

**O 18. RECYCLING TECHNOLOGIES OF POLYMERIC MATERIALS FOR
IMPROVEMENT OF THE ENVIRONMENTAL IMPACT IN ALBANIA**

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ABSTRACT: Management of polymeric waste is an important problem in the Republic of Albania due to their environmental impact. Most of the problems comes from polymeric materials that have been buried and burned in the landfill. During the last decade the percentage of the polymeric waste have been grown rapidly in the overall municipalities of Albania due to the increasement of the consumer usage of polymeric products. Based on it, our government recently have implemented the law for supporting recycling technologies and reducing the environmental impact that comes from polymeric materials waste management. Our research work will be focused will be focused on the state of art of the most implement recycling technologies for polymeric materials in the Republic of Albania.

Keywords: *Waste Management, Polymeric Materials, Environmental Impact*

INTRODUCTION

Nowadays, management of the solid waste materials is an important problem moment in the Republic of Albania due to their environmental impact. Table 1 depict the composition of the solid waste management in Albania [instat].

Table 1. Composition of the solid waste in Albania

Materials	Composition (%)
Scrap Metals	5.7
Papers	9.3
Plastics	13.1
Glass	6.1
Others	65.8

Based on the above information's it has be seen that the most of the problems come from polymeric waste such as plastic materials with 13.1% composition. During the last decade the percentage of the polymeric waste have been grown rapidly in the overall municipalities of Albania due to the increasement of the consumer usage of polymeric products. According to the obtained data from INSTAT and the Ministry of Environment, plastic waste generation is increased by reaching 388,152 tonnes per year in the whole Republic of Albania [INSTAT 2021, Ministry of Environment 2021, Dhoska et al., 2019 and Dhoska et al., 2019]. Sources of plastic waste are beverages, household furniture, vehicle equipment, sports equipment, medical equipment, equipment for agriculture and industry etc as can be seen in the Figure 1 [INSTAT 2021]. Our government have implemented the law for supporting recycling technologies and reducing the environmental impact that comes from polymeric materials waste management.

Recycling of the plastic waste is a very important way for managing solid waste and has a very large impact on environmental protection. Compared to profitable recycling of materials, such as glass and metal, recycling plastic polymers is often more challenging due to its low cost. Furthermore, there are some private companies in Albanian such as EVEREST ltd and Future Plast ltd that have been focused on the recycling of plastic polymers. In the present paper we will be focused on the state of art of the most implement recycling technology for polymeric materials in the Republic of Albania



Figure 1. Sources of plastic waste

RECYCLING TECHNOLOGIES

There are different recycling technologies that have been used in the private companies in the Republic of Albania. Most of them are as follows:

- Primary recycling
- Secondary recycling
- Tertiary recycling through chemical treatment;
- Energy recovery

Primary recycling

Primary recycling has been carried out in the annexes of production plants of polymer products where scraps and plastic waste are shredded and added with fresh raw material for moulding processes.

Secondary recycling

Secondary recycling uses post-use plastic waste which is pre-separated into different types of polymers or not. After the pre-separated, materials can be used directly as raw material (in the absence of fresh polymeric raw material) for the production of products with a limited field of use. Currently the most recyclable and reusable plastic materials are polyethylene-terephthalate (PETE), high density polyethylene (HDPE), low density polyethylene (LDPE) and Polypropylene (PP).

Tertiary recycling through chemical treatment

Tertiary recycling has used chemical treatment of plastic scraps (waste) by obtaining some products such as monomers, oligomers, chemicals or fuels. The tertiary recycling method is sometimes presented as the only viable solution. The depolymerization (decomposition) of a polymer into its simple substances (monomers) has been elaborated for a long time as part of degradation studies.

Energy recovery

Whenever separation and recycling are not feasible or when there is no promising market for recycled products another solution is based on recovering the calorific value of the polymers. As hydrocarbons, the energy content of polymers is twice as high as that of coal or paper and four times as high as that of general solid waste.

Despite some economic advantages, the idea of combustion is not accepted everywhere, the biggest problem is that of environmental hazards in general which are initiated during the combustion of toxic gases and heavy metal residues (acid rain), dioxins and chlorine chemicals such as polyvinyl chloride

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(PVC). Wherever incineration is used, plastics are usually not separated from general waste which reduces energy and also creates a greater amount of ash.

RECYCLING PROCESS

Figure 2 depicts technological scheme for the recycling process of the polymeric plastic waste materials such as PETE and PP that has been used in most of the private companies in Albania.

