

PolyMac

Publieke samenvatting / Public summary

Aanleiding

From 2030 onward, all plastic (food) packaging in the EU must contain a minimum amount of recycled material as defined by the Packaging and Packaging Waste Regulation (PPWR). Currently, besides PET containers, most plastic food packaging is made from polyolefins due to their cost efficiency and resource optimization. However, the European Food Safety Authority (EFSA) has not issued a positive opinion on any mechanical recycling process for polyolefins to be used in direct food contact. The cleaning efficiency of mechanical recycling is often not high enough to remove all contaminants. Without viable technical solutions to produce safe, food-grade recycled polyolefin resins, the industry will face significant challenges. If such solutions are not developed, a considerable portion of the European food packaging sector may be forced to shift to alternative raw materials, disrupting well-established, optimized packaging technologies. This shift could have unpredictable consequences for overall environmental performance, making the development of approved recycling solutions with high cleaning efficiency a critical priority.

Doelstelling

ALPLA has developed a patent-protected technical approach ("PolyMac") to purify recycled high-density polyethylene (rHDPE) with an organic solvent, which demonstrates excellent molecular cleaning: low molecular weight components incl. all relevant contaminants are removed nearly completely. Based on the lab scale findings (up to 20L scale) a technical concept has been designed. ALPLA and NTCP will build a pilot plant in

Projectinformatie / Project information

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Algemene informatie / General information

Penvoerder / Secretariat

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Heerenveen, the Netherlands for solvent-based recycling of HDPE using the PolyMac technology. Operation in batch mode will be used to evaluate the chosen technology for every single process step in the core cleaning technology and the auxiliary process (e.g. solvent recovery). Subsequently the line will be adapted to a continuous mode, including integrated solvent-recovery, reaching a production capacity of 200 kg/day (TRL 7). The product will be tested in application trials. Construction and operation of the pilot plant will provide the information and experience to prepare a design of an industrial scale demonstration plant for food-grade HDPE recycling. Estimated CO₂-reduction: 1,9 kg CO₂ eq/kg product with respect to virgin HDPE production.

Korte omschrijving

ALPLA and NTCP will build a pilot line for the PolyMac technology. The line will be operated batch-wise (10 kg/day) in an ATEX-proof box-in-box. The chosen equipment will be evaluated in an iterative fashion addressing technical bottlenecks. Produced rHDPE will be analyzed and the cleaning efficiency in relation to process parameters evaluated. Then, the line will be adjusted to allow continuous operation (200 kg/day) and integrated with a solvent recovery loop, enabling a fully circular process. Once a stable process has been reached decisive parameters, preferable settings, establishing safe process windows and control variation in product quality are addressed. The continuous line will be used to produce rHDPE to be taken forward in compounding and application tests as milk jars (externally and/or internally). NTCP will characterize various feedstocks in relation to the recycling process. The pilot line will be used to collect the information necessary to substantiate an application for EFSA approval and as the starting point for the engineering design of the demonstration plant. Further adaptation will make the pilot suitable for alternative (non)-packaging materials.

Resultaat

The project will have the following results: 1. Batch

pilot plant (10 kg per day) for solvent-based recycling of food-grade HDPE in an ATEX- proof box-inbox at NTCP in Heerenveen; 2. Operational pilot plant (200 kg/day) for solvent-based recycling of food-grade HDPE (TRL7), also to be used for alternative (non)-packaging plastics; 3. Best technology identified for each process step; 4. Implementation of a closed loop for solvent recovery and information on energy and solvent consumption and waste generation in a continuous operation; 5. Knowledge of preferable parameter settings and safe process windows; 6. Information on accumulation trends for certain substances in the solvent cycle; 7. Production of sample material for development of the compounding concept; 8. Identification of preprocessing conditions suitable for various input streams for solvent-based recycling; 9. Demonstration of the processability of recycled HDPE into new bottles; 10. Experience and data for the design of an industrial demonstration plant; 11. Substantial evidence and data to support an application for food-approval of a novel technology (EFSA).

De data in deze applicatie is afkomstig van de Rijksdienst voor Ondernemend Nederland (RVO) en wordt in samenwerking met de Topsector Energie ontsloten.

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