

PET Packaging Component Sink or Float Evaluation

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Introduction – Scope, Significance and Use

The float/sink step is an important process step when PET articles are recycled. There may be a float/sink step after granulation, and a float/sink separation is commonly employed after the hot caustic wash step.

The density of PET flake is 1.37 g/cm³ and so PET sinks in water. It is generally desirable that other package components such as labels, closures, dispensers and attachments completely float in water so that they can be cleanly separated from the PET.

This document presents a standard laboratory test method to evaluate the ability of a specific package component to float in room temperature water, as well as after exposure to hot water at 85° C as occurs during hot caustic wash of PET flake. Some materials may increase in density above 1.0 because of exposure to hot water. A comprehensive evaluation of a new material or product requires exposure to hot water.

There are situations where an investigator can develop useful information from the room temperature evaluation only. Examples might be the impact of fillers in polyethylene or polypropylene on float/sink behavior. Another is the impact of inks on the float/sink behavior of label films when it is known that heat exposure does not change the density of the label film.

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Test Method Summary

A packaging component of interest is either granulated or cut into pieces before mixing with water and a detergent. Ability of the component to float in water is observed visually and can be measured gravimetrically. Detergent is necessary to allow water to fully wet the component and displace air bubbles that might adhere to the component.

Equipment Required

- Weigh scale (0.01 ± grams)
- Thermometer
- Hot plate with magnetic stirrer, or an over-head mixer
- Means to size reduce the test component to about 1 cm pieces – could be a laboratory granulator, hand shears, scissors.

Materials Required

- 250 ml glass beakers
- 10 individual items of component to be tested (for example 10 closures or 10 labels)
- Drying pans
- Any common liquid dish wash detergent

Test Method Steps

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Room temperature water evaluation:

- 1) Size reduce the 10 items of the component to pieces about 1 cm in dimension and mix together to create a single test sample.
- 2) Weigh the size reduced sample material.
- 3) Add the size reduced sample to a volume of tap water about 10x the weight of the sample; the volume of water is not critical and can be adjusted to give a good visual separation of floating and sinking material.
- 4) Add a six drops of dish detergent to each 100 ml of water volume.
- 5) Mix the water and plastic component using the stirrer or mixer for 5 minutes.
- 6) Shut-off the mixer and observe whether the material floats or sinks in the water. A visual evaluation is expected to be sufficient to observe pieces that float and pieces that sink.
- 7) If there is a combination of floating and sinking material, the floating material can be recovered, dried and weighed to report the % that floats. The composition of the floating material can be characterized.
- 8) The sinking material can also be recovered and characterized.

Heated water evaluation:

1. Heat water and detergent to 85° C on the hot plate.
2. Add the size reduced items to the hot water and mix for 15 minutes to simulate the time employed for hot caustic wash of PET flake.
3. Shut off the mixer and evaluate float and sink behavior as above.

Test assessment

In a comprehensive assessment, the desired outcome for PET recycling is that 100% of the size reduced sample that is not PET floats after exposure to heated water.

Any sinking material can be characterized for composition and this knowledge used to redesign the packaging component. Alternatively, an investigator might employ the PET Closures and Labels Benchmark Test or Critical Guidance Protocol to evaluate the compatibility of the sinking material with PET.

DOCUMENT VERSION HISTORY

Version	Publication Date	Revision notes
1	November 16, 2018	