

BARRIERS TO SOURCING REUSABLE MATERIALS

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Abstract Nowadays companies must approach the protection of the natural environment as an integral part of their management process. The using of waste as raw materials in manufacturing processes is in line with the idea of maintaining justice across generations. However, business practice has shown that in order for such activities to take place, companies need first to grapple with numerous barriers arising in the course of their adaptation to participate in reverse channels. The purpose of this paper is to present sample barriers encountered during the sourcing of reusable materials, which are the products of the company's organisational structures and the nature of the entire secondary materials market. Planning the supply of reusable materials supply is more complex compared with planning the supply of primary materials. This is because the flow of resources occurs through many reverse channels with unstable supply and material quality (industrial and household waste). The supply, which means the availability of raw materials, depends on many issues. However, the limited availability of natural resources makes creating sustainable supply chains, operating like ecosystems, a pressing requirement.

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1. INTRODUCTION

The literature on the subject often says that environmental protection should be treated as an integral part of the management process. Strategic activities should be consistent with the aim of not “exhausting” the environment, include amongst others the recycling strategy as well as the conservation of energy and raw materials. (Adamczyk & Nitkiewicz, 2007, pp. 66-67) The companies following the “3R” rule (Reduce, Reuse and Recycle) should participate in reverse channels and employ reusable materials as an input material for production processes. (Corrêa & Xavier, 2013, p. 1) (Sadowski 2008, p. 130) Taking into account reverse material flows in the supply chain has been the idea underlying the development of ecologistics and reverse logistics, which includes the solutions related to the managing of different kinds of waste. (Kruczek, 2012, p. 166)

Bringing the issues related to the supply of reusable materials closer requires the definition of waste in the first place. Waste could be defined in the following way: „Wastes are worn out physical goods as well as solid, liquid or gas matter generated by people or by their commercial activity, that are no longer usable in the place and at the time in which they were created and that are hazardous to the environment”. Such waste may be generated at a workplace (industrial waste), and in locations where people live (household waste). (Korzeń, 2001, p. 15, 23) However, for other companies such waste may become a useful raw material, an intermediate product or even a final product, (Szołtysek, 2009a, p. 9), because waste becomes useful goods when it gets reused (Szołtysek, 2009b, p. 16). Using waste as reusable materials is in line with the idea of maintaining justice across generations, namely sustainable growth in which the needs of the current generation are to be met without compromising the abilities of future generations to meet their own needs. (Valadbigi & Ghobadi, 2010, pp. 544-545) (Kozłowski, 2001, p. 51)

2. SOURCING REUSABLE MATERIALS

2.1. Supply channels for reusable materials

A logistic channel means a certain number of entities (companies) which cooperate with one other in order to deliver „the right good to the right place and in the right time, maintaining an appropriate quality at the lowest possible cost.” (Abt, 1995, p. 91) (Abt, 2001, p. 16) The organisation of logistic channels is aimed at reducing to a minimum the number of those logistics functions which are overlapping (doubled). The complexity of this organization depends on the number of intermediaries and units which are involved in the process. Assuming that macrologistics systems are general (in economic terms) in their nature and micrologis-

tics systems relate to particular companies, then metalogistics systems are in the middle of the aggregation level and thus are referred to as logistic channels. (Abt, 1995, p. 91, 93)

To be able to operate every production company purchases materials, and sourcing-related decisions related to selecting sources affect the company's results. (Mokrzyszczak, 1998, p. 70) (Coyle, Bardi & Langley Jr., 2010, p. 103) Each and every environmentally conscious company should perform a specific overview of the way in which raw materials are selected and managed, (Jedliński, 2010, p. 39) in order to make informed ecological purchases. Ecological procurement may be defined as „supplying a company with materials and services which meet ecological criteria.” (Bendkowski & Radziejowska, 2005, p. 33)

Sourcing reusable materials may choose from the following: a long-term cooperation with trading partners, using the services of an intermediary, (Pruska, Malak, Stachowiak & Adamczak, 2011, p. 1226), performing a one-off purchase transaction using a primary distribution network or directly from the customers.

