Issues of solid household waste disposal in the context of state environmental policy in Sevastopol

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Abstract. The peculiarities of the current situation with the environmental crisis require careful study of the waste recycling of previously accumulated and newly generated solid municipal waste. The use of technological developments and solutions for environmental conservation meets the most stringent ecological standards. These demands are due to the special natural and climatic status of Sevastopol. The purpose of the study is to substantiate the use of effective and simple method of sorting solid waste –hydraulic separation of solid household waste as one of the types of industrial waste separation. The article presents its advantages and possible application in Sevastopol. This advanced technology is stated to be effective in waste recycling as it provides separating unsorted waste and utilizing almost 80 percent of the volume. A feature of this method is the use of equipment manufactured for the paper industry for sorting and processing solid waste. In conclusion it is noted that the particularbenefit of the hydraulic separation is in its relative simplicity, as well as economic and environmental profits.

1 Introduction

The solution to the waste recycling problem connected with accumulated and generated solid municipal waste is stated to be one of the most important issues of environmental policy in Sevastopol. In the medium and long term determining a new area for disposal of increasing volumes of waste cannot solve the problem of municipal areas. By 2030, 100% of household waste in the country should be sorted and half of it recycled. Everyone is involved in the process: government, business, population. Russians have reason to expect the effective realization of the project called “Clean Country”.

In strategy of Sevastopol socio-economic development until 2030 in the field of environment issues (paragraph 5.8. Environmental policy)the most important issues of state environmental policy in the city are analyzed [1]. The use of technological developments for environmental conservation meets the stringent ecological standards due to the special natural as well as climatic status of Sevastopol [1]. “In this situation, it is necessary to

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develop modern environmentally friendly production facilities in the city of Sevastopol for sorting accumulated waste with their subsequent processing into finished products: secondary raw materials, synthetic diesel and electricity" [1, p. 147].

"Solid municipal waste in the city of Sevastopol is 200 thousand tons per year. At the same time, the current facility for sanitary cleaning of Sevastopol landfill for receiving solid municipal waste in Pervomaiskaya gully with a capacity of 170 thousand tons per year and with a service life limited to 2025-2026, with a waste sorting line with a capacity of 40-52 thousand tons/year. Thus, the city is currently faced with the problem of exhausting the capacity of the landfill for receiving and recycling municipal solid waste" [1, p. 20].

The environmental awareness of people should increase significantly due to different citywide waste separation programs. The new approaches to the regulation of medical, biological, radioactive waste, adjustment of requirements for products containing recycled materials are needed. Construction of facilities of waste sorting and disposal, formation of supply chains is necessary. This should function comprehensively, it takes much time.

At the same time, there are technical and technological solutions to the problem of the environmental crisis that are not implemented at all. The reason for such one is considered to be the lack of a special personal system of relationships and values, aimed at the entire world.

2 Materials and Methods

The subjective of the study is to analyze substantiating the use of hydraulic separation of solid household waste as one of the types of industrial waste separation

The following research objectives are:

1. To conduct a theoretical analysis on the problem ofecological problems in Sevastopol.
2. To describe a contribution of Sevastopol state university in the solution of solid municipal waste processing.
3. To present the possibility of realization of hydraulic separation of solid household waste method.

This study provides scientific information and theories for the most environmentally friendly methods. Methods used in this paper include theoretical learning as well as analyses.

When determining planning applications, environmental issues are an important consideration. The latter includes"strategies, development guidelines and land use plans related tonature conservation and biodiversity" [2], air and water quality, climate change and waste recycling.

Environmental issues were considered by many scientists which emphasize the urgent need to address environmental issues. "In the future, the world will face many new environmental problems, yet the scientific and policy research community will not necessarily recognize these problems as they come up. Which agendas environmental scientists and policymakers advance depends on many factors, including media attention and socioeconomic and historical dynamics" [3, p. 2].

D.G. de Barros Franco, M.T. Arns Steiner, R.P. Fernandes, V. F. Nascimento write about Efficient Waste Management Systems (WMS) control that "is a global challenge since the waste volume has grown continuously" [4, p. 3]. L.Bilgili, A.Yusuf Çetinkaya, M.Sarı made "analysis of the effects of domestic waste disposal methods on mucilage with life cycle assessment" [5, p. 2]. Results of their experiment showed that "composting had the greatest positive impact via reducing the deleterious impacts of organic wastes, which were the major source for nutritious groundwater" [5, p. 3].

Z. Wang, Z. Chen, C. An showed the potential First Nations SWM improvement strategies which are introduced through education and training, process improvement, and zero-waste possibilities [6, p.7].

A. Kaur, R. Bharti, R. Sharma state that"population growth and economic development, there is gradual increase in production of waste and demand of electricity worldwide. According to World Bank statistics, the global Municipal Solid Waste generated was 1.3 billion tons in year 2012 and this is expected to increase above 2.2 billion tons per year by 2025" [7, p. 904].

