



GENERAL NOTICE 78

Impact of tethered PE caps on the regeneration of rigid PE packaging

SUMMARY

The aim of this general notice is to assess the impact on mechanical regeneration of tethered cap closure systems in the rigid PE packaging stream.



Sorting centre

Ability of packaging waste to be channelled to the regeneration plant



Regeneration

Ability of packaging waste to be converted into ready-to-use flakes or granulate



Use of recycled material

Ability of flakes or granulate to be converted into new products

Study scope

This study assesses the impact of tethered PE caps through the integration of injection grades into the rigid PE stream, particularly when recycled material is used to manufacture bottles by extrusion blow moulding.

Given the current state of regeneration equipment and techniques available in France, tethered PE caps used as a closure system offer 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.

1. CONTEXT

Since July 2024, attached caps, known as "tethered caps", have been mandatory for all beverage bottles of up to 3 litres to meet the requirements of the Single-Use Plastics Directive. Widespread implementation of tethered caps aims to reduce environmental pollution caused by plastic caps and to improve recycling via better capture rates.

Cap attachment to the bottle is permitted by the addition of a tamper-proof ring. This generally results in an increase in average cap weight. Improved cap capture and the addition of a tamper-proof ring therefore increase the proportion of caps in rigid PE tonnage.

PE grades used for caps are "injection" grades with a higher melt flow rate than those used for bottle production.

In the rigid PE stream, the addition of tethered caps mainly concerns milk bottles which to date make up 32% of marketed volumes.

The technical characteristics of the recycled material were evaluated with a view to reprocessing as bottles by extrusion blow moulding, a common application for rigid PE and the most demanding in terms of expected characteristics.

This notice seeks to assess the impact of tethered PE caps on mechanical regeneration of the rigid PE stream by extrusion blow moulding and on the quality of the recycled material. This notice specifically assesses the impact of increasing the quantity of injection grades in the rigid PE stream through an increase in cap weight and 100% cap capture.

2. IMPACT ON REGENERATION

2.1. Principle and analytical criteria

In its recyclability study, COTREP assessed the impact of tethered caps 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).

**rPE means recycled material from rigid PE packaging.*

2.2. Test samples

Based on market analysis, a tethered PE cap model representative of models on the market was selected.





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 standard stream already contains an estimated 1% of caps by mass considering the market share of milk bottles (32%) and a cap capture rate of 30%.

Tests were performed with 3.8% and 6% tethered PE caps by mass to take account of:







- Market share of milk bottles (32%) with a 100% cap capture rate
- A peak concentration of milk bottles in rigid PE bales (50%) and 100% cap capture

2.3. Results

IMPACT OF TETHERED PE CAPS ON RIGID PE REGENERATION PROCESSES

RECYCLING PROCESSES	IMPACT	DESCRIPTION
 SHREDDING		No impact on shredding
 WASHING AND SPINNING		No impact on washing and spinning

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

RECYCLING PROCESSES	IMPACT	DESCRIPTION
 FLOTATION AND DRYING		<i>No impact on flotation or drying</i>
 EXTRUSION/ GRANULATION		<i>No impact on extrusion/granulation</i>
 EXTRUSION BLOW MOULDING		<i>No impact on extrusion blow moulding</i>

 Caution
  No impact

TECHNICAL CONCLUSIONS

Through tests performed by COTREP, it was possible to assess the impact of tethered PE caps used as a closure system on mechanical regeneration of rigid PE household packaging.

Results obtained show that the use of tethered caps as a closure system does not disrupt the different regeneration processes or quality of recycled material, considering a 100% cap capture rate and a concentration peak of 50% milk bottles in the rigid PE stream.

Given the current state of regeneration equipment and techniques available in France, tethered PE caps used as a closure system offer 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.