

# Territory of Innovation Ideas, Technologies and Creative Solutions in the Eco-world

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**Abstract**—In this paper, the authors explain the essence of the risk of serious environmental pollution, for example, the late processing of plastic waste. The authors presented a comparative analysis of the decomposition of materials such as paper, plastic bags, and plastic products. An example is given of disposing of garbage into the special colored container, which differs depending on the raw materials that must be subsequently processed, for example, blue is for paper waste, yellow – for waste packaging of plastic products, green is for glass, dark is for food waste, etc. The authors presented the classification of types of plastic, and investigated the increased need for the processing of plastic products in Russia, and showed the scheme of their processing.

**Keywords**—*plastic; recycling; waste; garbage; utilization; container*

## I. INTRODUCTION

At present, it is not realistic to find a person who would not try to create something of his own, a new, unique, creative one. The Internet, the rapid development of social networks, information and educational technologies only contribute to this. Nevertheless, often ideas that are so necessary for the modern society and capable of solving some problems, including the most important environmental ones, are lost in such a huge flow of information [1]. Therefore, it is necessary to create a territory of innovative ideas, technologies and creative solutions in order to create the eco-world that we want so much. Everyone can become users of such an open information space, and by sharing their ideas, even conceptual ones, turn them into reality with the help of the information community [2].

At the moment, there are many projects and startups of environmental orientation, which offer some solutions to the problem of utilization and recycling of accumulated thousands of tons of household waste so that our planet does not turn into a big landfill. Among all types of household waste, plastic is currently the most serious problem, it is known, it is not concealed, and there are many attempts to solve it [3].

## II. CONTENTS

All objects created from natural materials, over time, decompose and return to the natural circulation of substances.

Waste of used goods, products, products, objects are sent to a landfill, where their natural decomposition takes place. But more recently, many of the objects produced using modern technical and technological advances no longer decompose on their own, and innovative plastic packaging, which was designed to keep food products usable for a long time, is an example of this [4]. High operating parameters and other positive characteristics of plastic packaging were appreciated by a wide range of consumers and became widespread, forgetting that the time of its decomposition in the natural environment is very long, which experts estimate from one hundred to three hundred years.

It is known that different types of garbage are characterized by different periods of decomposition in nature. For example, paper decomposes in 2-5 months, cigarette butts can lie in a landfill for up to 12 years, plastic bags last up to 20 years, and some plastic products persist for centuries, that is, they have durability and resistance to environmental conditions.

It is known that every person throws 50-80 kg of polymer products into landfills every year: plastic dishes, plastic bottles, plastic bags, etc. Multiplying the given dimensions of plastic waste by the total population of the planet, it becomes clear why polymers are so dangerous to live on Earth as a whole [5].

## III. CHARACTERISTICS OF THE SITUATION

The production of plastic products currently continues to increase, so plastic waste will increase and the problem will worsen. Plastic is a serious danger to the world. Polymers can get into the stomachs of birds, which will lead to the death of birds, and the latest UN data report that over one million sea fish perish on Earth every year due to plastic, which may lead to the death of entire species in the future. Sea open spaces are also clogged with plastic waste, and the last cleaning done by volunteers several years ago showed that about 80% of all the garbage collected fell into the ocean from land, and not from sea-going vessels, as it was considered [6]. Thus, it is necessary to find methods and methods for recycling plastic waste, without waiting for a real environmental disaster, the probability of which only increases every year [7].

In Germany, the population has been trained since childhood to dispose of garbage in accordance with the type of waste. There are special containers for collecting garbage near the houses. The number of containers can vary from three to eight. They differ according to the already known color scheme: blue for paper waste, yellow for waste packaging of plastic products, green for glass, dark for food waste, etc. Residents of houses are trained and already habitually sort garbage, and the company that produced this product must dispose of it. That is, the cost of the manufactured product, object or product includes not only its cost but the cost of its disposal. There are penalties for those who incorrectly ungrouped waste, for example, threw paper or plastic into a glass container, since it is known that when separating waste, it is easier to recycle. Also, each container has its own specific day when it is taken to a processing plant. The garbage collection schedule is prepared a month in advance and sent to every resident of Germany by e-mail. The love for recycling among the inhabitants of Germany is tied not only to ambitiousness but also to the fact that 14% of all the raw materials used are obtained in the light industry through recycling. In German supermarkets, they prefer to use paper bags for packaging of products rather than plastic bags, which, unfortunately, happens exactly the opposite in Russia.