It should also be emphasized that use of technological solutions for the disposal (processing) of production and consumption waste must meet the required environmental standards because Sevastopol has a special climatic natural and status. That is why the given issue is relevant.

3 Results

Recently the Regional Waste Management Operator was determined in Sevastopol. The city was one of the first to become one of the regions of the country where this important stage of industry reform, implemented by the Government of the Russian Federation, was launched.

From 2017 to 2019, a new waste management system is being introduced in the constituent entities of the Russian Federation. The road map is prescribed in Federal Law No. 89 "On production and consumption waste" by Federal Law (version valid from March 1, 2024) [8].

Furthermore, it is planned to introduce separate waste collection and sanctions for improper disposal, the consecutive ban initiation on the recyclable waste disposal in the Fundamentals of state policy in the field of environmental development of the Russian Federation for the period until 2030.

There is an increasing concern regarding the sustainable solid waste management (SWM) around the world [6]. The problem of waste disposal is relevant nowadays. Every year, new ways for waste collection are developed, and various disposal methods are used depending on the hazard class of the waste [9].

The major purpose of waste disposal is the rapid and safest waste destruction. Recycling has to meet some main tasks:

– Regeneration. This process provides restoring waste as secondary raw materials. It can be material for reuse as it obtained another purpose.

– Recovery (for further use). This operation provides extracted valuable substances. They are derived from waste. For example, low molecular weight raw materials are obtained when plastic is recovered.

– New products manufacture. They can be obtained from recycled materials. So, rubber products or unusable plastic are used in the making new plastic parts, various coatings, paving stones, shoe soles.

– Recycling. This process provides waste reusing as initial aim – scrap metal is melted down, new paper is made from waste one. Concrete, polymers, glass, textiles and more can be recycled.

Sevastopol State University has contributed to the development of environment protection by proposing their methods of solution. So, students of the Polytechnic Institute have developed an unmanned catamaran-type device for collecting garbage on water, "Sea Scorpion". The one and a half meter long marine debris cleaner weighs about 60 kg and really looks like a scorpion with its stern bent upward. It cleans on the water, removes garbage that is above the water - plastic and wood. The mechanism for collecting garbage is located inside the device and is a mesh network. The stern is a kind of radio beacon that

receives signals from the operator's console; LED beacons are attached to it, allowing other watercraft to identify it as a marine object. Garbage collection can be done in the bays of Sevastopol. Now this is done by people who manually collect garbage from the boat. This is much more difficult and costly.

A relevance and necessity of ecological problems solutionare beyond doubt as currentlySevastopol is faced with the problem of exhausting the capacity of the landfill for receiving and recycling municipal solid waste.

The regulations for waste disposal are set out in Federal Law "On Industrial and Consumption Waste" [8]. So, the requirements for waste management in the municipality's territories are listed in the Article number 13. The requirements for handling waste of hazard are stated in the Article number 14. Federal Law determines the transporting and storing waste procedure as well. All rules connected with recycling are aimed at one goal - to reduce the negative impact of waste on the environment [8].

Improved living standards lead to increased waste. If they are not processed, the area of fertile land will shrink. In addition to legal landfills, unauthorized landfills arise. According to the Ministry of Natural Resources, they occupy 30 million hectares. And every year the area of spontaneously generated "garbage" increases by 2 times. The problem is relevant for all countries, but in Russia it is considered especially pressing. Over 90% of all waste is sent to landfills. 3% of them are incinerated and 4% are recycled [10].

The main difficulty of untimely disposal is the inaction of district authorities, who do not want to engage in long-term planning for waste recycling, make their own proposals, and there is also a lack of centralized management.

One of the most effective and simple method of sorting solid waste ishydraulic separation. Such advanced technology makes it possible to separate unsorted waste and then reuse almost 80 percent of the volume. This method feature is equipment using manufactured for processing solid waste [11].

4 Discussion

Black Clauson was the first who discovered a solid waste hydraulic separation system. Waste was fed into a mixing tank filled with water by means of plate feeder. It was crushed there. The ballast and large scrap metal were shared through a separator. Then sand, glass and small metal parts were divided in a cyclone [11]. Sediment was separated from the pulp. Paper, textiles and other fibrous fractions were processed. The water purified passed through the hydropulpator. The processing cycle lasted one hour and a half.

"With this technology, there was no need for subsequent purification of the compost from ballast fractions. At the company's pilot plant, 13% of paper pulp, 4% of glass, 9% of ferrous and 0.3% of non-ferrous metals were recovered from solid waste" [10, p. 38]. To manufacture granular fuel the company used the fibrous fractions as it has difficulties in marketing paper pulp.

