

STOCK MANAGEMENT WITH THE EXAMPLE OF THE PRODUCTION/LOGISTIC COMPANY VIVE TEXTILE RECYKLING

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Клепацький Б., Дзедзиц-Ягоцька І. Управління запасами на прикладі виробничо-логістичної компанії VIVE Textile Recykling

У статті розглядаються основні проблеми управління запасами підприємства. Основна увага приділяється ABC-методу та XYZ-методу аналізу, а також “just in time”-підходу як системі управління постачанням, яка полягає в забезпеченні підприємства всіма елементами запасів у необхідній відповідності з існуючим попитом з боку споживачів безпосередньо до робочого місця і точно в термін.

Ключові слова: *запаси, логістична компанія, виробнича компанія, just in time, ABC-метод, XYZ-метод.*

Klepacki B., Dziedzic-Jagocka I. Stock Management with the example of the production/logistic company VIVE Textile Recykling

The main problems connected with enterprises stocks management are considered in this article. The main attention is devoted to ABC-method and to XYZ-method of analysis as well as to “just in time” as a supply management system consisting in providing all stock items of an enterprise precisely in accordance with the demand indicated by a customer directly to the workplace and “just in time.”

Key words: *stocks, logistic company, production company, just in time, ABC-method, XYZ-method.*

Клепацкий Б., Дзедзиц-Ягоцкая И. Управление запасами на примере производственно-логистической компании VIVE Textile Recykling

В статье рассматриваются основные проблемы управления запасами предприятия. Основное внимание уделяется ABC-методу и XYZ-методу анализа, а также “just in time”-подходу как системе управления снабжением, состоящей в обеспечении предприятия всеми элементами запасов в необходимом соответствии с существующим спросом со стороны потребителей непосредственно к рабочему месту и точно в срок.

Ключевые слова: *запасы, логистическая компания, производственная компания, just in time, ABC-метод, XYZ-метод.*

The importance of stocks and stock management. The stocks are tangible, non-liquidated part of an enterprise current assets accumulated for future use. Without the stocks, it is difficult to imagine an efficiently operating company. The size and the structure of the stocks depends on numerous factors. The crucial one is a degree of stability of the supply and demand in the supply market. When the market is saturated and relatively stable, and it is easy to acquire various resources, a company may accumulate small stocks. Other important factors include: the organisational efficiency of the inventory system, cyclical nature of the

supplies, harmonious cooperation with shipping companies.

Every manufacturing and service company maintains material stock and finished goods stock. Manufacturing companies accumulate stocks in three important areas including: procurement, production and distribution [1, p. 136-138].

Conducting business activity is associated with maintaining stocks, providing for the continuity of business processes and stability of production and sales. An enterprise may accumulate various kinds of stocks: materials, work in progress, finished goods. Each type of a stock plays a different role in a business process.

Manufacturing companies accumulate mainly material and finished goods stocks, while in the case of commercial companies the most important role is played by merchandise stocks. Service companies keep the stocks of materials that can be used to provide a service.

Maintaining stocks is connected with substantial costs that are frozen capital. While maintaining stocks, one has to take into consideration the holding costs. We can mention several reasons why an enterprise maintains stocks despite generating high costs: maximising the level of customer service, preventing production stoppages, preventing uncertainty, economy of scale in terms of purchasing or production, minimising the seasonal changes in demand.

As already mentioned, an important part is improving the level of customer service. The higher the customer service, the more stocks are accumulated by an enterprise. An increase in finished goods stocks enables to secure the sales against the changes in demand. Maintaining larger stocks of finished goods decreases costs associated with lost business called shortage costs. They are the costs associated with stock-outs of goods, resulting in inability to fulfil orders from clients. The costs of lost business are also connected with client churn. The larger the volume of stocks maintained, the higher the costs of maintaining such stocks, and the lower the shortage costs should an order be placed. In order to resolve the problem of maintaining stocks in an enterprise, one should prevent stoppages and uncertainty.

Maintaining large stocks ensures continuity of enterprise operations. However, maintaining high level of stocks requires adequately high financial resources. They may be acquired from loans and credits. Therefore, enterprises try to optimise the level of stocks.

Maintaining stocks by an enterprise is also associated with price discounts accompanying material purchases of large batches of goods. The quantity of stocks enabling the continuity of a business process is limited depending on the level of risk associated with a loss of supplies as well as the lead times of alternative source. Enterprises that have accumulated stocks are capable of meeting the demand, which ensures a stronger market position. Accumulating stocks enables protection as well as the control and adjustments of price changes. As a result we can minimise the risk of price changes, exchange risk associated with foreign currency purchases

and interest rate risk associated with credited purchases [1. p. 136-138].