Entering into a long-term cooperation consists in finding a trading partner that would „produce” waste on a regular basis and in regular quantities over a specific period of time. This is because it is impossible with sourcing reusable materials to launch make-to-order production, as waste is a by-product of the company's primary activity. Another solution is procuring reusable materials from intermediaries. An intermediary acquires/buys waste on the market and then sells it on at a price including margin. (Pruska, Malak, Stachowiak & Adamczak, 2011, p.1226) In other words, an intermediary acts as an agent in reverse material flow, buying out waste from the final links in the supply chain and from production companies engaged in other supply chains. An intermediary acquires waste that is no longer of any use to his suppliers and sells reusable materials, i.e. waste which can be recycled in the production process. An intermediary deals with such activities as cleaning, completing, packaging, which means providing services recipients.

A single purchase transaction from a business partner may imply seeking a supplier of reusable materials also on an internet-based waste material exchange. The exchange of information such as buy or sell offers is performed through a website, constituting a virtual meeting venue for entrepreneurs. (Pruska, Malak & Stachowiak, 2010, p. 170) After a contract has been entered into, waste is moved between the two participants of the transaction, which means that the waste material exchange does not constitute a material flow link, but a material information link.

Each supply channel presented above is a standard source of raw materials, based on an order for a fixed quantity as determined by the demand. Acquiring materials through a primary distribution network or directly from the customers is an “imposed” supply.

Reverse material flow in the supply chain, i.e. via the primary distribution network or directly from the customers is used for products which were returned by customers or handed over in order to perform repairs, maintenance, recycling or dismantling. Reverse logistics incorporates not only an ecological aspect, related

to reducing the amount of waste stored in landfills, but also a service-related aspect, e.g. which includes repairs and maintenance. (Harrison & Hoek, 2010, p. 183) Returns from the market, even though not planned and or ordered, may constitute a source of reusable materials. At the same time products that were handed over for repair or maintenance cannot be treated as supplies, because they do not increase the level of inventory assigned for meeting current material requirements. The companies that succeeded in introducing closed loop supply chain management into their structures (for example BMW, Xerox) perceive the retrieving of used products as one of key aspects of their activity. Returns should be treated as assets, economic added value. However closed loop supply chains are mostly viewed in terms of costs, potential revenues from the reusing of materials are being ignored. (Grabara, 2004, pp. 243-245)

2.2. Barriers to sourcing reusable materials

Not all companies source reusable materials, which is a very beneficial practice, because it reduces environmental pollution and serves as a cheaper alternative to acquiring primary materials. Such a trend creates many obstacles in business practice. This chapter addresses those barriers which have the greatest, according to the Authors, impact the sourcing of reusable materials.

The first of the barriers is ecological consciousness of the management staff. Even though a trend of fostering a green image of a company is prevalent, the management staff still views waste as the so called necessary evil. Seeking alternatives to waste utilization in other industries is not a basic activity and is not, consequently, one of operational tasks assigned to employees. In most cases companies are focused on their daily activities, particularly in the wake of the economic crisis. Cost-cutting measures are being taken and funds for research and development remain unchanged.

Another barrier, which is a derivative of the barrier mentioned above, is including reusable materials in the product structure. Replacing primary resources with substitutes should be taken into account at the design stage. The role of purchasing department is to satisfy the demand that arises. If reusable materials from other logistics chains or from end customers are not taken into account at the design stage, then acquiring reusable materials is very difficult for purchasing departments. Although is a risky venture, the employees of purchasing departments may seek alternatives to primary materials - provided that they know technical parameters of the parts to be incorporated into a product. The purchasing department is not familiar with all the operations scheduled to be performed at work stations; purchasing reusable materials may then interrupt the production schedule, as these materials may require cleaning or sorting. With the processing of reusable materials production cycles are getting longer - compared with using primary material, which poses another barrier for the company.

The technology applied by a given company is also a specific barrier. The purchasing department is subordinate to the production department, therefore if a given material cannot be used in the production cycle, purchasing reusable materials of the kind is not justified. This barrier may be attributed to the lack of appropriate technology on the market or to high investment costs, which are beyond the company's capability.

