surface can also adversely affect sorting or block radiation at the sleeve material surface.

Transparent areas can improve packaging capture, particularly when they are at the top or bottom of a full sleeve.

#### **d. Resin type**

Optical sorters scan the combination of packaging resin and design resin to determine channelling at the sorting centre. To ensure proper channelling, the combination must be compatible and enable efficient identification of the packaging body's plastic resin. Not all combinations are compatible.

### **3/ INFLUENCE OF LABELS AND SLEEVES DURING REGENERATION**

The regeneration stage is primarily aimed at recycling the main component of the packaging item, i.e., its body. The regeneration process aims to eliminate the designs from the packaging using the different steps described below and to direct them mainly to energy recovery. **The labels and sleeves are therefore not recycled.**

Designs will mainly be eliminated during:

- **sorting by flotation** which uses density to separate different plastic resins that are not of the same type. For example, a PP label ( $d < 1$ ) on a PET bottle ( $d > 1$ ) can be easily separated during the flotation stage.
- **aeraulic sorting** which eliminates the flexible fraction after drying.

Depending on the body/design resin combinations, regeneration behaviour will differ. This is why COTREP assessed the influence of labels and sleeves during the regeneration stage for each combination. The results of these studies gave rise to several COTREP general notices that are listed at the end of this notice.

This notice is a summary of the information and knowledge available to date regarding the following body/design resin combinations:

- PET bottles and dispenser bottles with a PP/OPP or paper label
- PET bottles and dispenser bottles with a sleeve made of PETG, PS, PE, PO PET of  $d < 1$ , crystallised PET or PVC
- Rigid PE with a PP/OPP or paper label
- Rigid PE with a sleeve made of PE, PETG, PS or PVC
- Rigid PP with a PP/OPP or paper label

The term "rigid" denotes 3D packaging, i.e., bottles, dispenser bottles, trays and pots, as opposed to the term "flat materials" which denotes 2D packaging.

#### 4/ SUMMARY OF SLEEVE AND LABEL IMPACT ON SORTING AND REGENERATION

The following tables provide a summary of COTREP's knowledge and recommendations for the different packaging and design combinations. Many factors can affect the sorting potential of packaging. The results below are derived from research on packaging items representative of the market.

The issue of ink on labels and sleeves is not covered in the tables below. It is covered in a separate notice: AG 03.

The issue of adhesive used for labels is not covered in the tables below. It is covered in a separate notice: AG 10.

##### a. Labels on PET

Sorting and recycling potential of PET packaging items with labels			
Material	Impact(s) during sorting and regeneration		Cotrep's opinion
PP/OPP	 Sorting	A full label reduces sorting efficiency and directs packaging to the coloured PET stream	Full compatibility - ideal
	 Regeneration	No impact on regeneration	
Paper	 Sorting	A full label reduces sorting efficiency	Partial compatibility - tolerated
	 Regeneration	Partial defibering of the paper during the pre -wash and wash phases	

##### b. Sleeves on PET

Sorting and recycling potential of PET packaging items with sleeves (< 60µm thick)			
Material	Impact(s) during sorting and regeneration		Cotrep's opinion
PETG	 Sorting	The bottle will be directed to the coloured PET stream.	Non-compatible and/or disruptive
	 Regeneration	Some bottles rejected. Process pollution, losses and deterioration of rPET quality.	
PS	 Sorting	The bottle will be directed to the clear PET stream.	Non-compatible and/or disruptive
	 Regeneration	Some bottles rejected via optical sorting. Deterioration in rPET quality.	
PE	 Sorting	A full sleeve reduces sorting efficiency and directs the bottle to the coloured PET stream.	Full compatibility - ideal
	 Regeneration	Compatible but resulting in greater losses and waste at regeneration plants.	
PO*	 Sorting	A full sleeve reduces sorting efficiency and directs the bottle to the coloured PET stream.	Full compatibility - ideal
	 Regeneration	Compatible but resulting in greater losses and waste at regeneration plants.	
PET d<1	 Sorting	A full sleeve directs the bottle to the clear PET, coloured PET or rejects stream (random).	Partial compatibility - tolerated
	 Regeneration	Some bottles rejected. No impact on regeneration if the bottles pass through the optical sorting process.	
Crystallised PET	 Sorting	A partial sleeve directs the bottle to the clear PET or coloured PET stream. A full sleeve directs the bottle to the coloured PET stream.	Need for further regeneration tests
	 Regeneration	Not yet investigated.	
PVC	 Sorting	A full sleeve directs the bottle to the rejects stream.	Non-compatible and/or disruptive
	 Regeneration	Significant rPET losses and deterioration of rPET quality.	