Thus, even knowing all the above problems, the industry continues to create products and packaging from materials that do not decompose independently or the process of their natural decomposition is long and destructive to the environment. Considering the problem of recycling, it's worth saying that, unfortunately, not much depends on an ordinary person, but it is necessary to take an active part in this process, be it sorting garbage, dismantling plastic bottles by color, plastic types, orchestrating the regular garbage collection process giving it a "second life", a "second chance", until such time as technical and technological achievements have reached the parameters of its high-quality processing.

Today, the following types of plastics are known:

- PET or PETE (code PETE, PET and number 1.) - polyethyleneterephthalate (PET or PETE). Products made from such plastic can release heavy metals and substances that affect a person's hormonal balance into a liquid. PET is the most commonly used type of plastic in the world. It is important to remember that it is intended for single use.
- HDPE - high density low density polyethylene (HDPE). This is a plastic that does not emit almost any harmful substances. Experts recommend buying water in such bottles.
- PVC - polyvinyl chloride (PVC). Products from this material emit at least two hazardous chemicals that have a negative effect on the human hormonal balance. It is a soft, flexible plastic that is commonly used for storing vegetable oil or packing children's toys.

- LDPE - high density low density polyethylene (LDPE). This plastic is used in the production of bottles, and in the production of plastic bags. It does not release chemicals into the water it stores.
- PP - polypropylene (PP). This plastic is white or translucent, used as a packaging for syrups and yogurts. Polypropylene is valued for its heat resistance, that is, it does not melt when heated and is relatively safe.
- PS - polystyrene (PS) is often used in the manufacture of coffee cups and containers for fast food.
- OTHER or O – other plastics. This group includes any other plastic that cannot be included in previous groups.

Currently, Russia has begun the process of installing containers in which garbage is collected separately: plastic (bottles, containers from curds, etc.), glass, paper, food waste, etc. But according to the research, it is clear that until recently, any garbage was thrown into such containers, without separating it. Inscriptions in neither large font, nor pictures, nor infographics helped. Now, adaptation to this process of separating garbage into containers has already passed, and many people have unmistakably learned and understood precisely that the partition of garbage is important. Plastic debris is dismantled by color, plastic category, density, is free from contamination (soda, coffee, dairy products, etc.). In this section of the problem, plastic requires a special approach, since it must be rinsed with special means before sending to recycle, crush. Separately sorted caps from plastic bottles. For some unknown reason, before throwing a plastic bottle, it is customary to twist the cap on it, although this is not advisable to do, because the cap on the bottle is a completely different plastic and must be collected and processed separately. The caps are made of lighter plastic and cannot be mixed in any way with the plastic of the bottle itself. Next, the plastic passes through the stage of crushing, turning into chips, each plastic being crushed separately. Next is the process of melting to another object. Since the bottles are made of plastic intended for single use, you can recycle it into packing tapes, paving tiles, tiles, film, brushes, and much more.

At the moment, the scheme of plastic processing (PET) is as follows. Collection (bottles) using mesh tanks or special containers for separate collection of waste and garbage, sending separated waste for recycling to the plant, "cutting" plastic products (processing into a plastic paste, molding into steel form), manufacturing a new product, assembling the resulting product.

The created eco-world needs ideas, technologies and creative solutions [8]. You can give examples of non-standard solutions, "second chance" for products from recycled plastic. Muzzicycles Company, Brazilia, has released a bicycle, the frame of which is made of 200 recycled PET bottles. The bike turned out to be lightweight, durable and has a guarantee of 100 years, but unfortunately,

the plastic will burn out in the sun, that is, the plastic will lose all color saturation.

