

# SELECTED ASPECTS OF THE ORGANIZATION OF THE PROCESSES OF REVERSE LOGISTICS OF PACKAGING WASTE IN MANUFACTURING ENTERPRISES

## 1.1 INTRODUCTION

Current legal regulations concerning the operation of manufacturing enterprises are shaped through the paradigm of sustainable development, and aim at satisfying increasingly bigger pro-ecological needs of entire societies. By making producers responsible for packaging waste and presenting appropriate actions in this respect, states aim at minimization of harmful impact on the natural environment. Processes of reverse logistics are thus particularly significant for manufacturing enterprises, and appropriate organization of these processes leads to economic benefits and simultaneous improvement of relations between companies and the environment. Background literature indicates that appropriate organization of the processes of reverse logistics improves not only competitiveness of firms, but also their market image. This however requires appropriate actions on the part companies, which focus on the integration of economic and environmental goals in the organization of the processes of reverse logistics.

The hereby paper discusses the problems of selected aspects of the organization of the process in manufacturing enterprises and focuses on the economic aspects expressed in maximization of profit through reduction of costs, and ecological aspects focusing on the implementation of legal regulations, improvement of relations with the environment and developing pro-ecological image of companies.

## 1.2 REQUIREMENTS OF SUSTAINABLE DEVELOPMENT OF COMPANIES

Manufacturing enterprises constantly face the task of supplying selected raw materials or products to appropriate places and at appropriate time. The topic of the organization of the processes of reverse logistics should start from defining the concept of logistics which should be understood as „[...] organization, planning realization and control over the flow of goods from the moment of their purchase, through production and distribution to the end user, with the purpose of meeting market requirements at minimum costs and economical involvement of capital [...]” [5]. Another definition is suggested by Professor Elżbieta Gołębska, who observes that logistics is nothing but a me-

thod, whose task is to manage the full chain of delivery within the enterprise and between companies, from planning to control. This is connected not only with the flow of products, but also with circulation of information and finance through the indirect forms, starting from the original source [6].

At the time of broadly understood consumerism, the society must cope with the problem of waste, which has always accompanied people in result of their lifestyle or production activity. The increase in the amount of waste, both municipal and packaging requires constant improvement of the system of waste management [19]. Taking into account the concept of logistics, there is a need to quote the definition of reverse logistics according to which „[...] reverse logistics is the totality of processes of waste management (including damaged waste) and information [...] from the place of their emergence [...] to the place of their destination, with the purpose of recovering value (by means of repairs, recycling or processing) or appropriate storage in such a way that the flows are economically efficient and minimize negative impact of waste on the natural environment. [...]” [14]. It becomes clear that reverse logistics is based on the logistics approach of enterprises to waste management, and if it is possible, on recovery of economic value of waste by means of application of various processes of recycling, which constitutes an element of eco-management.

Protection of the environment and natural resources constitute the reason for which such concept was coined. At the time of globalization, similar issues are also labeled as „eco-logistics”. The branch is still not well developed in Poland, and the first definitions can be found in background literature from 1999 [14]. Foreign resources present reverse logistics as an aspect of efficiency, which translates into the involvement of actions aimed at recycling, and their course is reverse to standard logistics actions [14].

The phenomenon of reverse logistics is increasingly more observable and appreciated by various enterprises, since reverse logistics itself may apply to returns, complaints, waste or packaging recovery. Entrepreneurs who not observe regulations are subjected to financial penalties, as manufactures are responsible for the entire life cycle of products [12]. In highly industrialized countries, heaps of waste pose a serious threat to the environment, and thus manufactures, while taking into account the economic aspect, at the times of limited availability of raw materials, may also sell raw materials recovered through recycling [12].

For enterprises, such form of waste management should be not only profitable, but should also influence the development of a positive brand image. In this new area, logistics specialists should take advantage of their skills, and while taking into accounts potential profits and savings in enterprises, ought to implement this branch of logistics as well. There will be more work, and the forecasts show that in result of excessive consumption in Poland, more waste will be generated, which in turn will have to be recycled [12]. Short life cycle of packages, which fairly quickly become waste, constitutes a significant burden for the environment. Packaging „[...] is a product, including non-returnable products, made of any material, designated for storing, protection, transfer, delivery or presentation of products, ranging from raw materials to processed goods[...]” [15].

