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THE IMPORTANCE OF RECYCLING POLYMER WASTE IN HELPING TO PRESERVE THE ENVIRONMENT

Abstract. This scientific paper is devoted to determining the value of recycling polymer waste. The production of plastics remains one of the most productive sectors of the economy today, but along with growing production, the burden on the environment due to waste production increases year by year. For this reason, the organisation of plastics waste recycling and the production of consumer goods from prefabricated secondary raw materials is one of the main challenges of our time. Setting up a suitable production requires deeply defined organizational and technological measures. By ensuring that these systems work smoothly, it is possible to achieve effective results in the processing of polymer materials. The article describes the economic and ecological basis of polymer waste recycling.

Keywords: polymer waste, recycling, environmental significance of recycling, environmental safety.

Introduction

Environmental pollution from plastic and polymer waste is considered to be a global environmental problem because of the damage it causes to the overall environmental condition of the planet. Increasingly complex environmental problems and improvements in environmental protection laws around the world have shown that landfill of plastics and plastic waste is not necessary. The development of these factors and the environmental culture of the population has led to the development of appropriate recycling plans for plastic materials. Several ways of recycling plastic waste are now proposed,

among them the use of biodegradable waste, thermal and chemical recycling, and the reuse of polymer materials. Environmental and economic principles are important for the dual use of waste, such as demand from several consumers, correct compliance with national legislation and a favourable pricing scheme.

Eco-economics aims to ensure public health, a cleaner environment and products. Today, household waste is one of the burning issues of the time. An increase in population and the general standard of living has led to an increase in the consumption of various goods. This, in turn, has led to an increase in the amount of household waste. The problem of neutralization and recycling of household waste is not only to prevent environmental pollution, but also to reduce costs for transportation and disposal of waste, to reduce the land area for waste disposal, to obtain useful products, materials and energy from waste.

Materials and methods

There are several ways to recycle plastic waste. Primary recycling involves the direct use of low-productivity products and wastes internally. These are widely used in various types of thermoplastic polymer products, mostly with low levels of contamination. Secondary processing involves separation, purification and recycling of products as pure polymers or blends. In the third processing step the polymer waste is chemically processed to produce suitable products, monomers, chemical compounds or fuels. The polymer waste is also incinerated to generate energy. Typically, recycling of polymers depends on the type of product to be made from them, so it is important to consider these parameters when recycling waste. In addition, when some types of polymers are mixed with other types of polymers, high levels of contamination occur and therefore polymer recycling is important from an economic and environmental point of view [4].

Defining polymer classes and sorting them on the basis of physical and chemical characteristics is of central importance. Each class of polymer has different chemical properties and physical characteristics. The use of these

polymers in everyday life varies greatly, with some polymers being unique and used in all areas of the economy to create, store consumer goods. Which one is bigger or which one is smaller is important information for environmental and economic planning, and new polymer processing plants are built on the basis of this data. This data is then also of economic value. The balance between economic and ecological values must be calculated. If we keep in mind that polymer products are a global environmental problem associated with the destruction of natural ecosystems, then an ecological orientation in the economy is the most important component for the growth of the whole society.

The large accumulation of plastic products in the world has presented mankind with a new challenge, the problem of recycling them. The main environmental problem caused by plastic products is that they take between 100 and 400 years to decompose. Burial is therefore not an effective solution. As plastic products are not biodegradable, the ecology of large areas containing landfilled waste is destroyed.

Thermal destruction of plastics does not require landfill and large areas, but this method releases large quantities of pollutants into the atmosphere. These pollutants contribute to global warming and the formation of ozone holes, which increase every year. Creating appropriate new technologies for preventing pollutant emissions into the atmosphere is cost-effective. A highly efficient and environmentally friendly way of recycling polymer waste is to recycle it or, more precisely, to reuse it. There are several ways to recycle different types of polymers and other end-of-life products, among which hydrolysis, pyrolysis and mechanical methods stand out. Such methods are widely used around the world. But in order to recycle polymer waste more effectively, it is important to sort it first. The research took place on the student campus, the main aim of which is to study the consumption of plastic waste in everyday life. And an assessment of the synthesis of economic and environmental value orientations of modern consumers, using students as an example.

Result and discussion

The problem of plastic and plastic pollution refers to the collection of plastic products that naturally have a negative impact on the environment. Plastic pollution comes in many shapes and types. Plastic pollution negatively affects the land, waterways and oceans. The prevalence of pollution associated with these products is due to the low cost of plastic products and the widespread use of related products in human society.