Another interesting “second chance” of plastic products is the repeated use of disposable plastic cups from various manufacturers, which are effectively used for planting plants, and squash, cucumbers, pumpkins, etc., grow in water turned upside down in two-liter empty plastic containers twice as fast. These containers can also be used to fence plants with plastic fences, and if you make an impermeable plastic walkway, weeds will not grow under them and walking along with them, your shoes will not get dirty. Also watering cans and other watering devices are made from recycled plastic. It should be noted that during garden work, it was found that the larvae of the large wax moth, parasitizing in the honeycomb bees, absorb polyethylene with unprecedented speed that is the enemy of beekeepers, were able to help in solving problems with garbage. Also, found a bacterium that can process plastic at a rate of 0.13 mg per day from per square centimeter. Biodegradation by polyethylene tracks now requires further research.

Unusual re-use of plastic products found in the Indonesian city of Bandung. There was built a micro library of 2000 plastic ice bucket buckets. In addition to such a “second chance” for plastic, the mission of the library is to arouse people's interest in books and saying that “books are windows into the world”, and in this case, it turned out not quite allegorically. The facade of the library, created by local craftsmen from buckets of cheap ice cream, has not only a decorative function. The buckets perfectly disperse direct sunlight and are no worse than light bulbs in the room creating a pleasant internal illumination. Buckets are attached to the vertical steel struts, going from floor to ceiling in an inclined position so that rainwater does not fall into the room [9].

From recycled plastic can be made and the container itself for separate collection of garbage (see "Fig. 1"). Such a container was offered to students of Department Industrial Design, Bauman Moscow State Technical University. It can be installed in a cafe where they sell food in disposable dishes. When designing, the task was to take into account the dimensions and a number of other characteristics that allow prototyping the object, so that the user can accurately determine what needs to be ungrouped [10]. This device sorts each item individually.

The longer things around us remain unchanged, the more actively our mind tries to justify the need for change [11]. On this basis, the design can be continued and the container can be equipped with intuitive identification marks, infographics that will help sort the used dishes. The developed design concept of a container for collecting disposable plastic tableware will assemble plastic cups and appliances for food, having smaller overall dimensions in comparison with those options where plastic dishes are not ungrouped. After filling, the container must be emptied, and send the garbage to the plant for processing plastic products, where the processing is carried out: “cutting”, leaching, crushing and melting. Then, the “new chance” for plastic is the production of a new product. The designed device turned out to be a simple form,

easy, accessible to a large circle of users. This includes four compartments to collect different plastic cups (small, large, medium, etc.). The device is equipped with a compartment for draining the water that remained in the cup, a compartment for collecting plastic cutlery. The green color of the device is preferable, as it allows the user to understand that the garbage that falls into this container will be further processed.



Fig. 1. Design concept of the device – a container for collecting disposable tableware from plastic.

An addition to this concept is the idea of a litter bin with a voice effect, for example, a “thank-you” effect, or an idea from the company ThinkScream, which developed a plastic litter box with LED backlighting — a Wi-Fi icon that lights up when someone throws garbage at them, the device within 15 minutes distributes the Internet within a radius of 50 meters, which is attractive to young people who often need to communicate, resorting to Wi-Fi [12] [13] [14].

#### IV. CONCLUSION

There is not much space on our planet to waste it empty, mindlessly throwing waste, especially plastic, into nature. We must learn to effectively process what we produce, otherwise our descendants are in great danger [15]. A strong contribution from every person is needed - ideas, creative solutions for creating an information territory of innovative ideas, technologies and creative solutions, so that by common efforts we can find methods and methods for utilization and recycling of waste products and especially plastic waste into new useful things [16] [17]. With the processing of plastic it is necessary to help our nature and try to do it, combining efforts.