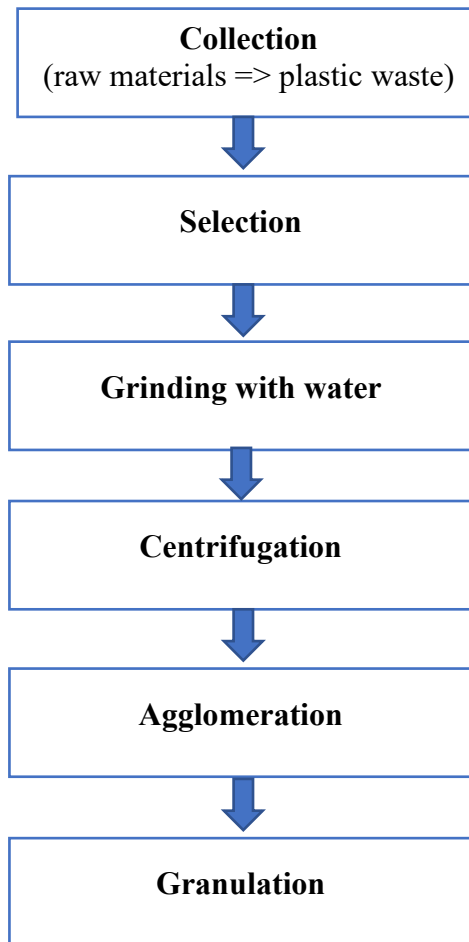


Figure 2. Technological schematic view of the recycling process of the plastic waste material

Collection

Collection points in Albania over the years and with the awareness of the people are increasing. Collection is carried out at different points of plastic waste collection. There are 4 collection points in Tirana, other points are located in Vlora, Fier, Gjirokastra, etc.

Selection

The selection is carried out in the recycling plant which is based on the composition of plastic waste in PETE and PP. The composition is identified by plastic codes as can be seen in the Figure 3.



Figure 3. Triangular symbols for recycling plastic materials

Grinding with water

It has been realized in a machine with 3400 rpm. The machines are not used at maximum capacity and in this case the supply is made at 440 kg per hour (even less). The grated pieces are in the order of 0.5-1 cm (with irregular shapes). Figure 4 shows grinding machine with water.



Figure 4. Grinding machine with water

Centrifugation

From the tub the washed material passes to the centrifuge at 4800 rpm. Water is eliminated during centrifugation. Through the conveyor of the centrifuge we have seen that PETE passes to the juicer where the complete removal of water and half-drying takes place while PP does not pass to the juicer. Figure 5 depict the final drying of the grinded material through centrifugal process.



Figure 5. Final drying of the grinded material

Agglomeration

Agglomeration process has been realised in agglomeration machine as can be seen in the Figure 6. PETE has been passed to the agglomerate which makes the total drying at 4200 rpm and making the material workable. From the other side PP from centrifuge passes directly to the agglomerate. PP fails to hold water as much as PETE and it dries faster than PE.



Figure 6. Agglomeration device

Granulation

Afterward, the material is inserted into the Granulator. The respective temperatures of the compounds are 180 – 245°C for PETE and 165 – 225°C for PP. Then the material passes through fillers and a water bath. Afterward, material obtained from the fillers is passed to the cutter and the material with the desired sizes is obtained with the dimensions that varied from 1 to 12 mm as can be seen in the Figure 7.

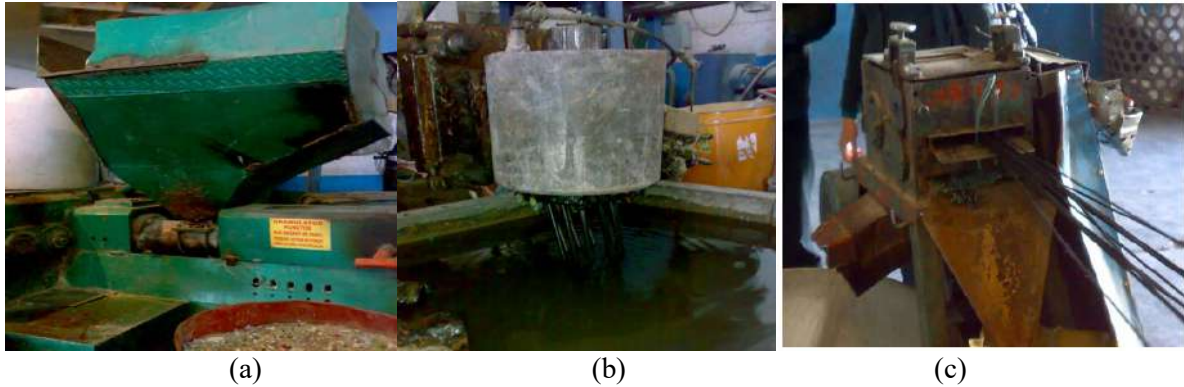


Figure 7. (a) Granulation (b) Pass the material through the fillers (c) Pass the material through the water bath into the cutter until the granules are obtained.

CONCLUSION

In the present paper we have briefly described the current situation of the polymeric waste management in the Republic of Albania and the state of art of the recycling technologies in the private companies. Furthermore, we have shown the recycling process for PETE and PP waste management materials from private companies that operate in Albania. Through the help of the government and the implementation of the recycling technologies we will reduce an environmental impact in the Republic of Albania.

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