Л.Н. Гумилев атындағы Еуразия ұлттық университетінің ХАБАРШЫСЫ.
ISSN: 2616-7263. eISSN: 2663-1261
ТЕХНИКАЛЫҚ ҒЫЛЫМДАР ЖӘНЕ ТЕХНОЛОГИЯЛАР СЕРИЯСЫ /
TECHNICAL SCIENCES AND TECHNOLOGY SERIES/
СЕРИЯ ТЕХНИЧЕСКИЕ НАУКИ И ТЕХНОЛОГИИ

IRSTI 73.31
Article

https://doi.org/10.32523/2616-7263-2024-149-4-293-307

Recycling in the logistics management system

O.V. Garmash, L.M.Malikova, G.V. Muratbekova, B. Manarbekkyzy, M.E. Kalekeyeva*[1]

Civil Aviation Academy, Almaty, Kazakhstan

(E-mail: kalekeeva.m@mail.ru)

Abstract. The application of recycling in the logistics management system will make it possible to create and maintain an effective and sustainable waste management system that will allow waste to be used as secondary raw materials or energy, instead of being thrown into landfills. The entities involved in the recycling process are manufacturers, importers, and trading institutions that introduce recycled goods to the market.The study used statistical analysis, systems analysis, synthesis, generalization, comparison, and analysis of literary sources.

The problem of waste disposal is currently one of the most pressing in the world. Industrial waste is formed as a result of human production activities in various industries. Recycling, which is the repeated transformation of substances or materials contained in industrial waste, is designed to solve waste disposal problems in order to obtain a substance or material with a primary or other purpose.The considered processes of utilization and recycling of waste of enterprises are only a part of the problems existing in this area. The scale of environmental projects is quite extensive, and logistics is featured everywhere, since logistics is based on the principle of rational use of resources.

Keywords: logistics, ecology, waste, pellets, processing, secondary raw materials, reverse flows, recycling.

Received 09.12.2024. Revised 18.12.2024. Accepted 23.12.2024. Available online 31.12.2024

[1]***the corresponding author**

Introduction

The topic of recycling in the logistics management system is relevant and has great significance for achieving sustainable development. In recent years, the problem of waste disposal and recycling has become increasingly relevant in light of the growing problem of the environmental crisis. Growing consumption and lack of waste management measures lead to environmental pollution and depletion of natural resources.

In the logistics management system, recycling is closely linked to supply chain management and waste disposal. Proper planning and coordination of the recycling process can reduce resource consumption, reduce the negative impact on the environment, and create a more sustainable waste management system [1].

Recycling also has economic significance. Reuse and recycling of waste can reduce the costs of purchasing new materials and raw materials, as well as create additional sources of income through the sale of secondary raw materials. From an environmental perspective, logistics covers the entire “life cycle” of a product, in particular the need to dispose of waste in various ways, the choice of the most environmentally friendly means of transport, etc. Logistics concerns not only the economic problems of enterprises, but also issues related to the need to take into account the problems of society and environmental protection.

Organizing an effective recycling process requires the development and implementation of appropriate strategies and policies. It is important to consider the integrity of the logistics management system to ensure effective collection, sorting, recycling and reuse of waste.

In addition, the introduction of a recycling system into logistics management can enhance the company's reputation and attract consumers who are increasingly focused on goods and services created with an environmental component in mind.

Overall, recycling in the logistics management system is a relevant and important topic that can bring significant environmental, economic and social benefits.

The application of recycling in logistics management systems can significantly improve the efficiency and environmental sustainability of the processes of transportation and storage of goods [2].

Justification:

Reducing resource consumption: Recycling allows waste and materials to be reused, thereby reducing the consumption of natural resources. In logistics, this can be applied, for example, by using packaging materials made from recycled paper or plastic.

Cost reduction: Reusing and recycling materials can help reduce the cost of acquiring new resources. This is especially true when expensive materials are used, such as in the manufacturing of electronics or automobiles.

Waste reduction: Recycling can reduce the amount of waste that would otherwise end up in landfills or incinerated. This helps reduce the environmental impact of waste and reduce negative impacts on the environment.

Improved corporate image: Proactively implementing recycling in logistics activities can improve a company’s image, especially in the eyes of an environmentally conscious audience. This can attract new customers and partners, as well as help retain existing customers.

Additional Marketing Opportunities: Companies can use their recycling efforts as part of their marketing strategy. This can help attract the attention of potential customers and convey a message about the company's concern for the environment and sustainability.

Compliance with Laws: Many countries already have laws and regulations that require companies to adhere to certain environmental standards and sustainability principles. Recycling can help companies comply with these requirements and avoid potential fines or penalties [2].

Thus, the hypothesis suggests that the introduction of recycling into the logistics management system can lead to a reduction in resource consumption, a decrease in costs, a reduction in waste, an improvement in the company's image and the creation of additional marketing opportunities.

Recycling in logistics is the process of reusing materials, components, and packaging to reduce waste and save resources. It is an important aspect of sustainable development and is becoming increasingly important for logistics companies worldwide. In this literature review, we will consider the main aspects of recycling in logistics.

