



LIFE AUTOPLAST Project

Recycling of special plastic waste from the automotive industry



waste management

recovery of waste

PROJECT DESCRIPTION

Disposal of vehicles in the European Union generates, every year, between 7 and 8 million tons of waste, which must be properly managed. The management of this waste is regulated by the European Directive 2000/53/ EC, modified by the EU Directive 2017/2096, which sets the ambitious goal of recovery and reuse of 95% of the material emerging from the treatment of end-of-life vehicles (ELVs). Nowadays, the recycling of the materials that make up the car tanks (HDPE - High density polyethylene) encounters various difficulties. First of all, during the recycling process, it is not possible to preserve (if not minimally) the properties of the material that make it suitable for the most types of use. Moreover, the hydrocarbons present in the fuel are absorbed, over the years, by the surface of the tanks, causing difficulties in the recycling. In fact, the plastic containing hydrocarbons (which can be present in quantities up to 2% of the total weight of the tank) recycled without purification and subsequently used in injection or extrusion molding processes, frees the absorbed hydrocarbons, generating environmental problems, odors and contributing to the degradation of the final products (such as, for example, pipes).



OBJECTIVES

In this context, the AUTOPLAST project had the aim of:

- developing and implementing a system for the recovery of special plastic waste from end-of-life vehicles, through the construction of an industrial-scale pilot plant based on an innovative technology;
- developing, as a replicable model, a selective collection system for plastic waste in the province of Brescia.

The project focused on the recycling of plastic materials deriving from tanks and bumpers of end-of-life vehicles, producing, on the specifically constructed treatment line, HDPE and PP granules.

PROJECT PHASES

The following actions were implemented within the project:

- **preparatory actions:** determination and inspection of the installation site of the pilot plant and submission of the application for the necessary authorizations; selection of the product and service suppliers;
- **design of the pilot plant,** conceived for the recovery of polypropylene bumpers (PP) and HDPE tanks. The innovative treatment of HDPE materials involves the use of sodium bicarbonate and coffee grounds in order to neutralize odors and obtain higher quality materials;



- **construction and start-up of the pilot plant** (by revamping an existing line);
- **validation and optimization of the technology and evaluation of the plant's performance.** Concerning HDPE materials, 3 processes have been evaluated:
 - Process 1: production of HDPE granules by extrusion of a material composed of 90% virgin HDPE and 10% material obtained from the tanks' treatment (traditional process); the material obtained is then sent to a phase of injection molding for feasibility and quality test of the final product.
 - Process 2 (innovative): production of HDPE granules by extrusion of a material composed of 70% virgin HDPE and 30% material obtained from the tanks' treatment. As in the previous test, the material obtained is subsequently sent to an injection molding phase to check the feasibility and quality of the final product.
 - Process 3 (innovative): production of HDPE granules composed of 70% virgin HDPE and 30% extruded material obtained from the tanks' treatment. In this case the virgin HDPE is not extruded together with the recycled material to avoid the double processing (in the subsequent injection molding phase) and therefore the degradation of the material.
- **development / preparation of the auxiliary material collection networks** (coffee grounds) used in the process;
- **promotion and planning of the plastic waste collection system and network from end-of-life vehicles**, specially bumpers. This action includes a pre-treatment (selection and volume reduction) of the waste at the collection plant, in order to optimize the subsequent transport to the treatment plant;
- **development of a network of end users.** Pilot users were selected to test the HDPE granules produced by AUTOPLAST by injection molding in different configurations; moreover agreements were signed with 10 potential users interested in the use of the material;
- **assessment of the environmental impact** of project actions using the Life Cycle Analysis (LCA) tool. Life cycle analysis is applied to quantify and assess the environmental impacts associated with new recycling technologies developed during the project. A **study** was developed for each alternative configuration in the supply chain (Figure 1);
 - comparison of the different bumper treatment scenarios (PP): Incineration, landfill disposal and the AUTOPLAST process: micro-collection + recycling;
 - comparison of the different HDPE granule production systems (virgin HDPE, HDPE composed of 10% material recycled accordingly to traditional processes, HDPE composed of 30% material recycled accordingly to the AUTOPLAST process);

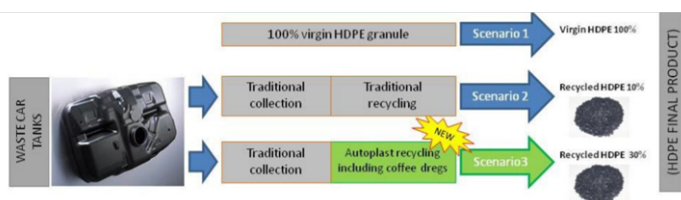


Figure 1. Scenarios considered in the LCA study for the treatment of bumpers and for the production of HDPE granules starting from the tanks (below)

- **evaluation of the most cost-effective alternative** considered in the LCA. This analysis was developed using the Life Cycle Costing (LCC) tool;
- **evaluation of the socio-economic impacts of the project.**

PROJECT RESULTS

The pilot plant was built in order to ensure a processing capacity of **400 tons of plastic material** for the whole project duration. AUTOPLAST has also led to the development of a **door-to-door collection network** through more than **200 agreements** with coachbuilders in the province of Brescia and neighboring areas, who were also involved in training and information activities. 160 tons of PP were withdrawn from the micro-collection network. The pre-treatment of the waste at the collection plant has allowed a **80% reduction in transport to the treatment plant**. Regarding micro-collection, a **manual** was drawn up describing the



transport, selection and volume reduction of waste.

The pilot plant made it possible to demonstrate on an industrial scale the effectiveness and sustainability of the innovative recycling treatment which, through the use of sodium bicarbonate and coffee grounds, makes it possible to neutralize the odors of waste coming from HDPE tanks and get a **higher quality final material**.

In order to obtain HDPE granules, the materials coming from the treatment plant are mixed with “virgin” granules. Thanks to the developed treatment, the **recycled material can be mixed with the virgin one up to 30% compared to the maximum of 10% in traditional processes**.

The **environmental impact study** carried out by LCA has shown that the treatment scenario of HDPE tanks proposed by AUTOPLAST, which foresees the use of a 30% recycled material inside the granules, is characterized by lower impacts on climate change (CO2 emissions) compared to other considered options. The results of the study indicate that further improvements could be achieved by further optimizing the quantity of recycled materials and reducing, where possible, transport and energy consumption.

Concerning the environmental impact assessment of the PP bumper recovery, the LCA results - based on comparison between waste management by incineration, disposal in landfill or recycling -, show that the AUTOPLAST scenario (micro-collection and recycling) involves the lowest environmental impact.



Acronym
 AUTOPLAST

Number of reference
 LIFE13 ENV/IT/000559

Reference Programme
[LIFE](#)

Beneficiary Coordinator
 VALSIR S.P.A.

EU contribution
 1.230,048

Call Year
 2013

Start Year
 2014

End Year
 2018

Beneficiary headquarters

Località Merlaro, 2
 25078 Brescia BS
 Italy

Region
 Lombardia

Description



Lombardia