RecyClass

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RECYCLASS TECHNICAL REVIEW

*Brussels, 5 July 2023*

The RecyClass Polystyrene Technical Committee (PS TC) investigated the effect of Ethylene Vinyl Alcohol (EVOH) used in PS packaging. The test campaign was made on PS sheets provided by Cobelplast. Tests were carried out following the procedures described in the RecyClass Recyclability Evaluation Protocol for PS containers[1].

The samples consisted in white, PS sheets with 5 wt.% of EVOH in the presence of Polyethylene (PE) grafted with Maleic Anhydride (MAH) tie layers with a ratio of EVOH/Tie layers of approximately 1 whilst the control material consisted of plain white PS sheets without EVOH.

Therefore, the tested structure was PS/Tie layer/EVOH/Tie layer/PS, as shown in Figure 1. This represents a high barrier multilayer sheet suitable for all range of products which require high barrier for oxygen, gasses, aromas and odours.

The tests were performed at ITENE research centre. The laboratory results showed no problems during the pre-treatment steps, where the PS flakes obtained by grinding the samples, performed efficiently in the floatation, showing no significant change on the density due to the presence of EVOH and PE-based tie layers.

Blends A.0, A.25 and A.50 were extruded into pellets without problems (Figure 2). The process was stable, without any sign of build-ups, filters' clogging or impurities in the final visual inspection. Pellets' properties were within the recommended benchmarks.

Pellets were injected to produce samples for the mechanical characterization via tensile testing, Charpy and flexural testing. All properties were within the benchmark recommendations except a slight deviation on the flexural modulus for A.50, with a deviation of 2.8 % over the accepted value. Colour measurements were performed over the injected plaques, showing no colouration or yellowing of any of the plaques.

The extruded pellets were mixed with virgin material to obtain the blends B.0, B.25 and B.50 and converted into sheets of approximately 800 µm (Figure 3). The virgin material was provided by Trinseo; resin STYRON A-Tech 1200 was used. The sheet extrusion process was stable, and the obtained sheets

[1] Recyclability Evaluation Protocol for PS containers

showed a good surface appearance, without noticeable defects that could compromise the quality of the material.

Samples were punch out from the sheets to perform tensile testing, obtaining results within the recommended benchmarks for all the blends.

On the base of these results, the PS Technical Committee concluded that EVOH up to 5 wt.% and in presence of PE grafted with MAH with a ratio of EVOH/Tie layer equal or less than 1 will not disturb the recycling process of natural, white and coloured PS. Therefore, the RecyClass Design for Recycling Guidelines for natural, white and coloured PS containers were updated by considering EVOH under the aforementioned conditions as fully compatible with PS recycling.

Therefore, the new set of Guidelines for natural, white and coloured PS containers will reflect the following:

- **Full compatible** with PS: EVOH ≤ 5 wt. % with PE grafted with MAH tie layers and EVOH/Tie layer ratio ≤ 1.
- **Limited compatible** with PS: EVOH **>** 5 wt. % with PE grafted with MAH tie layers and EVOH/Tie layer ratio ≤ 1.

*About RecyClass*

RecyClass is a non-profit, cross-industry initiative advancing recyclability, bringing transparency to the origin of plastic waste and establishing a harmonized approach toward recycled plastic calculation & traceability in Europe. RecyClass develops Recyclability Evaluation Protocols and scientific testing methods for innovative plastic packaging materials which serve as the base for the Design for Recycling Guidelines and the RecyClass Online Tool. RecyClass established Recyclability Certifications for plastic packaging, Recycling Process Certification and Recycled Plastics Traceability Certification for plastic products.

RecyClass – Plastic Future is Circular

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Annex I

Figure 1. PS/Tie layer/EVOH/Tie layer/PS, provided by Cobelplast.


Figure 2. Pellets. From left to right: A.0, A.25 and A.50.

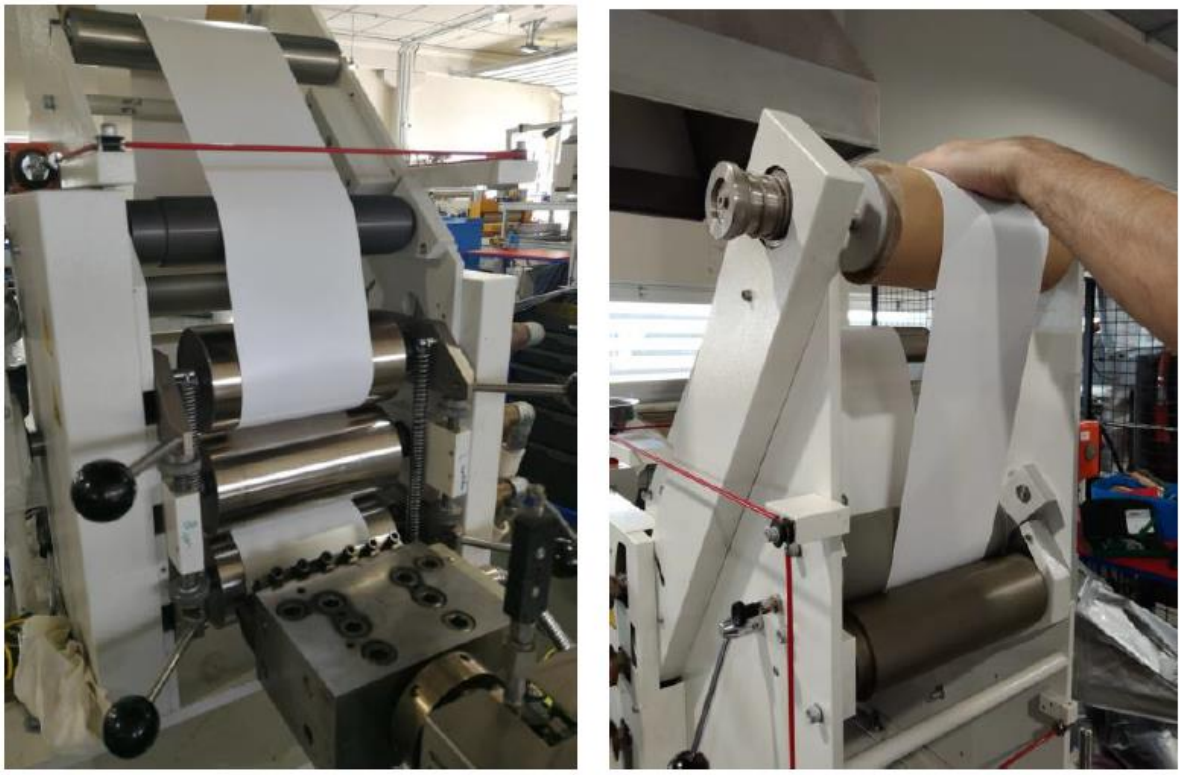

Figure 3. Sheet extrusion process.



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