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SUSTAINABLE SUPPLY CHAIN ON THE EXAMPLE OF THE STEEL SECTOR IN POLAND

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A sustainable supply chain provides products and services that meet customer expectations, and at the same time has the lowest possible impact on the environment in accordance with the principle of corporate social responsibility. There are still no system solutions in the steel sector in Poland. The aim of the study is to present the essence of the concept of a sustainable supply chain in relation to the life cycle product.

Key words: steel industry, menagement, activities, sustainable supply chain, Poland

INTRODUCTION

A sustainable supply chain in the steel sector focuses on minimizing negative environmental and social impacts at all logistic stages, from production, through storage, to delivery.

According to the State of Supply Chain Sustainability 2020 report by scientists from the Massachusetts Institute of Technology (MIT), this is mainly due to the sustainable management of resources (energy, water, raw materials, etc.) and the use of renewable energy sources. To this end, cooperation of all participants in the supply chain is necessary: suppliers of raw materials and packaging, carriers, distributors, etc. All of them should jointly undertake specific actions to use raw materials from sustainable sources or to rationalize the use of available resources. The creation of a sustainable supply chain results from the willingness to include this concept not only within the steel company, but also from its relationship with the environment. The possibility of operational implementation of sustainable development is related to the development of enterprises in the steel industry, which also affects the safety of work and the reduction of necrosis in accordance with the concept of Lean Manufacturing [1,2].

SUSTAINABLE DEVELOPMENT ASPECTS IN THE SUPPLY CHAIN

The implementation of green supply chain management allows steel companies to respond to the climate crisis and global warming. Supply chain companies are at the center of discussions and are often cited as one of the leading causes of pollution.

Logisticians more and more often see the future in the so-called sustainable supply chain. Sustainable development is now a response to the growing social, economic and environmental problems, the aim of which is to meet the needs of not only the final buyer, but also all contractors in the entire supply chain, bearing in mind environmental aspects. In this concept, it is necessary to consider the methods and techniques that should be followed by individual elements of the supply chain so that the products offered by them meet specific social, economic and environmental requirements.

The strategy for a sustainable supply chain is to implement new processes and reorganize established patterns of action. As a result, innovative products are created and new business opportunities are discovered, which enables the further development of the company. The strategy of action based on benchmarks is the implementation of new solutions and the reorganization of established patterns of action. When newer products are available and new business opportunities are revealed to allow the enterprise to grow.

It is hard not to prove that incompatible with the supply chain is now more than an aspect. To ensure a long term repair, repair but repair not for profit, repair repair for natural, and only repair element with repair.

The possibility of operational implementation of sustainable development is related to the development of enterprises in the steel industry and in relation to the product life cycle, which is defined in many ways. The concept of a product life cycle is well known, which consists of four phases: product launch, growth, maturity and decline. product / technology life cycle. However, the concept of the product life cycle is not used solely in a market context. In addition to the market aspect, the product also has a technical and technological dimension. Before a product appears on the market, it goes through many phases, such as collecting and selecting ideas, creating concepts, economic and financial analyzes, designing, building a prototype, and preparing it for launching on the market. The above activities

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Table 1 **Stages of implementing a sustainable supply chain in a metallurgical company [own research]**

Level 1	Supply Chain Environmental Footprint Assessment	Measurement of factors such as waste generation, toxicity of materials used, loss of sources and energy - Carbon Footprint - is a diagnostic tool to analyze the direct greenhouse gas emissions of an organization. It includes: organizational scope: company facilities and operational scope: greenhouse gas emissions during production and distribution. This can be carried out internally or by an external service provider, and may be subsidized by the government in some countries. - The GHG Protocol. The Greenhouse Gas Protocol was developed by the World Business Council for Sustainable
Level 2	Taking concrete actions for a sustainable supply chain	There are many areas for improvement in order to greener supply chain management which they include - Use of less polluting materials - Reduction of waste and packaging - Reducing energy consumption in buildings - Grouping of transport (for deliveries and / or for customers) - Improving delivery cycles - Optimization of product storage - Use of reverse logistics - Improved inventory identification for better management

