RECOVERY OF NON-RECYCLABLE PLASTIC WASTES TO OBTAIN CHEMICAL PRODUCTS

Eva Verdejo, *Head of Sustainability and Industrial Recovery at AIMPLAS*

Plastics remain one of the key materials in our society. They can be found in all the application sectors due to their benefits, ease of design, processability and cost. The most representative sectors are packaging, construction, automotive and electrical-electronic.

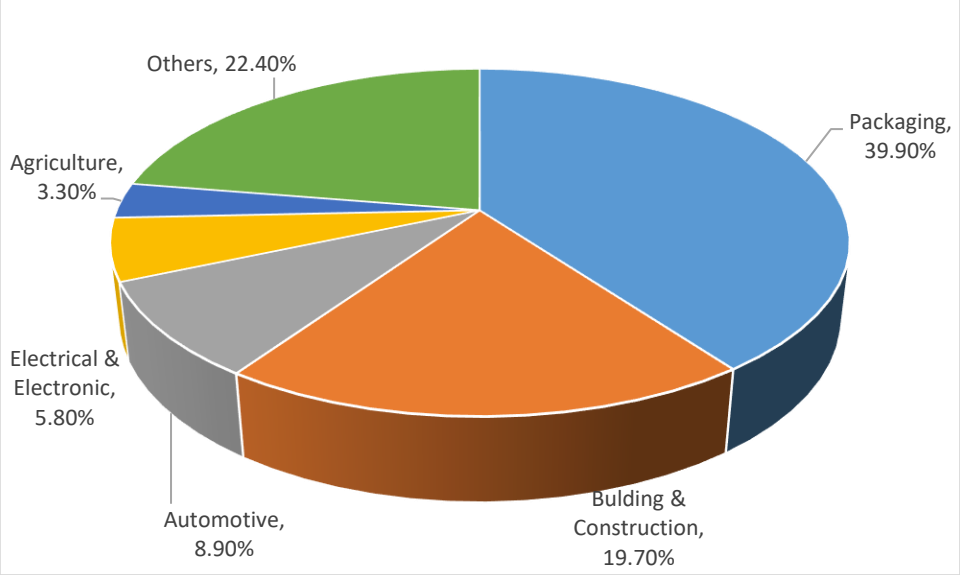

Figure 1. Distribution of European (EU-28+NO/CH) plastics demand by segment in 2015. Source: Plastics Europe.

Many of the plastic materials are intended for consumer goods, thus reaching the final consumer, who throws them away after their use, so a waste is generated. As the consumption of plastic materials keeps growing, the generation of waste increases progressively, too. On many occasions, products are not designed with ecologic and ecodesign parameters and many of them are currently considered non-recyclable.

The term 'non-recyclable' is very relative, since there are standards talking about recyclability, mainly of packages (*UNE-EN 13430:2005 Packaging - Requirements for packaging recoverable by material recycling*). This non-recyclability depends not only of the product, but also on whether management systems exist for each type of product. If there is a management system in place, this 'non-recyclability' becomes less relevant and the recycling quality becomes more important. Most of the plastic materials and, therefore, their products can be considered recyclable. But with products manufactured with different plastics, while they may be recyclable, the final quality of the recycled material is so low that there are not appropriate applications having characteristics demanded by the market. In contrast with this approach, alternatives will become relevant in coming years.

Besides this technical aspect, there is an economic factor: the low cost of landfilling in many countries that, among other considerations, make 30.8 % of post-consumer plastic waste end up in landfills in Europe.

