EFFECTIVENESS OF LOGISTICS PROCESSES OF SMES IN THE METAL INDUSTRY

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Abstract

In the paper issues in the field the organization of logistics processes are presented. The data presented in the work have been proceeds in a company operating in the market for the metal industry. The analysis of the effectiveness on organizational changes in logistics and transport between operations had been made. It has been shown the necessity of training from the scope visual control of production, and formalize control activities on the next two stages of the manufacturing process. The aim of the paper is to implement the principles of SMED method at the Department of stamping, and estimate the benefits from its use.

Keywords: Logistics process, visual control, effectiveness

1. INTRODUCTION

According to the classical division in logistics can be distinguished sphere of supply, production and distribution. The changes on the market today, directly or indirectly are related to logistics. Continual improvement is realized also in the logistics supply and production, storage and waste inventory and distribution logistics, in particular, against the requirements in customer service. Nowadays, the dynamic development of supply chains and their adaptation to the needs of internal and external customers occurs. Supply logistics is the process of obtaining materials and supplies, which are necessary for the functioning of the company. This involves the construction of many supply chains that are relatively fixed and regularly recurring in the required intervals. The study of time orders, the delivery period and storage period enables the company to reduce the amount of capital tied up in warehouse stock [1].

Logistics supply uses existing supply capacity, and coordinates the flow of goods and information to ensure the company materials, which in turn are used to produce or to trade sphere. Action on supply exceed its reach beyond the enterprise, and even beyond the borders of the country - they are taken inside, but affect the external preparation of material requirements through appropriate systems - MRP [2, 3]. Three general principles of supply logistics:

- Individual supply in case of demand - in this case, there is no need for a large storage of materials, which makes low capital commitment and storage costs, the disadvantage is the possibility of downtime at the delayed deliveries and the effect lack of optimal use production equipment, it often occurs in the case of the production unit under the accepted customer order.
- Supply with the use of inventory - raw materials remain in the stock levels in the company, they are stored in order to cover the internal material procurement to production, available at any time after the need, especially used in case of import of raw materials from long distances.
- Supply in sync with the production or consumptions - the supplier must deliver the material exactly at the periods that result from the production process in a company which is supplied with. Current daily supply is directed generally directly from transport to places of production, stocks are kept only in the form of small inventory of safety, thanks to this system is the low level of commitment of capital and storage costs, supplies are synchronized with the production and require reliable suppliers.

2. LOGISTICS OF PROCESS

Production logistics is involved in developing the optimal flow of materials and information hedging production processes across the enterprise, through the coordination of production activities. Logistics production

generates optimization of production inventory through the organization of the production system and its immediate surroundings of storage and transport. The subjects of logistics production are: planning, organizing and controlling the flow of raw materials, materials, components and semi-finished products during production. Starting from warehouses of supplies, through intermediate warehouses of manufacturing cell, warehouse at the workplace and departmental warehouses, and ending on finished products warehouse. Just like in other phases of the companies logistics, also in production logistics are: physical processes of flow and storage, as well as information flows that control these flows. Depending on these elements are presented in **Figure 1.** The aim and purpose of production logistics is to ensure an optimum flow of materials and information in the manufacturing process [4].

