

REVERSE LOGISTICS OF AUTOMOTIVE SPARE PARTS

ROMUALD SZOPA¹

Abstract: Reverse logistics is a relatively new area of research. It is fundamentally different from areas such as waste management, which mainly refers to the effective and efficient collection and processing of waste. The waste management assumes that the concept of waste specifies the products which have a new application. Therefore, we conclude that the problems with the clarification of reverse logistics concept and its delimitation in relation to other related areas of science, come down to the understanding of the concept of waste with all the consequences arising from its definition. Reverse logistics refers to such streams flow in which there is the possibility of creating value from withdrawn products when the output provides powering for the new supply chain. The main aim of the paper is to analyse of the organization of the supply chain system in the context of reverse logistics, putting special attention on its tasks in this process. Author mainly focuses on reverse logistics in case of automotive spare parts, presenting it as a competitive factor in logistics market.

Keywords: energy flow, liberalization of the energy market, tariff groups in the industry

1. Introduction

The practice of reverse logistics is based on the assumption that when a customer gets rid of the product, this does not mean that this product is worthless. Thanks to this approach, one may assume that reverse logistics is an essential competitive factor in modern logistics and supply chain management. The subject of reverse logistics is waste flow and information related to these flows. A temporary waste according to the waste understanding philosophy is a material good useless due to a defect or damage and which will be used after repair. Customers appreciate the high-quality materials that have excellent features and are environmentally friendly, while the manufacturer prefers recyclable materials and in cooperation with suppliers, he implements the use of recycled materials, which have comparable performance with new materials. The main task of reverse logistics is organization of the supply chain system that affects its cost and the level of customer service.

2. Literature review on reverse logistics

Reverse logistics can be defined as the reverse process of logistics. Traditionally, reverse logistics has been viewed primarily as the process of recycling products. Today, definitions vary depending on what company or segment of industry is attempting to define it. Retailers see reverse logistics as a way to get product that has been returned by a consumer back to the vendor [14]. Manufacturers tend to view reverse logistics as the process of receiving defective products or reusable containers back from the user. Center for Logistics Management defines reverse logistics as “The process of planning, implementing, and controlling the efficient, cost effective flow of raw materials, in-process inventory, finished goods and related information from the point of consumption to the point of origin for the purpose of recapturing value or proper disposal” [19].

¹ Prof., The Jerzy Kukuczka Academy of Physical Education in Katowice
szopa@word.katowice.pl
Mikołowska 72A, 40-065 Katowice, Poland

According to J. Szołtysek reverse logistics presents processes of the waste flows management (including damaged products) and information management (related to these flows), from the places of its formation (appearance) to the place of its destination in order to restore its value (by repairing, recycling or processing) or ensure its proper disposal and long-term storage. In such a way that flows will be economically efficient and they will minimize the waste negative impact on the human environment [21]. ‘The management of the reverse flows is an extension of the traditional supply chains with used product or material either returning to reprocessing organizations or being discarded’ [2].

Companies sometimes consider reverse logistics as „ an undervalued part of supply chain in general due to the following reasons: minima interest of top management, insufficient time commitment, change in functional priorities among and within firms, a lack of integrated corporate supply chain design target towards reverse logistics, a lack of awareness of the high potential value of integrating operations” [1]. However it has been highlighted that implementation of reverse logistics may lead to higher sales revenue and reduced operational costs [7].

For industries, the management of return flow usually requires a specialized infrastructure with special information systems for tracking and dedicated equipment for the processing of returns [5]. Reverse logistic products appear as a result of their return to the reverse flow because of various causes, such as the withdrawal from sale, overdue, obsolescence, and so on. The most important causes are listed in Table I.

Table I.