The barriers to using reusable materials in manufacturing new products include also the following (Sadowski, 2010, p. 46-47):

- information gap between the producers who would be interested in purchasing recycled materials and the sellers (recyclers) – lack of information on the composition of reusable materials and on the ways of using those materials in the a product severely hamper the development of the market of secondary resources,
- external technological aspects related to recycling and reusing of materials – arising when a manufacturer produces its products in a manner increasing the cost of recycling incurred by a company which deals with the processing of waste and the manufacturer is offered no incentives to redesign its product.

Yet another barrier is legal in character. It should be stressed the requirements of the protection of both the natural environment and human health puts waste under strict legal regulations and the producers themselves are often faced with a dilemma of deciding what falls into the category of waste and what does not. This is because there is no clear distinction between “intended” products and waste, which is a consequence of applying various methods of manufacturing and using product in different ways. „The legal regulations lack clarity of interpretation”. (Borowski, 2009, p. 85)

To sum up the above mentioned barriers, it should also be noted that supplying reusable materials requires organisational preparations in many departments in the company. Such decisions are made already at the stage of formulating the supply strategy, which is not an isolated, one-off action – because companies are open systems which operate under changing external conditions. Overcoming internal organisational barriers does not guarantee that sourcing, which involves reverse channels, will go smoothly and without a hitch. The availability or overall lack of supply of a given material on the market is a barrier created by environmental awareness of other market players. Dumping waste, which is potential reusable material, at landfills, reduces the supply.

Even though the obstacles described above have been overcome, the companies encounter other barriers - depending on the selected sourcing channel. Finding trading partners ready for a long-term cooperation with respect to providing reusable materials is a very complex process. It can be successful if the persons who do the searching have an in-depth knowledge on the issue and are very thorough in their activities. The task goes beyond the mere getting acquainted with the scope of operations of other market players. In most cases trading partners do not mention in their offers what kind of waste they produce, and in what quantities. At least

basic familiarity with manufacturing processes is a must to be able to find the most appropriate trading partner. Such a supplier will “produce” waste in an amount matching the requirements of the ordering party. What can be a barrier, however, is reluctance to share information on waste with a player in another supply chain. The lack of trust may effectively block such cooperation. On top of the, rising or falling customer demand is likely to disturb production plan at the manufacturer’s, which may translate into shortages or surpluses in the amount of waste on offer.

If companies are reluctant to enter into such cooperation they may opt for one-off purchase transactions as regards reusable materials. Another barrier which affects the plan for meeting material requirements is considerable uncertainty of supplies – especially when it comes to delivery times and delivery quality.

Supplying of reusable materials through a distribution network or directly from the customers raises other obstacles for companies. Market returns may constitute a source of reusable materials, however in quantities determined by the market – which are impossible to predict for a given period of time. A company does not order them as is the case with a standard supply channels; it is also forced to accept all returns, even if a given material is not required in the given period of time. Incurring additional storage is a barrier especially for companies which have a limited storage capacity or which hire storage areas from logistics operators. It is difficult to evaluate the quality of materials returned from the market; not every company is capable of functioning in such unstable and dynamically changing conditions.

As can be seen, planning the sourcing of reusable material is more difficult than planning the sourcing of secondary materials. This is because materials flow in numerous reverse channels - one material may come from many points. The availability of materials, namely the supply depends on many factors. All these interrelations combine into a multitude of barriers faced by companies before reverse flows of materials are put to actual use.

