RecyClass

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RECYCLASS TECHNICAL REVIEW

Brussels, 15 July 2024

The RecyClass PO Films Technical Committee investigated the impact of the combination of laminating adhesives and EVOH on recycling of PE films. This campaign was coordinated by the laminating adhesives Working Group (WG), with the specific support of Dow for the production of samples and started in September 2023. Following this test, the RecyClass PO Films Technical Committee managed to deliver new recommendations on the compatibility of EVOH and laminating adhesives combined with PE flexible packaging recycling.

The main targeted objective of this test campaign was to evaluate if the combination of an EVOH barrier layer with a laminating adhesive considered compatible with RecyClass Design for Recycling Guidelines could lead to unexpected properties deviations of the recyclate, compared to PE films with both barrier and adhesive features separated. With that in mind, the tested sample composition was carefully defined, to be comparable to previous results obtained with only EVOH or laminating adhesive, as illustrated in Annex 1. Therefore, the LDPE film was made of 5 wt% of EVOH, and 2.5 wt% of a solvent-free aromatic polyurethane (PU)-based laminating adhesive previously approved as limited compatible with PE film recycling by RecyClass[1]. The LDPE layers were made using Dow 310E grade.

The recyclability test was performed as per the RecyClass Recyclability Evaluation Protocol for PE Films, with a specific focus on the results of pellets yellowing and formation of gels and specks on 25 µm films. LDPE film Dow 310E was used as control material. Overall, the test showed relatively good results, with no unexpected deviations compared to what could be expected from EVOH and laminating adhesive separately. Among the key observations, a light deposit was observed on the melt filter, a yellowing of the pellets, and a decrease of dart impact resistance. Besides, an increase of the gels and specks compared to control materials was noticed, as expected due to the presence of EVOH. On the other hand, the yellowing of the pellets was attributed to the presence of the laminating adhesive, and was fitting with previous values obtained when testing the laminating adhesive alone in a LDPE duplex. No other deviations out of benchmark recommendations could be noted observed.

Overall, the outcome of this test campaign was that EVOH and laminating adhesives do not seem to react or interact together during the recycling process when both are present in the packaging. This

[1] RecyClass list of Approval Letters

result is one of the first where RecyClass is generalising the impact of the combination of barrier and laminating adhesive, with PE film recycling.

As a summary and according to the results that were obtained from the Recyclability Evaluation Protocol, the RecyClass PO Films Technical Committee defined that the combination of EVOH and laminating adhesive **will not need to be tested for each packaging anymore**, but that the **level of compatibility will correspond to the worst compatibility level related to EVOH and laminating adhesive presence, separately.**

It is important to highlight that for a laminate containing EVOH to be considered with PE film recycling, the amount of EVOH needs to remain below 5 wt% of the total weight of the film, and the laminating adhesive should not be a "Laminating adhesive specially developed for high thermal applications above boiling and/or for high chemical resistance"[2]. If one of these conditions is not fulfilled, a recyclability test will be necessary in order to obtain an Approval Letter.

Regarding the combination of EVOH and laminating adhesives in a PP laminate, more tests will be necessary to generate enough data to extrapolate the aforementioned conclusion. For other barrier materials like PVOH or PA, additional data will need to be gathered in order to provide clear recommendations for such combinations with barrier materials. Finally, the working group on laminating adhesive will continue to work on the development of a simplified assessment for laminating adhesives to be used in the PP flexibles stream.

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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[2] RecyClass Design for Recycling Guidelines for PE films

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Annex I

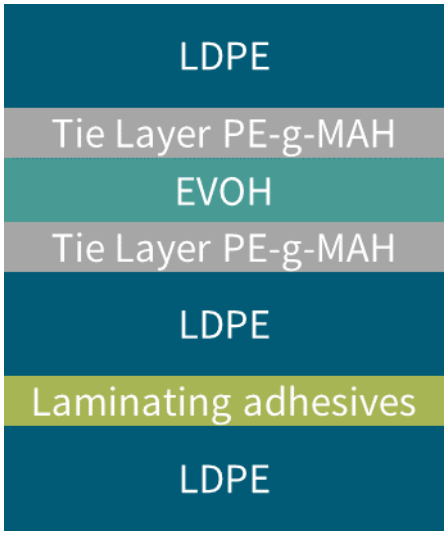

Figure 1: Composition of the sample used for the test campaign