Carbon Footprint Calculation from the Life Cycle Assessment of Post-consumer Recycled Polymers at PreZero

Carbon footprint of recycled polymers at PreZero Polymers Austria GmbH

- **Recycled PS: 885 kg CO_2-eq./t regranulate**
- **Recycled PP: 698 kg CO_2-eq./t regranulate**
- **Recycled HDPE: 769 kg CO_2-eq./t regranulate**
- **Recycled MPO: 769 kg CO_2-eq./t regranulate**

The values apply to unadditivated granulates made from 100% post-consumer lightweight packaging waste. A carbon footprint of approx. 2000 kg CO_2-eq./t is often given as a reference value for fossil plastics from virgin material, which is more than double that of PreZero's recyclates. Exemplary recipes of additivated granulates were additionally assessed and can be requested from PreZero in the long version of the study.

Fraunhofer UMSICHT conducted a life cycle assessment (LCA) of the mechanical recycled granulates at PreZero Polymers. The study was carried out in accordance with international standards for LCA methodology as described in ISO 14040/44. This document summarizes the key points of the LCA and shows the results in terms of the carbon footprint of the recycled polymers.

Goal of the study: The aim was to quantify the carbon footprint of four recyclate types (PP, PS, HDPE and MPO) from post-consumer waste (PCW) from lightweight packaging collection and partly post-commercial waste including required additives from mechanical recycling at PreZero in Haimburg.

Intended application and audience: Besides internal learnings, the results can be disseminated to clients. For further use, e.g. in greenhouse gas balances, the respective modelling requirements shall be checked in detail.

The geographic and temporal scope: The sorted bales for the mechanical recycling process originates from different European countries. The recycling takes place in Haimburg (Austria) for the reference year of 2022.

Product systems studied and technical representativeness: The investigated mechanical recycling technology aims to handle typical European post-consumer sorting fractions containing HDPE, MPO, PP, and PS in an industrial scale (status quo).

System boundary and functional unit: The system starts with the collection of burden-free PCW from lightweight packaging and/or commercial waste to the extrusion of the (additivated) regranulates including transportation and commercial sorting. The functional unit is the production of 1 ton regranulate including required additives.

Data requirements and sources: Data quality requirements of ISO 14044 and other frameworks are followed to the best of our ability. Primary data is collected for the mechanical recycling process at PreZero and if missing, secondary and data is approximated. Background data is taken from with the latest available data sets using the commercial LCA software "LCA for Experts"(version 10.9 ; database content 2025.1).

Handling multi-functionality: PCW is considered burden-free. Pre-sorted plastic bales are allocated on a physical basis considering the recyclable content to account that some outputs may be partly co-products and partly waste. The avoided burden approach (system expansion and substitution) is applied to recovered energy from the treatment of residues and metal scrap from demetallization process.

Impact assessment method: The impact of climate change is calculated according to IPCC AR6 (without biogenic CO_2) from the Product Environmental Footprint Method (version 3.1).

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