The most common reasons of the product returns [17]

SOURCE OF RETURN	CAUSES OF RETURN
CUSTOMER	<ul style="list-style-type: none"> • the product does not meet the expectations of the client; • the client does not understand or cannot properly use the product; • the product has been damaged; • the client returned product by abusing liberal returns policy
ANOTHER PARTICIPANT OF SUPPLY CHAIN (wholesaler, retailer, broker, etc.).	<ul style="list-style-type: none"> • out-dated or damaged product package; • seasonal product; • the product replaced by a newer model; • finished production product; • too high a level of product reserve (marketing returns, surplus stocks, slow-transferable product) • the product holder withdraws from the market

Reverse logistics is applied to products which are waste. Among them are the following main groups: waste materials, packaging materials (including reusable packaging), returns (purchased items returned to any dealer in the supply chain as a result of purchasing decision changing, purchase by mistake, quality defects), manufacturing and product wastes and finally waste products [21]. Mathematical modeling in RL research is mainly focused

on deterministic methods and there are limited research papers considering stochastic demand for the remanufactured products and supply of used products by the customer' [20].

Among the most popular producers who benefit the possibility of reverse logistics, we may identify those who produce photocopiers, car parts, disposable cameras, mobile phones, aircraft engine parts, reusable containers or computers [13].

To design properly a product that meets the requirements of reverse logistics, more precisely speaking one that will be easy to disassemble and is suitable for recycling or re-use, require a detailed analysis of its life cycle, the impact of environmental factors on the production, use by the customer and the way in which a customer will get rid this product [8].

Reverse logistics in the manufacturing process complies with the essential task. Waste that results from the use of products (related to the replacement of defective parts or components) and subjected to repair or regeneration processes in the production stage (eg. Car parts that do not meet quality standards), becomes valuable product. Regeneration may be a comprehensive treatment in which parts regain their required shape dimensions, parameters and characteristics necessary for further work [21]. The motor vehicle at the end of its life cycle also becomes waste that burdens the natural environment, and therefore should be recycled [11].

Acquisition of parts for the repair and regeneration may be structured (the excellent example is the action of the automotive industry companies). Perfectly suited to this are: alternators, starters, steering gear, wiper motors, suspension components, brake calipers, engine equipment, lights, brake master cylinders, etc. [21]. Environmental regeneration benefits are also important. The parts regeneration is significantly less strain on the environment than the production of a new part. To regenerate parts, 10-20% of the energy needed to produce a new item is consuming [15].

Ecological orientation of transport is the next objective of reverse logistics. Transport is the factor under which the environmental performance of logistics concepts is assessed. Thus, when we talk about optimization in terms of environmental redistribution, transport solutions should be reorganized. Individual features of the means of transport, such as gasoline or oil consumption, noise and exhaust secretion, accidents, and cargo protection, should be taken into account in the selection of vehicles. However, more important is ecological organization and mode of transport, which includes: reducing the overall importance of transport, the creation of larger transport units from old products and shifting the burden of the movement of products to the more environmentally friendly means of transport. Efficient and effective systems that arrange reverse logistics activities may significantly contribute to the increase in cost savings and improve the overall process of managing the return of goods, which is reflected in companies' competitive advantage [8].

Marking of the reverse bills is an important element in the reverse logistics. The reverse bills are receipts created to automate payment for returned empty containers (bottles, boxes) that are received in retail stores for a certain amount of money [9].

Developed countries have already implemented a number of advanced technology vehicle recycling system which is constantly innovated to fully and efficiently produce useful materials that are used as secondary raw materials in the economy.

This system is characterized by the following basic phases:

- the acquisition of vehicles for recycling,
- implementation of a components, parts and materials structured dismantling suitable for direct use, further processing or renovation,
- diverted components and materials processing,
- organized distribution of recycling [11].

In the United States remanufactured automotive parts market is estimated at 60 million units per year. In Western Europe it is only 15 million units [21]. According to forecasts by APRA (Automotive Parts Rebuilders Association) up to 2013 the number of reconditioned parts on the European market will double. This trend can be seen more clearly in Poland, where the number of remanufactured parts is estimated at about 1 million units. The recovery rate of parts that are suitable for the regeneration in our country is 20% [15].

