

## THE CONCEPT OF IMPROVING WAREHOUSE MANAGEMENT IN THE X PRODUCTION COMPANY

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**Abstract:** The article aims at the presentation of a concept referring to the improvement of warehouse management in the X production plant. The authors suggest two solutions: using storage racks at the picking process site and warehouse automation. Ultimately, the authors of the article present their basic calculation of the costs, indicating the increase in efficiency after the implementation of the discussed improvements.

**Paper type:** Case Study

**Published online:** 31 January 2017

Vol. 7, No. 1, pp. 31–39

DOI: 10.21008/j.2083-4950.2017.7.1.3

ISSN 2083-4942 (Print)

ISSN 2083-4950 (Online)

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**Keywords:** *warehouse management, storage racks, automation*

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## 1. INTRODUCTION

Warehouse is one of the key areas of functioning in manufacturing companies. Contemporary literature from a specified range of subjects, both domestic and foreign, confirms this view. The works of authors such as D.J. Bowersox, D.J. Closs, M. B. Cooper, P. Blaik, D.M. Lambert, J.R. Stock, L.M., Ellram, M. Nowicka-Skowron, H. Ch. Pfohl, M. Sołtysik, Cz. Skowronek and Z. Sarjusz-Wolski clearly indicate how a very important role plays indicated topics in the development of the modern enterprise.

In the 21st century, production companies have faced the necessity of constant improvement in the quality of their products, reduction in all the necessary costs, meeting the rigid requirements resulting from standards and customers' demands, proper care provided to the faultless functioning of warehouse management (Durlík 2000).

In their article, the authors focus on the concept referring to the improvement of an important department in the X production company, that is namely: warehouse management. The discussed X company is one of the leading companies which produce garden furniture on the home market.

The functions which play the main role in warehouse management in the analysed company are the following: the receipt of goods, storage, order-picking process and issuing of goods (Grzybowska 2010; Niemczyk 2010). Additionally, the significant contribution of innovative methods and tools applied to shape the processes should be emphasized: the improvement in the efficiency of the equipment working at the warehouse and the development of the human factor (Długosz 2009).

Warehouses come as an essential fragment of the logistic system, a link in the supply chain which connects producers with their final consumers in the market (Kozłowski & Sikorski 2009). Therefore, some reasonable concepts of improvement, which are adequate to the present situation of the X production plant, can develop a significant potential in proper management and functioning of the company. Based on the principle of matching and smooth flow of not only materials but, first of all, of information, it is possible to manage the company in the proper way in order to maintain its position in the market (Niemczyk 2008; Brzeziński 2002). Using their experience related to the work in the analysed X production company, the authors present only the most significant suggestions for the changes which should be implemented into that company.

## **2. THE CONCEPT OF IMPROVING THE PROCESSES OF WAREHOUSE MANAGEMENT**

Considering processes related to warehouse management, they should work in a cohesive and effective way, in terms of economy, providing proper flow of tangible and intangible means, which results in the achievement of all the assumed aims of the company.

The significant directions for the improvement of the warehouse management process which are suggested by the authors of the article for the analysed X production plant are the following:

- placing storage racks at the picking process site; it would speed up the packaging process and shorten the production cycle. It would also optimize the longtime of taking and transporting semi-finished goods to their order-picking process site.
- automation of the warehouse which will allow the company to improve and to apply the advanced technologies there; it will facilitate the production and distribution processes which are related to the dispatch of the products.

The indicated improvement may result in an increase in the efficiency of work as well as of service, and the whole process referring to the storage and production in the company.

## **3. IMPLEMENTATION OF CHANGES TO THE SYSTEM OF WAREHOUSE MANAGEMENT**

### **3.1. The concept of the improvement no. 1 – placement of a storage racks**

Trying to apply the proper tools which considerably affect the reduction in the costs related to the production of finished products and the increase in productivity, the authors of the article focus on warehouse management. When properly performed, it provides the correct flow of materials and information.