Stock management methods. There are three basic strategies of stock management: defensive, offensive and balanced:

- Defensive strategy – the main position in stocks is materials and finished goods, and the ratio of stocks to assets and current assets is high in comparison with the industry average,
- Offensive strategy – the main position in stocks is work in progress, and the ratio of stocks to assets and current assets is low in comparison with the industry average,
- Balanced strategy – is a blend of defensive and offensive strategies.

The purposes of stock management include:

- Ensuring adequate level of internal and external customer service, considering the quality and the ratio to total orders completed;
- Monitoring current and future demand for all goods required to avoid surpluses and shortages in production;
- Minimising costs by decreasing diversity of the stocks, defining economy sizes of ordered batches, and analysing the costs of creating and maintaining stocks.

Stock management refers mainly to the production of relatively cheap items with a sufficiently high turnover rate. Enterprises can employ a wide range of stock management methods. The fundamental methods used in stock management include: [ABC](#), [XYZ](#), EOQ (Economic Order Quantity) model, stock control models, investment approach, [MRP](#) (Materials Requirement Planning) systems, [DRP](#) (Distribution Requirement Planning) system, and JIT ([Just In Time](#)) system.

Above all the stock management requires a systematic grouping both in terms of their value and the turnover ratio. The two methods that may be used for the purpose of this grouping include: ABC method and XYZ method. ABC method starts from acknowledging the fact that often a limited number of tangible goods has a substantial share in the total costs of materials or total turnover. The material costs of the remaining large portion of goods account for a small share in the total costs of materials. Therefore the supply goods are classified into three groups: A, B, and C.

ABC analysis is a relatively simple analytical method. It is based on the Pareto law (or Pareto principle) stating that approximately 20% of the items have 80% impact on the effects of a given

issue. ABC method is used for classification and grouping of:

- suppliers,
- customers,
- operating costs,
- storage areas,
- stocks.

ABC analysis is used for a selective stock management. Assortment group management enables to identify from hundreds or thousands of the stock assortment items those that require an exceptional handling for example due to the

costs of a frozen capital. Typically, the classification system in ABC method divides assortment items into three groups, depending on the significance or value of these assortments.

Assortment item group A accounts for 20% of all assortments and generates 80% of the traffic. They include the assortments that are utilised often or in large quantities. Group B accounts for 30% of all assortments impacting ca. 15% of the traffic. The remaining assortments account for 50% and form group C generating only about 5% of the traffic.

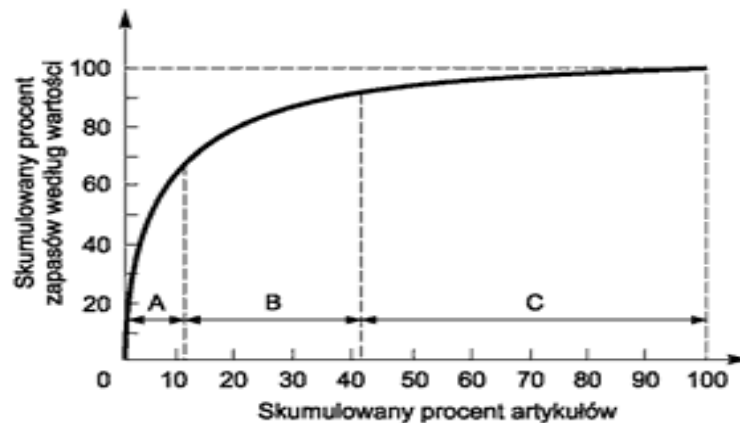


Figure 1. ABC analysis chart (vertical axis: Cumulative percentage of use by value; horizontal axis: Cumulative percentage of items)

Source: Waters D. Zarządzanie operacyjne / Waters D. – Warszawa : Wydawnictwo Naukowe PWN, 2007. – P. 570