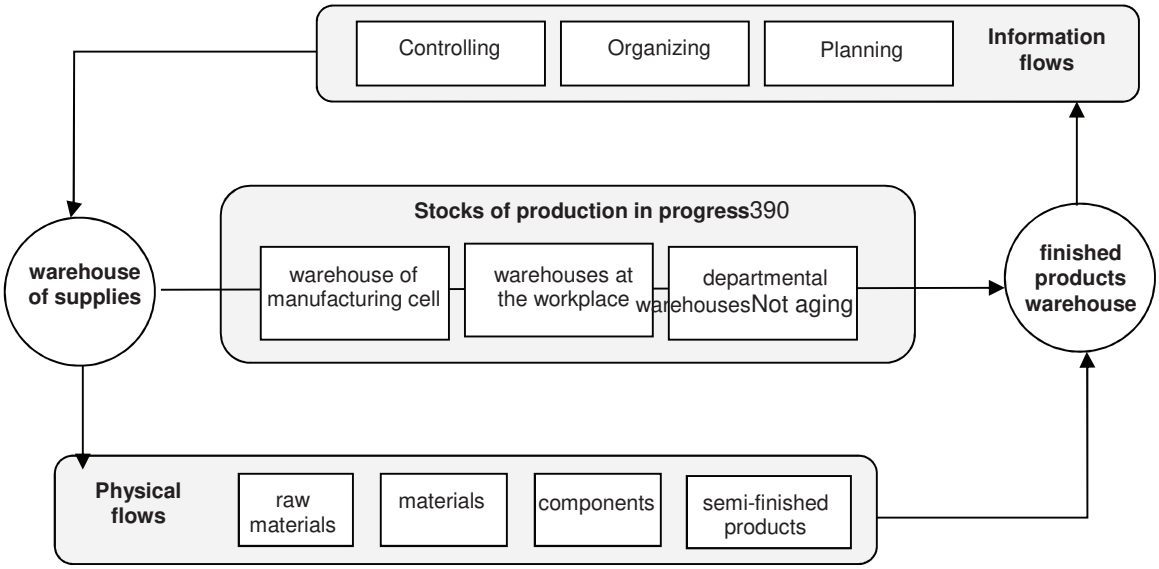


Figure 1 The main components and tasks of production logistics

The basic tasks of production logistics should support production in the field of materials, that is [2]:

- providing a material for production positions at the appropriate time,
- the movement of materials in the production process,
- production planning, taking into account the capacities available
- packaging and transport of semi-finished and finished products to the storage.

The whole of integrated to each other logistics processes, which influence each other and shall remain in a defined relationship with the environment creates a complete logistics system. **Figure 2** shows the components of the system and the scope of their functioning [2].

3. ANALYSIS OF FLOW STREAM IN ENTERPRISES AN INDUSTRY OF METALS PROCESSING

The research is a modern company dealing with production of aluminum profiles and their anodizing, painting and prefabrication**.** The main activity of the company is the production of pressed profiles of aluminum alloys and their machining and anodizing**.** Profiles are produced in two modern production lines, containing the press about the pressure of 1800 and 1400 tons**.** The second group of assortment in the company is the process of anodizing aluminum (implemented in solutions of sulfuric acid)**.** The company's offer also includes services for fabrication of aluminum products (cutting, drilling, milling, punching, etc.)**.**

