

Recycling flexible packaging; headache or an opportunity for the circular economy?

Prof. Steven De Meester¹

¹Laboratory for Circular Process Engineering, Ghent University, Kortrijk, 8500, Belgium

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Presenting author email: steven.demeester@ugent.be

In Europe there is around 11 Mt of plastic film available yearly¹. Recycling rates for films are typically lower compared to the average recycling rate for plastic. Currently a disappointing **23% of all waste films is recycled** in Europe². Most of this effectively recycled material is so-called post-production (clean) film or secondary (and tertiary) packaging, typically larger than A4, that was never in contact with any food. Films from household waste are currently rarely recycled in the EU, and if recycled, they are usually downcycled to dark films or to injection moulding applications. With the estimated recycling rate of 23% around 8 Mta of film is currently not recycled in the EU. Why is this?

Within this fraction, it is estimated that up to 20-40% could be multi-layer films³. This fraction is currently difficult or even unsuitable for mechanical/chemical recycling. Furthermore, these multi-layers are also embedded in monolayer film waste bales, as they cannot be separated with high efficiencies in current sorting and recycling plants. This makes the whole film fraction difficult to recycle. Next to the multi-layer issue, conventional mechanical recycling does not separate inks from polymers and as such, mainly dark-coloured pellets are produced after extrusion, for which there is only a limited market demand, for example towards garbage bags or agricultural films. Ink is not only an issue for multi-layers, but also for monolayers, or mono material multi-layers, which often embed the ink between layers. Next to that, there is also the issue of odour, which is potentially solvable for PET streams, but polyolefins, and especially film fractions, are more challenging to deodorise⁴.

In this presentation, this complexity is sketched together with potential ways of how to solve these challenges. This presentation will contain 6 chapters:

1. What is the current state of recycling flexible packaging?
2. Which types of advanced sorting exists and how can they help?
3. How can we improve the current recycling lines of flexible packaging?
4. How can we implement a new step, such as a chemical wash to remove inks and adhesives?
5. What can chemical recycling such as pyrolysis mean for flexible packaging?
6. What are conditions for a circular economy for flexible packaging?

References

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² Karen Laird, "PE flexible film recycling in Europe could more than triple given the right conditions," Sustainable Plastics, Jun-2020.

³ Tartakowski, Resources, Conservation and Recycling 55 (2010) 167, Denafas et al., Green Chem. 20 (2018) 3604.

⁴ M. Roosen *et al.*, "Towards a better understanding of odor removal from post-consumer plastic film waste: A kinetic study on deodorization efficiencies with different washing media," *Waste Manag.*, vol. 120, pp. 564–575, 2020.