

INTRODUCTORY TECHNICAL SHEET

1/ PLA and recyclability – General remarks

Poly(lactic acid) (PLA) is a biodegradable thermoplastic of the aliphatic polyester family. It is produced by the fermentation and polymerisation of sugars from plant resources (cornstarch) so can be considered as renewable resource-based.

This material can be converted through the usual plastics processes (extrusion, injection, etc.) and used in many applications including production of trays, film, fibre and bottles.

With a rigid, transparent appearance that cannot be visually differentiated from PET, it will be channelled into PET flows in French sorting centres.

Properties	PET	PLA
Density	1.35-1.40 g/cm ³	1.24 g/cm ³
Vitreous transition temperature	75-80°C	55-60°C
Melting temperature	245-250°C	145-155°C

- The density of both PET and PLA is greater than one, so they cannot be separated by floatation (in the reclaiming stage).
- PLA has a much lower melting temperature than PET and may deteriorate during the heat-up needed to convert PET.

Note: If PLA packaging ends up in the HDPE/PP stream, it will easily be separated out in the floatation stage and will be added to waste awaiting disposal.

2/ Studies conducted on the behaviour of PLA bottles during the reclaiming and recycling states (in a PET stream)

To study the behaviour of PLA bottles introduced into the French PET stream in small quantities, we mixed together the two bottle types in varying proportions.

2.1 Reclaiming study

The various PET/PLA mixes were added to a standard reclaiming line that is representative of the industrial sites currently operating in Europe.

The aim of this trial is to study the influence of PLA in the various stages (sorting, grinding, floatation, washing and drying) and to obtain flakes that can be used in the downstream recycling stages.

2.2 “Bottle to bottle” recycling study

This trial is intended to analyse the impact of PLA during the stages needed to make new bottles from flakes:

- Granule extrusion
- Post-condensation (rise in viscosity index)
- Plaque injection.

The most sensitive parameters are:

- Behaviour of granules during viscosity build-up
- Appearance of intermediate products
- Appearance and properties of obtained plate.

The products' appearance is assessed visually (qualitatively) and by colorimeter analysis of 2mm-thick plaques (injected from granules).

Acceptability limits are identical to those set in the document “Bottle to Bottle protocol” published by PETCore:

- colour (Lab) and transparency (Haze) of the plaques
- viscosity index after post-condensation
- ...

These acceptability limits are set with reference to a control sample that has undergone strictly the same stages as the tested mixtures.

2.3 “Bottle to fibre” recycling study

This study is used to assess the behaviour of PLA bottles during the fibre extrusion and drawing stages.

The studied parameters are mixture extrudability, pressure variations during extrusion, and appearance and strength of the fibres obtained. Tests were carried out according to COTREP test procedure P 1.05.2006

Note: Manufacturing conditions and fibre characteristics vary widely from one producer to another, depending on whether applications are for continuous or staple fibre. For these reasons, it seems difficult to extend the results of a study conducted with a single type of technology to the entire fibre industry.