Modern research and practical examples:

The study "The role of recycling in logistics management" by MHH Gadalla examines the role of recycling in reducing costs and improving the efficiency of logistics operations.

"Implementing reverse logistics: small retailer perspectives" explores the perspectives of small retailers on the implementation of reverse logistics and recycling.

Case study: UPS successfully implements a system of recycling and reuse of packaging, which reduces the use of new materials and reduces costs [5].

According to the author A.A. Fayustov, recycling should be given a broader meaning, and it should include not only the processing (utilization) of waste, but also the improvement of the quality of life based on progress in ecology, economics and even politics [3]. According toA.A. Chelnokov, L.F. Yushchenko, recycling is an area in which the scale and degree of processing of different types of raw materials varies significantly depending on the resource value of the waste raw materials [6].

The flow of goods and materials, having passed through the stages of production, distribution, circulation and consumption, does not complete its life cycle. As B. Gabosch and K. Richter rightly note, "the flow of materials, as a rule, does not end at the consumer and is often not directed only in one direction." And further: "While the production and distribution of goods actually proceed only in the direction from the supplier through the manufacturer to the consumer (primary flow), there is also a reverse flow of materials. Planning this flow, its organization and management is the task of reverse flow logistics."

Vinogradov V.M., Khromtsova O.V. believe that reverse logistics "includes flows of raw materials, work-in-progress stocks, finished goods and related information moving from the point of consumption to the point of their origin for the purpose of restoring value and proper disposal" [7]. O.N. Zueva, agreeing that the goal is to restore value and proper disposal, includes dangerous, damaged, expired and used goods, as well as containers in the flows returning from the sphere of circulation and consumption as a result of the reverse distribution of finished products, for the purpose of restoring value and proper disposal. True, in this case we are talking about reverse logistics, but the goals, as we can see, coincide. As for the reverse flows,

their movement is directed in the direction opposite to the direct flow and in this case the substantive side of the concept of "reverse logistics" does not raise questions. Questions arise when considering the structure of return flows presented in the works of a number of authors. Thus, P.A. Terentyev believes that reverse logistics characterizes the flows of “raw materials, unfinished production, packaging and finished products, going from the points of production, distribution and final use back along the chain of flows with the aim of returning their consumer properties or destruction.”

A slightly different definition is given by S.V. Potapova and S.A. Shakhnazaryan, who believe that reverse logistics "includes not only the return of goods, but also the movement of the following inventory items: pallets, container carts, and other containers for packaging individual items and goods that require temperature control (e.g., thermal covers); used packaging returned for reuse, recycling, or disposal, spare parts, goods sent for repair and goods returned from repair, movement of commercial and office equipment, secondary resources, and waste. This is the process of returning inventory items from the consumption sphere to the production sphere that can be reused and repaired." In our opinion, the concepts of "reverse" and "return" flows are interpreted as synonyms, since the structure of flows in both cases is largely the same.

The methodology

Life cycle analysis (LCA). This method allows to evaluate the energy and environmental efficiency of the recycling process taking into account all stages of the product life cycle, from its production to disposal.

Reverse Supply Chain Engineering. This method involves the analysis and optimization of the reverse flows of materials and components in the reverse logistics chain. It allows for the optimization of waste collection, recycling, and reuse processes.

Circular economy. This method is based on the concept of “from waste to resources”. It involves minimizing waste and maximizing the use of resources, improving the recycling and reuse of materials [8].

System analysis. This method allows to study the interaction of various elements and processes in the recycling system, as well as to identify key factors influencing the efficiency of this system.

Life Cycle Costing (LCC) Analysis: This method takes into account all costs associated with the recycling process, from production to disposal. This helps determine the cost effectiveness and feasibility of recycling.

All these methods allow us to study and optimize recycling processes in logistics in order to increase efficiency and resource conservation [9].

Findings/Discussion

To illustrate, we will examine the processing of sawdust. Wood is used in many areas of human life. In many of them, it undergoes special processing, which leaves behind a lot of waste. Often they are not used in any way, they are thrown away or burned, sometimes they are disposed of, for which the enterprise has to pay money and spend other resources.

One of the most rational ways to use them is to create a business for processing wood waste. In one quantity or another, this type of waste is available in any region of the country.

The main type of finished products obtained as a result of processing are fuel briquettes, granules, pellets, which are used in solid fuel boilers and are in great demand. Fuel pellets are granules that are obtained by pressing organic waste: wood, peat, straw, sunflower husks and other agricultural waste [10].

The problem of energy conservation has become a topical issue for discussion in the modern world. Moreover, this problem can be considered from different positions. Power engineers believe that the ideal fuel should be cheap and profitable. Environmentalists pay attention to emissions. Unfortunately, to this day, the problem of using alternative sources such as pellets rests only on the technical aspect of collecting, processing and delivering the finished product to the client at competitive prices. Fuel should be profitable, have good combustion efficiency, be easy to transport, be repackaged, be universal in storage and be safe.