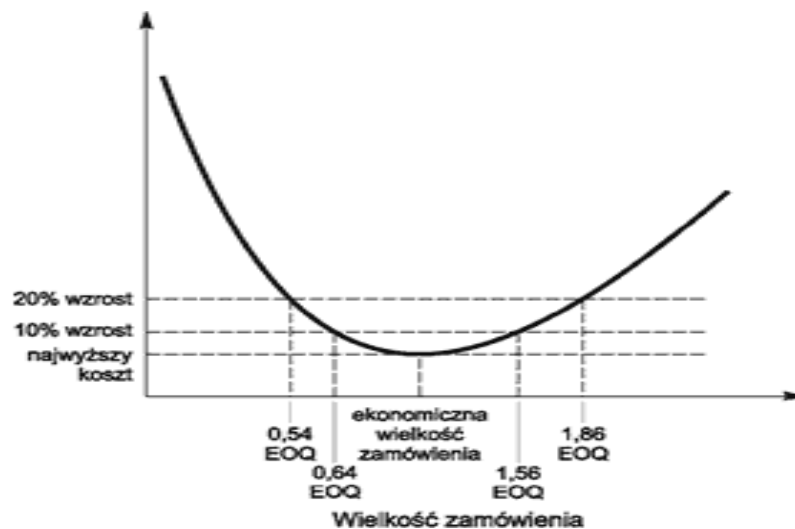


Figure 2. The chart shows the order size [vertical axis top to bottom: 20% growth; 10% growth; the highest cost; horizontal axis left to right: 0.54 EOQ; 0.64 EOQ; Economic Order Quantity; 1.56 EOQ; 1.86 EOQ]

Source: Waters D. Zarządzanie operacyjne / D. Waters. – Warszawa : Wydawnictwo Naukowe PWN, 2007. – P. 558

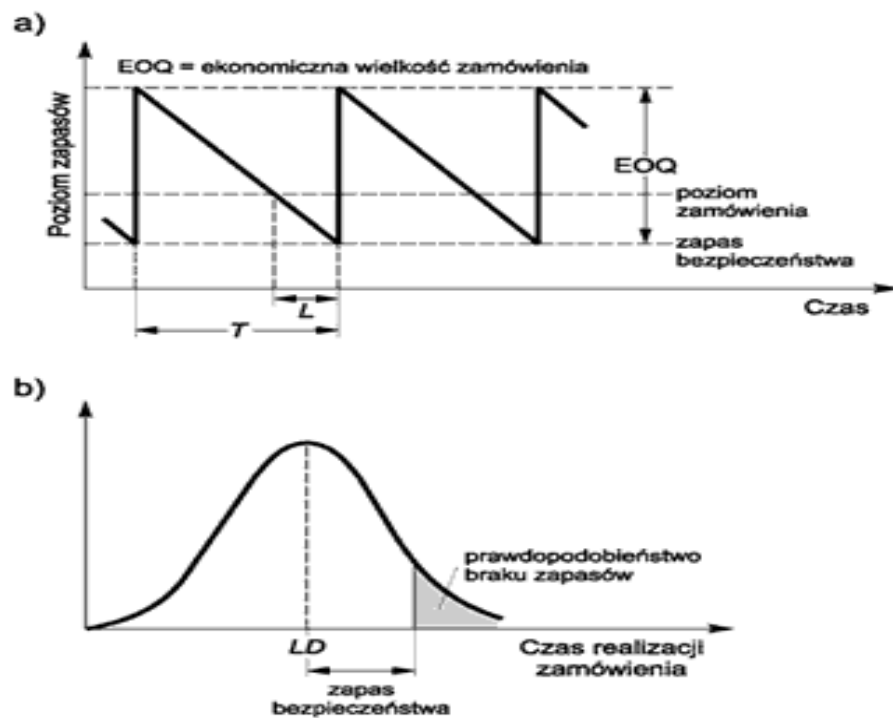


Figure 3. Effects of adding safety stock: a) stock cycles with safety stock, b) probability of stock-out with safety stock (handbook, p. 561) [upper chart vertical axis: stock level; upper chart top dashed line: EOQ = Economic Order Quantity; upper chart middle dashed line: Reorder level; upper chart bottom dashed line: Safety stock; upper chart horizontal axis: Time; lower chart shaded area: Probability of stock-out; lower chart range description: Safety stock; lower chart horizontal axis: Lead time demand]

Source: Waters D. Zarządzanie operacyjne / D. Waters. – Warszawa : Wydawnictwo Naukowe PWN, 2007. – P. 561

Stock management in demand independent systems aims at optimising the costs of providing and maintaining intermediates. While performing

stock management one should bear in mind that the completion of an order from a preceding period A must meet the demand arising in period B.

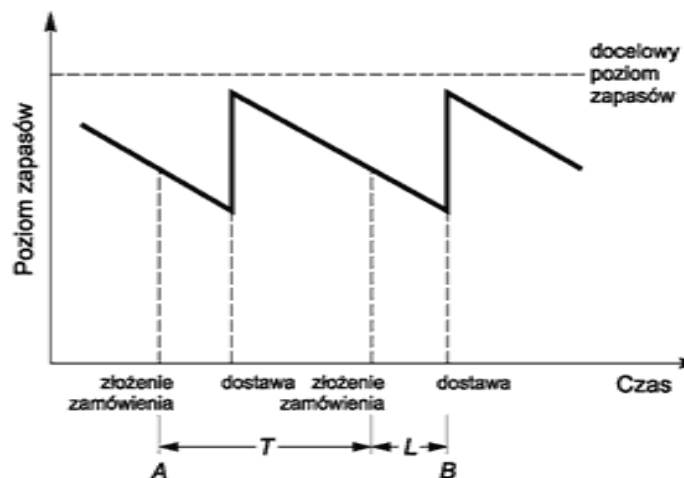


Figure 4. Order placed at A must meet the demand till B) [vertical axis: stock level; horizontal dashed line: target stock level; horizontal axis left to right: place order, order arrives, place order, order arrives, Time]