#### REFERENCES

- [1] M. McLuhan. Understanding Media: external human extensions. M.: Kuchkovo Pole, 2007. p. 464.
- [2] T. Yu. Tsbizova, N.Yu. Terekhova. About the prospects for the development of higher education in modern conditions // European Social Science Journal. 2013. No 2. p. 62-67.
- [3] V.Yu. Ivlev and M.L. Ivleva, “Philosophical Foundations of the Concept of Green Economy”, Proceedings of the International Conference on Contemporary Education, Social Sciences and Ecological Studies (CESSSES 2018). Series “Advances in Social Science, Education and Humanities Research”. vol. 283, pp. 869-873, 2018. DOI: 10.2991/cesses-18.2018.192
- [4] A.A. Drehalo, V.I. Ulyanovsky. Human ecology // Lomonosov Pomor State University. Arkhangelsk, 2007. No 3. p. 53-58.

- [5] N.I. Gubanov and N.N. Gubanov, "Criminal behavior: biological, social and personal conditionality", *Vestnik slavianskikh kultur – bulletin of slavic cultures-scientific and informational journal*, vol. 48, no. 2, pp. 53-66, 2018.
- [6] E. Giddens, *Slipping world. How globalization is changing our lives*. Moscow: Publishing house All World, 2004.
- [7] N.N. Gubanov and N.I. Gubanov, "Mental Responses to Risks in Modern Society", *Proceedings of the International Conference on Contemporary Education, Social Sciences and Ecological Studies (CESSSES 2018)*. Series "Advances in Social Science, Education and Humanities Research", vol. 283, pp. 1003-1007, 2018. DOI: 10.2991/cesses-18.2018.220
- [8] M.B. Oseledchik, V.Yu. Ivlev, M.L. Ivleva, "Knowledge as a non-equilibrium dynamic system", *Proceedings of the 2nd International Conference on Contemporary Education, Social Sciences and Humanities (ICESSEH2017)*. Series "Advances in Social Science, Education and Humanities Research", vol. 124, pp. 1-5, 2017. DOI: 10.2991/icesse-17.2017.1
- [9] J. Bidwell, *This is a breakthrough! 100 lessons of business innovation*. Moscow: Publishing house Alpina Innovation, 2019.
- [10] V.G. Breakalov, N.Yu. Terekhova. *Prototyping thechnology for creating physical models from polymeric materials // All documents*. Encyclopedic reference. 2015. No. p. 6-9.
- [11] R. Kaplan, *With the help of design*. Moscow: Publishing Lebedev Art Studio, 2014.
- [12] M.N. Pavlenkov, V.G. Larionov, P.M. Voronin. *Approach to predictive modelling of total municipal solid waste removal volumes*. *Biofuels*. Volume 8, Issue 3, 4 May 2017, Pages 373-376.
- [13] W. Beck, *What is globalization? The mistakes of globalism are the answers to globalization*. Moscow: Progress Tradition, 2001.
- [14] I. Prigogin, G. Nicolas, *The knowledge of the complex*. Moscow: Publishing LCI, 2008.
- [15] J. U. Stiglitz. *Clobalization: alarming trends / from English* G.G. Pirogova. M: National Social Science Foudation, 2003. p. 304.
- [16] M.B. Oseledchik, M.L. Ivleva, V.Yu. Ivlev, "A new paradigm for analysing knowledge transfer processes", *Proceedings of 4th International Conference on Education, Language, Art and Intercultural Communication (ICELAIC 2017)*. Series "Advances in Social Science, Education and Humanities Research", vol. 142, pp. 766-770, 2017. DOI: 10.2991/icelaic-17.2017.177
- [17] N.N. Gubanov and N.I. Gubanov, "Mental Bases of Social Solidarity", *Proceedings of the International Conference on Contemporary Education, Social Sciences and Ecological Studies (CESSSES 2018)*. Series "Advances in Social Science, Education and Humanities Research", vol. 283, pp. 998-1002, 2018. DOI: 10.2991/cesses-18.2018.219.