The history of pellet use goes back to the distant past. In the 19th century, people heated their houses with compacted wood chips. Today, pellets are mainly used to heat private cottages, and since this type of urban housing is quite interesting for local residents, the topic of heating with pellets will be of interest to a wide range of consumers. In addition, this type of fuel is currently widely used in thermal power plants in Europe.

The idea of pellet production first arose in Germany, the purpose of creating this product was to improve transportation technology. If sawdust is compacted, it is possible to increase the useful area of the machine during transportation and transport rawer materials with minimal costs. Everything ingenious is simple, and later in 1996 this technology was patented and began to be widely used not only for transporting sawdust, but also peat, straw, husks, grass, manure, litter, corn stalks, industrial waste, etc. [11].

The production of wood briquettes is similar to the production of pellets, only briquettes are pressed instead of granules. Briquettes are not as popular as pellets. They are used for the manual heating of the houses, specifically in conjunction with a fireplace. While pellets heat living spaces automatically.

Today they are widespread use in Denmark, Canada, Austria, Finland, the Netherlands, England, Norway, Italy, and France. New Zealand is a major consumer of pellets, this is due to the EU energy program, according to which the member countries of the union must achieve 20% use of renewable energy sources.

Pellets are one of the most energy-intensive types of fuel. The calorific value of wood pellets is comparable to coal and is 4.3-4.5 kW/kg. When burning 1 ton of pellets, the same amount of energy is released as when burning 1.6 tons of wood, 480 m3 of gas, 500 liters of diesel fuel or 700 liters of fuel oil. Tables 1 and 2 present the energy indicators for burning pellets.

Table 1. Heat of combustion of some types of fuel

Fuel type	Heat of combustion, kW/kg
Wood pellets	4,963
Wood briquettes	4,722

Firewood (birch)	2.833 (1278 kW/m3)
Diesel fuel	11.803 (10.15 kW/l)
Coal	6,133
Natural gas	8,000 kW/m3
Note – compiled by the author (Comparative characteristics of pellets with other types of fuel)	

Table 2. Fuel consumption during the heating season

Fuel type	Amount of fuel
Wood pellets	20 t
Wood briquettes	21.5 t
Firewood (birch)	78.5 cubic meters
Diesel fuel	9887 l
Coal	16.3 t
Natural gas	12544 cubic meters
Electricity	100 MW*hour
Note – compiled by the author (Comparative characteristics of pellets with other types of fuel)	

The most convenient and widespread method of pellet delivery is transportation by truck. Pre-packaged in special polypropylene packaging pellets (see Figure 1) are sent to the destination by special vehicle. The advantages of this method of transportation include the multifunctionality of the transport used, as well as the ease of accounting for the shipped fuel batches (bags with a capacity of up to 30 kg).

Figure 1. Pellets packaged in special polypropylene packaging [12]

But this method of delivery also has its disadvantages, among which are the need to use manual labor and physical force, as well as additional mechanical manipulations exerted on the pellets during loading and unloading operations.

Manufacturers also pack the material into huge plastic bags, commonly referred to as big bags (up to 1200 kg each).

Their delivery is carried out exclusively with the help of special vehicles and a crane; partial automation is also permissible, namely the transportation of pellets on pre-prepared pallets, but, unfortunately, this does not relieve the end user from the need to manually unload the fuel into the boiler bunker.

Figure 2. Packing pellets into big bags [12]

As it was said earlier, Germany became the birthplace of the term pellets, if a little more from history our ancestors also used dried manure for heating. But the Germans went further in this matter, today they produce special equipment for transportation, which allows saving time on loading and unloading operations.

An alternative is to deliver pellets using specialized vehicles (see Figure 3). This type of delivery has gained wide popularity and distribution in the West and in Europe, where the majority of orders for the transportation of pellets to consumers of domestic boilers are delivered in this way.

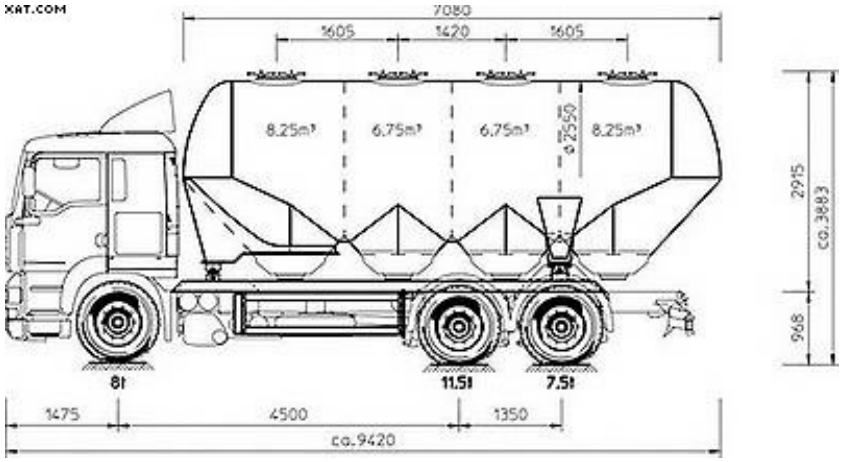

Figure 3. Pneumatic pellet loader [12]

Delivery of pellets by special vehicles – a silo truck or a pneumatic unloader (in Germany it is called Silowagen, that is, a silo truck, or Pelletslaster – a pellet truck) is widespread in European

countries, especially in Germany and Austria, where most orders for the delivery of pellets to users of domestic boilers are carried out in this way.

