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Beata Kanecka[*]

MATERIAL MANAGEMENT IN A MANUFACTURING COMPANY

A b s t r a c t: Materials management is undoubtedly one of the most important areas of activity of production companies. Without well-planned and properly managed processes, such as material procurement or a delivery system, the proper functioning of these enterprises would not be possible. Materials management covers a fairly wide range. Because of this, it also has a lot of problems. One of them is too high stock levels. According to the author, it is worth a detailed analysis. The aim of the article is to make the reader aware of the importance of materials management in manufacturing companies and to present the reader with innovative ways of solving one of the key problems in this area, which is maintaining an excessively high level of inventories.

K e y w o r d s: material management, management, inventory, supply, storage.

J E L C o d e: L 21

INTRODUCTION

Materials management is one of the areas of the production system. In order for this system to function without any disruptions, each of the areas and the processes included in these areas must function properly. A systemic approach to the enterprise is of key importance. The material economy covers a fairly wide range. Starting from the procurement process through material procurement planning to the procurement logistics itself. It also includes many other areas important from the company's point of view, such as the choice of supply sources or an appropriate supply strategy. Materials management is one of the most important areas of interest for manufacturing companies. Without the supply of raw materials, materials, assemblies or components

[*] Contact information: Beata Kanecka, Państwowa Wyższa Szkoła Zawodowa w Koninie, Wydział Nauk Ekonomicznych i Technicznych, Katedra Nauk Technicznych ul. Przyjaźni 1, 62-510 Konin, email: beata.kanecka098@gmail.com

necessary for production, it would not be possible to implement it. Proper planning, organization and control of individual processes have an impact on the correctness of each process taking place in the enterprise. They allow the enterprise to succeed. However, in every enterprise there are also processes that do not run smoothly. This article is the result of analyzes carried out in a manufacturing company in the area of material management. Its aim is to propose constructive solutions that will improve efficiency in this area and allow for a significant reduction in the level of inventories.

1. MATERIAL MANAGEMENT

Materials management covers a wide range. One of the most important areas that make up it is, among others, the procurement process. In the literature on the subject, it is defined as the phase of logistic processes that provides the enterprise with material goods necessary to perform tasks, e.g. raw materials, materials, fuels, cooperative elements. As a result of the implementation of these processes, the said goods flow from suppliers operating on the material market to the supply warehouses of the production company [Skowronek, Sarjusz-Wolski, 1999, p. 117]. The most important issues related to the processes of supplying materials include completeness, quality and timeliness of deliveries, which determine the efficient handling of production processes [Niziński, Żurek, 2011, p. 152]. The procurement process is a complex process that can be difficult to define. Purchases and supplies are very often treated as synonymous terms, however, they are often used interchangeably, despite the fact that supply is a much more extensive term than the purchase itself [Kauf, Płaczek, Sadowski, Szołtysek, Twaróg, 2016, p.77]. In terms of procurement, one can also refer to the value added chain of the famous American economist M.E. Porter. It considers the procurement process as an ancillary activity to support the basic operations. Among other things, thanks to it, the company can gain a competitive advantage on the market. Without auxiliary activities, it would not be possible to implement basic processes, which is why the procurement process is so important [Skowronek, Sarjusz-Wolski, 1999, p. 117]. It must certainly not be forgotten that the procurement logistics itself also plays a key role in the entire procurement process. Logistics in a broad sense is treated as an integrated system of shaping and controlling the processes of physical flow of goods and their informational conditions, aimed at achieving the best possible relationship between the level of services provided (the level of customer service) and the level and structure of related costs [Garbarski, Rutkowski, Wrzosek, 2000, pp. 436–437]. Within the scope of supply logistics, tasks and activities related to the supply market research, purchasing and cost control, searching for alternative cost sources, alternative materials and other activities aimed at reducing costs are performed [ed. D. Kisperska-Moroń, 2006,

p. 169]. Materials management covers the spheres of supply and production. In the sphere of supply, it includes planning the supply of materials, procurement (understood as the purchase of materials), determining the level of inventories, storing and delivering materials for production and managing waste generated in the production process. For the correct course of the supply process in the enterprise, it is necessary to create material flows tailored to the enterprise's needs and to select the appropriate supply strategy. Nowadays, supply should be defined as a set of activities that are necessary to acquire materials needed to ensure the company's operation, taking into account all factors influencing the rationalization of the supply process [Bendkowski, Radziejowska, 2005, p.40]. Procurement plays a very important role in material flow planning. It is the first link in the entire process of these flows. Without the supply of necessary raw materials, materials, assemblies and subassemblies, the material flow process could not be implemented.

