

Preliminary note

Impact of PET lids on the recycling of PET pots and trays*

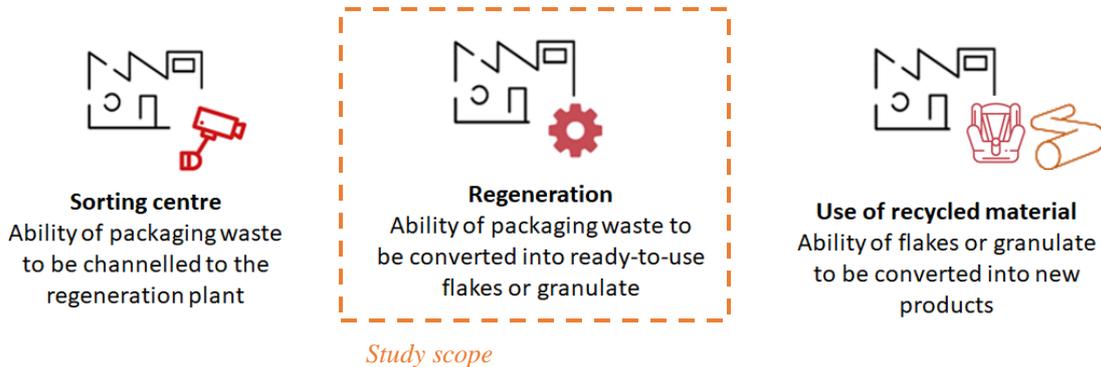
This preliminary note is intended to help with recycling (development of specific recycling streams) and eco-design projects under development.



Given the lack of a dedicated line, lidded PET trays are currently not recyclable in France.

Summary

The purpose of this preliminary note is to **assess the efficiency of a PET regeneration line in removing PET lids from the rigid PET stream** to ensure that they do not disrupt the recycling of PET trays* in the future.



The results produced show that **PET lids can be removed by aeraulic sorting in the vast majority of cases**. Consequently, on the basis of the equipment and techniques used in France, **a peel-off PET lid will not disrupt the recycling stream for clear and coloured PET trays, provided that the following are used:**

- a non-printed transparent peel-off PET lid on a clear PET tray
- a printed or non-printed peel-off PET lid on a coloured PET tray

In the clear PET stream, if ink is present, even in small quantities, this significantly reduces the quality of the recycled material.

During this test, residue from and the impact (process and material) of the sealing layer present on lids or on the sealing edge of the tray were not studied. **Further work is needed on the sealing agents used to assemble PET trays with peel-off PET lids or peel-off lids of density less than 1 to be able to draw a conclusion on the recyclability of the packaging as a whole.**

This study does not address labels that might be glued to the PET lids.

COTREP may review this document if industrial practices were to change, particularly if dedicated recycling lines were developed for PET trays.

* for simplification purposes, the term "tray" used in this document refers to all rigid packaging excluding bottles and dispenser bottles, such as pots for example

1/ CONTEXT

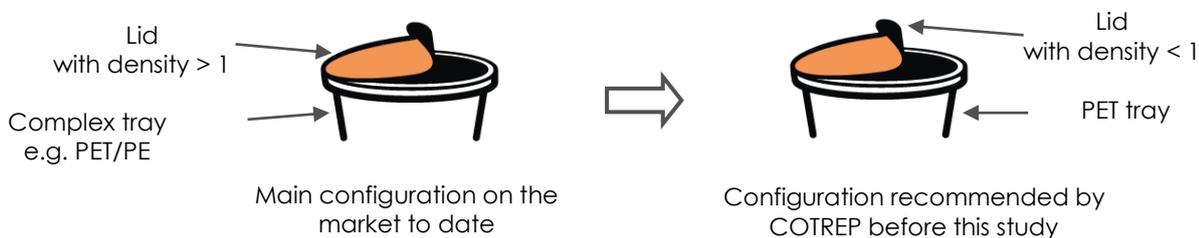
In 2021 in France, **there is not yet a specific recycling stream for PET trays***.

Today, non-lidded PET trays are recycled in the same recycling streams as PET bottles, whereas lidded ones are processed as sorting rejects, as in the majority of cases they do not comply with COTREP guidelines and disrupt existing recycling streams (e.g. disruptive lid, adhesive residue or sealing agent, etc.).



Lidded trays marketed to date are mainly composed of a multi-material PET/PE complex body and a complex lid generally with a density greater than 1. However:

- Complex trays such as PET/PE structures are not tolerated in rigid PET recycling streams as these materials are not compatible with mechanical recycling processes for the final applications currently addressed (see COTREP notice AG59). COTREP therefore recommends using a tray solely composed of PET.
- A lid with a density greater than 1 cannot be separated from the PET tray during the flotation stage at regeneration plants (see table in section 3.3). This is why COTREP recommends using a (clear or printed) peel-off lid with a density lower than 1 for PET trays.



Some market stakeholders offer PET lids, which, due to their density > 1 , are more complicated to separate from the packaging body (not separable by flotation) and, to date, are therefore considered incompatible with PET tray recycling.

In response to the difficulty of finding lids with a density < 1 meeting manufacturers' specifications (barrier properties, acceptable sealing, etc.) and in order to offer marketers more design possibilities, **COTREP sought to test the efficiency of a regeneration line in removing PET lids from the rigid PET stream, notably using aerulic sorting**, then, if necessary, to study the impact of remaining lids on rPET quality.

Important: in the clear PET stream, if ink is present, even in small quantities, this significantly reduces the quality of the recycled material (notably the colour of the rPET and its suitability for food contact). **This COTREP preliminary note therefore concerns only:**

- a non-printed transparent peel-off PET lid on a clear PET tray
- a printed or non-printed peel-off PET lid on a coloured PET tray



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In the case of printed lids on clear PET trays, COTREP still recommends using a peel-off lid with a density lower than 1.