Focusing on warehouse management, the authors of the article propose an improvement which consists in the placement of storage racks into the area of the picking process. It will allow the X company to achieve the assumed objectives, such as:

- shortening of the time during which semi-finished goods are taken and transported from the warehouse to their picking process site;
- speeding up of the packaging process;

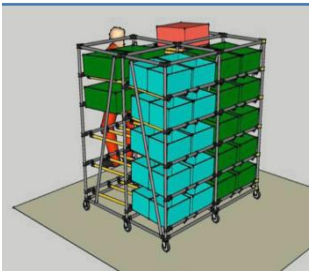
- proper increase in productivity;
- lowering of the internal transport.

According to the authors of the article, storage racks will come as an efficient base for the storage of the materials and semi-finished goods. They will also provide an opportunity for the internal logistics to function properly, particularly, as far as the warehouse processes are concerned in the area of:

- the proper level of storage (minimal and maximal supplies),
- the goods assigned with their proper locations.

According to the authors of the article, the essence of placing storage racks refers to the conditions required for the maximal increase in the flow of materials and information. A lot of significance in the implementation of that concept will be attached to the use of small containers which will facilitate and provide proper organization of workplaces – ergonomics. The use of containers will also improve the control over the consumption of materials during the production processes.

**Table 1.** The basic data referring to a storage rack

Name	Visualisation	Quantity	Size	Capacity
Storage rack X 4		10	1900 mm	20 boxes X 600x400x220
			1500 mm	+ 20 boxes X
			1900 mm	300x400x220
				+ 8 other boxes

The construction of the warehouse storage rack consists of the ESD stainless pipes. Its total capacity is 48 boxes. The stainless steel shelves fastened by the GS-A joints provide a possibility to make simple changes in their configuration.

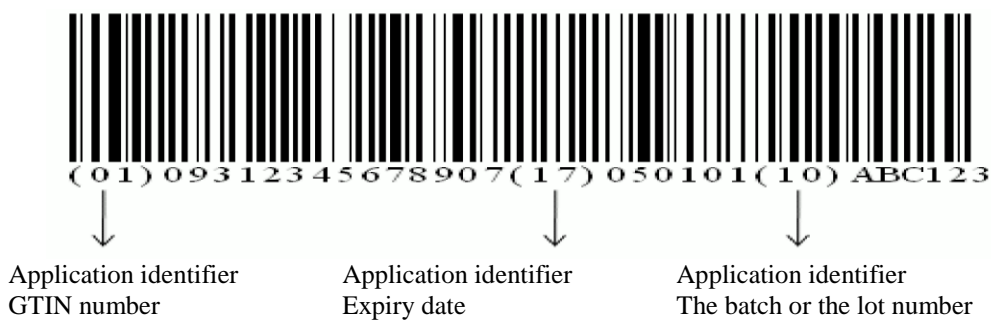
### 3.2. The concept of the improvement no. 2 – automation of warehouse management

The second concept presented by the authors of the article is the implementation of automation to the X production company. New technologies which can be introduced to the analysed company will provide some new possibilities and improvements required to achieve particular aims of warehouse management. In a production plant, a very advantageous solution based on automation would be the implementation of a bar code system – a system based on the automatic identification of finished goods.

The use of bar codes in the X production company will result in measurable advantages, such as: availability, efficiency, operational speed, low prices.

The authors suggest the following operational form of the discussed system:

1. During the code recognition, the light coming from the scanner is reflected by the bright elements of the code (gaps) and absorbed by its dark elements (bars).
2. The light reflected from the gaps generates weaker electric signals received by the scanner. When there is no reflection (bars) the signals become stronger.
3. Depending on the width of the bars, the length of the particular signals is also different. As a result, there is a string of electric signals generated; the signals are characterised by various intensity and various length. Obtained in such a way, the electric impulses are translated by the decoder of the scanner into the language of digits, letters and other signs, which are then sent to the computer.
4. The read signs are associated with the relevant description in the database.
5. By the use of the data reader, a so called collector, the employees of the X production company will be able to see orders to be realized and to prepare the required products.
6. The indicated system will also provide information about the location of particular goods. Considering the size of the X production plant, and its operational profile, which is connected with the constant development, the GS1-128 Code will be the most proper to be implemented there (see Fig. 1). Using application identifiers, the code provides coded information about the product, its producer and other complementary information.



