RecyClass

c/o Plastics Recyclers Europe
Avenue de Broqueville 12
1150 Brussels, Brussels

Phone: +32 2 786 39 08
info@recyclass.eu
www.recyclass.eu

The RecyClass Polystyrene Technical Committee (PS TC) investigated the effect of different decorations on PS packaging sorting. Tests were carried out following the procedures described in the RecyClass Sorting Evaluation Protocol for Plastic Packaging[1]. The tests were performed at Paprec's TRIVALO 27 sorting centre, in a real running process where samples were mixed with other waste, processed at a rate of 9 tonnes per hour by the facility. Three different decorations were assessed, as described below:

- PS yoghurt pot with PS banderole and PS lid (Sample 1).
- PS yoghurt pot with PS banderole and PET lid (Sample 2).
- PS yoghurt pot with paper banderole and paper/pet lid (Sample 3).

The samples were tested without any residues inside and the banderoles covered the full lateral surface of the pots. The average thickness of the pots wall was 100 µm. Pictures of the samples can be found in Figure 1, 2 and 3. Please note that samples 1 and 2 had transparent and non-printed OPS banderoles.

The test results showed that for all the samples, up to 30 % of the items were lost after the ballistic separation because sorted as 2D instead of 3D due to low weight and small size of the pots. In terms of near infrared (NIR) detection, the pots corresponding to sample 1, with PS lid and banderole, showed the highest efficiency (i.e. 96 %), followed by samples 2 and 3. The results are summarized in Table 1. It should be noted that, although all decorations did not hinder the detection of the underlying container (i.e. detected with over 80 % efficiency as defined in the RecyClass Sorting Protocol), pots with full PS decoration achieved an efficiency 13 % higher than those with paper labels and paper/PET lids.

These results highlight the importance of preferring a monomaterial approach when designing the PS pots while ensuring the highest possible sorting efficiency. It should also be noted that the lightweight nature of these pots, due to their thin walls, is a challenge for the sorting process, where the pots could end up in the residue fraction and not get recycled.

The results obtained align with previous investigations by RecyClass on the impact of various lid types on the sorting performance of PS pots. It is important to consider that positive sorting performance is essential for packaging to reach a recycling facility. The tested decorations and lids did not present significant challenges in terms of NIR detectability; however, they may behave differently in the

[1] Sorting Evaluation Protocol for Plastic Packaging

recycling process, where PET and PET/paper lids have proven challenging, as pointed out by the PS TC in a Technical Review published in January 2023.

Finally, the PS TC would like to highlight that, despite the good results in terms of NIR detection seen in this study, features as print, mass colouration, metallised decorations, barrier, among others, might require to perform a Sorting Evaluation Protocol. Known misleading features are listed on the RecyClass Methodology and the following size indications can be considered to ensure the recognition of PS:

- Size of non-PS surfaces on containers > 500 ml: < 70% coverage

- Size of non-PS surfaces on containers < 500 ml: < 50% coverage

Companies are encouraged to utilize the current technical review as a point of reference when deviating from the above recommendations. Additionally, they are invited to conduct a RecyClass sorting test to ensure that their unique combination of decorations on PS containers does not impede proper detection within the designated stream.

Moreover, given the trend of reducing plastic usage in pots, and acknowledging that the banderole serves a mechanical purpose by ensuring the proper top load performance, it is important to note that removing the banderole and increasing the thickness of the pot could allow up to 30 % of the pots to be recovered instead of being lost in the 2D fraction at the ballistic separator step. This issue is also connected to how effectively flexible parts are separated from PS rigid ones during the recycling process (air elutriation step), which is discussed by the PS TC in a separate Technical Review published in January 2024.

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.

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Contact : Jean-Emile.Potaufeux@plasticsrecyclers.eu, www.recyclass.eu

ANNEX 1

Table 1. Sorting test results

Sample	Sorted as 2D item	PS NIR detection efficiency
1	14 %	96 %
2	10 %	89 %
3	30 %	83 %

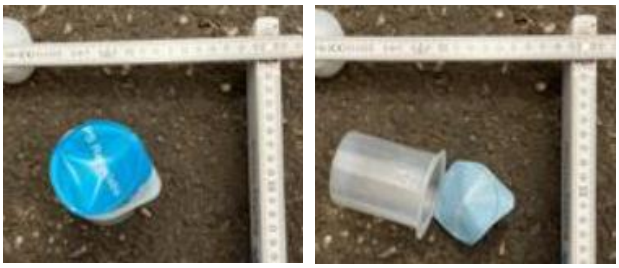

Figure 1. PS yogurt pot with PS banderole and PS lid (Sample 1). Please note that sample 1 had transparent and non-printed OPS banderole.

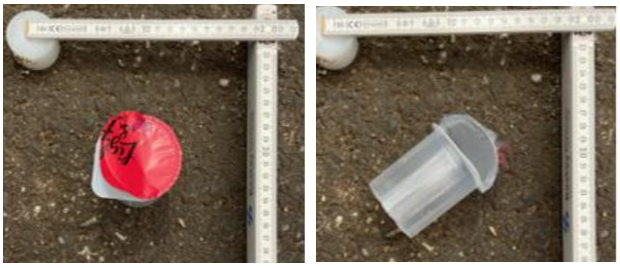

Figure 2. PS yogurt pot with PS banderole and PET lid (Sample 2). Please note that samples 2 had transparent and non-printed OPS banderole.

Figure 3. PS yogurt pot with paper banderole and paper/pet lid (Sample 3).