2. MATERIAL MANAGEMENT IN THE ENTERPRISE

The company the article refers to is one of the most recognizable companies on the Polish electricity market. It has several branches in Poland. Each of them is responsible for the processing or production of a different material or product.

For the purposes of this article, the research was conducted in one of the departments. It is responsible for the production of low (LV), medium (MV) and high voltage (HV) switchgears. Switchgears are electrical devices whose main task is to convert electricity and transmit electricity. It also produces rails, container stations, DC devices as well as urban and railways. The production in this enterprise is a unit production and less often small or medium series. This is a custom production. The company has basic product models that, at the customer's request, it is able to modify to meet their expectations.

However, the company is struggling with the problem of over-inventory. In order to analyze the level of inventories, an ABC analysis was performed. After it was carried out in relation to the inventory of materials and product inventories, the following conclusions were drawn: material inventories form the largest group of inventories, because their percentage share in the total number of items of material and product inventory is as high as 97%, while the percentage share of the number of items is only 3%. It is similar in the case of the value of inventories (PLN). Stocks of materials take up 93% of the value of all stocks, and products only 7% of this value.

Of course, the fact that the level of stocks of materials is much greater in terms of quantity and value than the level of stocks of products can be explained by the fact that this company is engaged in production activities, and the materials used for the production of products are mostly very expensive. The fact that

the company has much smaller inventories of products than materials proves it favorably, because it means that work in progress, semi-finished products or incomplete products are largely sold out and not stored in the warehouse, to the same extent as the inventories of the materials themselves for production.

A situation in which there is no inventory is very difficult to obtain in manufacturing enterprises, even impossible. This is especially the case when demand is not predictable. Out of stock is a risk of downtime or production stoppage. This situation is a loss for the company. However, stocks in the company are too large and consume too much financial resources.

Another conclusion that emerges after the above analyzes is that, both in the case of material stocks and product stocks, the largest in terms of value belong to groups A. The largest in terms of quantity are groups C. The third very important conclusion is that the largest stocks (in terms of quantity and value), both for materials and products, were accumulated in the period from 2015 to 2017. During these three years, the quantities and values of materials and product stocks were by far the largest compared to the remaining ten years.

Inventory analysis allowed to draw interesting conclusions and check the value and quantity of inventories broken down into materials and products. Thanks to such analysis, it will be possible to propose the most appropriate solutions to the problem. Its results are summarized in the table below. (tab. 1)

Table 1. Comparison of groups A, B and C for material and product inventories

	Materials			Products		
Group	Inventory value (PLN)	Quantity	Percentage (%)	Inventory value (PLN)	Quantity	Percentage (%)
A	5 642 905,33	541915	79,98	448 900,63	12436	79,83
B	1 058 839,94	262254	15,01	85 120,92	9304	15,14
C	353 225,05	218117	5,01	28 333,88	5137	5,03
Sum	7 054 970,32	1 022 286	100	562 255,43	26877	100

Source: Own study based on data received from the enterprise.

3. ACTION INFLUENCING THE REDUCTION OF THE STOCK LEVEL

When taking actions to reduce the level of inventories in the analyzed company, it is suggested to introduce the following solutions:

a) application of the MRP system (Material Requirements Planning),
b) use of quality circles,
c) creating a team of specialist for the liquidation of stock,