Source: Waters D. Zarządzanie operacyjne / D. Waters. – Warszawa :

Wydawnictwo Naukowe PWN, 2007. – P. 565

XYZ method is a variant of ABC analysis based on the classification of items according to their use structure thus providing better guidelines for decisions related to the choice of an adequate material disposition procedure. Item X is characterised by a high regularity of the use. In the case of article Y the use may rise or fall in line with a defined trend, but may also be subject to seasonal fluctuations. Item Z shows

only irregular use. Such item classification provides insight to a more effective purchasing. It enables to define the demand forecasting accuracy for individual types of items. This, in turn, provides additional insight to adequate and cost-effective material dispositions.

In order to perform XYZ analysis we group individual items based on their use structure. As a result we have the following classification:

Table 1

XYZ analysis based on the use structure, supply and forecasting accuracy

Item	Use structure	Supply	Forecasting accuracy
X	Regular use	Synchronised with production	High forecasting accuracy
Y	Use varies depending on the trend or is subject to seasonal fluctuations	Based on stock levels	Average forecasting accuracy
Z	Irregular use	Individual basis	Low forecasting accuracy

Just in time is a supply management system consisting in providing all stock items of an enterprise such as: materials, spare parts, components, semi-finished goods, etc., precisely in accordance with the demand indicated by a customer, directly to the workplace and “just in time.” Such organisation of the supplies firmly timed with the production process schedule (without the need to keep the stock) enables to decrease costs and capital outlays as a result of a substantial minimisation (and even elimination) of storage areas and a radical decrease of the current assets frozen in the form of stocks.

The originator of Just In Time approach is considered to be Taiichi Ohno, who has developed his idea based on the features found in Ford system and the American retail trade industry [2. p. 722]. The approach was first used by Kiichiro Toyoda in Toyota plants in 1950s. The companywide implementation was completed in 1962. Consequently, the approach was recommended to the company suppliers. The approach assumes organising the production based on pulling the materials and semi-finished goods from upstream activities in the process, which enables to minimise the stocks.

The following basic actions are undertaken in order to ensure the regularity of the material flow:

- organising production area in a way minimising the distances between the steps in a process,
- creating a product with the most effective tools regardless of their level of technological sophistication,
- creating small production nests,
- minimising the duration of the retooling process,
- advanced standardisation of products and processes,
- continuous development of workers qualifications,
- eliminating intermediate storage areas,
- locating suppliers in the vicinity of the plant,
- streamlining information flow [5, p. 49].

The full functionality of Just in Time system may be achieved with the assistance of supporting methods such as: Total Productive Maintenance, 5S, and QFD.

Just In Time concept has been transferred to the American and European companies. Many years of research performed by a number of scientists demonstrated that a substantial part of the organisations (even after many years from the start of implementation) did not manage to achieve as good results as the Japanese companies. The largest deficiencies related to:

- a substantial limitation of the decision-making autonomy postulated in Just in Time

through the use of norms and instructions and increasing dependencies between the steps of a production process resulting from liquidation of intermediate storage areas,

- lack of willingness to use the rights to organise their work by independent teams,
- substantially smaller effects of eliminating wastes,
- a lower discipline at work [2, p. 722].

The reasons of such situation are sought in cultural differences and the organisation of the economy. In Japan, the majority of business organisations is headed by keiretsu-large organisations embracing enterprises and banks. The exchange of lessons learned, knowledge and technologies occurs within these structures and is supposed to result in a better collaboration and understanding between contracting parties. In such circumstances it is substantially easier to develop long-term beneficial relationships with suppliers or to synchronise production.

