



GENERAL NOTICE 73

Impact of PVOH type water-based coatings on the regeneration of flexible PE household packaging

SUMMARY

The aim of this general notice is to assess the impact on mechanical regeneration of flexible PE household packaging containing a water-based barrier coating made from polyvinyl alcohol (PVOH).

In addition to this notice, sorting tests will also be performed on flexible PE with a PVOH type water-based coating 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

The outcomes of these pilot-scale tests show that a PVOH type water-based coating disrupts the various stages of the mechanical flexible PE regeneration process. During the washing stage, the washing water was seen to turn a milky colour with froth forming on the surface. Washing water quality is therefore impacted, with a potential risk of additional costs incurred for washing water treatment at regeneration plants. Moreover, partial loss of PE films with a water-based coating was shown during the flotation stage, resulting in substantial material wastage.

Further, in films produced containing PE with proportions of 1%, 4% and 8% PVOH type water-based coating, there was a slight impact on mechanical properties such as suitability for sealing compared with the standard film.

Given the current state of equipment and techniques used in France, **a PVOH type water-based coating on flexible PE offers limited compatibility** with flexible PE regeneration. This opinion may be reviewed with regard to technological and market developments if needed.

1. CONTEXT

The application of an aqueous-phase coating to PE films confers oxygen barrier properties which offer superior product protection and preservation. The distinctive feature of this coating is that it can be applied to films using conventional printing processes such as rotogravure printing.

This notice concerns water-based coatings composed mainly of polyvinyl alcohol (PVOH), which are applied in thin layers of around 1 to 2 µm to a PE film and account for 3% of the total film mass at most.

PE films with a PVOH type water-based coating can meet market needs for products requiring high barrier properties in dry conditions such as for coffee, biscuits, grains, etc.

This notice seeks to assess the impact of PVOH type water-based coatings on the mechanical regeneration of flexible PE packaging and the quality of the recycled material.

2. IMPACT ON REGENERATION

2.1. Principle and analytical criteria

In its mechanical regeneration study, COTREP assessed the impact of flexible PE with a PVOH type water-based coating on the regeneration process and 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.

2.2. Test samples







Tests were performed on complete packaging representative of structures available on the market. The films chosen are composed of a PE film to which a PVOH type water-based coating has been applied and laminated with a PE sealant film. The adhesive used for lamination is a polyurethane in standard use in flexible PE packaging.

A 100% rPE film was produced exclusively as the standard film for the study from granulate sourced from a regeneration process using packaging waste generated by the French selective collection system (flexible PE standard).

Tests were performed on PE films with 1%, 4% and 8% PVOH type water-based coating by mass to account, respectively, for current marketing, marketing potential in 2025 and a peak concentration in bales.

2.3. Results

IMPACT OF PVOH TYPE WATER-BASED COATING ON MECHANICAL FLEXIBLE PE REGENERATION PROCESSES




RECYCLING PROCESSES	IMPACT	DESCRIPTION
 SHREDDING		<i>No impact on shredding</i>
 WASHING AND SPINNING		<i>Milky tint to washing water and formation of surface froth. COD² and BOD³ measurements confirm the discharge of non-biodegradable matter in the washing water ⇒ <i>Washing water treatment required</i></i>
 FLOTATION AND DRYING		<i>Fraction in suspension. Between 40% and 60% wastage of test samples related to suspended fractions ⇒ <i>Substantial material wastage during flotation</i></i>



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

² COD: Chemical Oxygen Demand

³ BOD: Biological Oxygen Demand

RECYCLING PROCESSES	IMPACT	DESCRIPTION
 EXTRUSION/ GRANULATION		<i>No impact during manufacture of granulate at concentrations of 1%, 4% and 8%. The resulting MFIs are compliant</i>
BLOW EXTRUSION		<i>No impact on the process. However, there is a slight impact on the film's coefficients of friction and suitability for sealing depending on the proportion</i>

 Caution
  No impact

TECHNICAL CONCLUSIONS

Through tests performed by COTREP, it was possible to assess the impact of PVOH type water-based coatings applied as a barrier to PE films on mechanical regeneration of flexible PE packaging.

Results show that PVOH type water-based coatings partly dissolve in washing water, with a potential risk of additional costs incurred for washing water treatment at regeneration plants. Moreover, partial loss of PE films with a PVOH type water-based coating was shown during the flotation stage, resulting in substantial material wastage. In films produced containing PE with proportions of 1%, 4% and 8% PVOH type water-based coating, there was a slight impact on mechanical properties such as suitability for sealing compared with the standard film.

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.

Given the current state of equipment and techniques used in France, a PVOH type water-based coating offers limited compatibility with flexible PE regeneration. This opinion may be reviewed with regard to technological and market developments if needed.