



Life PlasPLUS - Recycling of high-quality secondary thermoplastics and critical raw materials coming from mixed WEEE and EoL vehicles

LIFE18 ENV/BE/000368

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Project description:

Background

Thermoplastics constitute a continuously increasing fraction of the overall growing plastic waste in Europe. In 2016, more than 26 million tonnes were consumed in sectors including the automotive and electrical and electronic equipment (EEE) sectors. Alone, these two sectors account for almost 15% of the total consumption of plastics in Europe. Decreasing the dependence of these fast-growing sectors on virgin plastic by using secondary thermoplastics will curb energy, water and resource consumption and reduce landfilling in Europe, a practice already phased out in nine European countries and discouraged by the EU legislation.

Properly separated thermoplastic streams could result in a much higher-value output, but state-of-the-art recycling processes fail to do this. Factors include the difficulty in obtaining economies of scale, low current processes yield (about 50%), and the presence of additives such as fillers or flame retardant substances such as bromine and antimony. As a result, secondary thermoplastics derived from shredder residues from waste EEE (WEEE) and end-of-life vehicles (ELV) cannot meet the high-quality specifications required by the automotive and electronics industries.

Objectives

LIFE PlasPLUS aims to provide a complete solution for the economic recovery of thermoplastics and by-products, starting from a heterogeneous mixed plastic feedstock (ELV and WEEE) and resulting in high-quality raw materials for the automotive and EEE sectors.

The specific objectives are:

- demonstrate the feasibility of recycling 45% of the plastic concentrate

handled by the Comet Traitements plant into added-value thermoplastic streams by scaling up a new froth flotation/triboelectricity demonstration unit;

- achieve a scale up of the current prototype from batch production of 150 kg/h with technology readiness level (TRL)6 to pre-commercial level of continuous production at 1 500 kg/h at TRL7. This will process >98%-pure polystyrene (PP), filled polypropylene (FPP) and acrylonitrile butadiene styrene (ABS) regrinds;
- adapt a sensor-enabled separator that can detect flame retardant plastics (FRPs) [250 kg/h throughput] and separate fibre-reinforced plastic at 250 kg/h;
- substitute >40% virgin thermoplastics with secondary ones in three new secondary compounds for the automotive and EEE markets;
- validate the quality of the produced compounds in three standard vehicle parts and in flame retardant batches for the EEE sector;
- showcase a closed-loop production for the valuable flame retardant element (Sb₂O₃), also validating its flame retardant performance in recycled plastics;
- conduct life cycle analyses and socio-economic analyses to confirm the environmental benefits and techno-economic soundness of the concept; and
- develop a replication and transfer plan as a sustainable business model for other facilities around Europe.

LIFE PlasPLUS will contribute to the Directive on waste electrical and electronic equipment, the End-of life vehicles Directive and the Landfill Directive. It will also support the EUs action plan for the circular economy and strategy for plastics in a circular economy.

Results

Expected results:

- an industrial froth flotation/triboelectricity unit is integrated at Comet Traitements facilities treating mixed plastic (lightweight, non-brominated);
- continuous plant operation which will recover around 40% ABS, around 30% PS and around 20% FPP regrinds in a purified, market-ready state;
- a one year demonstration period will result in over 920 tonnes of high-quality thermoplastic recycled product diverted from downcycling, cut over 1 kilotonne CO₂ eq. of greenhouse gas emissions, and save over 600 000 m³ of water and 8 850 MWh of primary energy;
- a validated automatic sorting process which uses artificial intelligence and rapid, non-destructive analytical techniques with a scalable sorting technology which builds a database of plastic compositions and training algorithms;
- separate approximately 16 tonnes of flame retardant-containing plastic, leaving 100 tonnes per year of plastic waste which can be further sorted, recycled and used for energy production;
- a first-of-a-kind pilot demonstration of Sb recovery from WEEE-derived waste, including extensive product characterisation (Sb₂O₃/ATO) and validation in flame retardant batches; and
- demonstration products containing at least 40% recycled plastic and recovered Sb.

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Environmental issues addressed:

Themes

Waste - Packaging and plastic waste

Waste - Waste recycling

Waste - End-of-Life Vehicles (ELV's) and tyres

Waste - Waste from Electrical and Electronic Equipment (WEEE)

Industry-Production - Electric - Electronics - Optical

Keywords

recycling, electronic material, alternative technology, by-product, water saving, energy saving, waste treatment, plastic waste, vehicle

Target EU Legislation

- Waste
- COM(2015)614 - "Closing the loop - An EU action plan for the Circular Economy" (02.12.2015)
- Directive 2012/19 - Waste electrical and electronic equipment (WEEE) (04.07.2012)
- Directive 2000/53 - End-of life vehicles (18.09.2000)
- Directive 1999/31 - Landfill of waste (26.04.1999)

Natura 2000 sites

Not applicable

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Beneficiaries:

Coordinator

Comet Traitements SA

Partners

CRF(Centro Ricerche Fiat S.C.p.A), Italy
ULI(Université de Liège), Belgium
SER(SERI PLAST SRL), Italy
CAM(Campine), Belgium

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Administrative data:

Project reference	LIFE18 ENV/BE/000368
Duration	01-JUL-2019 to 30-DEC -2022
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EU contribution	1,430,450.00 €
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