2.3. The market of reusable materials

The reusable materials market differs from the traditional one in many respects. On traditional markets a company must get such a price for its product which will cover all the costs (such as manufacturing, transport, marketing) together with projected profit margin; the customers interested in purchasing a product create demand and negotiate prices. The markets of reusable materials are regulated by the demand for services related to sourcing waste in order to make it usable, and not by the supply of reusable materials produced as a result waste processing services providers. Therefore, the supply of reusable materials is not determined by the demand for such materials. When the supply of reusable materials exceeds the demand, they must be sold at low prices or referred to landfills. Therefore the profitability of the recycling process is linked to a strong and stable diversified market of materials obtained from the stream of waste. (Sadowski, 2010, pp. 38-39)

A mutual interdependency between those two markets is of key importance as well. A dominant role of primary materials market may hamper the development of secondary materials market. This is because measures are implemented which are aimed at reducing the competitiveness of manufacturers on secondary market. (Sadowski, 2010, pp. 38-39)

A lower efficiency of the secondary materials market may also be related to the volatile prices of reusable materials; it can be caused by the fact that both demand and supply are not flexible on the secondary market. The price range of recycled materials is often greater when compared their primary market counterparts, which blocks investments in secondary materials market. Reusable materials market also hinges on waste sources. It should be stressed at this point that it is the most profitable to using waste from production in manufacturing brings largest profits. At the same time, using post-consumption waste is the least profitable, as their stream is not homogeneous. (Sadowski, 2010, p. 40) It is especially true in Poland, where municipal waste management is subject to many delays when compared with other European countries. (Bukowski, 2011, p. 30)

Emphasis should be also given to the transactions on this market concern waste – which is characterised diverse, fragmented and unspecific. It greatly impedes the planning and coordination of recycling processes. The composition, quality and the degree of usefulness for reusing and recycling of each and every lot are unknown. (Brdulak, 2012, p. 131)

3. CONCLUSION

Business entities must respond to the needs and requirements of the society, without compromising the requirements of environmental protection. Therefore the companies should incorporate the responsibility for the condition of the environment into the strategies they will pursue. Important issues related to the protection of the environment are pollution, the generation of waste, energy conservation and a rational consumption of resources in production processes. (Lysons, 2004, p. 492) (Walczyk, 2010, p. 175)

The limited availability has inspired the reorientation of the world economy in towards reducing the extraction of resources by applying material-saving technologies and increasing the use of recycled materials. The data analysis indicates that limited amount of resources will make recycling, regeneration and reusing even more popular. (Sadowski, 2010, p. 28) Sustainable supply chains require taking activities aimed at integrating material flows between the chain players and even between cooperating chains. Such activities produce closed material and energy loops. (Skowrońska, 2007, p. 40) With such business reality in mind the word 'waste' is being replaced with 'reusable material'. (Góralczyk & Baic, 2009, p. 145) Therefore it is of prime importance that companies start preparing

to adapt the requirements of reverse supply channels by overcoming the barriers related to sourcing reusable materials. The exemplary barriers presented in this paper will be taken into consideration in the future surveys of enterprises aiming mostly at identification of the correlation between the existing barriers of the supply of secondary raw materials and the selection of their supply channel.

It should be mentioned that collecting and processing used products is already a requirement in many cases, governed by the law. Those regulations apply to such product categories as cars, electronic devices and packaging. (Sadowski, 2010, p. 31)