In the European Union, the Directive of the European Parliament and Council of December 20th, 1994 on packaging and packaging waste constitutes the key legal act concerning environment protection and organization reverse logistics of packaging waste. In 2001 European standards were accepted, which specify the requirements concerning the characteristics of packaging which can be recycled. Yet, particular member states have relatively much freedom in respect of the way they fulfill the obligation of the Directive, provided the goals of the Directive are met. In Poland, the basic legal acts, which impose obligations on manufacturing enterprises in the above mentioned respect, include: the Law on Environment Protection of April 27th, 2001, the Law on Waste of December 14th, 2012, the Law on Maintaining order and Cleanliness in Communes of September 13th, 1996, the Law on Packaging and Packaging Waste Management of June 13th, 2013 and Law on the Obligations of Entrepreneurs in Respect Waste Management, Product and Deposit Fees of May 11th, 2001. The above mentioned laws, in accordance with the principle of extended responsibility of producers, impose upon manufacturers the obligation of recovery, and their responsibility is based on the „polluter pays” principle, which means that the costs neutralization is borne by the subject generating waste, and that the costs of preventing pollution are borne by those who cause it [18]. The basic obligation of each owner and producer of waste is to keep current qualitative and quantitative record, and producers are obliged to submit annual reports to the Province Marshal [17]. The state expects communes to accept regulations containing principles of maintaining cleanliness and order on their territories, so that entrepreneurs could be familiar with the principles of management of communal waste in particular areas [16]. In the model of production system, which assumes repeat use of certain elements of products, it is also assumed that recovered elements constitute a perfect substitute of new components, and that is why packaging waste should be recycled in first place, whereas combustion or storage should constitute a subsequent process.

Economic and social development of the world significantly influences the growth of waste generation, and the problems connected with management, storage and processing of waste have become a serious challenge for the civilization. The current formula of „sustainable development” has its roots in the second half of the 20th century, when the demographic growth, technological and industrial progress resulted in the increase in demand for consumer goods and shortening of the life cycle of numerous groups of products. The principle assumption of the concept of sustainable development consists in „[...] implementation of such policy and actions in particular sectors of economy and social life, which could preserve the resources and values of the environment in the condition assuring permanent, undisturbed possibility to take advantage of them both by present as well as future generations, with simultaneous preservation of functioning of natural processes as well as natural biological diversity at the levels of landscape, ecosystem, species and genetics [...]” [3]. This leads to two fundamental goals of sustainable development, which is intra- and inter-generational justice [7].

For the purpose of defining intelligent and sustainable development, in the document Europe 2020, the European Commission specified the priorities of the develop-

ment of economy based on knowledge and innovation, supporting, efficient economy, economy which is more environment friendly and more competitive, supporting economy offering high level of employment and assuring social and territorial cohesion [3]. Implementation of the requirements of the concept should also apply to adaptation of enterprises to the standards used in EU and member states, changes in production processes and implementation of new technological solutions as well as construction of installations and facilities supporting economical use of raw materials and energy.

The aim of each enterprise should be to operate in a way which reduces the negative impact on the environment to the minimum, implement as well as improve the system of cleaner production, which facilitates the achievement of a higher level of ecological production as well as forms of use and utilization of products. Cleaner production means production management which prevents and reduces impact on the environment at all phases of the product life cycle, from acquisition of raw materials to neutralization of waste [13]. Actions aimed at identification of cleaner technology should be based on reduction of energy consumption, precise planning of the logistics of production, segregation of streams of waste, designing packaging from biodegradable materials, economizing on products by introducing changes in their composition, materials used, preventing losses, reducing the emission of harmful substances, reducing the discharge of non-biodegradable substances to water, use of waste biomass as raw material for production of fuel. Each of these actions requires appropriate technologies, resources as well as legal and organizational basis, so that they could be implemented in accordance with the strategy of sustainable development [13].

### 1.3 ECOLOGICAL AND ECONOMIC ASPECTS IN REVERSE LOGISTICS

The concept of reverse logistics is not explicit, it may assume various forms depending on what a given enterprises products. Manufacturing of some foods does not generate practically any waste, whereas in case of other products, many materials cannot be used, that is why it is difficult to determine stages of the processes of reverse logistics which could be universal for all types of industry. Nevertheless, J. Szoltysek differentiated three general subsystems which specify major forms of activity of reverse logistics.

The first of the subsystems is collection of waste [14], which consists on the development of a logistics system facilitating access to used materials. Waste collection may assume various forms. Segregation of waste by consumers and subsequent transport to the company is the most popular, while increasing more enterprises encourages their customers to bring waste products in return for a discount in the price for new purchased goods. Waste can be collected in cans, which after they are emptied remain in the same place, or in containers which are transported to the place of neutralization of waste [4]. Waste collection increases the costs incurred by companies.

Disposal of waste is another differentiated subsystem [14]. The place of disposal must have appropriate size and operational characteristics depending on the amount of waste stored. Companies must organize space, which appropriate for the amount of wa-

ste stored [10]. The selection of suitable routes and means of transport is also significant. In Poland, trucks which dispose waste in the one-stage system are the most popular form of transport [4]. This means that they transport the cargo directly to the place where it is used.