The loading is recorded using automated systems that record changes in the pressure on the vehicle axles and calculated data obtained using the method of specific loading into the bunker [13].

This method of transportation has significant advantages:

– minimal costs for loading and unloading operations, which allows the seller to save money, since there is no need to hire a team of loaders - the loading and unloading process is fully automated;

– convenience for the consumer due to the increase in the number of customers, since the consumer now has the opportunity to receive pellets directly into the bunker of his boiler, without reloading and storage space;

– high speed of service due to the increase in the number of clients and reduction in transport downtime costs, since unloading pellets using pneumatic transport, as well as bunker loading into a vehicle, takes less time.

A pneumatic unloader is a cylindrical or rectangular container divided into several chambers (compartments) with a compressor for air supply, installed on the chassis of a truck, or in the form of a trailer or semi-trailer to a truck tractor.

These machines can transport from 15 to 28 tons of pellets, and even more with an additional trailer. Unloading is automatic, the driver enters a special ID code on the control panel located on the warehouse console. Pellets are fed from the warehouse upwards by an inclined belt conveyor, at the end of which there is a sieve, through which wood dust is sifted out and dumped into the conveyor chute, thus minimizing the dust content in pellets to 1%, and above the receiving hatch of the truck silo, pellets are poured into a large-diameter synthetic sleeve and from it they are fed into the transport tanks.

The driver takes a sample of the loaded pellets into a small plastic container or metal case and goes to the plant laboratory, where the pellets' moisture content, degree of abrasion, bulk density, and dimensions are determined. Then these pellets are poured into two bags, on which the results of laboratory tests, the date of shipment, and the vehicle number are recorded. One of the bags remains at the manufacturing plant, the second is transferred to the carrier. Using such simple methods, the quality of the pellets is monitored and controlled. After loading the silo truck, the weight is checked using electronic scales. 19 tons (full load) is the order volume for three homeowners per year (6 tons each, plus a small reserve). To properly distribute the load and improve control when moving to the next unloading location, the first chamber of the silo is first emptied (counting from the cabin). After the first, the fourth, and then the second and third chambers are unloaded. And in winter, when the road is slippery, the fourth compartment is never completely unloaded in order to slightly load the rear axles of the car. Figure 4 below shows a pellet truck.

Figure 4. Pneumatic pellet carrier [12]

Today, the market of manufacturers of specialized rolling stock is quite wide. In the process of evolution of delivery by road transport, German manufacturers faced the problem of delivery to narrow quarters of small cities and released a new series of low-tonnage pneumatic vehicles. Today, in Germany and other European countries, a market of used specialized vehicles for the transportation of pellets has already formed, where this transport can be purchased at quite reasonable prices and in good technical condition. The most economically feasible option can be considered the purchase of a semi-trailer.

The average pellet unloading speed is 1 m3 (650 kg) in 7 minutes. The developers managed to achieve the ability to unload pellets with a total length of unloading hoses up to 60 m. The height of the truck with a body is 2.61 m (without loading) and 2.53 m (with loading), the width is 2.30 m, the length is 6.77 m. For comparison: an 18-ton silo truck is 3.84 m high and 2.55 m wide. The cost of a new machine is 130 thousand euros. In Europe, a new 18-ton silo truck transports an average of 3 thousand tons of pellets per year and pays for itself in about four years.

According to the calculations of the equipment manufacturer, the profit per route can reach 500-800 euros, the payback period corresponds to 1.5 to 2 years. But for these data to have their result, the vehicle must make 100-120 trips per year [14].

It is clear that in practice such de+cisions are made on the basis of a much more complex analysis, taking into account a much larger number of factors, such as: the ratio of prices in various market segments, the choice between the export and domestic market, the ability to provide a particular level of quality, and so on. But the use of such transport and the payback period in our republic can take place in any case. Pellet production plants already exist in the Republic of Kazakhstan, the only open question today is the collection, delivery of finished raw materials to the consumer and competitive prices. Conclusions. Pellets can become an alternative for heating private houses in our country, since the consumption of pellets during the heating season is 27 tons compared to diesel fuel 13,347 liters and coal 22 tons. Despite the fact that we do not produce special equipment on the territory of our country, it is possible to use equipment manufactured in the EU countries that have been tested on the roads for several years. It is necessary to develop a logistics scheme for the delivery of finished raw materials to the consumer; in the economic calculations of the payback of this project, it is necessary to calculate the number of trips, which is an integral part of the payback.

