

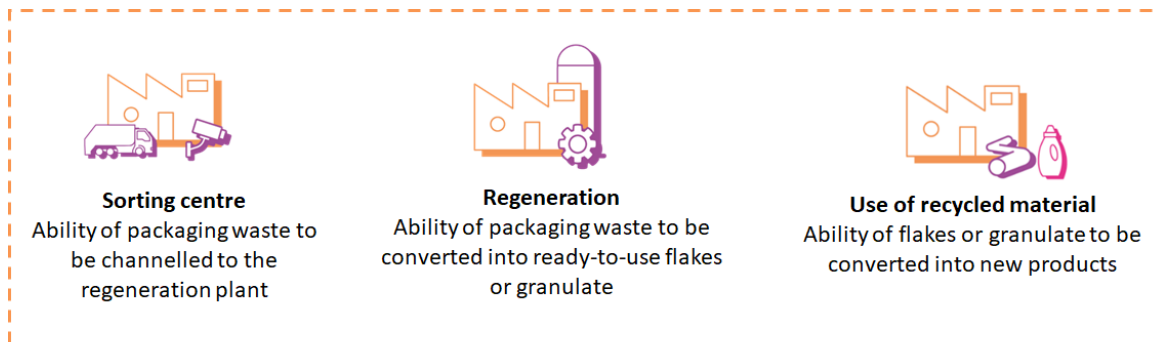


GENERAL NOTICE 77

Impact of thermoformed PE on the sorting and regeneration of rigid PE packaging

SUMMARY

The aim of this general notice is to assess the mechanical regeneration potential of thermoformed rigid PE packaging during regeneration of rigid PE household packaging.



Study scope

Thermoformed PE* packaging is a relative newcomer to the market. However, its production and marketing could increase in the coming years, and COTREP wishes to assess its impact in rigid PE streams.

Until now, rigid PE bales have mainly consisted of bottles (more than 90%), and the grade qualities of the recycled material obtained are therefore suited to extrusion blow moulding. With their extrusion/thermoforming grade, trays are liable to impact the regeneration of rigid PE streams and the quality of the recycled material (rPE**) in extrusion blow moulding applications.

This study does not assess the impact of PE trays with seal lids. The current guidelines for elements associated with rigid PE packaging apply to this thermoformed packaging.

In conclusion, given the current state of equipment and sorting and regeneration techniques available in France, thermoformed rigid PE packaging offers full compatibility in the rigid PE stream.

COTREP may review this notice in light of developments in sorting and recycling technologies, markets, or quality requirements for recycled material.

* "Thermoformed PE" denotes rigid plastic packaging excluding bottles and dispenser bottles, such as pots and trays.

**rPE means recycled material from rigid PE packaging.

1. CONTEXT

At present, PE is not commonly used as a material for manufacturing thermoformed packaging. Owing to the presence of a dedicated rigid PE recycling stream in France, manufacturers and marketers are increasingly exploring the thermoforming potential of PE sheets, for instance as a replacement for other polymers without recycling streams. To anticipate this innovation, COTREP wished to test the packaging in the current rigid PE stream.

Until now, rigid PE bales have consisted of more than 90% of extrusion blow moulding grade packaging (mainly bottles). With its extrusion/thermoforming grade, the packaging is liable to impact the regeneration of rigid PE streams and the quality of the recycled material (rPE) in extrusion blow moulding applications.

The PE used in trays, of thermoforming grade, does not have the same characteristics as the one used in extrusion blow moulding grade bottles, and this can affect the quality of the recycled material (viscosity index of recycled material, temperature resistance, etc.).

If such changes were to occur, an increase in thermoformed PE trays in the rigid PE stream could impact the recycling and quality of the recycled PE material. As a result, COTREP chose to examine the sorting and recycling potential of mono-resin PE trays in the current rigid PE stream.

This notice seeks to assess the impact of thermoformed PE trays on sorting and mechanical regeneration of the rigid PE stream by extrusion blow moulding and on material quality.

2. IMPACT ON SORTING

PE trays were firstly examined during the optical sorting phase on the premises of the manufacturers that supply optical sorting machines to French sorting centres. The aim of these tests was to check that the samples were indeed detected as rigid PE packaging items.

2.1. Test samples

The tests were performed on thermoformed trays made of PE with EVOH that were representative of the packaging examined. The trays were tested without any food residue or associated elements.

2.2. Results of static tests

The packaging was positioned beneath the optical sorting machine with near infrared (NIR) technology in conditions representative of optical separation equipment operation in French sorting centres. The results were as follows:

- The packaging was detected as rigid PE packaging. The trays were directed to the rigid PE stream without any disruptive impact.

The grade used did not disrupt detection of these trays, which were detected as rigid PE. Thermoformed PE packaging is directed to the rigid PE stream in sorting centres.

3. IMPACT ON REGENERATION

3.1. Principle and analytical criteria

In its recyclability study, COTREP assessed the impact of thermoformed PE trays on the regeneration process and quality of rPE produced from rigid PE household packaging.

These tests were performed on a pilot scale based on protocols defined by COTREP for recycling rigid PE packaging. The protocols are representative of industrial practices applied by regeneration plants processing streams in France.¹

Various physical-chemical criteria were measured during the test phases and compared to those of a standard sample composed of 100% rPE.

The technical characteristics of the recycled material were evaluated with a view to reprocessing as bottles (extrusion blow moulding).

¹For further information, see protocols Rigid PE-1 and Rigid PE-2 on the COTREP website: www.cotrep.fr

3.2. Test samples











Based on market analysis, samples of thermoformed PE trays representative of products that may be placed on the market were selected and procured. The trays were tested without any food residue or secondary elements (seals, labels, print, etc.). These trays were incorporated into the standard stream to simulate the addition of thermoformed PE elements to the rigid PE stream.

The standard stream used for the study comprises 100% rPE extruded sheets produced exclusively for the study from granulate sourced from French selective collection (rigid PE standard).

The penetration rates were defined on the basis of future marketing potential. COTREP sought to assess the impact of thermoformed PE packaging based on rates of 1%, 5% and 7.5% to reflect projected volumes marketed and peak concentrations in rigid PE bales.

3.3. Results

IMPACT OF THERMOFORMED PE ON RIGID PE REGENERATION PROCESSES

| RECYCLING PROCESSES | IMPACT | DESCRIPTION |
|--|---|--|
|  SHREDDING |  | No impact on shredding |
|  WASHING AND SPINNING |  | No impact on washing and spinning |
|  FLOTATION AND DRYING |  | No impact on flotation or drying |
|  EXTRUSION/ GRANULATION |  | No impact on extrusion/granulation |
|  EXTRUSION BLOW MOULDING |  | No impact during bottle manufacture At 7.5%, certain mechanical properties are slightly impacted. |



Caution



No impact

TECHNICAL CONCLUSIONS

Through tests performed by COTREP, it was possible to assess the impact of thermoformed PE on sorting and mechanical regeneration of rigid PE household packaging.

Results obtained show that the presence of thermoforming grade PE up to a proportion of 7.5% does not disrupt the different stages of the regeneration process.

Up to a proportion of 7.5% of rigid thermoformed PE packaging, the mechanical properties of the bottles are comparable to the standard but certain properties may be slightly impacted, without them representing a risk for end use.

Given the current state of equipment and sorting and regeneration techniques available in France, thermoformed rigid PE packaging offers full compatibility in the rigid PE stream.

COTREP may review this notice in light of developments in sorting and recycling technologies, markets, or quality requirements for recycled material.