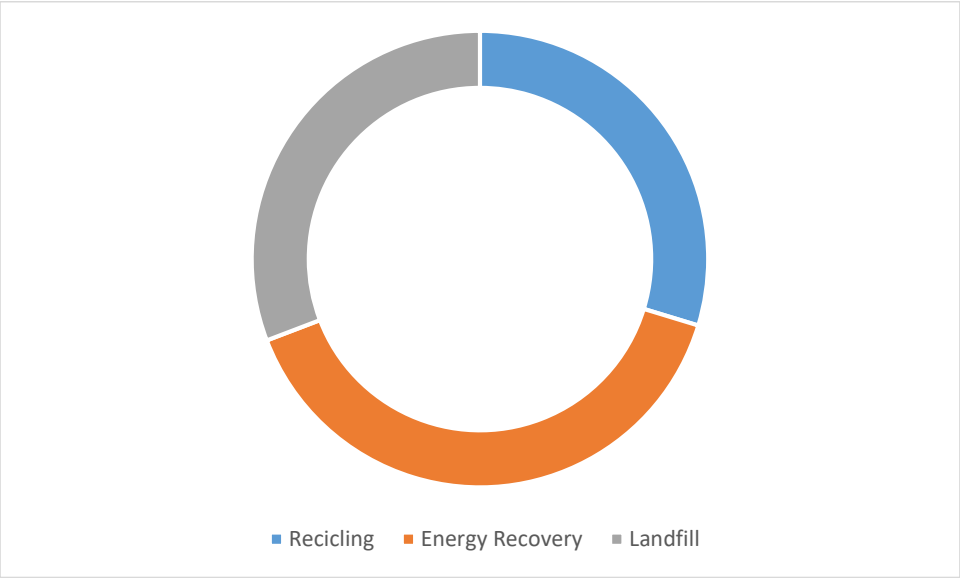

Figure 2. Plastics waste treatment in EU28+2, 2014. Source: Plastics Europe.

These figures are very large and represent a loss of resources and a linear economy, in contrast to a circular economy, where wastes are resources to be used in the same or different cycle than the one they come from but always with the highest hierarchical value.

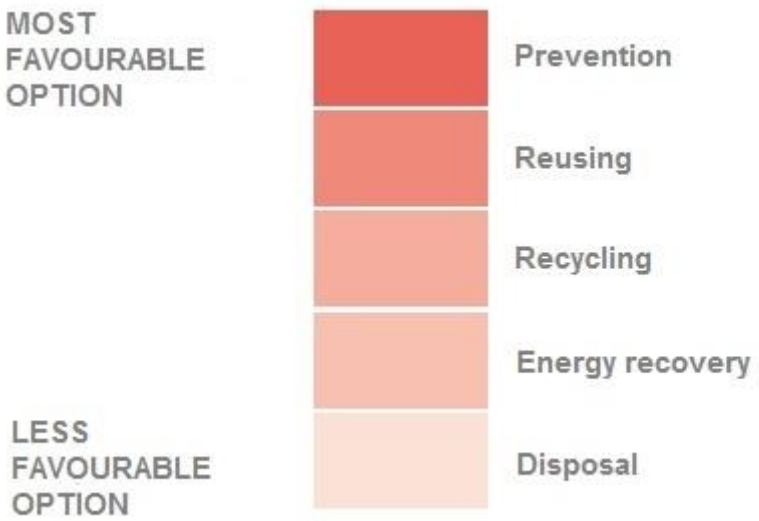

Figure 3. Waste hierarchy. Source: CICLOPLAST- AIMPLAS

Among these wastes ending in landfills, we find mixed wastes, which have not been separated or re-used and come from two key sectors: the automotive and electric-electronic. There are also other residues from the recycling plants themselves that initially came from waste from the packaging sector and the recycler has not found a material with the sufficient quality to have a market.

We should avoid putting these wastes in landfills. For that reason, it is important to work on eco-design solutions, mechanical recycling improvements and their applications and valorization solutions, as a complement to traditional mechanical recycling.

Within the framework of this last aspect, the project LIFE ECO-METHYLAL (LIFE15 ENV/ES/000208) "*High quality methylal from non-recyclable plastic waste by an improved Catalytic Hydro-Gasification Plasma (CHGP) process"* is presented. This project, coordinated by AIMPLAS, the Plastics Technology Centre, has as partners the following companies: 1) ACTECO, Productos y Servicios S.L.; 2) AIRESA, Agencia de Intermediación de Residuos y Soluciones Ambientales S.L.U.; 3) Blue Plasma Power S.L. (BPP); and 4) MI-PLAST. This project, with a Spanish-Croatian consortium, will demonstrate that these wastes, initially non-recyclable, can be recycled chemically to obtain a product such as methylal, which can be used in the chemical industry. The process through which the valorization is performed is Catalytic Hydro-Gasification Plasma (CHGP) and will represent a reduction of environmental impacts associated with landfill waste disposal and fossil-based chemical products.

Figure 4. Logo of the project LIFE-ECOMETHYLAL (LIFE15 ENV/ES/000208).

WWW.LIFE-ECOMETHYLAL.EU info@life-ecomethylal.eu

In this project, there is a transferable and replicable solution for Europe that is technically, environmentally and economically viable.