Similarly, the approach to personnel management is impacting the effects of Just in Time application. Japan is known for its tradition of employing some staff members in one enterprise from the end of their education until the retirement. Trade unions are concerned not just about the interests of their members but also the enterprise and the whole economy. The relationships between employees and their superiors are based on the Confucian principles of responsibility, loyalty, trust, and harmony. The wages are associated more with employees qualifications and the years of employment in the organisation and less with the seniority of a position in the hierarchy. The practices employed in Japanese education system favour cultivating the traditions of teamwork, which transforms later to a higher appreciation to recognising group achievements versus individual achievements [3, p. 447]. The European and American personnel management style takes into consideration completely different preferences of the employees, who strive individually for promotion and change jobs many times during their careers. A rapid growth of IT technologies enabled to develop new methods of production planning and control, such as MRP. The implementation of these methods is much faster than the full implementation of Just In Time approach, and in a short term it brings similar results. Even in Japan, many enterprises give up Just in Time in favour of MRP, especially if they deal with very complex products and manufacturing processes. However, compar-

ing the two concepts in a long term may prove the superiority of the Japanese approach. It results from the fact that unlike MRP, Just In Time embraces continuous improvement of every element of a manufacturing process [5, p. 52].

The structure of stock management. Depending on the function the stock may be classified as:

- Cyclical stock—is a current stock maintained by an enterprise. It is held for the purpose of production or sales.
- Anticipation stock—is a stock accumulated in very large quantities, of a leading nature, created in connection with future activities. It can be divided into a promotional stock (planned and accumulated for promotional and advertising activities), a speculative stock (accumulated in very large quantities), and a seasonal stock (associated with the seasonal nature of certain products or materials).
- Safety stock – is a stock providing for a continuity of production or sales.
- Work in progress stock – related to a technological stock maintained in production lines.
- In-transit stock – is a stock moved in external means of transportation.
- Spare part stock – this stock is usually maintained in small quantities.

Description of Vive Textile Recycling company. The fundamental goal of the company is to achieve a leading market position associated with the core business, i.e. processing secondary raw materials. Primarily, the company aims at developing a method enabling a full utilisation of second-hand clothes. These goals are of a particular importance in times of particular care about the environment.

In 1991 the company started its operations as a small warehouse of second-hand clothes located in Gyrki Szczukowskie near Kielce. At that time it focused only on selling sorted second-hand clothes brought from the Netherlands.

In March 1992 the company began importing pre-sorted clothes and employed the first workers to handle these operations. The gradual increase of the volume of processed clothes was accompanied by the growth of the headcount and production/storage facilities. In 1995 the scope of business was extended with the acquisition of processed second-hand clothes in Poland.

In the beginning of 2002 the level of daily processing reached 70 tonnes. The headcount

was nearly 400 persons, who were using over 8,000 square metres of production and storage facilities. At night of 7–8 October 2002 there was a fire that burned to the ground the work of many years. All storage and production facilities including the machinery and equipment as well as over 2,000 tons of textiles have been destroyed. The tragedy forced the company to reduce the headcount by over 50% within several days and to initiate the steps aiming at restoring the original operations. It was necessary to limit the quantity of textiles used for production. Therefore on 1 July 2003 the company sold ca. 6,500 containers spread all over the country.

During the first months after the fire, 150 persons processed 40 tonnes of textiles daily in rented facilities in Kielce, at Olszewski street. Thanks to the support of numerous individuals and institutions and dedicated efforts of the staff, in the middle of 2003 the company managed to restore the headcount and production levels from before the fire. The implementation of new technological solutions enabled to increase the scale of production and to plan to maintain this trend in future.

At the end of 2004 the company purchased a facility located in Chemar's property. The facility included a three-hectare lot and a 17,000-square metre plant. Currently the company employs 730 persons. It processes from 3,200 to 3,500 tonnes of textiles monthly. At the turn of 2004 and 2005 it launched a modern cloth sorting line, which is gradually enhanced.

As the leader in textile processing industry, VIVE Textile Recycling Sp. z o.o. acquires 3,500 tonnes of pre-sorted and sorted second-hand clothes monthly. Currently it cooperates with

various companies, predominantly located in the European Union (Germany, the Netherlands, Scandinavia) specialising in acquiring textiles used for further processing. The company purchases sorted and pre-sorted clothes from many suppliers.

During the whole technological process the company uses various materials (different packaging, EURO pallets, etc.) as well as specialist equipment. If you visit our Web site, you will find information about our current needs and thus you could send us your proposals for cooperation.

VIVE Textile Recycling Sp. z o.o. second-hand clothes warehouse is operating in the market since 1992. Thanks to many years of experience and very close cooperation with foreign suppliers the company is capable of offering the clothes meeting the needs of various clients.

Their offer includes:

- A. Pre-sorted clothes;
- B. Sorted clothes;
- C. Cleaning cloth;
- D. Clothing waste (data from company documents).