Environmental protection and sustainable development have become one of the main topics of modern society. Recycling, or waste processing, is one of the key elements in this process. Proper organization of waste processing not only saves natural resources, but also contributes to the improvement of the logistics system as a whole [15].

Logistics management includes the management of flows of goods, information and money. It is aimed at achieving optimal indicators of production and delivery of goods at the right time and with the required quality characteristics. Recycling, as an important component of the logistics system, ensures more efficient use of resources and a reduction in the negative impact on the environment.

One of the main advantages of recycling in the logistics management system is the saving of resources. By recycling waste, materials can be reused, which reduces the need to extract new resources. As a result, the use of energy, water and other natural resources is reduced, which in turn reduces the costs of their extraction and production.

Pellet production in recycling is a process of converting waste into a high-quality fuel. Pellets are a specific type of fuel that are granules of compressed and processed biomass, peat, wood and other organic materials.

The recycling of pellets offers a number of advantages. Firstly, it helps to reduce the amount of waste and the negative impact on the environment. The second advantage is that pellets are an environmentally friendly and efficient type of fuel that can be used in a variety of applications, including heating houses and businesses, as well as generating electricity.

The pellet manufacturing process involves several stages. The initial stage, of the manufacturing process involves the crushing and drying of the raw material. Then it is mixed with certain additives to provide the required pellet characteristics. The mixture is then pressed into granule form and then fired to increase the pellet strength and durability [4].

Conclusion

Using pellets as fuel has a number of advantages. Firstly, they are environmentally friendly, as their combustion produces fewer harmful substances than traditional fuels. Secondly, the production of pellets facilitates the recycling of waste materials and minimizes the consumption of natural resources. In addition, pellets have a high specific energy value, which makes them an effective type of fuel.

However, recycling in the logistics management system may face some problems. The lack of educational programs and information about waste recycling hinders the effective organization of recycling. The lack of infrastructure for waste collection and processing is also a significant obstacle.

To successfully implement recycling in the logistics management system, it is necessary to take a number of measures. Firstly, it is necessary to create educational programs aimed at raising awareness of the importance of recycling and the correct methods of its implementation. Secondly, it is necessary to develop infrastructure [16].

Also, the process of pellet production in recycling also has some disadvantages. Firstly, it requires certain financial investments at the stage of purchasing and servicing the necessary equipment. Secondly, the process of pellet production can be energy-intensive and require a large amount of raw materials.

In general, pellet production in recycling is a promising direction in the field of waste processing. It allows for efficient use of resources and reduction of negative impact on the environment. However, for it's successful implementation it is necessary to ensure sufficient investments and modern equipment.

The contribution of the authors.

Garmash O.V. – made a significant contribution to the collection and analysis of literature on continuous robotic manipulators inspired by biological models.His work focuses on the study of the current state of this technology, its application and management issues, which contributes to the development of more flexible and adaptive robotic systems.

Muratbekova G.V. – participated in the development of the concept of work and writing the text of the article with the presentation of analytical data, ensuring the integrity of all parts of the article.

B. Manarbekkyzy – participated in the critical revision of the content of the article and in the approval of the final version for publication

L.M. Malikova, Kalekeyeva M.E. – participated in the development of the concept of work and writing the text of the article with the presentation of analytical data, ensuring the integrity of all parts of the article.

References

1. Marchenko A.V. Recikling v logistike / A. V. Marchenko // Sbornik konkursnyh nauchnyh rabot studentov i magistrantov: v 2 chastjah / Ministerstvo obrazovanija Respubliki Belarus', Brestskij gosudarstvennyj tehnicheskij universitet; redkol.: N. N. Shalobyta [i dr.]. – Brest: BrGTU, 2019. – 177 s.

2. Pavlova V.V. Reversivnaja logistika: uchebno-metodicheskoe posobie dlja studentov napravlenija special'nosti «Transportnaja logistika (avtomobil'nyj transport)» / sost. V. V. Pavlova. – Minsk: BNTU, 2022. – 52 s.

3. Dnishev Fajustov A.A. Utilizacija promyshlennyh othodov i resursosberezhenie: osnovy, koncepcii, metody: monografija. - Moskva; Vologda: Infra-Inzhenerija, 2019. - 272 s.

4. Noak A. Sposoby pererabotki drevesnyh othodov [Jelektronnyj resurs]. – 2016. - URL: https:// andreynoak.ru/biznes/sposoby-pererabotki-drevesnyh-othodov/ (data obrashhenija: 03.10.2024)

5. UPS zapuskaet pervoe v svoem rode reshenie dlja povtornogo ispol'zovanija upakovki. [Jelektronnyj resurs]. – 2020. - URL: https:// https://logistics.ru/ustoychivoe-razvitie/ups-zapuskaet-pervoe-v-svoem-rode-reshenie-dlya-povtornogo-ispolzovaniya (data obrashhenija: 03.10.2024)

6. Chelnokov A.A., Jushhenko L.F. Obrashhenie s othodami: uchebnoe posobie / A.A. Chelnokov, L.F. Jushhenko, I.N. Zhmyhov, K.K. Jurashhik. - Rekreacionnye resursy, 2017. - 465 s.