Neutralization, processing or use of waste constitutes the third and final subsystem identified by J. Szołtysek. Collected and stored waste must be divided into three groups [14]. The first included waste which can be used in further production, which means that „[...] given waste can be used again for the same or some other purpose with no additional processing [...]” [14]. Materials from this group generate the highest savings for companies, since their subsequent use means that they do not need to process them or use new, more expensive materials. Another group is waste which after processing can be used again in production. Plastic bottles are a good example. When bottles are disposed by customers, firms collect them, and after cleaning and grinding, waste material is used for production of new bottles. This reduces the costs of enterprises, as they do not need to invest into new materials, but also forces them to develop an appropriate system guaranteeing constant supply of waste.

The third group includes waste materials which cannot be processed, or which are no longer useful in production. Such waste is neutralized. Although implementation of reverse logistics requires investment on the part of companies, potential benefits exceed incurred expenses. If the logistics system is well planned and operates in an optimum way, production costs will be lower compared to the period before its implementation. Furthermore, it may also function as an element of marketing actions. At the time of increased awareness of consumers, many of them may appreciate the fact that particular goods are produced from recycled materials, that is ecologically. This improves the image of the firm and its competitiveness.

Use of recycled materials and good organization of the processes of reverse logistics of packaging waste in manufacturing enterprises brings numerous benefits: economic, ecological and social. Economic benefits include reduction of the use of packaging materials, storage costs, costs of product packaging and amount of packaging waste [9].

In result of recycling materials, enterprises increase the ability to improve particular parameters and construction of packaging, which can significantly lower costs in the long term [8]. Also environmental fees are reduced [2]. Good organization of processes exerts a positive impact on national economy due to reduction of the use of other resources, extension of the materials basis, reduction of the costs of acquisition of raw materials, energy consumption in production, costs of processing, costs borne for protection of natural environment [14], as in result of generation and collection of waste, fees paid by firms are lowered and penalties eliminated [1].

Reduction of the threat to the natural environment is the most significant ecological benefit of the implementation of the above described practice, which results from the reduction of the amount of waste, often also those which not biodegradable [14]. In this way natural environment recovers its ability to absorb pollution and its natural balance [1]. The application reusable packaging decreases harmful emission to the atmosphere,

reduces consumption of electric energy, demand for water as well as water pollution or amounts of not useful waste [9]. Savings on materials, energy and labor are also increased. Use of supplements, e.g. waste paper, whose processing has a positive influence on the natural environment, is also important, since it lead to reduction of the conception of paper and board [8]. The basis of raw materials is extended, among others by recycled materials, and in result of the operation of industry land rehabilitation takes place [2].

Appropriate organization of the processes of reverse logistics of packaging waste brings also social benefits, since new and more useful types of packages are developed, which have specific technological advantages, e.g. Bag in Box, packages from corrugated board or cans. The society learns to manage waste as well as environment in a rational way, which in turn facilitates voluntary actions resulting from ethical approach [8]. Positive changes can be observed in the system of waste disposal by residents, since increasing better conditions of waste disposal are developed (standardized containers or special bags). The number of dumping grounds is reduced (including the unauthorized ones), inventories are performed more frequently [8], which translates into lowering the costs of storage.

## CONCLUSIONS

Increase in the interest in logistics in business and numerous regulations of the international law, connected with broadly understood environment protection as well intensified ecological awareness make entrepreneurs responsible for packaging waste and specify appropriate actions of manufacturers in respect managing the flow of waste. Familiarity with the standards of the processes of reverse logistics in contemporary manufacturing enterprises contributes significantly to better company image due to improvement of its relations with the environment, accompanied by numerous economic benefits. It is logical, that mistakes in the process of managing reverse logistics in enterprises cannot be avoided, but appropriate organization and conscious improvement of these processes may constitute a source of increasing competitiveness and determining the competitive position of the firm both on the local and international markets.

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**Abstract:** *The paper discusses the problems of the efficiency of selected aspects of the organization of the processes of reverse logistics of packaging waste in manufacturing enterprises. On the basis of the analysis of background literature, current legal standards and strategic documents, benefits resulting from its application are shown, and legal obligations of entrepreneurs are presented.*

**Key words:** *reverse logistics, packaging waste, manufacturing enterprises*

## WYBRANE ASPEKTY ORGANIZACJI PROCESÓW LOGISTYKI ZWROTNEJ ODPADÓW OPAKOWANIOWYCH W PRZEDSIĘBIORSTWIE PRODUKCYJNYM

**Streszczenie:** *W artykule omówiono problematykę skuteczności wybranych aspektów organizacji procesów logistyki zwrotnej odpadów opakowaniowych, w przedsiębiorstwie produkcyjnym. Na podstawie analizy piśmiennictwa, aktualnych norm prawnych i dokumentów strategicznych wykazano korzyści wynikające z jej stosowania oraz przedstawiono prawne obowiązki przedsiębiorców.*

**Słowa kluczowe:** *logistyka zwrotna, odpady opakowaniowe, przedsiębiorstwo produkcyjne*

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