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IMPROVING THE REVERSE LOGISTICS RESPECTING PRINCIPLES OF SUSTAINABLE DEVELOPMENT IN AN INDUSTRIAL COMPANY

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Abstract

Reverse logistics, the movement of materials back up the supply chain, is recognised by many organisations as an opportunity for adding value. The paper considers the theoretical framework and the conception of reverse logistics in literature and practice. The objective of the article is to propose tangible solutions which eliminate the imbalances in reverse logistics and improve the waste management in the company. The case study focuses on the improvement in the process of waste packaging in the context of sustainable development as a part of reverse logistics in the surveyed industrial company in Slovakia.

Key words

Reverse Logistics; Packaging; Waste; Industrial Company; Sustainability

INTRODUCTION

Nowadays, it is a big challenge for many companies in Slovakia, to introduce the principles of sustainable development into reverse logistics. Sustainable reverse logistics means an interdisciplinary approach to logistics processes including using less material, packaging and waste. In logistics processes should also be considered additional options of recovering and eliminating waste material.

The aim of the paper is to present the application of sustainable development principles for the improvement of the effectiveness of reverse logistics in a manufacturing company in Slovakia. The reason for doing so is the Extended Producer Responsibility (EPR). In July 2014, the European Commission published a proposal to review recycling and other waste-related targets in the EU, to encourage the transition towards a Circular Economy through the use of waste as a resource. So dealing with reverse logistics becomes important in industrial companies.

CHARACTERISTICS OF REVERSE LOGISTICS

Logistics and its issues have changed over the last decades; the characteristics of reverse logistics can prove this. The European Working Group on RL REVLOG characterises reverse logistics as the process including planning and control of material flow, inventory in progress, finished goods and related information flow from the place of manufacture, distribution or consumption to the point of recovery of the value or disposal. Reverse logistics has become a key competence in modern supply chains (Dekker, 2004). The growing interest in reverse logistics is associated with competition and marketing as well as economic and environmental factors (Ravi, 2005).

The term reverse logistics has been used only rarely in literature and only few authors can be named that dealt systematically with this area, but this has changed over the last few decades. According to Škapa (2002), reverse logistics is the collection, sorting, and recovery of used products, byproducts, surplus stocks and packaging. Its aim is to ensure that reverse flows will be reused, recovered or recycled in a way that is economically rational and environmentally friendly. The authors Dupaľ and Brezina mentioned in their monograph (2006), that the basis of reverse logistics is the material and material flow as an organised flow of all items, which are useful for the realisation of the production process and between production factors and the environment. Husáková (2008) defines that reverse logistics is the part of logistics dealing with management, supply and the realisation of the reverse flow of raw material in collection and conduction nets from customers towards the point of handling. New models of reverse logistics were introduced by Gežík (2012).

The reverse logistics system is based on four core processes (Mičietová and Šulgan, 2010):

- Gatekeeping: a landing inspection where the decisions are made on the passive income element (product, material) into the reverse logistics.
- Collection: collecting, gathering, the storage of products and materials for processing
- Separation: the subsequent allocation of the collected material according to another processing method.
- Disposition / re-processing: products and materials are processed according to the following character - repaired dismantled on functional moieties capable of re-operation, recycled, stored, burned.

There are other aspects of reverse logistics systems that the aforementioned broad definition does not encompass. There is an increasing need to address issues of sustainability and integration with other aspects (social, cultural, ecological, economical, ergonomic etc.) of logistics. Presley et al. (2007) introduced the notion of issues relevant to the three major pillars of sustainability in the reverse logistics process. Sustainable logistics in the context of social corporate responsibility means to understand environmental, social and culture aspects of all logistics processes of an industrial enterprise (Fidlerová, 2013).

From previous experience with the application of sustainable development principles in industrial companies in Slovakia within the research project KEGA No. 037STU-4/2012 "Implementation of the subject „Sustainable corporate social responsibility" into the study programme industrial management in the second degree at MTF STU Trnava", we state: *The concept of sustainable logistics should regard the equivalence between the enterprise and its environment including all stakeholders with respect to environmental, economic and social aspects of logistics in enterprise.*

Sustainable logistics means a process of planning, realisation and coordination of material and information flow from place of origin/production to the place of consumption, including recycling, dissolution and reuse of products. The main objective of sustainable logistics is to meet customer's requirements whilst minimising the negative influence on the environment and society (Sakál, 2009). Fleischmann et al. (1997) notes that economic and environmental issues are often intertwined. For example, increasing disposal costs make waste reduction more economical, and environmentally conscious customers represent new market opportunities. Ideally, one would like to combine both ecological and economic advantages, as suggested by the concept of a 'sustainable' economy.