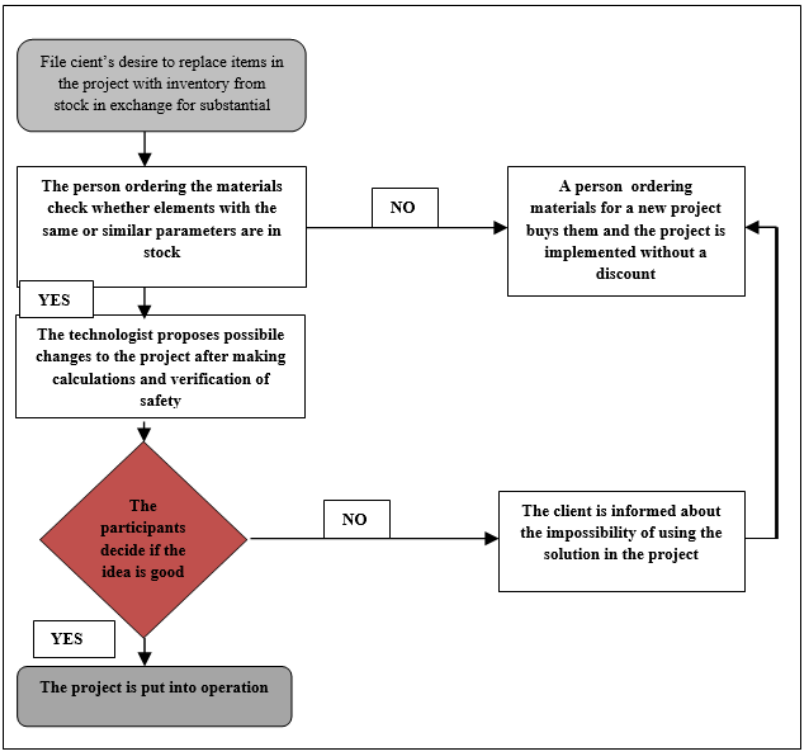
d) introducing a system for informing clients about the consequences of introducing changes to projects, the implementation of which has already started,
e) applying the Ishikawa cause and effect diagram.

MRP system (Material Requirements Planning) is a material requirement planning system. It is based on three basic pillars, which are the main production schedule, product structure and inventory [Miller, Sprague, accessed: March 5, 2020]. Applying an MRP system in the enterprise would be a good solution as it would prevent ordering materials that are unused and could become another stock. The company would know exactly the structure of the products, that is, it would know exactly what it needs and that is what it would buy. In addition, thanks to the MRP system, before purchasing new elements for production, it would be automatically verified whether such an element is in stock. If so, it could be used and thus get rid of the stock.

Quality circles are one of the methods of solving quality problems not only in production. Their goal is to create innovative solutions and improve the quality of processes. The idea of circles is to create groups of several people, usually at the same level of the organizational structure and exchange their ideas between team members. This tool aims to create new solutions and engage employees in the decision-making process [Lawler III, Mohrman, access: March 5, 2020]. The work of such a team would consist in searching for possible uses of the outstanding inventory in the projects of customers who expressed a desire for such modification in return for a significant price discount. The meetings of such a group could proceed as follows (Fig. 1)

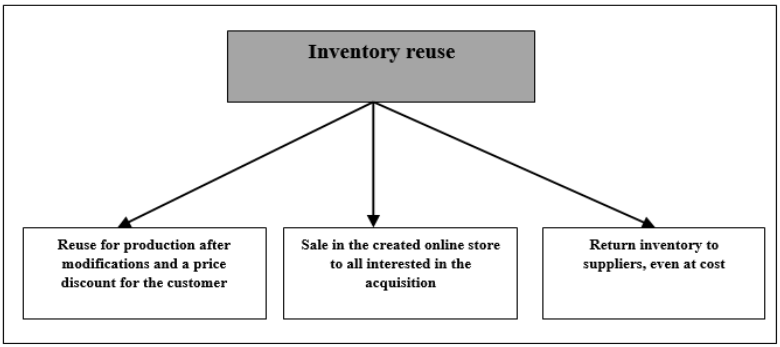
Creation of a work team whose purpose would be to liquidate the remaining stocks outside the warehouse. The team would be responsible for creating and running an online store in which both people from the industry and every Internet user could purchase the remaining stock at a lower price. In this case, it would be important to simply sell the inventory, even at cost, because it will be difficult to find a potential market for specialist parts in this industry (often made to order). The task of this group of people would also be an attempt to return the purchased items to the supplier. The purpose of this solution is to liquidate the residual stocks, and after introducing organizational changes in the management and management of stocks, to prevent their re-stacking. The above-proposed solutions are presented in the diagram below (Fig. 2).