3. Reverse logistics tasks in supply chains

Usually considerations on the supply chains are focused primarily on the flow from raw materials to finished product. More precisely speaking, it focuses on the manufacturing processes which produces a lot of waste. Meanwhile, the growing requirements of customers who demand diverse selection of products and product life cycle shortening results in increasing return flows of nutritious products, but useless in a given period or morally older [16]. Furthermore, the amount of waste and its increasingly destructive impact on the environment drew practitioners and business theorists attention on waste chain embedded in the context of the concept of sustainable development. Logistics concept of ecological imperative treats logistics supply chain as a system of few or several mutually coupled supply and sales processing matter and energy chain, which enables meeting the needs of the individual links in the logistics chain. The need to remove the effects of these needs is related to this matter [18].

We can distinguish following actors in reverse logistics activities:

- forward supply chain actors,
- specialized reverse chain actors,
- opportunistic actors.

Responsible parties can be, among others: original equipment manufacturer, wholesalers or retailers, independent intermediaries, specialized recovery enterprises, third party reverse logistics service providers, and governmental institutions, like municipalities taking care of waste collection [4].

The term reverse logistics refers to goods that flows back in the supply chain. Products can be returned by customers or passed to repair, maintenance, disposal or removal. Reverse logistics has both the service (repair, withdrawal from sale, etc.) ecological aspect [12]. The waste chain is a supply chain which has opposite direction to the core direction of the supply chain.

In the case of industrial waste, there are several possibilities for setting up the waste chain, therefore, we can distinguish the following types of strings:

- basic - including traditional supply chain and independent reverse logistics,

- closed production cycles of high-tech products, containing integrated reverse logistics dependent on basic supply chain,
- closed production cycles of standard products including integrated reverse logistics independent on the basic supply chain,
- customer-oriented closed production cycles [10].

Reverse logistics may contain a wide range of activities. These activities can be divided as follows: goods in reverse flow return to an end user or another participant in the distribution channel such as a retailer or a distribution center, or the product or packaging is a material in a reverse flow [3]. These two factors help in providing the basic outline for the characterization of reverse logistics activities. Regardless of their final destination, all the products in the reverse flow must be collected and sorted before sending them to the point of final destination. A major determinant reflected in the reverse logistics system is a place where products are introduced into the reverse flow [8].

The essence of the logistic approach to waste management is also the organization of the entire logistics process, which includes decisions regarding appointment the place of waste collection, collection and transportation of waste cost optimization and decisions governing size and type of transport packages [6].

Transport under the reverse logistics is the task of supplying the product and material waste from the manufacturing site to the destination place in the process of redistribution. We may distinguish three stages of these transport:

- limited to shipment of waste from the collection place to temporary storage,
- close transport, usually taking place between the place of storage and sorting point,
- distant transport to the place of recycling or disposal over a long period (rubbish dump) [17].

4. Automotive parts packaging and distribution

The company that storage spare parts has modern warehouses with a total area of more than thirty-two thousand square meters. About five hundred thousand stock items are spare parts and accessories for all types of VW, Audi and Skoda sold in Poland. Among them are almost all parts used in the construction of vehicles, both large bodywork parts and complete engines, as well as the smallest filters, gaskets and screws. Over 12,000 items are daily shipped to authorized recipients, and goods receipt from suppliers take place 24 hours a day. Warehouse operations are performed by using barcode scanners. To improve the speed of a spare part availability adopted from inbound delivery is the introduction of automatic postings immediately after the confirmation of its location. Another advantage is the possibility to obtain full information about the reasons of complaint and to complete the description of damage [8].

Multipacks are packages used to transport car parts to authorized dealers Skoda in Poland. These containers are produced by an external company, which delivers them to the company. Multipacks are made of metal, because at the time of transport they are loaded and then unloaded and stored in warehouses, therefore they must be durable. It is worth to mention that containers are reusable [5].