Table 2 **Examples of activities and benefits in the steel sector in Poland [own research based on the basis of reviews of reports from steel companies]**

Stakeholder	Action example	Potential benefits
Producer (metallurgical company)	- investing in research and development taking into account social and environmental benefits and costs - maintaining the highest standards at every stage of the supply chain, both to the customer and from the supplier rational management - respecting non-economic aspects when planning a business model	- reduction of CO2 emissions from fuel combustion - reducing the energy consumption of production processes - computerization of production and sales processes - reduction of material waste in production processes - educating the staff in the areas of ecology
Distributor	- reducing exhaust emissions in logistics processes with the use of motor vehicles	- benefit for the environment - reduction of air pollution - advantage for the distributor: optimization of logistics processes; - increasing the attractiveness of the offer for customers applying environmental standards
Client	- optimization of purchases	- environmental benefits: waste reduction, waste reduction

are part of the product innovation cycle, which consists of a product-related observation and research cycle and a product development cycle. The innovative product cycle together with the market cycle create the so-called integrated cycle.

There is also a material life cycle product, which is based on the transformation of materials and energy. It is a sequence of activities such as: extraction and purchase of raw materials (in the case of mills it is the purchase of raw materials), processing of materials, production and assembly of products, distribution, use, utilization and recovery. Materials and energy are processed in the process of production, packaging and distribution, use, maintenance, recycling (possibly) or disposal. Operating the material life cycle product is the basis for the use of many methods, techniques and tools. One such method is the life cycle analysis (LCA) used to evaluate materials, services, products, technologies and processes in terms of environmental and social impacts throughout the entire life cycle [3,4].

Life cycle product thinking is key to achieving sustainable development goals in steel companies.

It is hard not to notice that a sustainable supply chain is now much more than just an image aspect. It is even a necessity and an element of a long-term strategy focused not only on profit, but also on improving the impact on the natural environment and strengthening relationships with customers.

The implementation of a sustainable supply chain in a metallurgical company can be carried out in several stages (Table 1).

ACTIVITIES AND BENEFITS IN A SUSTAINABLE SUPPLY CHAIN OF STEEL COMPANIES

The main factors stimulating the creation of sustainable supply chains are internal forces (employees, management staff) and external forces (legal regulations, economic factors, suppliers, recipients, institutional actors) that put pressure on organizations. It induces steel companies to behave that is not fully justified by the economic calculation. Thus, these factors force actions for the benefit of society and the environment. At the same time, they are a source of isomorphism. Due to imitation or the necessity to adapt, the number of enterprises which operate on the basis of the concept of sustainable development is increasing. Increasingly, enterprises also undertake joint activities in this area.

Examples of activities and benefits in the supply chain in the metallurgical sector (Table 2).

CONCLUSIONS

Sustainable development is a business management system based on combining operational efficiency with strategies aimed at minimizing waste in terms of work, processes, energy and raw materials. To achieve a sustainable supply chain, a company must address environmental, social, economic and legal issues along the entire supply chain. Thanks to this approach, it will reduce the amount of waste and the environmental footprint, as well as improve working conditions and the health and safety of employees. Climate change is one of the greatest threats of the 21st century. For this reason, companies in the steel sector are constantly looking for effective solutions that would allow to reduce greenhouse gas emissions into the atmosphere in each area of activity (e.g. by supporting the so-called green logistics).

The article uses the following methods of collecting research material: the method of literature studies and the documentation-comparative method (Report on social and environmental responsibility of several metallurgical enterprises).The article presents issues related to the integration of sustainable development with supply chain management. Its implementation gives you the opportunity to save money while reducing the environmental impact. A green supply chain is also a good way to improve the image and environmental credentials of a steel company.

This article does not exhaust the enormity of the issues related to the integration of sustainable development with supply chain management, taking into account the product life cycle.

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