Figure 1. Flowchart of proceedings during the meetings of quality circles



Source: Own study.

Figure 2. Inventory reuse opportunities

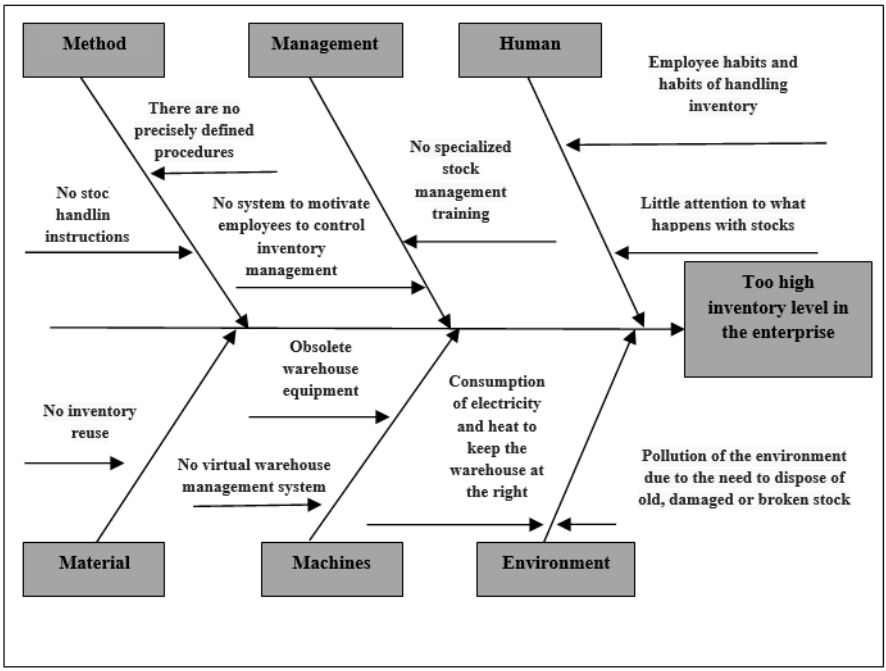


Source: Own study.

A fairly specific group of inventories are those that arise as a result of changes in projects introduced by customers. A method that may facilitate dealing with such a situation is to make the client aware that any change in the design during its implementation will burden him with the costs of making changes and the costs resulting from these changes in inventory. If a company introduces a monetary burden on customers, they will introduce changes less frequently, fearing additional costs. This solution, however, cannot be introduced too restrictively so as not to scare customers, and thus not to lose them.

Based on the problems faced by the company in terms of inventory management, an analysis was made using the Ishikawa diagram. Its use makes it possible to detect factors causing a specific problem in the classification into particular groups. This enables a thorough analysis of each of the causes and the use of the most appropriate solutions to the problem by eliminating each of them (Fig. 3).

Figure 3. Ishikawa diagram for the problem of too high stock levels in the enterprise