5. Return of spare parts by dealers

In the spare parts warehouses the SAP system was introduced and adapted to the rapid implementation of the complaint. After only a few months of working with new tools the number of complaints decreased by more than 20% [8].

An important part of the spare parts area is the rotation of regenerated parts. This process is particularly controlled by Skoda parts manufacturer and requires close operations monitoring in the process between stores and dealers and to enable reporting the condition of the settlement process [15].

Skoda Auto strives not only to fulfill existing environmental standards of recycling, but also runs out in this field in the future. Skoda cars guarantees its users the possibility of recycling vehicles withdrawn from use. Even at the design stage and production of vehicles the process of recycling is considered, therefore the majority of used materials is suitable for reuse. Skoda Auto fulfilled the requirements of EU law governing the possibility of recycling vehicles withdrawn from use. All types of cars Skoda received approval certificate in accordance with the requirements of the Community Directive 2005/64/EC. This means that the great majority of the materials used must be able to reuse. The main aim of cars recycling is to minimize the impact of scrapped cars on the environment [6].

Figure 1. presents example of Skoda Octavia 1.9 TDI 74 kW components with and reveals that Skoda creates a process that ensures compliance with legal requirements relating to the prohibition and restrictions on the use of lead, mercury, cadmium, hexavalent chromium, etc.

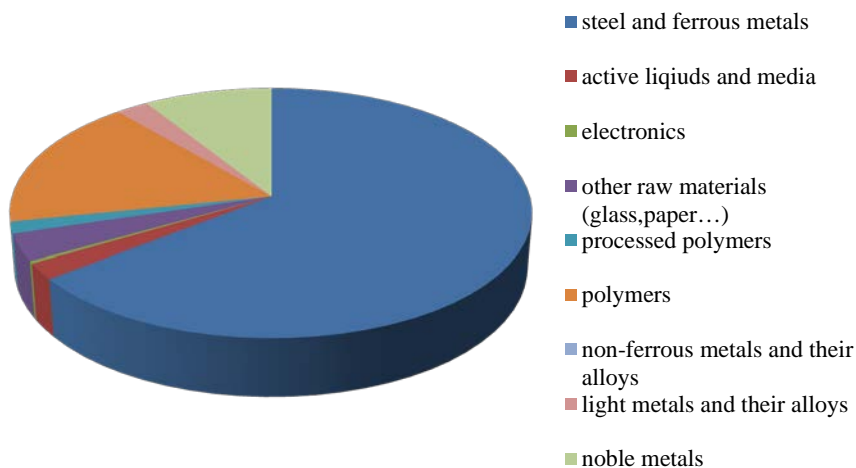


Figure 1. Example of Skoda Octavia 1.9 TDI 74 kW components [20]

As can be seen from Figure 1., a car in the majority consists of steel and ferrous metals, electronics and polymers. This proves that materials used in the car production may be reused.

6. Summary

Nowadays, reverse logistics plays an important role in logistics and supply chain management. This allows us to assume that any unwanted object has its value. Thus, a very important is organization of the supply chain system that affects its cost and the level of customer service. The most important elements of reverse logistics are waste flows and information related to these flows. There is a statement that temporary waste is a material good which will no longer be useful to user due to any defect or damage, but a user is willing to use it after repair. The most important for customers are materials which include excellent properties and meet rigorous environmental provisions and are environmentally friendly. Manufacturers want materials to be recycled. Suppliers and manufacturers implement recycled materials, which have comparable characteristics with new materials. Skoda cars meet the required level of recycling and creates processes that ensure the respect of legal requirements. Skoda creates a process that ensures compliance with legal requirements relating to the prohibition and restrictions on the use of lead, mercury, cadmium, hexavalent chromium, etc., therefore its cars are environmentally friendly.

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