



THE COMPANIES CONNECTING WITH THE AIM OF TREATMENT AND RECYCLING OF WASTE

Branislava LALIC, Danijela GRACANIN, Slobodan MORACA

University of Novi Sad, Faculty of Technical Sciences
Dositej Obradovic Square 6, Novi Sad, SERBIA

ABSTRACT

In this paper will be included the theoretical approach to the waste treatment, and its connection with the organizational structure of enterprises and the structure of related companies – cluster. The possibilities of investment in the development are limited and companies, mainly, have to find ways of its development alone. Companies are dependent on competition in order to be competitive. One of the answers to the question *How to increase competition*, in the limited conditions of growth and development is the fostering of cooperation relations. Companies don't exist only for themselves, then as an integral part of a complex network of connections with suppliers, customers, competition and public institution. Cooperation is the joint action of at least two companies in order to change the situation in which they are. Every participant contributes with their special skills and, at the same time make, a profit from the cooperation with other companies. The more companies help their cooperation partners to success, the greater the chances of their own success. The result is in improving the performance of common business, which is higher than the sum of the individual results of each company. And this is the new value of cooperation, is called synergy effect. The aim of this paper is the extension of the field of cluster action in general and especially development of clusters that have the primary aim of recycling and treatment of "hazardous waste", with emphasis on electronic and electric waste.

Keywords: Cooperation, competitiveness, environment protection, recycling, synergy effect

1. INTRODUCTION

Advanced operations that follow the growth of productivity and the level of resources exploitation inevitably leads to growth the amount of unwanted waste materials which arising as a by-product of the production process. In order to solve these problems, there are developed a large number of different approaches to talking about how to reduce the amount of waste during production and recycling of products. Considering that the changes are more quickly, companies can no longer rely on the current business practices in order to maintain their well-being, and also care about the environment. In the centre of attention of business and the public is often this problem and its proposed solutions, which refers to the removal of unwanted products from the production, waste treatment and care to protect the environment. Company, through the research and development component push the limits of knowledge about the products and processes and based on it initiate and implement new technological concepts. So, the company's activities enable increasing of production capacity and economic wealth.

The company always has the problem how to combine of width, depth and degree of integration of their business, realize the requirements such as liquidity, profitability, earnings and stability of operations. In an effort to align their size, business structure, management style, company must [1]:

- ✚ increase diversification of their business
- ✚ initiate and implement new development projects
- ✚ associate with other companies, buy or take over new companies
- ✚ access to strategic business alliances
- ✚ restructure macro-organizational structure and management style

Small and medium-sized enterprises represent an interesting sector for research considering representing about 95% of the total economic environment. And the significant amount of waste generated within the framework of their production systems. It is important to observe them from the

aspect of natural reduced technological and financial features for the consistent implementation of treatment and in addition to maintaining the competitiveness of production from the standpoint of cost of products. One of solution is a certain type of association efforts in order to waste treatment with acceptable terms of business.

2. ELECTRONIC AND ELECTRICAL WASTE

Depending on the stage of development of human society, the collective and individual consciousness, the state of national economy, way of life and technological development, the quantity and quality of solid waste, access to the collection, transport, treatment and final delay are changing. This is the result of consideration of the importance of managing solid waste from the aspect of preserving the health of the population and a healthy environment. Inadequate care of solid waste can have a negative impact on basic segments of the environment (air, water and land) and therefore the health of the population. From the viewpoint of ecology and preservation of living space one of the biggest global world's problems is the electronic waste. Specificity of electronic waste is the complexity and obsolescence speed of electronic products and replacement with new. In addition, the electronic waste is a valuable source of secondary raw materials (fig. 1.) and toxic if treated incorrectly. Rapid technology change, low initial cost and even planned limitation of the product resulted in the rapid growth of the problem through the world. Products such as TV, mobile phones, computers and related computer equipment, cameras, printers, and other have become a large part of municipal solid waste and therefore the flow of electrical waste is identified as one of those who record the fastest growth in Europe today, making 4% of municipal solid waste. The leading continent in the annual production of this waste is North America with over 20 million tons after which the following Europe and Asia with 14 million tons and the other continents are on the level of about 5 million tons.