7. Vinogradov V.M., Hramcova O.V. Recikling i utilizacija transportnyh sredstv. - Knorus, 2022 g. – 306 s.

8. Golubeva, E.R. Recikling i pererabotka othodov [Tekst] / E.R. Golubeva, O.B. Ionov. - M.: Feniks, 2014.

9. Lazarev V.A., Kul'kova I.A. Reversivnaja logistika logistika vozvratnyh i obratnyh potokov. [Jelektronnyj resurs]. – 2019. - URL: https://cyberleninka.ru/article/n/reversivnaya-logistika-logistika-vozvratnyh-i-obratnyh-potokov (data obrashhenija: 01.11.2024)

10. Klinkov A.S., Beljaev P.S. Utilizacija i pererabotka tvjordyh bytovyh othodov: uchebnoe posobie / A. S. Klinkov, P. S. Beljaev, V. G. Odnol'ko, M. V. Sokolov, P. V. Makeev, I. V. Shashkov. – Tambov: Izd-vo FGBOU VPO «TGTU», 2015. – 100 jekz. – 188 s.

11. Kokurin D.I. Osnovy reciklinga. Obshhaja teorija: uchebnoe posobie dlja bakalavriata i magistratury / D.I. Kokurin, K.N. Nazin – M.: Izdatel'stvo Jurajt, 2019. – 121 s.

12. Perederij S. Perevozka pellet, ili chto obshhego u pylesosa i transporta, perevozjashhego granuly. LesPromInform №8 (90)'2012. [Jelektronnyj resurs]. – 2012. - URL: https://lesprominform.ru/jarticles.html?id=2981 (data obrashhenija: 01.11.2024)

13. Horoshavin, L.B. Osnovnye tehnologii pererabotki promyshlennyh i tverdyh kommunal'nyh othodov: [ucheb. posobie] / L. B. Horoshavin, V. A. Beljakov, E. A. Svalov; [nauch. red. A. S. Noskov]; M-vo obrazovanija i nauki Ros. Federacii, Ural. feder. un-t. – Ekaterinburg: Izd-vo Ural. un-ta, 2016. – 220 s.

14. Rukovodstvo po utilizacii i pererabotke othodov / pod red. V.M. Shnejdera. - M.: Zashhita okruzhajushhej sredy, 2015.

15. Barchukova, I.S. Pererabotka polimernoj tary / I.S. Barchukova. - M.: Izd-vo MGTU im. N.Je. Baumana, 2019. – 100 s.

16. F., Al'zhanova F. Razvitie innovacij i tehnologij v uslovijah globalizacii: mirovoj opyt i Kazahstan / F. Dnishev, F. Al'zhanova. Almaty: Institut jekonomiki KN MON RK, 2013. – 62 s.

О.В. Гармаш, Г.В. Мұратбекова, Л.М.Маликова, Б.Манарбекқызы, М.Е. Қалекеева
Азаматтық авиация академиясы, Алматы қаласы, Қазақстан

Логистикалық басқару жүйесіндегі рециклинг

Аңдатпа. Логистикалық басқару жүйесінде рециклингті қолдану қалдықтарды қоқыс тастайтын жерге тастаудың орнына оларды қайталама шикізат материалдары немесе энергия ретінде пайдалануға мүмкіндік беретін қалдықтарды басқарудың тиімді және тұрақты жүйесін құруға және қолдауға мүмкіндік береді. Өндірушілер, импорттаушылар, сондай-ақ нарыққа рециклинг тауарларын енгізетін сауда мекемелері рециклинг процесіне қатысатын субъектілер болып табылады. Әдісі: статистикалық талдау, жүйелі талдау, синтез, жалпылау, салыстыру, әдеби дереккөздерді талдау.

Қалдықтарды кәдеге жарату проблемасы қазіргі уақытта бүкіл әлемдегі ең өзекті проблемалардың бірі болып табылады. Өнеркәсіптік өндірістің қалдықтары өнеркәсіптің әртүрлі салаларындағы адамның өндірістік қызметінің нәтижесінде пайда болады. Қалдықтарды кәдеге жарату проблемаларын бастапқы немесе өзге мақсаттағы субстанцияны немесе материалды алу мақсатында өндіріс қалдықтарындағы субстанцияларды немесе материалдарды қайта түрлендіру болып табылатын рециклинг шешуге арналған.

Кәсіпорындардың қалдықтарын кәдеге жарату мен қайта өңдеудің қаралған процестері осы саладағы проблемалардың бір бөлігі ғана болып табылады. Экологиялық жобалардың ауқымы айтарлықтай кең және логистика барлық жерде пайда болады, себебі логистика ресурстарды ұтымды пайдалану қағидатына негізделеді.