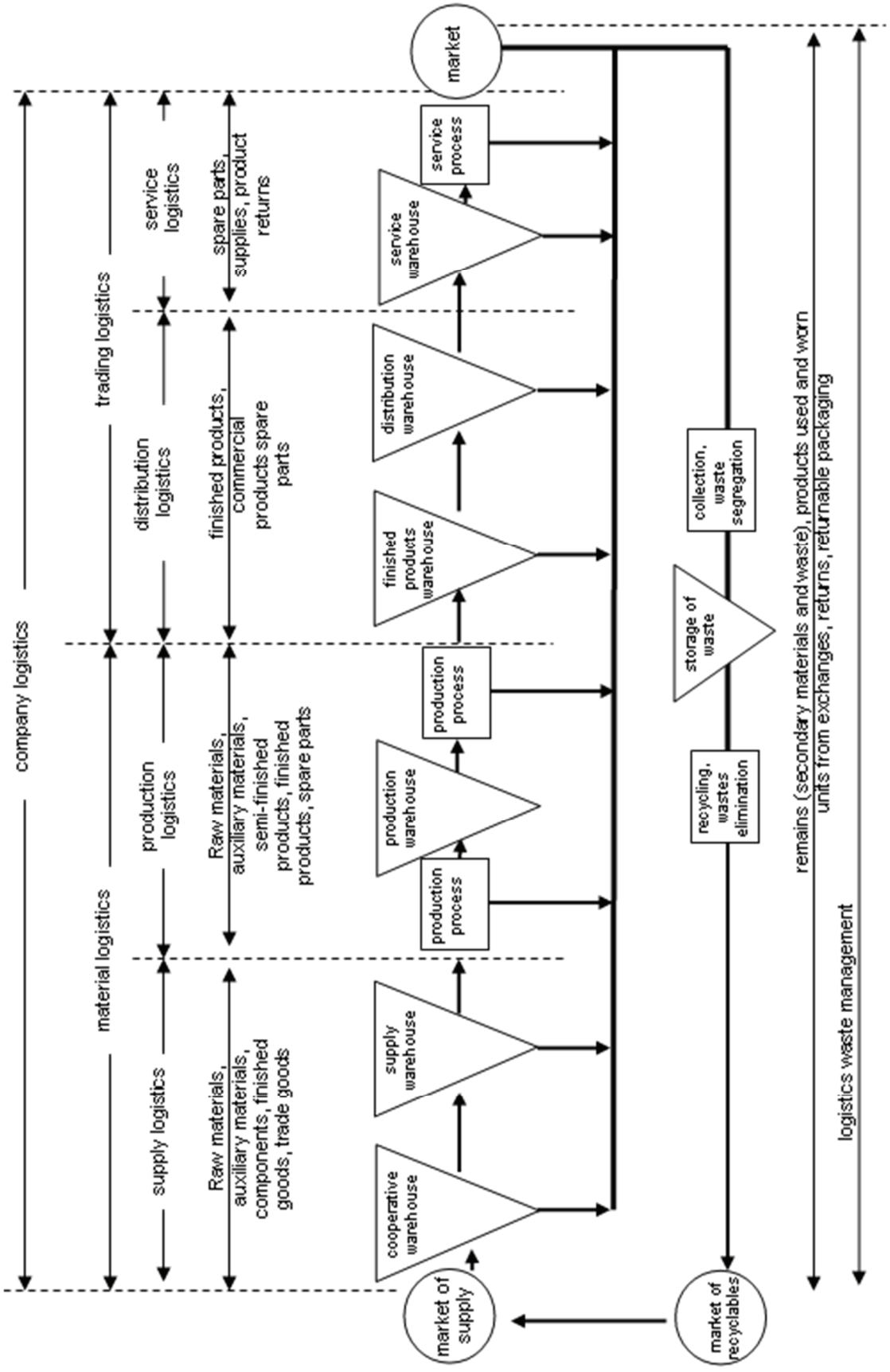


Figure 2 The divisions function of logistics systems according to the phases of the material flow

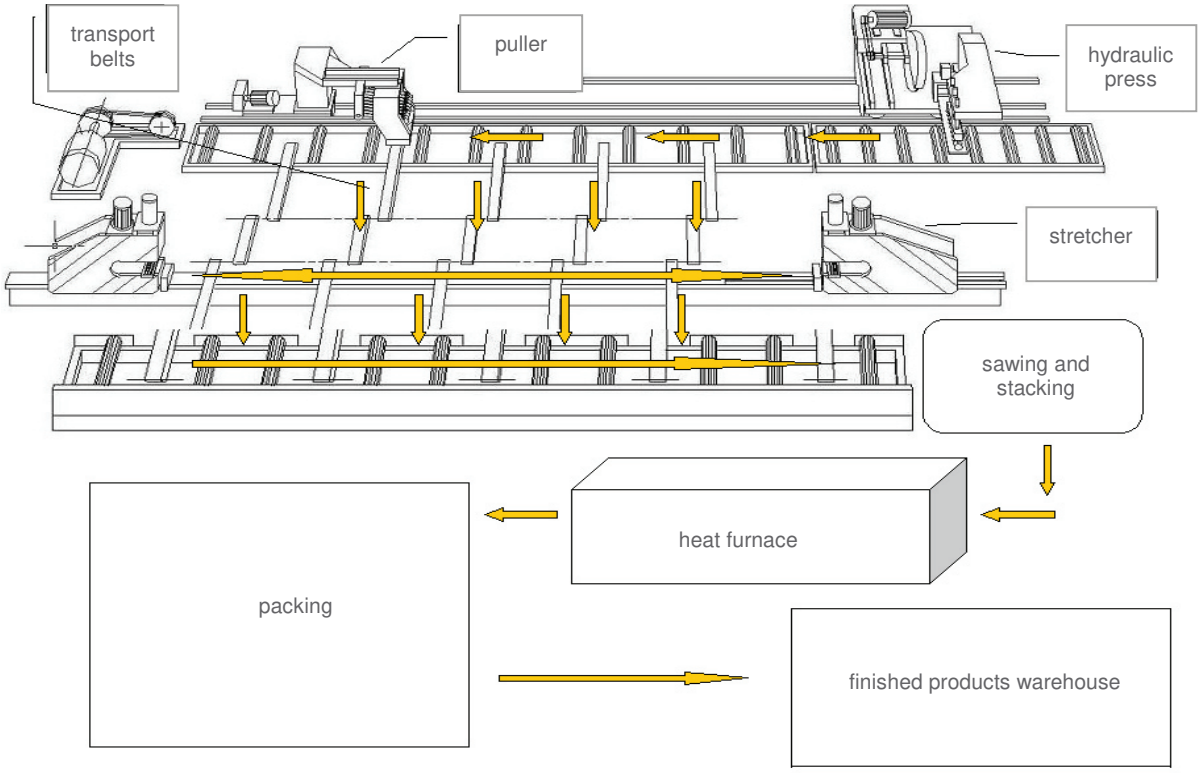


Figure 3 Flow diagram of raw material

The process of aluminum extrusion profiles is implemented automated process line. It includes: furnace for heating of ingots; hydraulic press for extrusion, double puller (one part is provided with a saw), tenter, saw and the paver, and a furnace implementing the process of accelerate ageing. Profile coming out of the press is gripped by the puller, and then cuts the element at the maximum length 52 m. The profiles are cut to length commercial according to the order, they are then arranged in baskets technological. The next step is heat treatment, which takes place in a gas furnace with forced air circulation (**Figure 3**).