The sales of the textiles is heading in two directions:

a) Direct sales – is associated with the clients buying the textiles in our warehouse, where they can examine the clothes and select the assortments that meet their needs. The clothes is exposed in two forms:

- packed in bags of 15 to 100 kilograms or bales of 45 to 300 kilograms;

b) Indirect sales – is associated with placing the order by the clients and preparing the textiles in accordance with the specification.

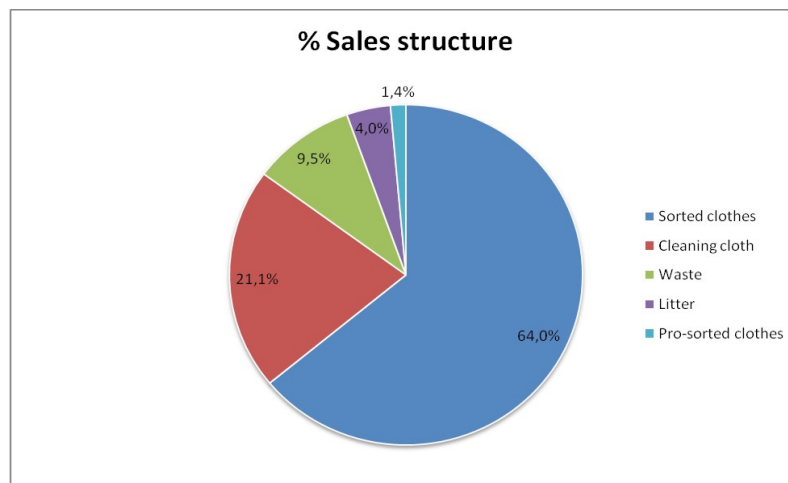


Figure 5. Sales structure in kilograms

Source: Company historic data

The mission of our company is to create the largest in the region and one of the largest in the country shipping/transportation companies operating the fleet enabling the transportation of extended space cargoes as well as offering the clients the use of exchangeable containers,

- providing the highest quality transportation services;
- meeting the requirements of our clients;
- honesty (data from company documents).

VIVE Textile Recycling Sp. z o.o. shipping department was established in 1997. The creation of the department was associated with the need to provide specific transportation and logistics services complementing the core business of the company.

As time went by and the whole company grew, its operations were extended with the shipping/transportation services aimed at completing the orders from domestic and foreign partners.

As a modern and stable company, it is capable of proposing satisfactory terms and conditions of cooperation to every partner. At the same time, the many years of experience in this industry is the basis of the firm assumption that the company is capable of meeting the client needs. Larger purchases are accompanied with favourable discounts and various special offers.

The results. Just in Time as a management philosophy associated with all areas of Vive Textile Recykling business, ensures a proper operations of the company. It is described as an integrated system, related to its core business, e.g. the production and other processes treated as supporting operations (e.g. finance, HR, purchasing).

The method challenges the level of costs. It eliminates all potential sources of costs occurring in the processes by producing good results in the right place and delivered just in time. The costs of activities that do not create value and generate losses are reduced. Above all, such activities include all processes associated with material management and storage of the finished goods.

Just in Time system is oriented at enhancing profitability by improving the whole production process in terms of minimising costs. It does not mean that the cost reduction is achieved at the cost of low quality of the products. In fact, in the case of Just in Time, lowering the level of costs incurred in certain processes leads to an increased quality.

The longer the storage duration of the materials, the lower is their quality and capability to

use them directly in the production process. Moreover, the system decreases the costs of machinery retooling costs and their potential failures. It results from the maximum reduction of the lead time, i.e. from reporting till fulfilling the demand. The cost reduction is also supported by a maximum utilisation of the production capacity, which also impacts the reduction of the finished goods stock. This feature of Just in Time system is a result of the assumption that each production batch has its client and cannot be accumulated in stock.

The above figure and table show the weekly stocks of finished goods. Figure 7 shows that the highest level of stock occurred in weeks 3 5, while the lowest level of stock was recorded in week 31, which was caused by seasonal factors, vacation period, and the changes associated with shipping second-hand clothes not sorted in the country, that were supposed to be introduced in the Ukraine.

The basis for the introduced Just in Time system is performing the production in small batches, and maintaining the high quality of the products and team work.

The main goals of Just in Time production include: shortening the production cycle, minimising the material stocks, and additionally eliminating time wastes and maximising the speed of the material flow.

Decreasing material stocks in Just in Time system: enables a substantial decrease of costs associated with eliminating the need to invest in storage facilities; and ensures a better utilisation of the company assets since they are not frozen in the materials kept in stock.

Every product developed in Vive Textile Recykling is designed in terms of its modularity, ease of production, and eliminating any unnecessary production complexity.

The production at VTR was organised based on multi-item pipeline forms, ensuring a balanced load of the posts and the ability of an instant halting the production line in the case of any irregularity.

