
CISUFLO - Market uptake of the separated materials by the plastics converting sector - Survey Results

Confidential Document (only for survey participants, CISUFLO partners and coordinator)

Polymeric multilayer-structured materials are all extremely difficult to recycle as they are composed of multiple layers, and hence they are landfilled or incinerated at their end-of-life. Therefore, developing a methodology to delaminate/separate polymers from polymeric multi-layered materials is of great importance. Separation of the individual polymer fractions enables subsequent recycling. The novel PolySep process leads to this delamination/separation, and so enables the separation of a polymer bonded to a substrate.

The goal of the survey was to get a better understanding of the potential market uptake of the separated materials by the plastics converting sector. The survey covered topics such as the level of purity for the separated material streams, the expected mechanical properties as well as the maximum allowed contamination level and moisture content for the secondary raw materials.

The outcome of the survey, summarising the results at the EU level, is reported below. The data are aggregated to guarantee confidentiality.

1 Executive summary

The total annual consumption of the European flooring materials market is about 3 billion square meters, of which ceramics account for 34%, carpets 34%, laminate 15%, and vinyl around 10%¹.

The main goal of CISUFLO is to set up the **systemic framework for circular and sustainable 'floor coverings'** in the EU and to minimise the total environmental impact of the sector. 'Floor coverings' comprise textile floor coverings or 'carpet', resilient floor coverings or 'vinyl' and laminates or 'wood'. The systemic framework will allow to align all the steps along the value chain to ensure maximum value retention of the products and the materials for the whole system. At each step, the technical feasibility as well as socio-economic aspects need to be taken into account. At full circular level, data management needs to be ensured.

New recycling technologies for floor coverings are a key enabler to circularity in the EU

Including textile floor coverings, synthetic turf, automotive carpets and other technical applications, the value of the EU production in 2018 was 4,56 billion € (including an exported value to rest of world countries of 1,12 billion €)². Europe is therefore an attractive region for the flooring market; however, an important stepping stone is to address the post-consumer waste stream of floor coverings to ensure appropriate collection and sorting schemes so that product's potential value is maintained.

Different pilots have been implemented in the frame of CISUFLO to demonstrate at EU level the feasibility of the CISUFLO systemic innovations for a thoroughly integrated circular value chain for flooring systems.

2 Survey Outcome

[European Plastics Converters](#) (EuPC), as member of the CISUFLO project, conducted a survey (12 companies responded). The contacted companies are exclusively converters from EuPC and CISUFLO partners' network spread over Belgium, France, Germany, Italy, the Netherlands, Spain and the United Kingdom.



2.1 Composites used in flooring products

The graph below presents the most used polymers to make up composites in the participants' flooring products.

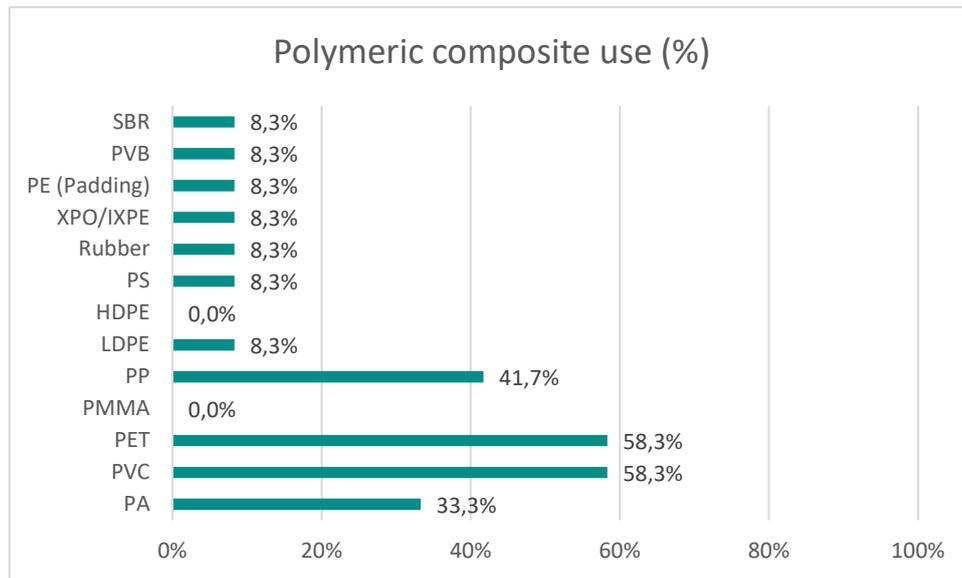


Figure 1. Polymers commonly used in flooring products

According to this outcome, PVC and PET are the most used polymers in the flooring industry. Yet, this data is still far from reality as PMMA is quite a well-spread polymer in the flooring sector although it does not show on the graph.

Table 1 below describes whether the participants' composites contain plasticizers such as phthalates.

ADDITIVES in composites	
Plasticizers presence	66,7% replied YES
	33,3% replied NO
Phthalates presence	33,3% replied YES
	66,7% replied NO

Table 1. Additives presence

2.2 Separation of material composites into constituents

The survey identified that **33,3%** of participants already carry out some sort of separation of material composites into their constituents with a separation rate between 40 and 70%.

2.3 Solvent requirement and physico-chemical properties of separated streams

a) Solvent

According to the survey, although one participant stated that tetrahydrofuran (THF)* is a possible solvent for PVC dissolution, participants would unanimously prefer to carry out separation with a solvent that is REACH compliant, non-hazardous and regenerated after the separation process.

(*) highly flammable liquid and vapour, causes serious eye irritation, is suspected of causing cancer and may cause respiratory irritation³



b) Maximum concentration of residual solvent(s)

According to the participants, the final product must meet indoor air quality values and respect Volatile Organic Compounds (VOC) emission limitations (often below 10 µg/cm³).

c) Purity level

The participants would accept between 80% and 99% purity with a set purity of 85% for PA6 (answer from 2 participants).

d) Moisture content

Although 0,3 wt% max. volatiles is typical for PVC, participants would accept between 0,5 and 10 wt% moisture content in the secondary raw materials.

e) Mechanical properties

According to the survey, participants would expect the same parameters as for virgin materials while bearing in mind that density of powder/chemicals and colour will most likely be different. One participant gave **34-62 MPa** tensile strength as an accurate requirement for **rigid PVC**.

2.4 Secondary raw materials

According to the survey results, **42%** of participants would rather **sell** the secondary raw materials while **58%** would rather **use** them.

2.5 Market price for recycled polymers

Table 2 shows that according to the responses, one can find different market prices for some recycled polymers.

Recycled material	r-PA	r-PVC	r-PVC	r-PVC	r-PET	r-PP	r-PP
Type (if specified)		Flexible	Rigid	LVT material		regular	Black injection moulding
Price range (€/kg)	3-4	0,2-0,3	0,6-0,7	1-1,8	1,5-1,8	0,4-0,6	0,9

Table 2. Recycled polymers price ranges

References

- 1 <https://www.mordorintelligence.com/industry-reports/europe-floor-covering-market>
- 2 [LEADING THE CARPET INDUSTRY TOWARDS CIRCULAR ECONOMY A 2030 STRATEGIC APPROACH, 2020, ECRA](#)
- 3 <https://echa.europa.eu/substance-information/-/substanceinfo/100.003.389>