Proper preparation of production is an important elements of the manufacturing process due to its continuous nature. This element is implemented to ensure uninterrupted operation of individual workstations. An important element of the processes is changing assortment of production. Production, which is carried out under the order of the customer, is characterized by technological change and changeover of the workstations in each production run. **Figure 4** presents the examples of ongoing contracts.

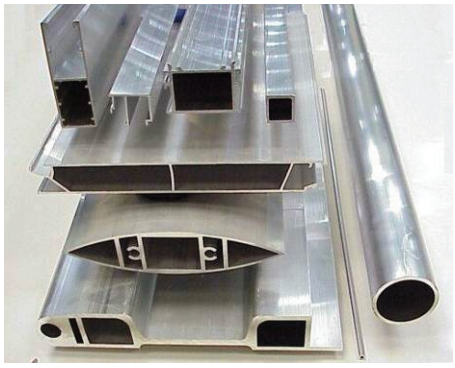
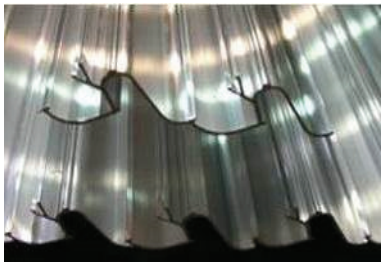
a-  b-  c- 

Figure 4 Examples of the product realized in the production of: a) raw materials batch, b) the finished product - hollow sections, c) the finished product - open profiles

One of the most important elements of the quality the final product is selection of the proper type of alloy. It material has the greatest effect on the final characteristics of manufactured profile, both the physical properties and decorative. These determinants decide about capability to fulfill the established product feature. The main material used to produce alloys are Al-Mg-Si designed with the addition of Mg_2Si. These are the most widely used alloys in the bench press. Material goes to the company in the form of ingots (**Figure 4a**) having a diameter of 178 mm (7 ").

Assessment of the quality of extruded profiles includes a first visual inspection of the surface profile in the workplace, then the dimension of the profiles measured by the device Vision H300. This instrumentation allows to measure all aspects of the cross-sectional profiles (including radii, contour deviation, the distance of the holes and the other elements - difficult or even impossible to verify using traditional methods). Based on the results of measurements performed is the documentation, which covers the full compatibility of the complex dimensions of the profiles of all the requirements of the cross-sectional geometry. The surface quality of extruded aluminum profiles also depends on condition of the matrix, aluminum alloy, which was used for the production and on the characteristics of the production process. Each profile, which is produced in a company is assigned to one of three quality grades may be obtained directly after the hot extrusion. Only by making the additional surface treatment (anodizing, painting), it is possible to achieve a higher surface quality than offered in the highest quality for the raw profiles.

The main element of improving processes carried out in the company was the implementation of SMED method (*Single Minute Exchange of Die*). The basic idea behind the method is to shorten the changeover time for the workstation, i.e. to carry out each changeover in less than 10 minutes. The assumptions of this method are carried out by this distinction and simplify the whole process to changeover were carried out using the least amount of tools and working time [5, 6]. Nearly 60 % improvement up time resulted from the implementation of the main principles of ordering process changeover, through adequate preparation and organization tools necessary for carrying out the process. The biggest saving downtime was noted at the stage of cutting and packaging profiles. **Figure 5** shows another 22 measurements of the duration of the preparation process for changing the assortment that is the position of the cutting and packaging profiles. The first five time measurements were made before the improvement actions, aimed at implementation of system solutions for the preparation the process of retooling. The first attempts to achieve the objectives of the improvement resulted in an increase in the duration of the process. However, further developments showed effective reduction in the duration of operations for the preparation and changeover the workstation. What further term allowed significantly reduce the rate of time-consuming changeover operations preparation and commencement of production of a new series of products.