Production and sales planning at Vive Textile Recykling is limited to general parameters, especially financial plans developed on annual basis. The plans are based on sales analysis. The impact of the market behaviours on the production is limited by the flexibility of a disposed capacity and varying intensity of its utilisation in time.

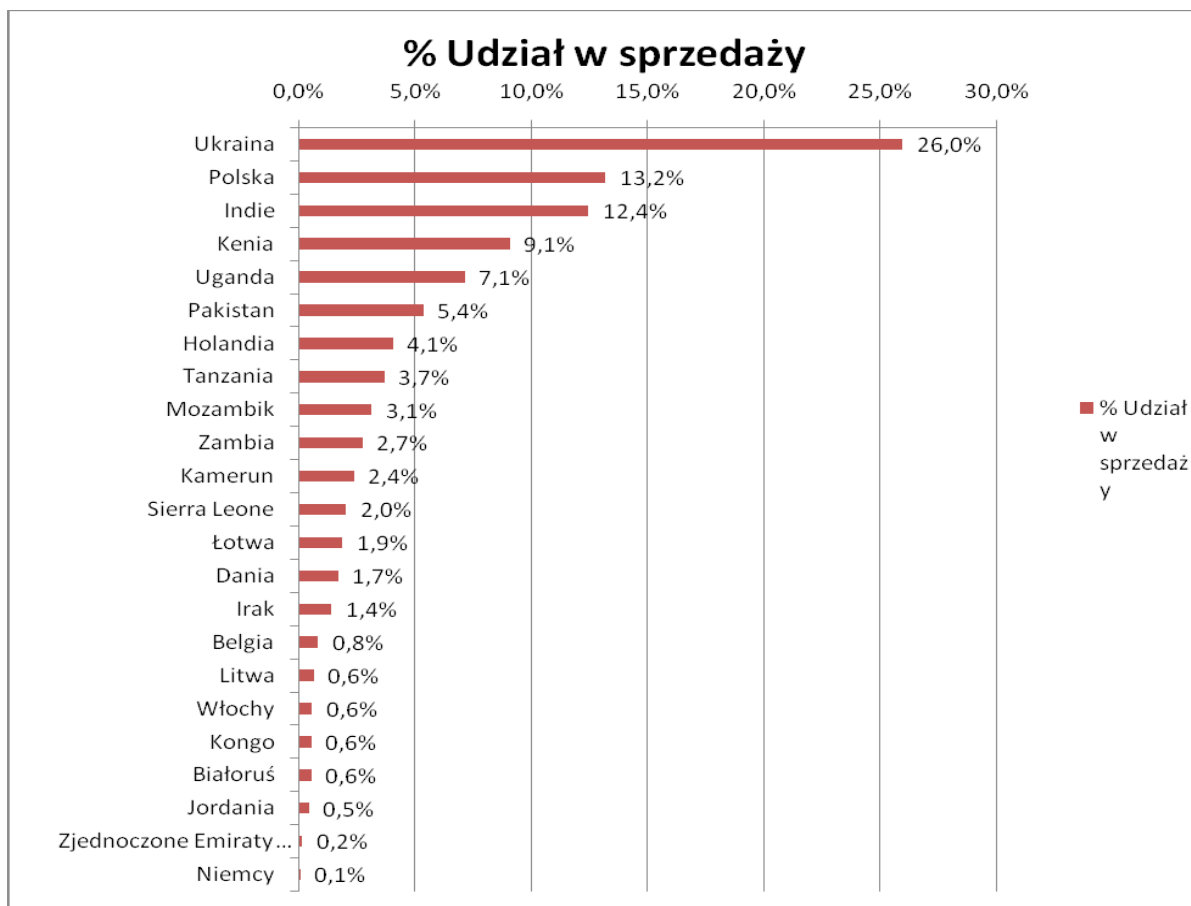


Figure 6. Percentage share in sales

[figure header: Percentage share in sales; country names on the left top to bottom: Ukraine, Poland, Indie, Kenya, Uganda, Pakistan, The Netherlands, Tanzania, Mozambique, Zambia, Cameroon, Sierra Leone, Latvia, Denmark, Iraq, Belgium, Lithuania, Italy, Congo, Byelorussia, Jordan, United Arab Emirates, Germany; key on the right: Percentage share in sales]

Table 2

Sales directions

Country	% share in sales
1	2
Ukraine	26,0%
Poland	13,2%
Indie	12,4%
Kenya	9,1%
Uganda	7,1%
Pakistan	5,4%
The Netherlands	4,1%
Tanzania	3,7%
Mozambique	3,1%
Zambia	2,7%
Cameroon	2,4%
Sierra Leone	2,0%