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REFERENCES

- Abt St., (2001), *Logistyka w teorii i praktyce*, Akademia Ekonomiczna w Poznaniu, Poznań.
- Abt St., (1995), *Systemy logistyczne w gospodarowaniu. Teoria i praktyka logistyki*, Akademia Ekonomiczna w Poznaniu, Poznań.
- Adamczyk J., Nitkiewicz T., (2007), *Programowanie zrównoważonego rozwoju przedsiębiorstwa*, PWE, Warszawa.
- Bendkowski J., Radziejowska G., (2005), *Logistyka zaopatrzenia w przedsiębiorstwie*, Wyd. Politechniki Śląskiej, Gliwice.
- Borowski G., (2009), "Produkty odpadowe jako surowce wtórne", *Inżynieria ekologiczna*, No. 29, pp. 85-96.
- Brdulak H., (2012), *Logistyka przyszłości*, PWE, Warszawa.
- Bukowski Zb., (2011), "Gospodarka odpadami komunalnymi – nowe regulacje", *Ecomanager*, No.10, pp. 30-34.
- Corrêa H.L., Xavier L.H., (2013), „Concepts, design and implementation of Reverse Logistics Systems for sustainable supply chains in Brazil”, *Journal of Operations and Supply Chain Management*, Vol. 6, No. 1, pp. 1 – 25.
- Coyle J.J., Bardi E.J., Langley Jr. C.J., (2010), *Zarządzanie Logistyczne*, PWE, Warszawa.
- Grabara J., (2004), "Zasady zamkniętych pętli łańcuchów dostaw", I.K. Hejduk (Ed.), *Teoria i praktyka modelowania systemów logistycznych*, Wyd. Uczelniane Politechniki Koszalińskiej, Koszalin, pp. 240-248.
- Góralczyk St., Baic I., (2009), "Odpady z górnictwa węgla kamiennego i możliwości ich gospodarczego wykorzystania", *Polityka Energetyczna*, 12, 2/2, pp. 145-157.
- Harrison A., Hoek R., (2010), *Zarządzanie logistyką*, PWE, Warszawa.
- Jedliński M., (2010), *Między ekologią a ekonomią szkie problematyki zielonej logistyki*, Wyd. Uczelniane PWSZ im. Angelusa Silesiusa w Wałbrzychu, Wałbrzych.
- Korzeń Z., (2001), *Ekologistyka*, Biblioteka Logistyka, Poznań.

- Kozłowski St., (2001), "Ekostulecie (wiek XXI) a sytuacja w Polsce", F. Piontek (Ed.), *Ekonomia a rozwój zrównoważony*, Wyd. Ekonomia i Środowisko, Białystok, pp. 45-63.
- Kruczek M., (2012), "Model łańcucha logistyki odwrotnej zużytego sprzętu elektrycznego i elektronicznego", *Zeszyty Naukowe Politechniki Śląskiej. Seria Organizacja i Zarządzanie*, 60, pp. 165-179.
- Mokrzyśczak H., (1998), *Logistyka. Podstawy procesów logistycznych*, Wyd. WIG, Białystok.
- Pruska Ż., Malak M., Stachowiak A., Adamczak M., (2011), "Determinanty wyboru strategii zaopatrzenia w ramach zrównoważonego rozwoju przedsiębiorstw", *Logistyka*, No. 5, pp. 1223-1230.
- Pruska Ż., Malak M., Stachowiak A., (2010), "Wastes market as a solution for enterprises and environment", M. Fertsch, K. Grzybowska (Eds.), *Logistics in the company - selected aspects*, Publishing House of Poznan University of Technology, Poznań, pp. 165-174.
- Sadowski A., (2010), *Ekonomiczne i ekologiczne aspekty stosowania logistyki zwrotnej w obszarze wykorzystania odpadów*, Wyd. Uniwersytetu Łódzkiego, Łódź.
- Sadowski A., (2008), "Zrównoważony rozwój z perspektywy logistyki zwrotnej", *Problemy Ekorozwoju*, vol. 3, No. 2, pp. 129-132.
- Skowrońska A., (2007), "Koncepcja logistycznego imperatywu ekologicznego", *Logistyka*, No. 4, pp. 37-41.
- Szołtysek J., (2009a), "Ewolucja logistyki zwrotnej. Odpady i sposoby ich zagospodarowywania na przestrzeni wieków oraz co z tej lekcji wynika współcześnie", *Logistyka* No. 5, pp. 8-11.
- Szołtysek J., (2009b), *Logistyka zwrotna*, Wyd. Biblioteka Logistyka, Poznań.
- Valadbigi A., Ghobadi S., (2010), "Sustainable Development and Environmental Challenges", *European Journal of Social Science*, Vol. 13, No. 4, pp. 542-548.
- Walczyk M., (2010), "Koncepcja społecznej odpowiedzialności przedsiębiorstw w praktyce biznesu", R. Grądzki, J. Gralewski, A. Marcinkowski (Eds.) *Rozwój zrównoważony – zarządzanie technologiami*, Instytut Nauk Społecznych i Zarządzania Technologiami Politechniki Łódzkiej, Łódź, pp. 178-193.

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