RecyClass

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RECYCLASS TECHNICAL REVIEW

Brussels, 15 July 2024

Labels and adhesives on natural and white HDPE containers

The White Packaging Task Force (TF), under the guidance of the RecyClass HDPE and PP Technical Committees (TC), investigated the impact of labels and adhesives on natural and white HDPE containers recycling. The test campaign was made by testing four HDPE samples already present in the market, as illustrated in Annex 1 and in Figure 1 and Table 1.

One of the primary objectives of the test was to assess how friction induced by grinding could affect the removability of the labels. Considering that most recyclers employ wet grinding and that most laboratories are equipped with dry grinding equipment, a comparative analysis of these two processes was conducted to evaluate their impact on the label removability rate.

The trials were performed at the Nationaal Testcentrum Circulaire Plastics (NTCP). Dry grinding was applied on a laboratory equipment with a 20 mm sieve whilst wet grinding was applied on an industrial scale equipment with a 15 mm sieve.

Tests were conducted using a new experimental procedure. The essence of this procedure was to classify the flakes after grinding and washing into three categories, in order to calculate a label removability rate:

- Clean container flakes.
- Clean label flakes.
- Contaminated flakes (flakes with label still attached on them, flakes with adhesive residues, clogged flakes).

The results indicated that the labels were effectively removed after the grinding step, with wet granulation performing slightly better than dry granulation, as demonstrated in Table 2 and Table 3 in Annex 1. The label removability further improved following the washing step at 40 °C, without the addition of any chemicals, showing a complete removability for some of the samples. The similar results obtained through dry and wet grinding indicated that applying these procedures at a laboratory scale will be representative of what might occur at a recycling facility.

Based on these initial findings, the White Packaging TF have concluded that a revised procedure should be implemented, replacing the current Washing Quick Test Procedure for Film Labels. This updated procedure incorporates a grinding step and operates with a bigger quantity of material.

Moreover, the HDPE TC have concluded that the wording in the "Adhesive for Labels" section within the Design for Recycling Guidelines shall be revised as follows:

Full compatible with HDPE containers:

- Removable in the recycling process

Non-compatible with HDPE containers:

- Non-removable in the recycling process

The PP and PS TCs concluded that, for the sake of alignment, the same wording will be used in the PP and PS Design for Recycling Guidelines.

Additional research will be necessary to provide insights into the adhesive behaviour during the washing step, the inclusion in these procedures of paper labels, testing on PP and PS samples, among other areas of interest. The White Packaging TF will address these matters and will revise the procedures once additional information has been collected.

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

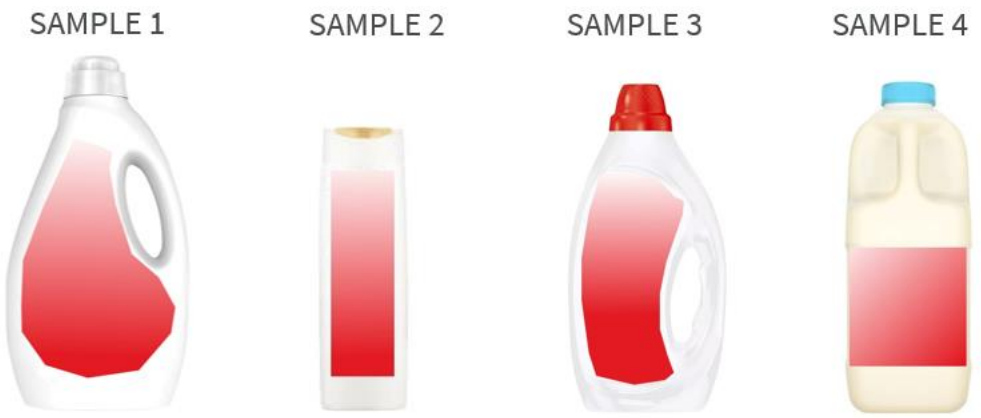

FIGURE 1. REPRESENTATION OF THE 4 TESTED SAMPLES.

TABLE 1. SUMMARY OF THE TESTED SAMPLES' PROPERTIES.

Component	*Sample 1*	*Sample 2*	*Sample 3*	*Sample 4*
Container	*White HDPE*	*White HDPE*	*White HDPE*	*Natural HDPE*
Adhesive	*Non-tackified acrylic emulsion*	*Non-tackified acrylic emulsion*	*UV-Acrylic hotmelt*	*Modified acrylic emulsion*
Facestock	*PE White, 79 µm*	*PO clear, 52 µm*	*PE white, 120 µm*	*PP white, 50 µm*
Labelled part (wt%)	*27.2*	*40.7*	*40.3*	*6.8*
Wall thickness [mm]	*1*	*0.65*	*1*	*0.45*

TABLE 2. RESULTS OF DRY GRINDING AND WASHING.

Sample	*Adhesive*	*Facestock*	*Type of grinding*	*Removability rate after grinding*	*Washing Temperature*	*Removability rate after washing*
Sample 1	*Non-tackified acrylic emulsion*	*PE White, 79 µm*	*Dry Grinding*	*81.1 %*	*40 °C*	*92.4 %*
Sample 2	*Non-tackified acrylic emulsion*	*PO clear, 52 µm*	*Dry Grinding*	*91.9 %*	*40 °C*	*91.5 %*
Sample 3	*UV-Acrylic hotmelt*	*PE white, 120 µm*	*Dry Grinding*	*96.8 %*	*40 °C*	*100 %*
Sample 4	*Modified acrylic emulsion*	*PP white, 50 µm*	*Dry Grinding*	*99.8 %*	*40 °C*	*100 %*

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TABLE 3. RESULTS OF WET GRINDING AND WASHING.

Sample	*Adhesive*	*Facestock*	*Type of grinding*	*Removability rate after grinding*	*Washing Temperature*	*Removability rate after washing*
Sample 1	*Non-tackified acrylic emulsion*	*PE White, 79 µm*	*Wet Grinding*	*84.5 %*	*40 °C*	*100 %*
Sample 2	*Non-tackified acrylic emulsion*	*PO clear, 52 µm*	*Wet Grinding*	*99.5 %*	*40 °C*	*99.5 %*
Sample 3	*UV-Acrylic hotmelt*	*PE white, 120 µm*	*Wet Grinding*	*100 %*	*40 °C*	*100 %*
Sample 4	*Modified acrylic emulsion*	*PP white, 50 µm*	*Wet Grinding*	*100 %*	*40 °C*	*100 %*

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