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Etma Plastic Tubes Committee
Position Paper on the Recyclability of Plastic Tubes

1. Background

The European Green Deal and Circular Economy Action Plan made commitments to increase the recycling of plastics and therefore reduce the use of virgin materials. All packaging on the EU market shall be recyclable or reusable by 2030 in order to achieve the best possible level of waste prevention and resource efficiency.

As part of its plastics strategy, in 2018 the EU doubled its previous plastic-packaging-waste recycling target from 22.5 percent (meant to be achieved by 2008) to 50 percent by 2025 and 55 percent by 2030.

2. Assets of plastic tubes for better resource efficiency and sustainability

Plastic tubes are contributing to a high level of resource efficiency because

- they are a light-weight packaging and offer a better packaging weight to filling volume ratio compared to other packaging such as bottles
- their weight has been considerably reduced over the years
- they allow a high restitution rate
- they protect the filled product and thus avoid product/food waste

Packaging in general should not be downgauged without proper consideration of shelf-life and product protection requirements because much more energy resources are contained in the packed product compared to the packaging.

Life Cycle Assessments (LCA) can be a helpful tool to assess a product's sustainability performance and to optimize the design for recycling.

3. Recyclability of plastic tubes

A high recyclability of plastic tubes needs to be ensured by consistent design for recycling of packaging and requires an efficient post-consumer collection, sorting and recycling infrastructure.

3.1 Design for recycling

Consistent design for recycling means that plastic tubes (including shoulder and caps) should consist of only one material, if technically feasible and functionally reasonable. Material mixes are possible as long as they do not impede the recyclability of the tube in existing waste management systems. Plastic tubes shall be designed so that they comply with the sorting requirements for rigid PE or PP containers. In addition, masterbatches/varnishes/inks should be used which do not hamper the tube's recyclability.

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Some of the main design for recycling recommendations for full material recycling compatibility of PE and/or PP tubes are as follows:

- Mono-material design preferred (e. g. PE body and PE/HDPE cap or PP body and PP cap)
- Ideally, tube body, shoulder and cap consisting of more than 90% of PE or PP
- With PE tubes, HDPE in contrast to LDPE/LLDPE to be maximized, ideally more than 50% of the total weight of body, shoulder and cap
- PP caps also allowed on PE tubes under certain conditions
- EVOH barrier material content maximum 5 % of the tube material weight, including body, shoulder and cap
- Tie layers are considered as grafted polyethylene (polyethylene-grafted maleic anhydride preferred)
- Light-color masterbatches preferred
- Direct printing with non-toxic inks following EuPIA Guidelines (minimized surface coverage preferred)
- Amount of pigments and fillers only to extent that density of total tube material <0.970 g/cm^3
- Liners in caps and applicators PE-based (for PE tubes) or PP-based (for PP tubes)
- Tamper-evident ABL/PBL foils allowed on PE/PP tube shoulder (removed by end consumer before use)
- Metallization of caps and applicators only allowed, if near-infrared (NIR) detection is not affected
- Tube diameter should be >=16 mm (below only limited recyclability given mesh size in sorting plants)

3.2 Collection, sorting and recycling infrastructure

Besides a consistent design for recycling, consumers' willingness to separate their household waste and an efficient infrastructure for collection, sorting and recycling is required in order to achieve high-quality recycling of plastics. A corresponding consumer education and investment in state-of-the-art collection/sorting/recycling technology is paramount.

The designed tube needs to be compatible with these state-of-the-art infrastructure's requirements. In this context the EU Commission is pushing in its Circular Economy Action Plan for a harmonization of Extended Producer Responsibility systems in Europe to implement efficient collection and sorting schemes across the EU to allow for a comprehensive recycling of materials. Modern technologies such as NIR detection or future marking technologies under development are needed to efficiently sort plastic packaging materials.

Several organizations such as Plastics Recyclers Europe (PRE), American Plastic Recyclers (APR) or the MORE Recycling initiative in Europe and the US have analyzed the existing recycling infrastructure and are developing industry guidelines which lay down requirements for the recyclability of plastic tubes in existing waste management systems. In Europe, for example, PRE's RecyClass guideline is widely accepted. In the US APR have published the paper "Plastic Squeeze Tubes Design Resource Document - HDPE and PP Based Tube Packaging" in August 2020.

The design for recycling recommendations in chapter 3.1 were derived on the basis of these guidelines and should secure PE and PP tubes' compatibility with the recycling requirements of existing waste management systems.

Also bio-ethanol based plastic materials (e.g. sugarcane-PE) can be handled in existing recycling streams, whereas bio-degradable and oxo-degradable plastic materials should not be used because they impede the quality of the sorted plastic packaging fraction.

4. Conclusion

Plastic tubes are a resource efficient packaging and fully recyclable, if certain design for recycling criteria are fulfilled, consumers properly separate their household waste and a state-of-the-art collection, sorting and recycling infrastructure is in place.

5. Disclaimer

This document must be considered as a living document which needs updating in case of changes to the guidelines mentioned.