**Fig. 1.** An example of the GS1-128 Bar Code; Source: the authors' study based on the data provided by the X production company

Considering the implementation of automatic identification in the company, there are some unavoidable aspects referring to the selection of the proper equipment indispensable for the cohesive operation of the system which will contribute to the company's benefit.

#### **4. THE ANALYSIS OF ADVANTAGES. THE INFLUENCE OF CHANGES ON THE PROCESS OF WAREHOUSE MANAGEMENT**

The changes in the process of warehouse management will considerably affect the proper operation of the X production plant. The implementation of the improvements will result in the following advantages:

a) Shortening of the working time.

While analysing the situation in accordance with the process in a more detailed way, it is possible to save time by the placement of the storage racks and the automation of the warehouse management system. It will be also possible to provide good organisation during the order-picking process and preparation of orders for the realisation by employing an additional worker. This person's task will be to maintain the proper level of supplies. Equipping the worker with a platform truck will also provide the proper level of supplies stored on the storage racks. Moreover, automatic identification will allow the company to save time, considering the significant facilitation which is provided during the preparation of the required goods for the dispatch and the preparation of the required documentation for the transportation of the realised orders. The bar codes will provide good organisation during the preparation of the required goods by sending particular orders to the reader – in that way it will be possible to realise such orders much quicker. The main advantage here is the proper location of the stored materials to which the particular goods are assigned.

b) Lowering of the costs referring to the internal transport.

While employing an additional worker, it is advisable to provide this person with a platform truck, thanks to which the worker will be able to maintain the proper level of supplies on the storage racks in an easy and economical way. The implementation of the improvement referring to the automation will change the organisation of the warehouse. The company takes advantage of its transport paths, namely: warehouse aisles which provide good coordination and proper operation of high lift trucks. All the unnecessary operations in warehouse management result from an ergonomically improper configuration of the warehouse rack system. Placing the warehouse racks in a precise way, it is possible to avoid a number of superfluous operations.

c) Increase in the productivity.

Another advantageous aspect refers to the increase in productivity in terms of time consumption. The tact time is shortened, and that fact increases the efficiency of the production processes. The production company may then operate faster and more effectively, avoiding the stoppages which before resulted from longer handling operations.

d) Facilitation of stocktaking in the warehouse. Control over the proper level of supplies. Accessibility of the goods.

The implementation of the improvement referring to automation will allow the workers of the X production company to find the required goods faster and to effectively control the quantities of the supplies in the warehouse.

e) Control over the proper level of supplies, accessibility.

In practice, stock control in the analyzed production company X will take place in the system of continuous control. Analyzed the system of continuous control (Perpetual System) will be responsible for: monitoring the state of the current inventories, taking appropriate decisions on a regular basis on-line (on-line system). The benefits of this system are: current information on the state of supply and reduced operating costs (less safety stock).

## **5. CALCULATION OF COSTS GROWTH PRODUCTIVITY AND PRODUCTIVITY**

A basic cost calculation which presents the increase in efficiency and productivity after the implementation of the improvements.

The basic estimation of the costs referring to the increase in the efficiency has been directly calculated in the X production company, and it is presented below:

a) Shortening of the time during which the semi-finished goods are taken from the warehouse: from 23.36 min. to 19.55 min.

b) Calculation of the number of working hours devoted to take the products from the warehouse.

23,36 min x 4 lengths of way taken by the workers = 01:34:24 (94 min) x 20 days = 1880 min (31,3 h/month) 2 workers x 31,3 h = 62,6 h/ month

c) Calculation of the profit obtained from the sale of a cabinet (on the example of the selected kind of the "ATU" cabinet production).

1 cabinet – the sales price – 500 PLN

production cost – 79,10 PLN

profit 420 PLN

d) Production of 3 cabinets during one hour (one worker)

3 cabinets x 8 h = 24 cabinets

after the improvement, the productivity increases up to 4 pieces per one hour.

4 cabinets x 8 h = 32 cabinets

e) Calculation of the time reduction after the improvement.