The particular attractiveness of the method is in its relative simplicity, as well as economic and environmental benefits. Now this technology has begun to be mastered in Russia, for which it is especially interesting due to the almost complete lack of implementation of waste sorting by ordinary people. For example, the city authorities are discussing a plan to build a waste processing plant based on the hydroseparation method [12].

New methods of disposal and recycling of household waste are being developed in Moscow. Instead of burning garbage, new methods of recycling waste using water will be applied. This is planned to be done at waste processing plants. The first of them will be built in the east of Moscow in the Rudnevo district.

According to Moscow government, this method of disposal provide the solution of the problem with garbage and it will no longer need to be destroyed at waste incineration plants, preserve the ecology of the Moscow region, and will also bring additional revenue to the city budget due to processing of separated raw materials [12].

It is planned to process up to 1,500,000 tons of municipal waste per year at this waste processing plant. This fact is a strong argument for investing in the construction of a plant, because previously this waste was simply stored in landfills [13].

According to statistics received from the city's municipal services, today only about 20% of household waste is recycled, the remaining 80% is simply transferred to landfills, which causes irreparable harm to the ecology of the region (fig. 1).

In addition, there are practically no places left at these test areas, and no more than five years are left to resolve this problem.

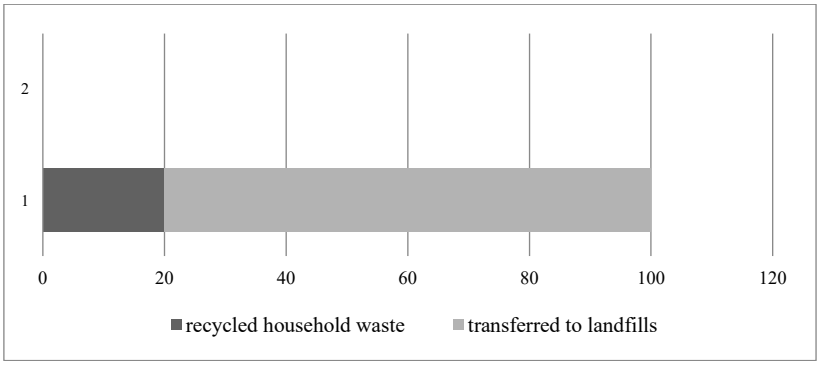

Fig. 1. The problem of household waste recycling

The waste recycling plant reduces the amount of garbage disposed of in landfills by approximately five times, which will thereby shift the apogee of the garbage collapse in the capital by 20 to 25 years.

The following advantages of the hydraulicseparation method can be highlighted:

1. The manufacturing technology does not pollute the environment. It is non-toxic.
2. The enterprise can supply itself with resources of energy.
3. A production process of recycling and sorting is of lower cost.
4. The manufacturing process of sorting and recycling numbers 20-30 workers. It is fully automated.
5. While alternative technologies provide recycling only 50%, the unsorted solid waste recycling is considered to be 80%
6. The cost of building is 1.5 times lower than the construction of waste incineration plants [12].

Thus, to solve the garbage problem of Sevastopol, it is necessary to build a sorting and processing complex as soon as possible. The waste management operator « Improvement of the City of Sevastopol » prepared a feasibility study for a future recycling complex – waste sorting plant with a capacity of 35 tons per hour. Fully automatic sorting is provided, allowing you to select 90 percent of secondary resources,

Recycling will include not only solid waste from the population and enterprises, but also construction, bulky, electronic, and hazardous waste. Ideally, only food scraps can be stored at the landfill. Sorted recyclables (glass, metal, plastic, cardboard) will pass through equipment for cleaning, drying, crushing, pressing and will be sold. The plastic will be additionally sorted by type and processed into granules from low pressure polyethylene, PET flexes (secondary raw materials, the result of processing plastic, mainly plastic bottles,

into special flakes), and plastic profiles. Everything that cannot be recycled will be turned into RDF fuel (Refuse Derived Fuel - fuel based on crushed and compressed waste).

One of the most effective methods of sorting solid waste is hydraulic separation.The particularbenefit of the method is in its relative simplicity, as well as economic and environmental benefits.

5 Conclusions

In order to summarize, it should be emphasized that the most important issues of state environmental policy in the city are considered to be technological solutions for environmental conservation which must meet the most stringent environmental standards. The following rule is admitted in socio-economic strategy of development of Sevastopol until 2030: city residents have to participate in a resolution of mentioned above problems.

It should be said that the main advantage of the hydroseparation method is that such production operates at the normal temperature of the waste being transported and, unlike waste incineration plants, does not release anything into the air.

After all, environmental protection is important because it directly affects the quality of our lives. Polluted water and air, destroyed forests and land, endangered species of animals and plants – all this affects our health, well-being and economy, and in this regard the disposal and recycling of industrial waste plays a key role. The particular benefits of the hydraulic separation are in its relative simplicity, as well as economic and environmental benefits.

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