Country	% share in sales
1	2
Latvia	1,9%
Denmark	1,7%
Iraq	1,4%
Belgium	0,8%
Lithuania	0,6%
Italy	0,6%
Congo	0,6%
Byelorussia	0,6%
Jordan	0,5%
United Arab Emirates	0,2%
Germany	0,1%
TOTAL	

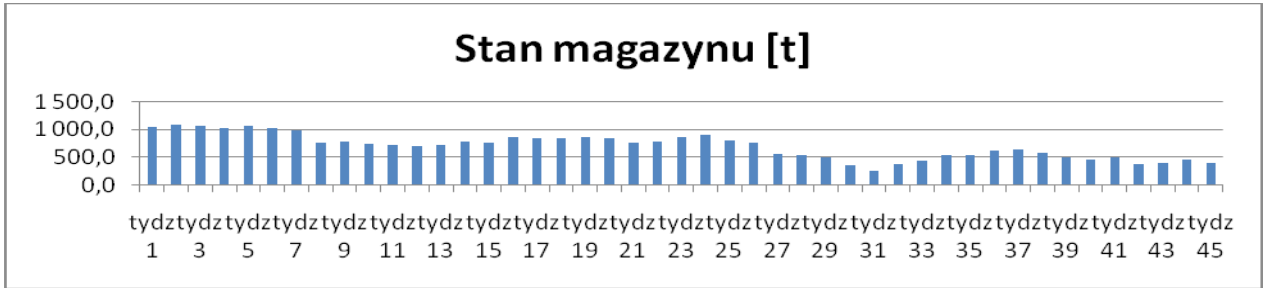


Figure 7. Weekly stock levels in tonnes [figure header: Stock level; horizontal axis: tydz. = week]

Table 3

Stock levels

Week number	Stock [tonnes]
1	2
1	1,054,0
2	1,077,0
3	1,063,0
4	1,033,0
5	1,076,0
6	1,019,0
7	988,0
8	766,0
9	774,0
10	750,0
11	729,0
12	700,0
13	727,0
14	772,0
15	761,0
16	867,0
17	849,7
18	845,4
19	854,0
20	832,0
21	759,3
22	777,0
23	866,0

Week number	Stock [tonnes]
1	2
24	899,0
25	792,0
26	762,0
27	559,0
28	546,0
29	500,6
30	355,2
31	257,0
32	376,1
33	434,0
34	542,4
35	539,8
36	621,0
37	629,5
38	580,4
39	502,3
40	464,8
41	488,4
42	379,9
43	393,4
44	462,8
45	398,4

Conclusions. Currently there is a number of available problem solving tools and techniques. ABC and XYZ analysis, as well as Just in Time belong to these techniques, that actually offer numerous benefits. However, it is important to maintain consistency and reliability in selecting and employing a single problem solving technique. This determines the number of uses and the scale of the benefits offered by a given tech-

nique. Surely, a thorough analysis will show valid results and information, that will help in managing of various domains within a given enterprise.

A general description of Just in Time approach and the resulting benefits may seem unrealistic and applicable only to a theoretical model of a production company operating in an ideal environment. However, this management

approach is properly functioning in an environment characterised by an aggressive competition, bringing the above mentioned benefits to the clients and shareholders. Various quantitative tools, directly associated with the costing methods, are used to achieve the goals of this approach. The method proves how to use effectively the costing domain and convinces that it is

a cross-functional, flexible and effective domain.

The application of Just in Time system resulted in an improvement of the production efficiency achieved at the price of substantial seasonal stocks associated with the wide range of products, as well as a low defectiveness of the finished products. In this case, the update of the demand level plans was required.

LITERATURA

1. Grzybowska K. *Podstawy logistyki* / K. Grzybowska. – Warszawa : Wydawnictwo Difin, 2009.
2. Morris J. *The transfer of japanese management to alien institutional environments* / J. Morris, B. Wilkinson // *Journal of Management Studies*. – Oxford : Blackwell Publishing, 1995. – November, 6.
3. Tachibanaki T. *Further results on Japanese wage differentials: nenko wages, hierarchical position, bonuses, and working hours* / T. Tachibanaki // *International Economic Review*. – Oxford : Blackwell Publishing, 1982. – June 2/82.
4. Waters D. *Zarządzanie operacyjne* / D. Waters. – Warszawa : Wydawnictwo Naukowe PWN, 2007.
5. Witkowski J. *Logistyka firm japońskich* / J. Witkowski. – Wrocław : Wydawnictwo Akademii Ekonomicznej we Wrocławiu, 1998.