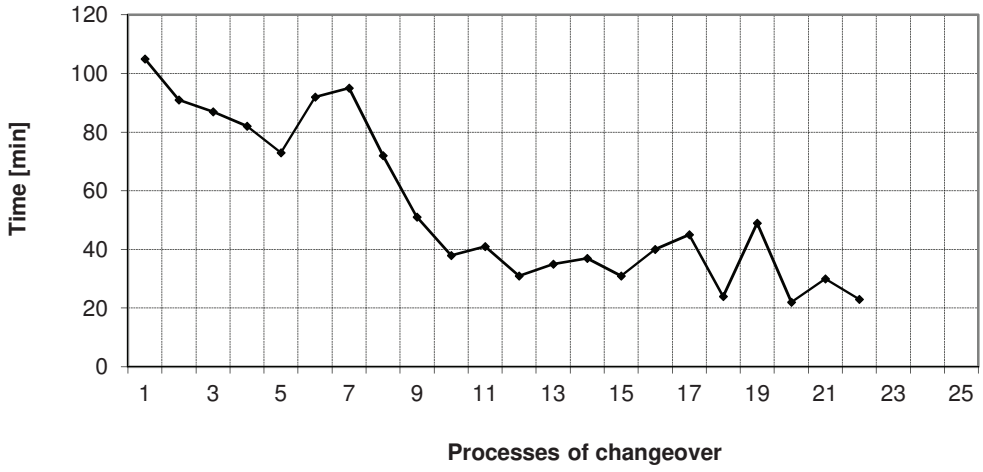


Figure 5 Flow diagram of raw material

4. CONLUSION

Management of the logistics chain is a guarantee of development and existence of a market whose needs are variables as variables are customers' expectations. Managing the supply process must be reliable and on time, handling of warehouse transportation not adversely affect the quality of the product, while the ordering process must operate without interruption, since its purpose is to satisfy the customer's needs within a given time [7]. More and more companies aim at minimize the total cost of the product and information flow, while maintaining the level of quality and service delivery. The organization also seeks to ensure the shortest possible delivery time and possibly high reliability. In this case, the optimization requires increasing the supply frequency and flexibility at low cost flow, and optimize inventory levels.
In the scale of the supply chain efficient management is based on the integration and management of three types of flow or basic processes: products, information, and money. One of the main tasks in supply chain management is to reduce of uncertainty, which is the cause of purchases on reserve or creating a safety stock.

A significant part of the operating costs of industrial enterprises, especially metallurgical, provide logistical costs. In that case in the management of such business, an important issue is the system of logistics management. A helpful tool in solving problems related to the control of transport processes can be system analysis and system modeling logistics for company [8].

Method of photography the workplace during the changeover indicates areas that can be improved and helped to construct the documentation used at the stage of preparation for this process. An important element of the implementation of new rules of conduct was the simultaneous analyze the level of quality. Comparative analysis the level of quality at the Department of stamping did not indicate an increase in the level of manufacturing defects. Properly prepared table verification, improving operational tests and the necessary adjustment of the machine settings do not cause increase in the level of non-conforming products. Kaizen philosophy, that is, continuous improvement is a never-ending spiral activity of the company that builds small improvements, one by one, for a comprehensive final effect.

REFERENCES

[1] MESJASZ-LECH A. The use of it systems supporting the realization of business processes in enterprises and supply chains in Poland, *Polish Journal of Management Studies*, 2014, vol. 10, no. 2, pp. 94-103.

[2] RUTKOWSKI K., Zarządzanie łańcuchem dostaw - próba sprecyzowania terminu i określenia związków z logistyką. *Gospodarka Materiałowa i Logistyka*, 2004, vol. 12, pp. 2-18.

[3] JURSOVA S., WITKOWSKI K., INGALDI M. Logistic Flows of Megallurgiacal Aggregate Operation. In *Carpathian Logistic Congress 2013*. CLC'2013. Cracow: TANGER, 2013, pp. 458-462.

[4] KRUCZEK M., ŻEBRUCKI Z. Instrumenty usprawniania przepływów materiałowych w produkcji (cz. 1). *Logistyka,* 2011, vol. 6, pp. 25-28.

[5] CZAJKOWSKA A., INGALDI M. Analiza wąskich gardeł w procesie otrzymywania wyrobu odlewanego. In *Inżynieria produkcji. Wybrane aspekty zintegrowanych systemów zarządzania produkcją*. Częstochowa: Wydawnictwo Wydziału Inżynierii Produkcji i Technologii Materiałów Politechniki Częstochowskiej, 2015, pp. 99-109.

[6] ULEWICZ R., KUCĘBA R., Identification of problems of implementation of Lean concept in the SME sector, *Economics and Management*, 2016, vol. 8, no. 1, pp. 19-25.

[7] ULEWICZ R., MAZUR M. Doskonalenie transportu wewnętrznego z wykorzystaniem koncepcji lean - studium przypadku, *Przegląd Organizacji*, 2015, vol. 7, pp. 6-13.

[8] KRÓLIK R., NOWODZIŃSKI P. Analiza systemowa łańcucha logistycznego na przykładzie przedsiębiorstwa hutniczego. *Logistyka*, 2010, vol. 4, pp. 94-98.