



GENERAL NOTICE 68

Impact of EVOH on the regeneration of flexible PE household packaging

SUMMARY

The aim of this general notice is to assess the impact on recycling of flexible PE household packaging associated with an EVOH barrier.

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




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

EVOH is a polymer commonly used as a barrier in flexible packaging structures to meet product protection requirements. This notice seeks to assess the impact on recycling of EVOH in the flexible PE stream.

Its results show that EVOH has no impact on the regeneration process or the quality of rPE produced if its concentration in the general flexible PE household packaging stream is under 2%. However, concentrations of 5% EVOH in the stream disrupt recycling of flexible PE packaging.

It should be noted that the appearance of the films produced was not assessed in this test. A further study may be performed to supplement this notice.

In conclusion, given the current state of equipment and techniques used and the fact that EVOH currently accounts for less than 1% of French flexible PE household packaging tonnage, EVOH does not disrupt the regeneration of flexible household packaging.

COTREP recommends using just enough EVOH in a packaging unit to achieve the required functionality.

If the quantity of EVOH on the market were to increase substantially, COTREP reserves the right to revise its opinion.

1. CONTEXT

Ethylene vinyl alcohol, or EVOH, is a polymer commonly used in packaging for its gas, aroma and flavour barrier properties which offer superior product protection and preservation.

COTREP has previously assessed EVOH in rigid HDPE and PP packaging (AG52 and AG53).

In 2020, 5,000 tonnes of PE film containing EVOH were marketed in France. The estimated quantity of EVOH present in **flexible PE household packaging tonnage in France in 2020 was under 1%**.

Since the sorting instructions are being extended and a dedicated recycling stream exists in France for flexible PE packaging, more and more manufacturers and marketers are considering flexible PE/EVOH structures as substitutes for structures based on other polymers with no recycling streams. If such changes were to occur, levels of EVOH in the flexible packaging stream could rise significantly **to almost 2% by 2030**.

The aim of this notice is to assess the impact on regeneration of EVOH barriers in flexible PE packaging.

2. IMPACT ON REGENERATION

2.1. Principle and analytical criteria

In its recyclability study, COTREP assessed the impact of EVOH 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 protocol is representative of industrial practices applied by European regeneration plants¹.

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

2.2. Test samples









Based on market analysis, 3 different samples were selected and procured from several suppliers to ensure representativeness of PE/EVOH structures available on the market. The films were tested without any food residue or secondary elements (labels, print, metallised elements, etc.).

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


Tests were performed with 1%, 2% and 5% EVOH by mass to take account of: estimated market penetration rates in 2020, projected volumes marketed in 2030, and occasional peaks in concentration in flexible PE bales.

2.3. Results

IMPACT OF EVOH ON FLEXIBLE PE REGENERATION PROCESSES

RECYCLING PROCESSES	IMPACT	DESCRIPTION
 SHREDDING		No impact on shredding
 WASHING AND DRYING		No impact on washing and drying
 FLOTATION		No change to the flotation water or residual elements on flakes
 EXTRUSION/ GRANULATION		<p>No impact on the physical-chemical properties of granulate identified at 1% or 2%.</p> <p>At 5%, the material expanded significantly and rods broke frequently</p> <ul style="list-style-type: none"> ⇒ No impact at 1% and 2% ⇒ Porous granulate at 5% ⇒ 5% EVOH significantly affects granulate characteristics

¹ The protocols used can be consulted on the COTREP website: <https://www.cotrep.fr/etude-technique/>

RECYCLING PROCESSES	IMPACT	DESCRIPTION
BLOW EXTRUSION		<p>No impact on the physical-chemical properties of films identified at 1% or 2%.</p> <p>At 5%, the mechanical properties of the film were poorer than the standard sample.</p> <p>⇒ No impact at 1% and 2%</p> <p>⇒ At 5%, decline in mechanical properties</p>



Impact of structures

Distinctions can be drawn between packaging structures containing EVOH based on their various constituent layers, including:

- The types of EVOH used with variable ethylene content depending on the available formulations
- The types of tie layers or compatibilisers used to bind these different layers

For this study, several market-representative structures composed of different layers were tested. The tests performed did not reveal any impact attributable to these structures. Additional studies are needed to assess the risk of any impact.

TECHNICAL CONCLUSIONS

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

The results show that at concentrations of 1% and 2% in general flexible PE household packaging tonnage, EVOH has no impact on the regeneration process or the quality of rPE produced. However, concentrations of 5% EVOH in the stream disrupt recycling of flexible PE packaging.

It should be noted that the appearance of the films produced was not assessed in this test. A further study may be performed to supplement this notice.

In conclusion, given the current state of equipment and techniques used and the fact that EVOH currently accounts for less than 1% of French flexible PE household packaging tonnage, EVOH does not disrupt the regeneration of flexible household packaging.

COTREP recommends using just enough EVOH in a packaging unit to achieve the required functionality.

If the quantity of EVOH on the market were to increase substantially, COTREP reserves the right to revise its opinion.