Note: given that no industrial regeneration line exists for PET trays, the tests were conducted with settings similar to industrial regeneration lines for PET bottles.

2/ PRINCIPLE AND ANALYSIS CRITERIA

COTREP studied the impact of flexible PET lids on the rigid PET stream during the shredding, washing, flotation, drying and aeraulic sorting of flakes to determine the quantity of PET lids remaining in the regeneration process until the extrusion/granulation stage.

These tests were performed on a pilot scale on the site of an equipment manufacturer recognised by the trade for its PET regeneration capability. Tests were performed on the basis of the COTREP PET bottle regeneration procedure, representative of the industrial practices applied by European regeneration operators for PET bottles.

Note: as the parameters applied (notably during aeraulic sorting) are those used in the PET bottle recycling streams, they may potentially be adjusted to better reflect the process conditions of dedicated tray lines when implemented.

3/ TEST PROCEDURE

3/1. Sample type and constitution

To facilitate the flake count on test completion, sortable black PET trays and transparent PET lids, both representative of the French market, are selected.



Sortable black PET tray



Transparent PET lid

The impact of the sealing layer on lids is not assessed as part of this study. To overcome this aspect, PET lids used during testing do not have a sealing layer and are not sealed to the trays at the start of the test.

After studying lidded PET trays available on the market, COTREP assessed that the lid represents on average **10%** of the overall packaging weight (tray + lid).

3/2. Performance of tests

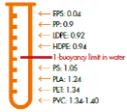
The following procedure was applied:

- 1. Shredding of samples:** 10 kg of lids and 90 kg of trays are shredded into 12 mm flakes simultaneously in water. A tray + lid blend with 10% lid content is obtained.
- 2. Washing and flotation:** the flakes are washed at 85 °C with soda and detergent, followed by a flotation stage with the addition of a sinking agent facilitating separation by element density.

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3. **Drying and aeraulic sorting:** after drying in hot air at 130 °C, the flakes are put through an aeraulic sorting process. "Bottle parameters" are used with no specific setting aimed at improving separation.
4. **Flake recovery and sorting:** 300 g of flakes are collected and sorted manually to assess the quantity of PET lids remaining out of the total PET tray flakes.

3/3. Results analysis

Recycling stage	Impact	Description
 SHREDDING	 No impact	Flexible lids are shredded with rigid ones, without any impact
 WASHING	 No impact	No impact
 FLOTATION	 No impact	No separation between the PET lids (d>1) and PET trays (d>1)
DRYING and AERAULIC SORTING	 No impact	Aeraulic sorting enables separation of the vast majority of PET lids. After the black tray flake and transparent lid flake count, the residual amount of PET lids is < 0.7%.
 EXTRUSION/ GRANULATION	Not done	Given this rate, a regeneration test used to assess the impact of the remaining lids on the quality of the rPET is not considered necessary (this test is not discerning enough to assess the impact of a different PET grade with a concentration of less than 1%).

Notes:

- As the test parameters are those used for bottles, the recycling yield is highly degraded. Recycling yield is not the purpose of this test and is not considered when interpreting the results.
- As PET lids are mainly composed of PET, the quantity of sealing layer present in the stream (with a residual PET lid rate < 0.7%) is estimated at less than 0.1%*.
*Calculation done with a sealing layer representing 12% of the PET lid and assuming incoming material solely composed of trays with PET lids.
- The residue from and the impact (process and material) of the sealing layer present on lids or on the sealing edge of the tray were not studied. Further work is needed on the sealing agents used to assemble PET trays with peel-off PET lids or peel-off lids of density less than 1. The impact of sealing agents during the recycling process warrants evaluation as degradation could disrupt the food contact compliance of the end product and/or negatively affect visual aspects.

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3/4. Supplement - Additional test performed

The configuration tested and described previously (shredding/washing/flotation/drying/aeraulic sorting) is currently the most widespread configuration implemented by French regeneration operators.

During these tests, a second configuration was tested to help regeneration operators working on future recycling lines dedicated to PET trays. In this second configuration, the aeraulic sorting stage comes after the shredding stage and before the washing/flotation/drying stages. In theory, this configuration could enable separation of lids in the early regeneration stages and thus prevent:

- “Pointless” washing/drying of lids that will not be recycled subsequently
- sealing layers on lids causing process problems during the washing and drying stages.

This second configuration produced less efficient results with a residual PET lid rate of 10%. These inferior results could be partly explained by the lack of a proper drying stage before aeraulic sorting on the test line; as the lid flakes are too wet they cannot be correctly separated from the tray flakes.

TECHNICAL CONCLUSIONS

Today, non-lidded PET trays are recycled in the same recycling streams as PET bottles, whereas lidded ones are removed from this stream and are not recycled.

This preliminary note is intended to help with recycling (development of specific recycling streams) and eco-design projects under development. **Given the lack of a dedicated line, lidded PET trays are currently not recyclable in France.**

The tests performed assessed the efficiency of a regeneration line (with “bottle settings”) in removing PET lids from the rigid PET stream to ensure that they do not disrupt the recycling of PET trays in the future. **The results produced show that PET lids can be removed by aeraulic sorting in the vast majority of cases.** A residue of 0.7% of PET lids was assessed. Given the small amount of PET lid residue and its composition, and without regard for the sealing agent, it is not necessary to perform a regeneration test to conclude on the acceptance of 0.7% of PET lids during PET tray recycling.

Consequently, on the basis of the equipment and techniques used in France, a **peel-off PET lid will not disrupt the recycling stream for clear and coloured PET trays, provided that the following are used:**

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