Plastic pollution takes many forms, including contamination of water bodies (waste dumping in rivers, lakes, seas, oceans), dispersion of small plastic particles into the aquatic environment and multifaceted impacts on marine and terrestrial ecosystems. Today, through proper use of advanced technologies, large-scale recycling of various wastes is taking place. Various variants of the green economy concept are being developed. Newly built production plants are incorporating the latest technological developments. The main thrust of these measures is to ensure the environmental safety of society.

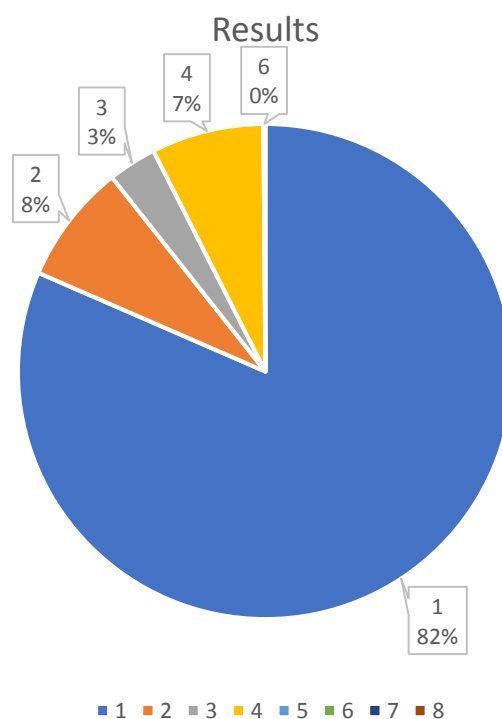


Figure 1. Results of the waste sorting study (82% - PET, 8%-HDPE, 7%-LDPE, 3%-PVC).

The results of surveys conducted among university campuses show a high level of consumption of products that are made from polymer materials (Fig. 1). The most used commodities were plastic bottles with a monthly weight of 184.21 kg (82%), the second most used commodity was plastic bags with a monthly weight of 17.69 kg (8%), the third most used commodity was bottle caps, bags and others with a monthly weight of 16.59 kg (7%).

At present, along with economic, social and industrial development, ensuring environmental safety of the population is one of the priority areas. An integral part of the modern environmental protection system is to ensure ecological well-being by achieving a harmonious and high level of industrial development. As a result of the appropriate use of advanced technology, large-scale recycling of various wastes is being carried out. During the polymer waste sorting studies, students were surveyed to determine their value orientation. The results of the surveys are shown in Table 1.

Table 1

Results of the student survey

№	Questions	Main	Medium	Low
		1	2	3
1	Product material	37	13	
2	Product packaging material	13	24	13
3	The potential for degradation in nature	14	22	14
4	Recyclability	25	15	10
5	The states of the ecosystem	26	16	8

The questions included whether you prefer the material of the product, the packaging material of the product, the potential for degradation in nature, recycling, and the state of the ecosystem. The results were positive, 37 students out of 50 said that they prefer a more environmentally friendly type of product,

40 students are interested in the secondary use of products, 42 students care about the state of the ecosystem.

The economy is becoming more complex, with new industries and different types of goods being created. New products are created through synthesis based on the latest advances in chemical technology, resulting in unnatural products being released into the environment. The release of these memory products into the environment disrupts the natural balance. For this reason, it consists of studying and explaining the basics of the harmonious relationship between mankind and nature to the next generation, for ecology as a science seeks to study the environment in which we live, our home, while economics studies the basics of housekeeping. The opposition of environmental considerations and solutions to economic ones, and the prioritisation of economic outcomes over environmental considerations, can lead to the wrong decisions. For this reason, the doctrine of sustainable development, which is gaining popularity worldwide, seeks to strike a balance between these two viewpoints.

Various polymer waste treatment technologies and their cost-effectiveness show that it is possible to manage the public economy from an ecological point of view. Specialised environmental studies and research in the industrial sector are needed to identify this possibility. Only on the basis of the data gathered from these studies it is possible to create an effective model of production organisation. Ecological technologies serve as an excellent aid in the creation of an efficient production model and in the establishment of its operation. Here, environmental technology is the end product of an efficient model based on the analysis and verification of environmental data. However, consideration of economic requirements is also considered an important principle in the design of any environmental technology and model, since the capacity to ensure the efficiency of the respective model is determined directly by the requirements of the public economy. A combination of economic efficiency and environmental

efficiency is important here, as disturbing one of them results in an imbalance. The combination of the two efficiency models creates a unique balance. This is primarily the content of the planned use of natural resources, with the acquisition of secondary raw materials from plastics and plastics.

Conclusion

Thus, in order to achieve sustainable human development, unlike in the food chain, energy and natural resources must be added to the process chain at each stage of material transformation, the part that can be used as secondary raw materials must be taken away, and the waste must be disposed of. A technology must be created to reduce the number of links in the process chain, the energy input at each link and the amount of waste.

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