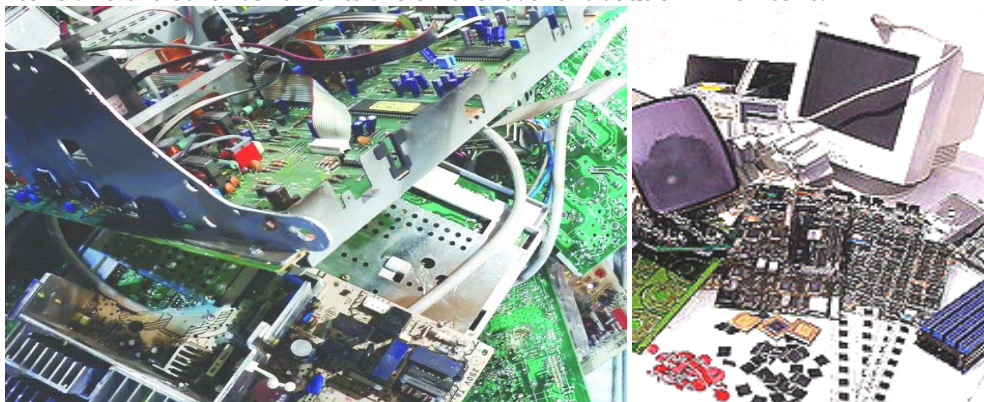


Fig. 1. Waste as a source of secondary raw

The main producers of electronic and electrical waste are classified into three groups:

- ✚ Individuals and small companies,
- ✚ Big companies, institutions and government organizations and
- ✚ Manufacturers of original electronic equipment (OEMs).

Analysis conducted by European experts show how the early nineties of the last century, the share of electronic waste in the overall European household waste was about 2 percent, or 4 million tons. In the end of the nineties the amount of electronic waste is increased to 6 million or 4 percent of household waste. It is estimated that the growth of the amount of electronic waste in Europe will be at the rate of 5 percent a year, so that by the end of this decade the amount of waste to be doubled.

Comparison, the growth of the amount of electronic waste today is three times greater than the increase in municipal solid waste. The level of recycling in developing countries is growing, but not keep step with the growth of waste production.

The European Union has adopted two Directives about problems related to electrical and electronic waste. First Directive is "Waste of Electrical and Electronic Equipment" (WEEE) - Directive on electrical and electronic waste, while the other RoHS (Restriction of the use of hazardous substances) - Directive on the restrictions for the use of hazardous substances. These two Directives have become a valid law of the EU from July, 2006, and any product that does not obey the criteria of the Directive will not be able to be sold in EU countries. WEEE Directive aims to improve the management of electrical waste and encourage manufacturers to produce devices with plan of their recycling. Key part of this Directive is that manufacturers are responsible for charges linked with the collection, recovery, recycling and treatment of electric waste. RoHS Directive complements the WEEE Directive with limit the amount of potentially hazardous materials contained in electrical devices. In

order to meet the requirements of the Directive on electrical and electronic waste, it is necessary to establish efficient organizational and logistics feedback system [5].

Problems that occur in the processing electronic waste arising from products diversity (fig. 3) on the market (difficult collection), diversity of types and manufacturers of similar products, and the unsuitability of products for recycling. Regulations and recommendations on the waste care exist in a number of developed countries (Germany, France, Austria, Switzerland, USA, Japan, etc.). Implementation and enforcement of regulations are assumed associations linking manufacturers, traders of waste.



Fig. 2. Waste diversity

In Germany, the introduction of regulations on the care of electronic waste establish processing system whose goal is to achieve the higher degree of slip material, and to achieve complete processing to the same standards of quality, which are compatible with all participants in the material flow. In order to ensure efficient collection and processing electronic waste founded the Association for the recycling of material that deals with the improvement of waste. They have established a dense network of about 160 place for waste collecting (in all places with 50 000 inhabitants), dismantling of device is done in more places, and provides the processing of the high technical level [8].

Entrepreneurs who are dealing with the processing of waste must have a certificate that includes the place of technical equipment for waste (machine, secured and protected storage, staff expertise), dismantling and separation according regulations to the Association (which provides the quality of waste fractions) and sale processed waste (e.g. not allowed independent sale devices, parts, or fractions of waste, but only through association of recycling material, or their authorized companies). Price of electrical waste care (for devices or individual fractions) establishes the by the job, and covers the cost of admission, transportation, reassembly, use, or removal of waste. Often in response to the issue of waste states recycling. It now provides a large proportion of the need for materials. However, do not forget that recycling is subject to the second law of thermodynamics. Each time when a certain amount of material recycled, one part is the inevitable and irretrievably lost.

Today, the recycling efficiency for the majority of used metal moving about 30%. In addition, recycling creates more pollution and requires investment of large amounts of energy to the waste materials collected, transported and processed. Energy saving and recycling are important, but they still represent only a partial solution to the problem of waste and energy problems [4].