Түйін сөздер: логистика, экология, қалдықтар, пеллеттер, қайта өңдеу, қайталама шикізат, кері ағындар, рециклинг.

О.В. Гармаш, Г.В. Муратбекова, Л.М. Маликова, Б. Манарбекқызы, М.Е. Калекеева
Академия Гражданской Авиации, г. Алматы, Казахстан

Рециклинг в системе логистического управления

Аннотация. Применение рециклинга в системе логистического управления даст возможность создавать и поддерживать эффективную и устойчивую систему управления отходами, которая позволит использовать отходы как вторичные сырьевые материалы или энергию, вместо их выбрасывания на свалку. Субъектами, участвующими в процессе рециклинга, являются производители, импортеры, а также торговые учреждения, которые внедряют товары рециклинга на рынок. В исследовании были использованы статистический анализ, системный анализ, синтез, обобщение, сравнение, анализ литературных источников.

Проблема утилизации отходов в настоящее время является одной из самых актуальных во всем мире. Отходы промышленного производства, образуются в результате производственной деятельности человека в различных отраслях промышленности. Проблемы утилизации отходов призван решить рециклинг, который является повторным преобразованием субстанций или материалов, содержащихся в отходах производства, с целью получения субстанции или материала с первичным или с иным назначением. Рассмотренные процессы утилизации и переработки отходов предприятий являются всего лишь частью существующих в данной области проблем. Масштабы экологических проектов довольно обширны, и везде фигурирует логистика, так как логистика базируется на принципе рационального использования ресурсов.

Ключевые слова: логистика, экология, отходы, пеллеты, переработка, вторсырье, обратные потоки, рециклинг.

References

1. Marchenko A.V. Recikling v logistike / A. V. Marchenko // Sbornik konkursnyh nauchnyh rabot studentov i magistrantov: v 2 chastjah / Ministerstvo obrazovanija Respubliki Belarus', Brestskij gosudarstvennyj tehnicheskij universitet; redkol.: N. N. Shalobyta [i dr.]. – Brest: BrGTU, 2019. – 177 s.

2. Pavlova V.V. Reversivnaja logistika: uchebno-metodicheskoe posobie dlja studentov napravlenija special'nosti «Transportnaja logistika (avtomobil'nyj transport)» / sost. V. V. Pavlova. – Minsk: BNTU, 2022. – 52 s.

3. Dnishev Fajustov A.A. Utilizacija promyshlennyh othodov i resursosberezhenie: osnovy, koncepcii, metody: monografija. - Moskva; Vologda: Infra-Inzhenerija, 2019. - 272 s.

4. Noak A. Sposoby pererabotki drevesnyh othodov [Jelektronnyj resurs]. – 2016. - URL: https:// andreynoak.ru/biznes/sposoby-pererabotki-drevesnyh-othodov/ (data obrashhenija: 03.10.2024)

5. UPS zapuskaet pervoe v svoem rode reshenie dlja povtornogo ispol'zovanija upakovki. [Jelektronnyj resurs]. – 2020. - URL: https:// https://logistics.ru/ustoychivoe-razvitie/ups-zapuskaet-pervoe-v-svoem-rode-reshenie-dlya-povtornogo-ispolzovaniya (data obrashhenija: 03.10.2024)

6. Chelnokov A.A., Jushhenko L.F. Obrashhenie s othodami: uchebnoe posobie / A.A. Chelnokov, L.F. Jushhenko, I.N. Zhmyhov, K.K. Jurashhik. - Rekreacionnye resursy, 2017. - 465 s.

7. Vinogradov V.M., Hramcova O.V. Recikling i utilizacija transportnyh sredstv. - Knorus, 2022 g. – 306 s.

8. Golubeva, E.R. Recikling i pererabotka othodov [Tekst] / E.R. Golubeva, O.B. Ionov. - M.: Feniks, 2014.

9. Lazarev V.A., Kul'kova I.A. Reversivnaja logistika logistika vozvratnyh i obratnyh potokov. [Jelektronnyj resurs]. – 2019. - URL: https://cyberleninka.ru/article/n/reversivnaya-logistika-logistika-vozvratnyh-i-obratnyh-potokov (data obrashhenija: 01.11.2024)

10. Klinkov A.S., Beljaev P.S. Utilizacija i pererabotka tvjordyh bytovyh othodov: uchebnoe posobie / A.S. Klinkov, P.S. Beljaev, V.G. Odnol'ko, M. V. Sokolov, P. V. Makeev, I. V. Shashkov. – Tambov: Izd-vo FGBOU VPO «TGTU», 2015. – 100 jekz. – 188 s.

11. Kokurin D.I. Osnovy reciklinga. Obshhaja teorija: uchebnoe posobie dlja bakalavriata i magistratury / D.I. Kokurin, K.N. Nazin – M.: Izdatel'stvo Jurajt, 2019. – 121 s.

