O.V. Borodich
National research
Tomsk Polytechnic University
Tomsk, Russia

Waste recycling as a problem of energy efficiency

Industrial waste consists of used packaging bags, bottles, household and industrial equipment, paper, cans, food debris, rubble and other. According to the UN, amount of such waste is 500–600 kg per capita annually. Throughout the world, there are old disposal sites, every year there are more and more of it. Dumps spoil landscape and upset the balance of the environment.

Today, the question of the re-use of waste materials is burning. Western Europe and Japan pay much attention to the issue of sorting. Therefore, their work in exporting of solid household waste, its recycling and disposal is organized at the highest level.

To understand how effective the processing of waste is and how it pays off the cost of the construction of facilities for such processing, you need to know about recycling methods. Initially, there is sorting of solid waste. It is important to state special containers, which are designed for different types of garbage. Containers should be organized in locations where the waste is formed and where the garbage is gathered. When such containers are filled with pre-sorted waste they should be sent to a special station where experts are engaged in re-sorting of waste for control. This is done in several steps, many of which may be automated. At this stage, a variety of materials such as paper, various plastics, glass and metals are sorted. Initially mixed refuse are removed from the collection vehicle and are placed on a conveyor belt in a single layer. Next, automated machinery such as disk screens and air classifiers separate the recyclates by weight, separating lighter paper and plastic from heavier glass and metal. Cardboard is removed from the mixed paper and the most common types of plastic by hand. A spectroscopic scanner is used to differentiate between different types of paper and plastic based on the absorbed wavelengths, and subsequently divert each material into the proper collection channel.

Strong magnets are used to separate out ferrous metals, such as iron, steel, and tin-plated steel cans («tin cans»). Nonferrous metals are ejected by magnetic eddy currents This magnetic eddy current is repulsed by a large magnetic field, and the cans are ejected from the rest of the recyclate stream.

Finally, glass is sorted on the basis of its color: brown, amber, green, or clear. It may either be sorted by hand, or with the help of an automated machine that uses colored filters to detect different colors.

Many people from different countries have found an unusual and creative way to solve environmental problems. A lot of waste that we mindlessly throw away we can use again. So, many designers use wood waste for creating new furniture designs. Almost all of these applications are based on the sorting of waste, the accumulation of certain objects of the same type, which would be otherwise thrown away and their subsequent use as elements of a new product. For example, from a large number of old school rulers some of the designers create chest of drawers. Another designer produces the armchairs from cork of the wine bottles. [2]

In addition to the practical application of such an approach (to collect a lot of similar parts together) is used in the art. Consequently, the artists not only decorate the urban environment (usually such works belong to the park sculpture), but also draw attention to environmental issues. Fish from of plastic bottles polluting the ocean, sculptures of animals and humans, are made from hard decomposing plastic and metal waste and become durable decoration of parks. [6] [3] One of the most famous in this area are Subodh Gupta, an Indian artist from New Delhi and Joshua Allen Harris from Lemmon, South Dakota. [7] [4]

Yet, the main focus is the deep processing, material separation and recycling. Many supermarkets (unfortunately, in the West, but not in Russia) only use paper bags and only from paper produced from recycled materials. Recycled materials can also be converted into new

products, which can be used again, such as paper, plastic, and glass. Dispose of waste second, not only the cost of raw materials reduces, but also significant energy savings. Artificial fibers and fabrics are obtained from recycled plastics, it is more economical than obtaining these fibers from oil, as part of the process was complete during initial manufacture of, let us say, a plastic bottle that is used as a basis in the secondary process. The clothing from these fabrics are produced in conventional manner for everyday wear and for special occasions: shorts, shirts, evening dresses made of nylon, Dacron and other synthetic fibers. [1] [8]

The above-described methods of disposal of secondary raw materials require infrastructure and investments. Another method is the personal recycling: reuse of containers and refuse components for other purposes. An example of such use is flowerbeds, sculptures and playgrounds from old tires, numerous in our country. Many old items can be used in households for other purposes, for example, convenient holder for a minor subjects towels, pens, letters is made out of a torn tennis ball. [5] Development of this area of utilization requires not only a change of mentality user (someone may refuse to use products from waste, simply because they are not new), but also the organization of exchange of creative solutions in the use of overage subjects.

The process of recycling and re-use of recycled materials turns out to be beneficial for many reasons, the amount of waste sent to landfills decreases, natural resources are conserved, energy is saved, greenhouse gas emission is reduced and new jobs are created.

References

1. Chua, J.M. Riz Wants to Recycle Ocean Plastic Into Snazzy Board Shorts // Ecouterre. [Электронный ресурс] / URL: http://www.ecouterre.com/riz-wants-to-transform-ocean-plastic-into-100-percent-recycled-board-short (дата обращения: 31.03.2015).
2. Cork Chairs // Inspiration green. [Электронный ресурс] / URL: http://www.inspirationgreen.com/cork-chairs.html (дата обращения: 30.03.2015).
3. Patriota A. Rio+20: protecting environment is not enough // The Guardian. [Электронный ресурс] / URL: http://www.theguardian.com/commentisfree/2012/jun/20/rio-20-protecting-environment (дата обращения: 31.03.2015).
4. Preuss, S. Giant Skull Made of Pots and Pans //.1800 recycling.com. [Электронный ресурс] / URL: http://1800recycling.com/2010/08/skull-pots-pans#.Ul0x7hZTzwc (дата обращения: 31.03.2015).
5. Wongpakdee, P.K. Art Without Waste. Rockport Publishers, 2014. Via Facebook preview.
6. Детское эко-творчество: скульптура слона из 900 переработанных пластиковых бутылок // Экобыт.ru. [Электронный ресурс] / URL: http://www.ecobyt.ru/article/240714/1139 (дата обращения: 31.03.2015).
7. Надувные уличные скульптуры Джошуа Аллена Харриса // Kultorologia.ru. [Электронный ресурс] / URL: http://www.kulturologia.ru/blogs/250909/11530 (дата обращения:31.03.2015).
8. Хазан А. Как делают одежду из переработанных пластиковых бутылок // Recycle. [Электронный ресурс] / URL: http://recyclemag.ru/article/kak-delajut-odezhdu-iz-pererabotannyh-plastikovyh-butylok (дата обращения: 31.03.2015).

Scientific supervisor: D.V. Shepetovsky, senior teacher, TPU (Tomsk polytechnic university), Russia