COTREP

Comité Technique pour le Recyclage des Emballages Plastiques

Resin

Flexible PE

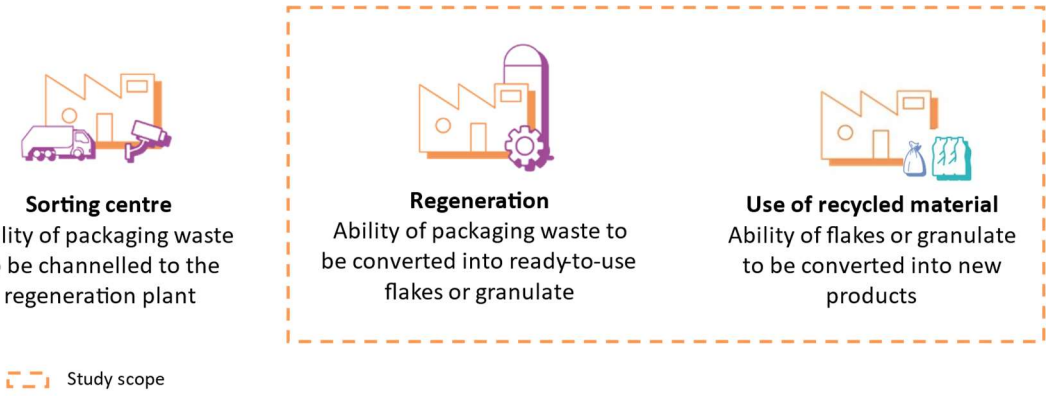
GENERAL NOTICE 70

Impact of PA on the regeneration by mechanical recycling of flexible PE household packaging

SUMMARY

The aim of this general notice is to assess the impact on regeneration of flexible PE household packaging containing a polyamide (PA) barrier.

In addition to this notice, sorting tests will also be performed on various flexible PE/PA structures to assess whether they can be directed to regeneration plants.



PA is a polymer commonly used as a barrier in flexible packaging structures to meet product protection requirements.

During sorting processes, 100% separation performance cannot be achieved, and therefore a small quantity of PA will be present in the PE stream. COTREP tested the potential impact of this residual packaging on regeneration.

Results obtained show that at PA levels of 1% or above in general flexible PE household packaging tonnage, the quality of recycled PE produced is affected. Extrusion cannot be performed properly to produce new film. PA is prone to porosity that is invisible to the naked eye making the blow extrusion process unstable.

In conclusion, given the current state of equipment and techniques used, PA disrupts the regeneration by mechanical recycling of flexible PE household packaging. COTREP encourages efforts to seek compatible alternative barriers.

This general notice does not deal with the behaviour during regeneration by mechanical recycling of flexible PE household packaging incorporating a copolyamide PA 6/6,6 barrier. These packaging structures containing PA 6/6,6 will be the subject of a specific study by COTREP.

1. CONTEXT

Polyamide (PA) is a polymer commonly used in packaging for its oxygen barrier properties which offer superior product protection and preservation.

The market for chilled products such as smoked salmon, grated cheese, cooked pressed cheeses and cured meats requires a PA type barrier for product preservation. In France in 2020, 18,000 tonnes of flexible packaging contained a PA barrier.

This notice seeks to assess the impact of PA barriers on the regeneration of flexible PE packaging.

2. IMPACT ON REGENERATION

In its recyclability study, COTREP assessed the impact of PA on the quality of recycled PE (rPE) produced from flexible household packaging. These tests were performed on a pilot scale based on protocols defined by COTREP for recycling flexible 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.

2.1. Test samples

Distinctions can be drawn between packaging structures containing PA based on their various constituent layers, including the types of PA used and the types of tie layers or adhesives used to bind PA to PE.

Based on market analysis, 2 different samples were selected and procured from several suppliers to ensure representativeness of PE/PA structures available on the market. The films were tested without any food residue.

A 100% rPE film was produced exclusively as the standard film for the study from granulate sourced from French selective collection (flexible PE standard).

Tests were performed with 1% PA by mass to take account of the efficiency limitations of separation techniques.

2.2. Results

IMPACT OF PA ON FLEXIBLE PE REGENERATION PROCESSES

RECYCLING PROCESSES	IMPACT	*DESCRIPTION*
SHREDDING	✓	*No impact on shredding*
WASHING AND SPINNING	✓	*No impact on washing or spinning*
FLOTATION AND DRYING	✓	*No impact on flotation.* *Note that the presence of PA makes drying prior to extrusion more difficult as PA tends to reabsorb moisture easily*

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

RECYCLING PROCESSES	IMPACT	*DESCRIPTION*
EXTRUSION/ GRANULATION	✓	*Compliant granulate with a 1% PA content was obtained*
BLOW EXTRUSION	!	*Unstable blow extrusion, presence of porosity invisible to the naked eye at PA levels of 1% with the need to supply the bubble with air to maintain a constant blow ratio*

! Caution ✓ No impact

TECHNICAL CONCLUSIONS

Through tests performed by COTREP, it was possible to assess the impact on regeneration of PA as a barrier in PE films in the flexible PE household packaging stream.

Results obtained show that:

- At PA levels of 1% or above in general flexible PE household packaging tonnage, the regeneration process and the quality of rPE produced are affected. PA is prone to porosity that is invisible to the naked eye making the blow extrusion process unstable.

In conclusion, given the current state of equipment and techniques used, flexible PE/PA disrupts the regeneration by mechanical recycling of flexible PE household packaging marketed in France. COTREP encourages efforts to seek alternative barriers.

This general notice does not deal with the behaviour during regeneration by mechanical recycling of flexible PE household packaging incorporating a copolyamide PA 6/6,6 barrier. These packaging structures containing PA 6/6,6 will be the subject of a specific study by COTREP.