12. Perederij S. Perevozka pellet, ili chto obshhego u pylesosa i transporta, perevozjashhego granuly. LesPromInform №8 (90)'2012. [Jelektronnyj resurs]. – 2012. - URL: https://lesprominform.ru/jarticles.html?id=2981 (data obrashhenija: 01.11.2024)

13. Horoshavin, L.B. Osnovnye tehnologii pererabotki promyshlennyh i tverdyh kommunal'nyh othodov: [ucheb. posobie] / L.B. Horoshavin, V. A. Beljakov, E. A. Svalov; [nauch. red. A. S. Noskov]; M-vo obrazovanija i nauki Ros. Federacii, Ural. feder. un-t. – Ekaterinburg: Izd-vo Ural. un-ta, 2016. – 220 s.

14.Rukovodstvo po utilizacii i pererabotke othodov / pod red. V.M. Shnejdera. - M.: Zashhita okruzhajushhej sredy, 2015.

15. Barchukova, I.S. Pererabotka polimernoj tary / I.S. Barchukova. - M.: Izd-vo MGTU im. N.Je. Baumana, 2019. – 100 s.

16. F., Al'zhanova F. Razvitie innovacij i tehnologij v uslovijah globalizacii: mirovoj opyt i Kazahstan / F. Dnishev, F. Al'zhanova. Almaty: Institut jekonomiki KN MON RK, 2013. – 62 s.

Information about the authors:

Garmash O.V. –c.t.s., Associate Professor, Academy of Civil Aviation, st. Akhmetova 44, 050039, Almaty, Kazakhstan, 8-777-087-36-19, e-mail: olm78@mail.ru

Kalekeyeva M.E. **–** doctoral student in the specialty "Aviation Engineering and Technology", JSC "Academy of Civil Aviation", st. Akhmetova 44, 050039, Almaty, Kazakhstan, 8-707-199- 00-58, kalekeeva.m@mail.ru

Muratbekova G.V. **–** c.t.s., docent, "Academy of Civil Aviation", st. Akhmetova 44, 050039, Almaty, Republic of Kazakhstan, 8-701-414-04-07, gv170471@mail.ru

Malikova L.M. **–** c.t.s., docent, , associate professor, Academy of Civil Aviation, st. Akhmetova 44, 050039, Almaty, Kazakhstan, e-mail: larisa.malikova.73@mail.ru

Manarbekkyzy B. **–** senior lecturer of "Academy of Civil Aviation", st. Akhmetova 44, 050039, Almaty, Kazakhstan, 8-705-297-47-05, baxit.85@mail.ru

Гармаш О.В. **–** кандидат технических наук, ассоциированный профессор Академии Гражданской Авиации, Академия Гражданской Авиации, ул. Ахметова 44, 050039, г.Алматы, Республика Казахстан, 8-777-087-36-19, e-mail: olm78@mail.ru

Қалекеева М.Е. **–** докторант по специальности «Авиационная техника и технологии», АО «Академия гражданской авиации», ул. Ахметова 44, 050039, г.Алматы, Республика Казахстан, 8-707-199-00-58, kalekeeva.m@mail.ru

Муратбекова Г.В. **–** кандидат технических наук, доцент, профессор Академии Гражданской Авиации, Академия Гражданской Авиации, ул. Ахметова 44, 050039, г.Алматы, Республика Казахстан, 8-701-414-04-07, e-mail: gv170471@mail.ru

Маликова Л.М. **–** кандидат технических наук, доцент, ассоциированный профессор, ул. Ахметова 44, 050039, г.Алматы, Республика Казахстан, 8-701-355-34-69, e-mail: larisa.malikova.73@mail.ru

Манарбекқызы Б. **–** сеньор лектор Академии Гражданской Авиации, ул. Ахметова 44, г.Алматы, Казахстан, 8-705-297-97-05, e-mail: baxit.85@mail.ru

Гармаш О.В. **–** техника ғылымдарының кандидаты, ассоциированный профессор, Азаматтық авиация академиясы, Алматы, Ахметова көшесі 44, Қазақстан Республикасы, 8-777-087-36-19, e-mail: olm78@mail.ru

Қалекеева М.Е. **–** «Авиациялық техника және технологиялар» мамандығының докторанты, «Азаматтық авиация академиясы» АҚ, Ахметова көшесі, 44, 050039, Алматы қ., Қазақстан Республикасы, 8-707-199-00-58, kalekeeva.m@mail.ru

Мұратбекова Г.В. **–** техника ғылымдарының кандидаты, доцент, профессор, Азаматтық авиация академиясы, Алматы, Ахметова көшесі 44, Қазақстан Республикасы, 8-701-414-04-07, e-mail: gv170471@mail.ru

Маликова Л.М. **–** техника ғылымдарының кандидаты, доцент, ассоциированный профессор, Алматы, Ахметова көшесі 44, Қазақстан Республикасы, 8-701-355-34-69, e-mail: larisa.malikova.73@mail.ru

Манарбекқызы Б. **–** оқытушы, Азаматтық авиация академиясы, Алматы, Ахметова көшесі 44, Қазақстан Республикасы, 8-705-297-47-05, e-mail: baxit.85@mail.ru