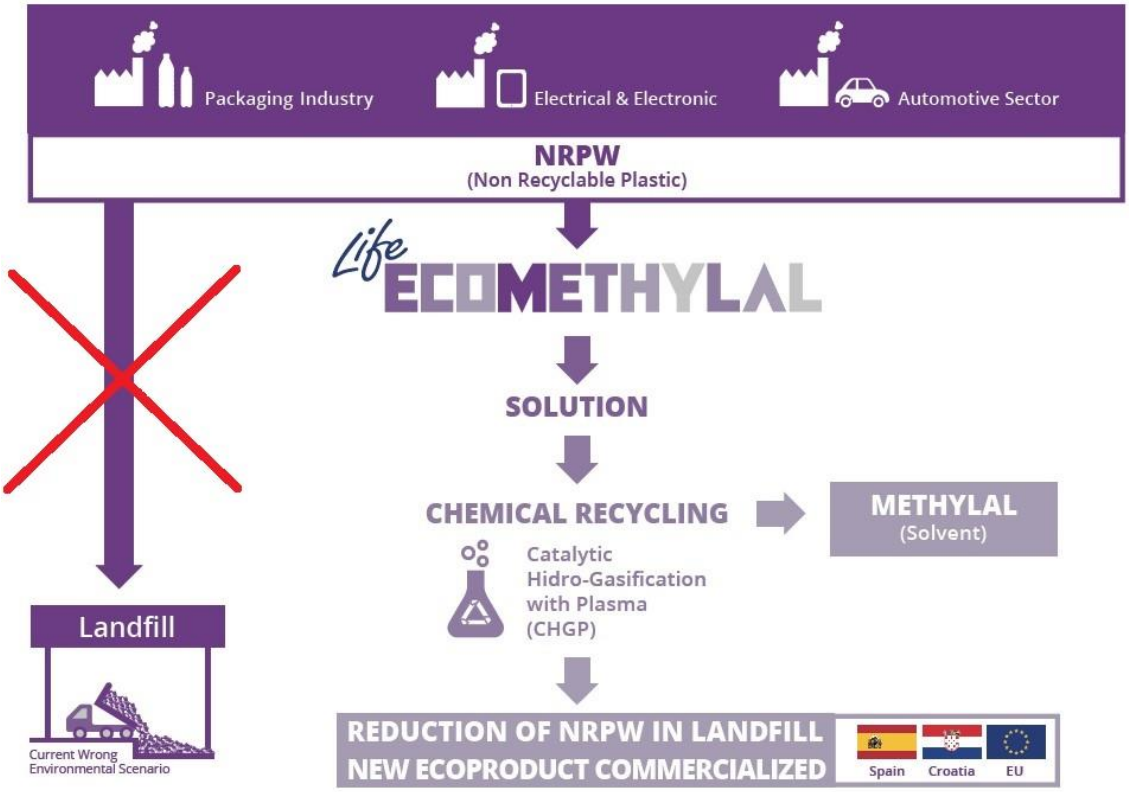

Figure 5. Project's infographics

CHGP technology is a patented development that, in this case, is applied by means of the construction of a pilot plant with a small treatment volume (10-15 kg/h), thus demonstrating that large waste throughputs are not needed, as is the case with other technologies complementary to mechanical recycling, such as energy valorization. It is also a modular and transportable unit, as shown in the project, since it will be manufactured at BPP's facilities and transported to ACTECO (Spain). Then, MI-PLAST (Croatia) will test it with the different characteristic wastes and provide demonstrations to the plastics, waste management and public sectors, with the aim of verifying its operation and effectiveness.

As a result of this valorization, methylal will be obtained. It is a chemical substance used in different sectors, such as the chemical, plastics and automotive industries. This substance could be fossil-based, but since it is based on waste that currently does not have a commercial outlet, it involves a considerable reduction of environmental impact.

This solution, and the project LIFE-Ecomethylal in general, contributes to implementing the roadmap of a resource-efficient Europe, the circular economy action plan, the packaging and packaging waste directive, the directive on electric and electronic equipment wastes, the end-of-life-vehicle directive, the waste framework directive and the landfill directive.

The project partners forecast installing at least 15 industrial plants in Europe within five years of the completion of the project. This will allow the treatment of a total of 114,000 metric tons of plastic each year, yielding 91,200 tons of methylal. These plants will also make it possible to save 74,400 tons of CO_2 emissions and 3,400 million megajoules of energy each year.