We agree with Bajdor et al (2015) that there are many logistics activities, which can be considered as sustainable, lots of them lie at the intersection with the economic bottom line, and have some potential economic advantages.

Sustainable reverse logistics is most closely connected with waste management in companies and helps to meet objectives of sustainable development and the requirements of law at the same time. Sustainable reverse logistics represents an important part of the logistics processes in industrial enterprise (Fidlerová, 2013).

In Slovakia, it is possible to find ways of its application in indirect form, as waste management. Through the introduction of producer responsibility for produced waste in the new waste law in Slovakia, the task of reverse logistics gains increasingly in importance.

IMPROVING REVERSE LOGISTICS WHILST RESPECTING THE PRINCIPLES OF SUSTAINABLE DEVELOPMENT IN THE INDUSTRIAL COMPANY

An analysis was conducted in the industrial company, and with regards to the volume and capacity of production, it is considered to be the biggest LCD TVs supplier for the whole European market producing computers, televisions, digital cameras, game consoles etc.

In our research, we addressed the critical analysis of reverse logistics in the company to find a solution for its enhancement. The analysis of materials and information flow showed that every work position or process in the manufacturing company is connected with waste production and treatment. The produced waste should be separated to a maximal rate according to the environmental policy of the company.

The material and information flow begins with the material purchasing in the company for production. All purchased material is distributed into the production process, where the waste first occurs. Waste can be general divided into 2 main groups: hazardous and other, including all the remaining waste types (fig. 1).

All packing waste should be transported to the local sectors with the collection points for each department and subsequently transported to the central sector. The waste should be moved to disposal for reducing or recovering, often recycled and further use. For the reduction of waste in the surveyed industrial company the following eight simple rules are applied:

1. Prevent the waste production.
2. Ensure the reuse of materials from which the waste came.
3. Use of the materials produced from recycled waste as much as possible.
4. Use the recyclable materials as much as possible.
5. Separate waste according to the requirements arising from their activities.
6. Place the waste into containers.
7. Select and safely dispose of the hazardous waste.
8. The waste can be exported from the company only with permission.

All employees who work in the company must pass training on the proper treatment of waste - collection system, recycled sorting. This training must be passed by each newly recruited employee and is renewed every two years. Workers employed in hazardous waste environments must undergo special training for the handling of hazardous waste, and this training is repeated every year. In order to continuously comply with the rules, the staff must be aware of the new rules, therefore they are always available on the bulletin boards located at intersecting corridors of each production line. Each employee has to follow the aforementioned rules for waste treatment in the company. Training aimed at protecting the environment, and knowing the rules is provided by external employee training with the focus on reverse logistics and waste management.

