

COLLECTION AND RECYCLING OF EXPANDED POLYSTYRENE (EPS) IN THE URBAN ZONE OF VALLADOLID – LIFE COLRECEPS

A. Aguado¹, E. Pérez²

¹CARTIF Centro Tecnológico, Parque Tecnológico de Boecillo 205, Boecillo, Valladolid, 47151, Spain

²TURQUEPLAST, Calle Turquesa 15, Valladolid, 47012, Spain

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Presenting author email: aliagu@cartif.es

Expanded Polystyrene (EPS) is a plastic material used in several sectors such as packaging or building. It is used in packaging, as a food tray, due to its hygiene, isolation, lightness and resistance. However, one of the most important issues is its recycling since EPS is a petroleum product and therefore not biodegradable.

Nowadays in Spain, 80% of the EPS waste finishes up at landfills (about 32000 tonnes/year), and the remaining 20% is recycled. The amount of EPS waste that was generated in Europe in 2010, according to data obtained from CMAI (Chemical Market Associates) was 1.6 million tonnes. In order to valorise and close the life cycle of these waste so as to make a good use of them in industry, LIFE COLRECEPS Project will solve the environmental problem due to the accumulation of big amounts of EPS wastes in landfills, being not biodegradable and occupying large volume because of its low density.

LIFE COLRECEPS Project (LIFE ENV/ES/000754) aims to the implementation of a demonstration pilot plant for the recycling of EPS waste to obtain new pearls of EPS. These pearls will be used to manufacture new products based on recycled EPS. The duration of the project is 45 months with completion on 30/06/2017.

LIFE COLRECEPS Project expects to reduce more than 50% of the EPS waste in landfills as well as to close its life cycle and to valorise it, giving and added value to this waste, manufacturing new products based on EPS recycled to be further used in the industrial sector.

LIFE COLRECEPS Project will also fulfil with environmental policy and legislation of the European Union through the implementation of Directive 2008/98/EC on waste management, reducing waste in landfill and increasing recycling in a more environmentally sustainable.

The technical actions of the project more important are the next:

- *Obtain a reliable and detailed data of the amount of EPS waste generated in the urban zone of Valladolid.* It has carried out a statistical analysis of the production of EPS waste generated in Valladolid, which it has built a reliable database being pioneered in the knowledge of the conditions of EPS waste production generated in the Valladolid area. The sectors studied are construction, shopping center, industrial, median, small and big distribution, and end users. The Figure 1 shows the results obtained.

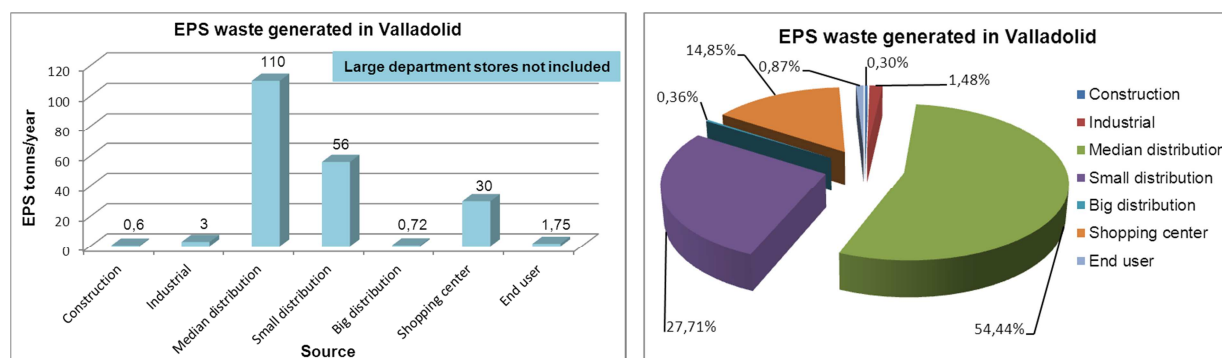


Figure 1. EPS waste generated in different sectors in Valladolid.

- *Develop an optimized logistic model for the collection, storage and transportation of EPS waste.* The logistic alternatives studies (environmental and economic) have taken into account several types of collection, such as a) the daily direct collection, b) collection using reverse logistic process, or c) collection by waste managers. The total volume of EPS waste to collect is from 90.4 m³/day. Considering an average density of waste of 8 kg/m³, 723.2 EPS waste kg/daily must be accessed. The both economically and environmentally more favorable alternative has been provided through collecting waste managers, as shows a summary in the Table 1. These waste managers collect the waste in the concentration center of the distribution company, where a light compaction will be carried out, reaching a density of 20 kg/m³. Then, the waste are subjected a second compacted process achieving a density between 250-700 kg/m³. The final form of the waste is a briquette of high

density which could be palletized for its transport to a final destination. These compacted wastes could be included directly in the recycling plant of the LIFE COLRECEPS Project.

Table 1. Comparison between different logistic alternatives.

Alternative	Total distance (km)	Total time (h,min)	Costs (€/kgEPS)
a	62.80	18h 15min	0.45
b	315.60	10h 13min	0.44
c	19.60	2h 46min	0.34

○ *Design and construction of a demonstration pilot plant of EPS waste recycling.* This recycling plant will recycle 500 kg/day of EPS waste. It consists basically on a grinder to chop the waste to be recycled to a suitable size (approx. 1 cm). This material then pass through an extrusion and pelletizing (150 kg/h) to achieve compact EPS pearls ready to be introduced into a reactor of 2 m³ where they are injected an expanding agent. In the Figure 1 can be seen a scheme of the recycling process. Thus EPS pearls obtained may be processed in conventional EPS, with which any type of product could be manufactured fulfilling all the minimum quality requirements for the sector in which they are to be introduced.

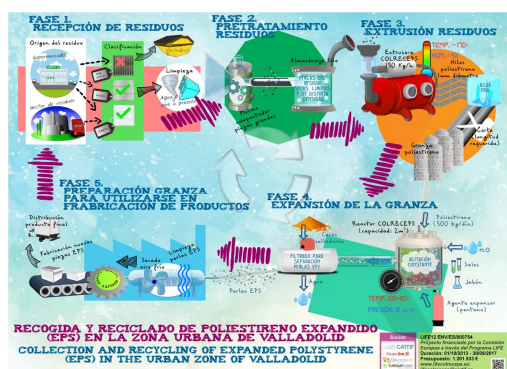


Figure 2. Scheme of the EPS recycling process.

○ *Design and manufacture of recycled EPS prototype.* The recycled EPS obtained will have a quality enough to be used as raw material for the manufacture of packaging boxes. It is obtained 0.8 kg of EPS pearls/kg of EPS waste recycled, so this supposes 400 kg EPS/day. A new mould to manufacture specific products for packaging sector has been designed and constructed (see Figure 2). These new products will be analysed to check if they meet all the requirements needed to be used. In addition, they will be designed specifically for the consumer with better properties than those usually used.



Figure 3. Designed mould (left) and EPS recycled prototype (right).

These expected results are for a medium sized urban area such as the city of Valladolid, which is expected to act as a model city and the success of the LIFE COLRECEPS Project promotes the export of the recycling process in European cities of similar characteristics after finishing this project.