\*PO = polyolefin

### c. Labels on PE

Sorting and recycling potential of PE packaging items with labels			
Material	Impact(s) during sorting and regeneration		Cotrep's opinion
PP/OPP	 Sorting	A full label could direct the packaging to the PP stream.	Full compatibility - ideal
	 Regeneration	No impact on regeneration.	
Paper	 Sorting	A full label reduces sorting efficiency.	Partial compatibility - tolerated
	 Regeneration	Partial defibering of the paper during the pre-wash and wash phases.	

### d. Sleeves on PE

Sorting and recycling potential of PE packaging items with sleeves (< 60µm thick)			
Material	Impact(s) during sorting and regeneration		Cotrep's opinion
PETG	 Sorting	A full sleeve reduces sorting efficiency.	Partial compatibility - tolerated
	 Regeneration	Compatible but resulting in greater losses and waste at regeneration plants.	
PS	 Sorting	A full sleeve reduces sorting efficiency.	Partial compatibility - tolerated
	 Regeneration	Compatible but resulting in greater losses and waste at regeneration plants.	
PVC	 Sorting	A full sleeve reduces sorting efficiency.	Non-compatible and/or disruptive
	 Regeneration	Limits potential recovery from regeneration plant rejects.	
PE	 Sorting	No impact on sorting.	Full compatibility - ideal
	 Regeneration	No impact on regeneration.	

### e. Labels on PP

Sorting and recycling potential of PP packaging items with labels			
Material	Impact(s) during sorting and regeneration		Cotrep's opinion
PP/OPP	 Sorting	No impact on sorting.	Full compatibility - ideal
	 Regeneration	No impact on regeneration.	
Paper	 Sorting	A full label reduces sorting efficiency.	Partial compatibility - tolerated
	 Regeneration	Partial defibering of the paper during the pre-wash and wash phases.	

### f. Sleeves on PP

The sorting and recycling potential of PP packaging with sleeves has not been researched.

At the very least, a PVC sleeve will limit potential recovery from recycling rejects and you are recommended to opt for an alternative solution.

## **5/ STUDIES CARRIED OUT BY COTREP ON THE IMPACT OF LABELS AND SLEEVES**

The following general notices have been issued to explain the impact of each type of label and/or sleeve and advise for or against their use:

- **AG 08:** Impact of a PVC label or sleeve on a PET bottle
- **AG 13:** Impact of an aluminised paper label on a PET bottle
- **AG 14:** Impact of a PVC label or sleeve on an HDPE bottle
- **AG 15:** Impact of a PP/OPP label or sleeve on a PET bottle
- **AG 16:** Impact of a PP/OPP label or sleeve on an HDPE bottle
- **AG 17:** Impact of an LDPE label or sleeve on a PET bottle
- **AG 18:** Impact of an LDPE label or sleeve on an HDPE bottle
- **AG 42:** Impact of a PS label or sleeve on a PET bottle
- **AG 43:** Impact of a PS label or sleeve on an HDPE bottle
- **AG 44:** Impact of a PETG label or sleeve on a PET bottle
- **AG 45:** Impact of an aluminised paper label or sleeve on an HDPE bottle
- **AG 66:** Impact of sleeves on the sorting and recycling of rigid PE packaging
- **AG 67:** Impact of sleeves on the sorting and recycling of PET bottles

These notices are available on the COTREP website: [www.cotrep.fr](http://www.cotrep.fr)