



# Tray Circularity Evaluation Platform

---

## Quick Test QT502

### Sink-float separation test

**November 2024**

This work has been published by the Tray Circularity Evaluation Platform with experts in the plastics packaging and recycling industry. The information contained in this document is for general guidance only. Any details given are intended as a general recommendation based on the best of our knowledge at the time of publication. It does not necessarily guarantee compliance with the different recycling schemes. This is by no means a comprehensive list. Users are therefore advised to make their own enquiries to check for specific and up-to-date information.

While steps have been taken to ensure its accuracy, the Tray Circularity Evaluation Platform cannot accept responsibility or be held liable for any loss or damage arising out of or in connection with this information being inaccurate, incomplete or misleading. Opinions expressed and recommendations provided herein are offered for the purpose of guidance only and should not be considered as legal advice.

# 1. Introduction

---

The objective of the Tray Circularity Evaluation Platform (TCEP) is to evaluate technologies and products to allow new PET tray innovations whilst optimizing the environmental and economic consequences for the recyclability of PET.

TCEP has formulated guidelines to evaluate the influence of tray innovations - such as barrier materials, resin formulations, additives and non-PET components in or on PET trays - on R-PET recycling processes. Barrier materials can be applied as a coating, introduced in a co-extruded multilayer configuration or blended with the matrix material. Additives can be incorporated into the base material during polymerization or added during thermoforming in the form of liquid or solid master-batches. Other non-PET components can be labels, glue, sleeves, caps, printings, etc.

Laboratory analyses on the recyclability of new innovative PET trays can be relatively expensive and usually have a time delay between sampling and getting useable results of several months. Besides, assessing the test results is a difficult task that requires training and experience. This is often seen as an inconvenience.

For this reason, TCEP has developed a series of rapid and low-cost techniques for the quick assessment of PET trays. All quick tests include a complete explanation of the scope, techniques, equipment and test conditions, as well as a “summary interpretation” explaining how to use the test results. Quick tests can either be executed at the internal laboratory facility or by an independent test laboratory with minimal investment in equipment.

The results of the quick tests are purely indicative, and may not be considered as an advice, a recommendation or a formal approval by TCEP. For a complete assessment, further tests may be required to highlight all possible effects of innovative PET trays on the recyclability of collected trays into r-PET, the processing of the r-PET into products and the final product properties. Please contact TCEP for more information.

## **SAFETY PRECAUTIONS**

**This guideline is intended for use by qualified personnel who recognize safety hazards and are familiar with the safety precautions required in regard to application of this guideline. The appropriate laboratory safety procedures must be used before, during, and after testing operations.**

## 2. Quick Test QT 502

---

### Scope

Floatation is an efficient, density-based sorting method used to separate light, floating components (such as caps and labels) from heavy, sunk components (such as ground PET trays). Non-PET components that sink together with PET flakes cause serious processing inefficiencies which limit the use of r-PET in applications such as trays, film, sheet and fiber. Combinations of PET with other material types that sink in water should be avoided.

The density of some materials may change by applying heat. This Quick test has therefore a separate procedure in hot water for foamed materials. All other labels or components can be tested in cold water.

**Important note:** It is highly recommended QT 502 to be combined with an oven test QT 500 for confirming that there is not discoloration.

### Principle

The efficiency of the sink float separation procedure is determined by the amount of test sample that floats at the surface of the water.

### Apparatus

- Technical balance, accurate to 0,1 g
- Beakers of 1000 ml
- Hot plate stirrer, or similar equipment
- pH meter
- Drying oven
- Thermometer (0-100°C, +/-1°C)

### Sample

50 g PET flakes (tray regrind - clean and dry - no caps/labels) - record the weight

50 g regrind from test sample (cap, label, seal, etc. - clean and dry) - record the weight

### Procedure (foamed materials and shrink sleeves or labels)

- Fill beaker with 800 ml tap water (pH between 7 and 8)
- Boil the water for 10 minutes, and allow cooling to room temperature
- Transfer 350 ml of the boiled and cooled water to another beaker
- Heat this water at 70°C
- Put the test sample in the hot water and stir at 500 rpm for 15 minutes
- Remove the beaker from the magnetic stirrer
- Allow the water to cool down to 25-30°C
- Remove all particles that float at the surface with a sieve
- Eliminate any PET flakes which might got trapped in the floatables
- Dry the floating fraction for 2 hours at 85°C
- Cool to room temperature, weigh and record the weight of the float fraction
- Repeat the test with the PET tray regrind

### Procedure (other potential floatable components)

- Fill beaker with 700 ml tap water (pH between 7 and 8)
- Boil the water for 10 minutes, and allow cooling to room temperature
- Transfer 350 ml of the boiled and cooled water to another beaker
- Put the test sample in the water and stir at 500 rpm for 2 minutes
- Stop the magnetic stirrer and allow the water to rest for 2 minutes
- Remove all particles that float at the surface with a sieve
- Eliminate any PET flakes which might get trapped in the floatables
- Dry the floating fraction for 2 hours at 85°C
- Cool to room temperature, weigh and record the weight of the float fraction
- Repeat the test with the PET tray regrind

### Results

The efficiency of the sink float separation is calculated as follows:

*floatation efficiency* = (weight of floating fraction) / (weight of test sample) x 100 (in %).

### Test report

The test report includes the following information:

- Reference to the TCEP Quick Test QT 502
- All details necessary for complete identification of the material tested
- Description and detailed photos of the samples before, during and after testing
- Floatation efficiency of each sample
- Details of any deviation from the test method, as well as any incident which may have influenced the results
- Date and place of the test

### Remark

This quick test is designed as a quality indicator to monitor a single critical parameter in PET recycling. Other specific tests are needed to carry out a full screening for possible effects of innovative PET trays on the recyclability of collected trays into r-PET, the processing of the r-PET into products and the final product properties. Please contact TCEP for more information.

## Photos



**Photo 1:** From left to right, beaker with 300 ml water at pH 7,5; label sample; regrind caps sample



**Photo 2:** Sink float separation of regrind caps sample



**Photo 3:** Sink float separation of regrind labels sample