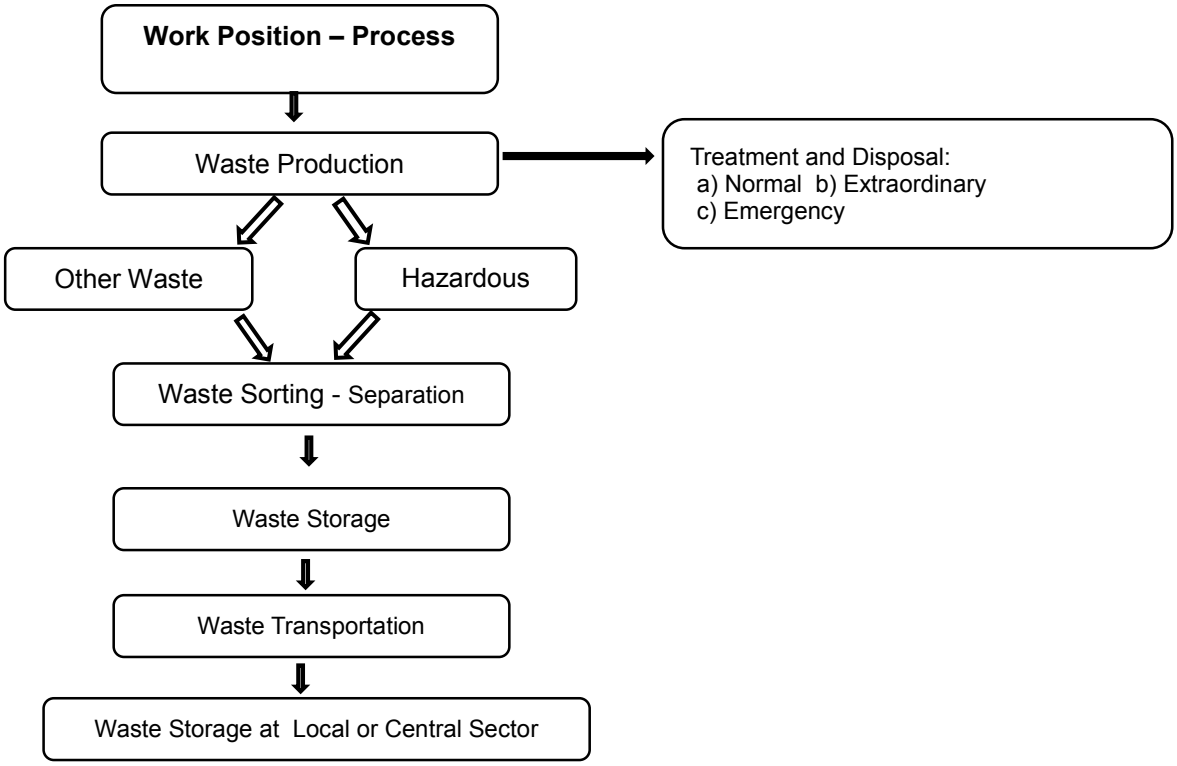

***Fig. 1**. Mapping the packaging waste flow in the work place (Drawn by authors)*

Improving the reverse logistics in the context of sustainable development in companies should respect the hierarchy of waste management and the concept of 3R: prevention, preparing for reuse, recycling, and other recovery (fig. 2).

The concept behind the first R, reduce, is that the number of purchases should be limited. The concept behind the second R, reuse, is that you should reuse items as much as possible before replacing them. The concept behind the third R, recycle means that items or their components are put to some new purpose as much as possible. On top of the waste hierarchy is prevention, which can ensure the protection of the environment and also reduce cost in the company. The second level of waste hierarchy is the reuse of waste and our improvement covers this area.

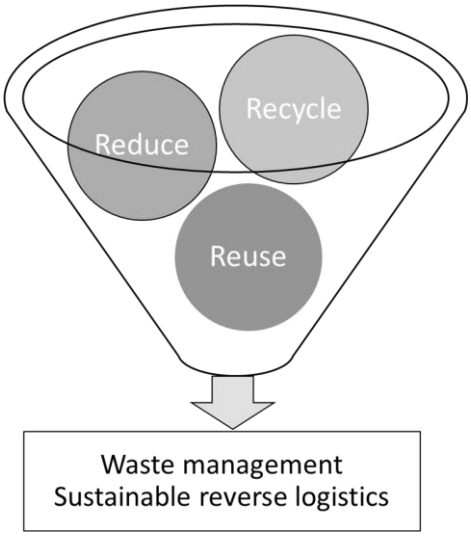

***Fig. 2**. Concept of 3R applied in waste management to achieve sustainable reverse logistics (Drawn by authors)*

In our solution we focused on two types of waste produces in the company, which can be further recovered – these are recycling during production and the handling of manufactured goods. Both are packaging waste, which increase rapidly with growing production. The first packaging waste is cardboard followed by EPE foam.

Cardboard is used for the transport of smaller devices which may cause during transport damage to the original packaging of the goods.

EPE foam is used often to pack various smaller parts of the goods. The advantage of EPE foam is that it is very adaptable, a smooth and highly durable material.

First, recyclable cardboard (cardboard boxes) as a packaging material was considered. Two methods were already applied in the company for its reuse: reinforcement of trucks, to prevent physical damage of goods during transport and for storage of smaller products. Still a high amount of cardboard boxes were classified as waste, so we propose their further use, namely (Moncmanová, 2014):

1. The prevention of potential damages using cardboard on Euro pallets with deposited goods for shipping – e.g. an LCD with a large scale but a narrow box. Depositing cardboards on top of the euro pallets provides a more solid basis for storing goods. The location of collection points for cardboard in the company was estimated by means of labelled containers.
2. For better storage of several stocks of the goods, cardboards could be used as a basis for the goods deposited on pallets. It ensures better stability for stored goods where it is deposited on each other.

The introduction of cardboard reuse will reduce the amount of waste for disposal, which would ensure reduction of volume and costs.