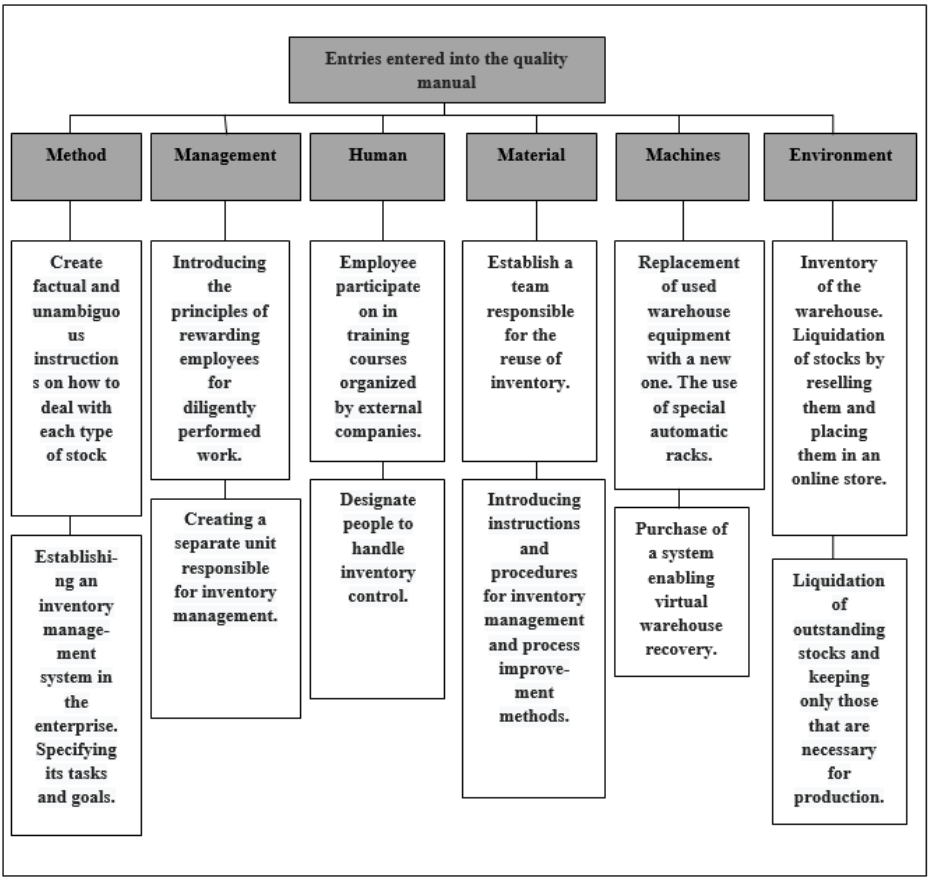


Source: Own study based on data received from the enterprise.

Applying at least a few of the methods proposed above could have a positive effect on the company's inventory management system. A gradual but regular introduction of changes would also be beneficial.

After the analysis with the use of a cause-and-effect diagram and a detailed analysis of the problem of excessively high stocks, a quality book was introduced in which the following entries were made: (Fig. 4)

Figure 4. Entries made in the quality manual aimed at eliminating the causes of the problem



Source: Own study.

Each of the proposed tools and methods brings a different solution, or even several of them. Their analysis, examination of short- and long-term benefits could help the company to solve the problem of excessively high stock levels.

The analysis would also be helpful in releasing the frozen cash. Most importantly, it would enable the creation of a new inventory management and management system. Its main goal would be to get rid of obsolete, outstanding inventory, and then prevent it from accumulating again. The new system would be based on keeping only the parts necessary for production in quantities to meet current production with a maximum of two to three weeks in stock.

SUMMARY

In every production company, the most important thing is detailed and thoughtful planning of all processes, because to a large extent well-planned and coordinated processes are the determinant of its long-term results and successes. The problem of too high stock levels was observed. Efforts were made to propose the best possible solutions. It has been pointed out that in order for the problem to be successfully solved, its causes should be thoroughly understood. The research that was conducted concerned a specific, existing enterprise, real data and was conducted as a case study.

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Abstract: Materials management in manufacturing enterprises is undoubtedly one of the most important areas of its functioning. The article aims to present the essence of the selected area and make the reader aware of its rank. The first chapter presents theoretical issues regarding the area of interest of the article. These include, among others: the supply process, its planning method, supply logistics, material management, the role of supply in material flow planning, material demand planning, material flow control methods in enterprises, purchase and supply planning in the material supply process, methods of choosing supply sources and ABC analysis in material management. The second chapter presents the company. It contains its general characteristics. Then the focus was on the characteristics of supply logistics, order planning procedure, materials management, methods and factors affecting the choice of supply sources. After analyzing the material management and analysis of the current level of inventories using the ABC method, there was an indication of problems existing

in the company. The search for their causes and proposals of effective solutions began. The methods and tools that were used were: MRP method, quality circles and a carousel of ideas used in their operation, as well as cause and effect analysis using the Ishikawa diagram. Several other solutions have also been proposed. All, however, were intended to eliminate the problem. All calculations and analyzes created for the purposes of this article have been supported by company data and direct interview with employees responsible for the supply process.

Key words: materials management, management, inventory, supply, storage.