3. CLUSTER

Establishment of networks and cooperation are often the key to improved profitability and increased innovation. The fact is that without development there is no development of the region and the entire country. Clusters can be seen as response to globalization. Globalization leads to a greater labor division and strengthen the economic connections. In the era of globalization, wireless communication, integration of various forms of communication, the faster and cheaper transport, it seems paradoxically to say that geographically business grouping plays an important role. In practice, the location remains an important competitive advantage. While certain technologies and skills move around the world, some are spatially limited. Capital (digitalized information, components, machinery) and labor force have the mobility, and social capital is rooted in local culture and institutions. Constant competitive advantage is not created through the movement of goods, services and capital that all have access [2]. The importance gets the presence of those factors whose mobility is not significantly improved through process of globalization.

Clusters have the opportunity to develop their specific mix of competitive advantages, based on locally developed knowledge, interpersonal relations, cultural heritage and other local features [3]. Most experts define cluster as a limited geographic concentration of similar, related or complementary business process, with active channels for business transactions, communication and dialogue, that share specialized infrastructure, labor market and services, market products and are faced with common opportunities and threats. One of the most important reasons why the regions should think and work on clusters is the competitive advantage in the global market [2]. Cluster is different from other forms of connectivity within their geographical boundaries through inclusion and use of funds, how the exchange of products, management information - knowledge chain, and the importance of how they are associated.

4. THE COMPANIES CONNECTING WITH THE AIM OF TREATMENT AND RECYCLING OF WASTE (EXAMPLES OF SUCCESSFUL CLUSTER IN SERBIA)

Primary possibility is independent work on the delay and sanction of waste in the system. Usually the systems with higher volume of production access to this work because have larger quantities of waste. Then the cost per unit of waste treatment and disposal are not so large and don't have significant impact on total production costs. However, if are observe a small company then costs, at least that part which is fixed, have a significant influence on the forming of final product prices [3]. Through that, companies have unrealistic frame for the forming of strategy. Why say that is unrealistic? Because without competition there is no chance for creation of profit and if there is no profit then investment in environmental protection does not exist. Without investment in the environment very quickly come to the feedback response when the production system is the problem and potential danger to the environment. In the environment, which is not safe, it is more difficult to hire workers and need motivate them with more money. Clusters are a natural join of several different companies (fig. 3) with same aim, waste treatment – disposition of dangerous material [3]. It must be emphasized that the cluster does not work as a set of factors that the connection is imposed, or are forced to appear in the association of this or that reason. Cluster cares about company's specificity, and allows the company to choose the level and type of cooperation in the cluster, as well as to define which part of the production wants to entrance in the cluster. On the basis of their location and common needs, they may find their benefit as a member of cluster associations.

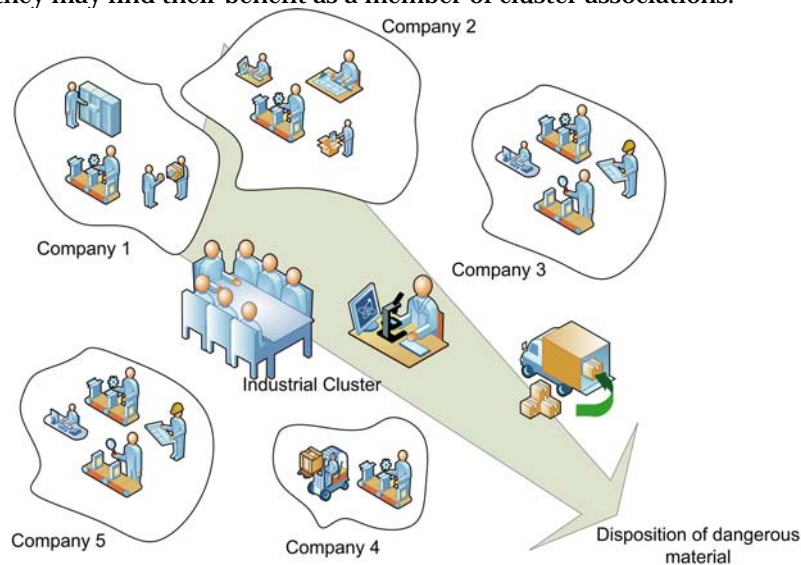


Fig. 3. Cluster structure

Fund "Eko krug" is the cluster of ten companies, two research institutes and Non-governmental organization (NGOs), which dealing with the recycling of electronic, electrical, industrial and hazardous waste, promoting sustainable development in order to educate about the need for environmental protection. This is the first cluster in field of recycling hazardous waste, that through team work contribute solving the proper system of waste management on the basis of its rich experience and good practices acquired abroad and in the Republic of Serbia. The fund is a non-profit organization dedicated to establishing good practice in the development of perception of the waste generator: socially responsible business, innovative business through the connection of different social entities, with the aim of waste management. This cluster is registered as a Foundation because Republic of Serbia doesn't have a law on clusters, and our laws do not know the concept of clusters,

and possible forms of registration are: Fund, Ltd., the association of citizens, non-governmental organizations. The main objectives of the fund are:

1. Scientific approach to systematic treatment of electronic and electrical waste, to improve the knowledge of all stakeholders, which would raise consciousness in society about the need for regular treatment with technical materials (secondary raw materials)
2. Development and adoption of new technologies in the treatment with technical materials and their sale in the local industry
3. Help to generator of waste in finding adequate solutions in the management of hazardous waste
4. Prevention of environmental pollution from the dispersed electric and electronic waste

The Fund was created as a response to globalization and trends in the business related to recycling and the protection of the environment in which the cooperation of experts and businessmen is more sweeping than the individual performances. The primary goal of "Eko krug-a" is cooperation with all governmental and non-governmental national and international organizations to achieve the right member. Making this kind of cooperation is especially necessary when we have in mind the necessity of the new legislation - primarily the new law on waste management. The draft new law provides that owners of spent batteries and the accumulators will be obliged to be storage on certain place. In our country a places for the storage of this kind of waste doesn't exist yet, the cluster will try to identified, construct and assort these places through their activities and cooperation with representatives of local self-government in order to increase the amount of collected waste [7].

Cluster for organized collecting and recycling spent batteries and accumulators named "Galenit" is the only of this kind in our country. The cluster represent the interests of their founders and members, representatives of companies engaged in production of batteries and accumulators and of whose business is the collection, transportation and recycling of this type of waste. The primary goal is to support the development of clusters and the promotion of organized collection and environmentally safe recycling spent batteries, and accumulators. Also, the important field of activity cluster "Galenit" is the promotion of dialogue and the establishment of better cooperation between the companies engaged in production, sales and recycling batteries and acumulators with non-governmental and governmental institutions such as the Ministry of Economy and regional development, Economic Association of Serbia and the Ministry of Environment and Spatial Planning [8].

Ecological Association "Helix" was founded in 2005. and from establishment "Helix" is involved in many activities related to environment protection through the implementation of various programs and projects that aim at the protection of endangered animal species, improvement of environmental protection, environmentally safe waste management, increasing energy efficiency and preserving natural resources in the Republic of Serbia. To achieve its objectives association "Helix" in particular collecting and processing scientific and technical literature in the field of environmental and human rights and environmental protection, organize professional meetings, seminars and other forms of education in this field, cooperate with universities, professional associations and other organizations that deal with environmental and human rights in general [9].

5. CONCLUSION

The issue of ecology is essential if we want to achieve competitiveness. This is an expensive process, but there is no alternative, because all that is related to environmental has influence on the development and the role of the state, the obligations of industry and chambers of commerce. For the implementation and harmonization of regulations are needed huge funds, because investments in this sector is very expensive. Europe is ready to assist that process, because when candidate country accession to the EU, EU environment becomes a unique space. As an example we mention Slovenia where for preparation, adaptation and implementation of environmental protection regulations was necessarily eight years and 2.7 billion euros. The first steps in adjusting the legal framework of a EU candidate country starts from obligations which waiting the industry considering any industrial facility must meet all regulations in the field of environmental protection [8].

Suitability of products for care, stimulate the development of new generation of products - recycling product. This is a complex and serious problem and task. Namely, the first experience has shown some difficulties and shortcomings in development of recycling products. One of the major problems is the lack of information about recycling procedures which describe how a material suitable for recycling, the impact on the environment, and other properties these products Then, there are no clearly established criteria and balance of measures for material and products, as a measure of ecological quality of products. What is interesting, there is and lack of experts in this area. In order to solve these shortcomings, it is necessary to equally participate and material manufacturers, producers of final products, institutions for the collection of waste and educational institutions. The current policy of the United States encourages the export of waste and that slows way of innovation that is

necessary to really solve the problem at source - in the place of design and production. This allows manufacturers to delay the implementation of aggressive approach to reducing the toxicity of own products. The emphasis should be put on the electronic products that represent a great problem because of their toxicity and speed limitation.

REFERENCES

- [1] OECD, Small and Medium Sized Enterprises: Tecnology and Competitiveness, 1993, Paris
- [2] Porter, M. E. Competitive Advantage of Nations, Free Press, 1998.
- [3] Moraca, S. Strategy for cluster establishing and development in Vojvodina, 2007.
<http://www.spriv.vojvodina.sr.gov.yu/>
- [4] www.well.org.rs
- [5] www.scribd.com/doc/6815412/ELEKTRONSKI-I-ELEKTRICNI-OTPAD
- [6] www.hktdc.com, Crunch time for EU directive on waste disposal
- [7] FundEko krug, www.ekokrug.org.yu
- [8] Cluster Galenit, www.galenit.org.rs, Baza znanja
- [9] Ecological Association Helix, www.heliks.org.rs