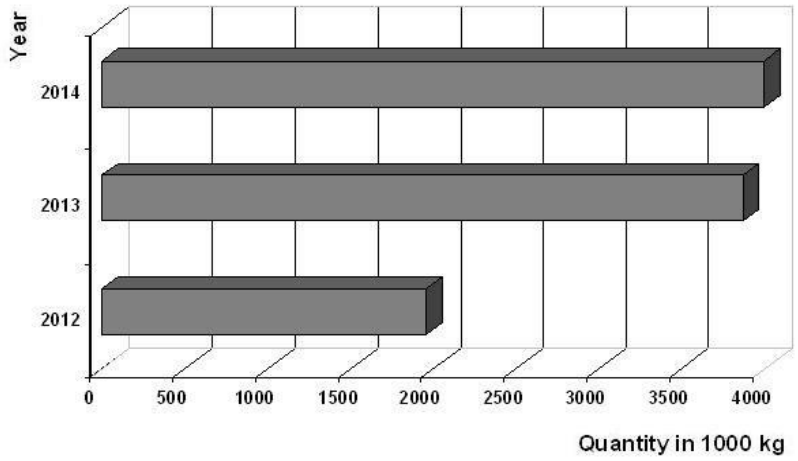

Fig. 3 *Graph showing the amount of cardboard used in the company (Drawn by authors)*

The volume of packaging waste - cardboard in 1000 kg is presented in Fig.3. As shown, the estimated percentage of cardboard used in the industrial company has increased from 1800 000 kg in 2012 to nearly 4 000 000 kg in 2013 and 2014, which means a measurable increase. According to information from the company with the application of the proposed solution for cardboard waste, it would be possible to increase its utilisation to 68 %. (Moncmanová, 2014).

The second measurement is focused on EPE foam as packaging waste in the surveyed company. First, the produced amounts of EPE foam were analysed (fig. 4), then the solution was applied for waste respecting the principles of sustainable development.

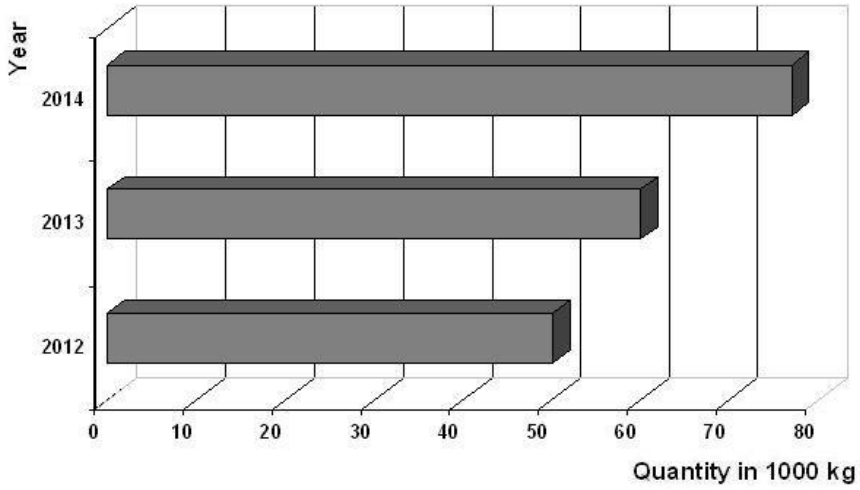

Fig. 4 *Graph showing the amount of EPE foam used in the company (Drawn by authors)*

The proposed solutions for EPE foam are as follows (Moncmanová, 2014):

1. For the use of EPE foam as filling in boxes with parts destined for reclamation – it is not necessary to order the new EPE foam in the desired shape, as EPE foam is easily adaptable. The benefit of the presented solution is cost reduction for disposal and also for ordering the new EPE foam for the packaging process.

2. Packaging the accessories of manufactured goods – with the purpose to ensure the protection of goods against damage during transport. According to experiences in the company the most appropriate packaging is EPE foam thanks to its adaptive properties.

All collection points for packaging waste would be localised near the place of its origin, so where the goods are unpacked and sorted. For its storage the cardboard could be used again. From the economic point of view, if this packaging waste will be recovered and used for other purposes in the company, it would reduce costs for its collection and disposal. The proposed measurement from an ecological point of view also leads to the reduction of the negative influence on the environment and respects the sustainable development principles.

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CONCLUSION

Reverse logistics and its processes are an important part for any industrial company. The concept of sustainable production in companies can fail without undertaking specific aspects. We have pointed out some concrete solutions about applying the principles of sustainable development in reverse logistics for the company.

From our experience during the research, we expect in future more applications and improvements in the field of sustainable reverse logistics with the intersection of economic, ecological and social issues within the economic bottom line, which brings potential synergic effect and advantages for the company and its stakeholders. As shown in the presented case study, it will bring benefits not only in ecological but also the economic sphere, because they are interconnected.

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