

PET Package Materials Balance Test

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Introduction – Scope, Significance and Use

This document presents a standard method to evaluate PET packages using a materials balance to identify components and percentages of the package that are expected to be recovered through the flake wash and float/sink process steps.

When PET packages are recycled there are three production scale outcomes for material in the package:

1. A primary salable product – the focus of this test is the amount of clear PET that can be recovered for recycling.
2. Salable side streams – polyethylene or polypropylene closures, for example, and
3. Waste streams – fines, materials lost into wash water, or materials lost in air separation are example sources of waste.

When considering the recycle performance of a PET package good engineering discipline may involve:

- Documenting the weight % of all components associated with a package; for example, container, closure and label weight percents on a given package.
- Predicting the recycling outcome of each component.
- Measuring a materials balance to confirm the predicted outcome.

This test can be used with any PET package of interest and can include the entire package with PET and closures, dispensers, attachments and labels. Alternatively, the test might focus on a component of the package such as the PET container with a label only, or with a dispenser only. The procedure uses 500 grams of package for illustration but can be scaled up or down to any convenient starting weight of sample.

This materials balance can be used to support claims for the percent of a package that can be recovered for recycling. The materials balance can be used in a description of the expected recycling performance of a new package design.

This test does not consider any waste that might be created during air elutriation of either the PET flake, or elutriation of materials that are recovered by floatation in the float/sink step. Losses from these steps can be considered in a separate evaluation.

If there are sinking solids recovered with PET flake, but which are not PET flake, APR strongly recommends that additional testing be conducted to evaluate the impact of those non-PET solids in the recycle stream.

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Reference Documents

[PET-P-00 Standard Laboratory Processing Practices](#)

Granulation and Washing: PET-P-03 and PET-P-04

Test Method Summary

This test anticipates that a sample set of entire packages will be evaluated; for example, complete PET packages with labels, closures or dispensers and any attachments or other design features. The test might also be used to investigate components of a package such as the PET container and label only; or a PET package and a dispenser only.

PET packages of interest are granulated. 500 grams of the resulting granulated flake is exposed to the steps of washing, rinsing, float/sink and drying. The sample is characterized for recovery and loss of materials in these categories:

- Recovered with the washed and dried PET flake.
- Recovered in the float stream from the wash, rinse or float/sink steps.
- Recovered as sinking solids from water separated from PET flake after the wash, rinse and final float/sink steps.
- Lost as suspended or dissolved solids in the wash water.

Total materials recovery and loss is recorded and reported. The actual results are compared to predicted results.

Equipment Required

Equipment referenced in PET Practices for Granulation and Wash; PET-P-03 and PET-P-04.

Materials Required

As described in the above practices listed for equipment requirements.

Test Method Steps

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1. List and weigh each component of the package being evaluated. List the package components in as much detail as possible. For example, if there is a dispenser, one might break out floating and sinking plastic components as well as metal components. Or if there is a label, consider the impact of the label, ink and adhesive weight. This information can be displayed in a Package Data Table such as the example given in the Evaluation section below.
2. Calculate the weight percent of each component of the package and show on the Package Data Table.
3. Predict the recycling outcome of each component on the Data Table. The recommended outcome categories are:
 - Recovered with the washed and dried PET flake.
 - Recovered in the float stream from the wash, rinse or float/sink steps.
 - Recovered as sinking solids from water separated from PET flake after the wash, rinse and final float/sink steps.
 - Lost as suspended or dissolved solids in the wash water.
4. Granulate the PET packages.
5. Weigh the total amount of granulated material that will be introduced into the wash step.
6. Wash the resulting PET flake using the method presented in PET-P-03 to create dry PET flake.
7. Recover and weigh:
 - Dry PET flake recovered.
 - Dry floating solids recovered.
 - Dry sinking solids recovered after the wash and rinse water was separated from the recovered PET flake.
8. Show results using a table such as shown in the Example Data Report Table given below in the Evaluation section. The weight for material lost as suspended or dissolved solids is calculated from knowledge of the other actual recovered values.

Evaluation

This procedure is used only to collect and report data. The results of the materials balance are often used as description information in support of a broader characterization of recycling performance of the PET package.

The presence of sinking solids contained in the PET flake, that are not PET flake, indicates the need for additional evaluation to understand the impact of the non-PET solids on recycling.

Example Package Data Table

List the package components in as much detail as possible. For example, if there is a dispenser, one might break out floating and sinking plastic components as well as metal components. Or if there is a label, consider the total of the label, ink and adhesive weight.

Package component	Actual weight of component	Per cent of package weight	Recycling outcome prediction (note 1)

Note 1: Recommended prediction categories:

- Recovered with the washed and dried PET flake.
- Recovered in the float stream from the wash, rinse or float/sink steps.
- Recovered as sinking solids from water separated from PET flake after the wash, rinse and final float/sink steps.
- Lost as suspended or dissolved solids in the wash water.

Example Data Report Table

Recovery outcome category	Predicted weight	Actual weight	% of prediction
Recovered with the washed and dried PET flake.			
Recovered in the float stream from the wash, rinse or float/sink steps.			
Recovered as sinking solids in water separated from PET flake after the wash, rinse and final float/sink steps. Lost as suspended or dissolved solids in the wash water.			
Lost as suspended or dissolved solids in the wash water.			

DOCUMENT VERSION HISTORY

Version	Publication Date	Revision notes
1	November 16, 2018	Original Document
2	September 3, 2024	Updated hyperlinks to match new website