20,18min – 14,02min = 6,16 min

f) Considering the production time of a cabinet – 20 min.

24 cabinets x 420 PLN profit = 10.080 PLN

440 PLN x 20 working days = 201.600 PLN

g) During the reduced production time of a cabinet to 14.02 min.

4 cabinets per 1 working hour

4 cabinets x 8 working hours = 32 cabinets

32 cabinets x 420 PLN profit = 13.440 PLN  
 h) The difference in the profit  
 13.440 PLN - 10.080 PLN = 3.360 PLN  
 13.440 PLN x 20 working days = 268.800 PLN  
 i) The costs of the improvements  
 employment of two workers who would handle the storage racks 2.720 PLN  
 remuneration of one worker 1.360 PLN  
 2 workers x 1360 PLN = 2.720 PLN  
 j) Purchase and assembly of the storage racks  
 2.000 PLN x 10 storage racks = 20.000 PLN  
 k) Purchase and assembly of traditional racks (5m of height)  
 862,25 PLN x 12 storage racks = 10.347 PLN  
 l) Additional administration costs  
 training for the workers 1.500 PLN  
 2 workers x 1.500 PLN = 3.000 PLN  
 m) Total costs referring to the implementation of the improvements.  
 20.000 PLN + 10.347 PLN + 3.000 PLN + 2 PLN = 36.067 PLN  
 n) Profit generated by the sales of the cabinets after the implementation of the improvements 13.440 PLN  
 financial results per one year 13.440 PLN x 12 months = 161.280 PLN  
 remuneration of two workers:  
 2.720 PLN x 12 months = 32.640 PLN  
 implementation costs 20.000 PLN + 10.347 PLN + 3.000 PLN = 33.347 PLN  
 profits obtained by the company per one year, which are generated after the implementation of the improvements 161.280 PLN - 120.960 PLN = 40.320 PLN

## 6. CONCLUSION

Looking ahead into the development of the X production company, it is possible to state that its automation comes as one of the most significant factors which will allow the company to minimize its costs. The discussed company will be able to save even up to 50% of the time of its operations and realization of its orders, due to the fact that the location of particular goods will be easy to identify at once.

A similar element is the implementation of the storage racks. Considering the fact that there will be an additional worker employed, who will take care of the constant maintenance of the supply level, the number of stoppages in the company can be practically reduced to zero, in comparison to the fact that so far there has been quite a number of them in the company.



## REFERENCES

- Blaik P., (2001), Logistyka, PWE, Warszawa.
- Bowersox D.J., Closs D.J., Cooper M.B., (2002) Supply Chain Logistics Management, McGraw-Hill, New York.
- Brzeziński M., (2002), (ed.), Organizacja i sterowanie produkcją, Agencja Wydawnicza Placet, Warszawa.
- Długosz J., (2009), Nowoczesne technologie w logistyce, PWE, Warszawa.
- Durlik I., (2000), Inżynieria zarządzania, part I, Strategia i projektowanie systemów produkcyjnych, Agencja Wydawnicza Placet, Warszawa.
- Grzybowska K.,(2010), Gospodarka zapasami i magazynem, part 1,PWN, Warszawa.
- Koplnowski R.,Sikorski J., (2009), Nowoczesne rozwiązania w logistyce, Kraków.
- Lambert D.M., Stock J.R., Ellram L.M., (1998), Fundamentals of Logistics Management, Irwin/McGraw-Hill, New York.
- Niemczyk A., (2008), Zapasy i Magazynowanie, ILiM, Poznań ,vol. II.
- Niemczyk A., (2010), Zarządzanie magazynem, WSL, Poznań.
- Nowicka-Skowron M., (2000), Efektywność systemów logistycznych, PWE, Warszawa.
- Pfohl H.Ch., (2001), Systemy logistyczne, ILiM, Biblioteka Logistyka, Poznań.
- Skowronek Cz., Sarjusz-Wolski Z., (2000), Logistyka w przedsiębiorstwie, PWE, Warszawa.
- Sołtysik M., (2000), Zarządzanie logistyczne, AE w Katowicach, Katowice.

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