MANAGEMENT OF INVENTORIES IN AN ENTEPRISE IN THE CONTEXT OF PRODUCTION CONTINUITY

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Abstract:
Inventories are a very important category in the accounting of every enterprise. Inventory management is one of the major decision-making areas for the company's management board. Proper inventory management allows reducing total costs and increasing the quality of production, which is the goal of an integrated management system. Proper financial management can also positively affect the maintenance of liquidity in the company.
The purpose of this article is to present issues related to inventory management in a company in the context of continuity of production and fluidity of a subject.

INTRODUCTION

Inventories are a very important category in the accounting of every enterprise. They play a major role in the maintenance of production continuity and, in consequence, contribute to obtain increased profits from sales, which in turn influences the economic unit's liquidity. Detailed information on inventories is indispensable for the production activity of an enterprise as this knowledge, on the one hand, makes it possible to avoid unnecessary costs related to the maintenance of storage facilities and, on the other hand, allows a quick reaction in a situation when increased stocks are needed to increase the production.

Enterprise inventory management is one of the major decision-making areas for the management board. Proper inventory management allows reducing costs and increasing the quality of production, which is the goal of an integrated management system [15]. Maintenance of short-term liquidity is determined by having sufficient financial means obtained from the sale of goods and services. The inflow of these means also depends on the manner of managing the inventories in which financial means are frozen [5]. The financial liquidity of an enterprise, i.e. its ability to pay current liabilities on a timely basis, requires a sufficient amount of current assets. On the other hand, having short-term receivables in the form of commodity credits makes it possible to increase revenues from sales provided that these means can be easily and quickly liquidated [5].

The aim of this article is to present issues related to stock management in an enterprise in the context of production continuity and financial liquidity of a subject. The applied research methods have been based on literature studies in the investigated area and inventory management evaluation. Indicators calculated on the basis of financial report data describing inventory management will be subjected to analysis. These methods will be presented in the context of their usefulness for inventory stock management in the examined enterprise. The research will be conducted for a company listed on the Stock Exchange. The basic research hypothesis is the assumption that inventory management is essential for maintaining the continuity of production in a company and affects its financial liquidity. Verification of the above hypothesis is the basic aim of this article.

INVENTORIES AND THEIR SIGNIFICANCE IN AN ENTERPRISE

Inventories are a very important part of most operations in a company. According to the contents of IAS 2, inventories include assets which:
- are earmarked for sale in the course of business activity,
- are in production designed for such sale, or
- have a form of materials or deliveries of raw materials used in the production process or when providing the services.

Moreover, inventories include goods which have been purchased and earmarked for resale. Stocks also comprise finished products or products being currently manufactured by an economic unit, including the materials and raw materials waiting to be used in the production process. Their level in large measure depends on the value of sale. Inventories are the least liquid part of short-term assets [3].

Inventories reduce the risk related to the uncertainty and promptness of deliveries as well as market uncertainty. Delivery chains from the supplier to the recipient are often delayed. The obtained commodities' quality is not always satisfying. Suppliers can have problems with providing the ordered goods on time. An adequate level of stocks enables an enterprise to maintain smooth production despite delivery fluctuations. An enterprise is usually not able to precisely evaluate the demand for its products. By maintaining

the stocks, it can satisfy the demand even if it suddenly increases [4].

Ordering raw materials, transport, production and the storage of products in larger quantities is usually cheaper per one unit of a product than when all the above activities are performed for each product separately. Additionally, when purchasing bigger quantities of raw materials, enterprises are frequently given a discount by suppliers.

The sale of some products is subject to considerable season changes. While maintaining a smooth production, an enterprise also collects stocks during a period of low demand, thus preparing itself for a period of high demand. The availability of some raw materials may be subject to season changes. In a period of higher supply, an enterprise can collect inventories and get prepared for a period when raw materials will be less accessible.

INVENTORIES VERSUS FINANCIAL LIQUIDITY OF AN ECONOMIC UNIT

Inventories can also exert a considerable influence on financial liquidity. Increased stocks result in a reduction of cash, whereas decreased stocks release cash. Therefore, a change in inventories affects the financial condition of the company [8].

Liquidity is understood as an ability to pay short-term liabilities on a timely basis. To settle these payments, a unit uses the possessed cash resources and components of the assets which can be relatively easily and without high costs conversed into cash [14]. In a properly functioning company adequate relationships should be maintained between particular components of these assets and short-term liabilities.

Financial liquidity is extremely important for every economic subject, as it determines its solvency towards contractors. The maintaining of both short-term and long-term financial liquidity requires an organisational efficiency and determines the subject's image. Particularly important is the level and structure of the working capital of a given economic unit. The loss financial liquidity results from a too low level of working capital, whereas superliquidity is due to its excessively high level. Most financial liquidity management methods are related to working capital. For this reason it is so important to determine a required level of working capital in financial liquidity management as well as competent management of its changes and sources of this capital financing [13]. An indicator which presents the level of working capital in the evaluation of an enterprise's liquidity is the share of working capital in the assets. In the statistical analysis of financial liquidity a few indicators are used, among others:
- financial liquidity current ratio,
- financial liquidity quick ratio,
- cash ratio [9].

Current ratio shows the relationship between all the components of current assets and the total short-time liabilities [11]. This ratio provides information on the enterprise's ability to promptly pay its short-time liabilities from current assets. In general it is assumed that if its value ranges between 1.2 and 2.0, the enterprise has a capability of fulfilling its short-term liabilities.

A more accurate picture of liquidity is expressed by high liquidity ratio (quick ratio), as it contains only the components of current assets that have been corrected by the level of inventories as well as prepayments. This ratio indicates the degree in which liquid current assets cover short-

term liabilities. The value of this indicator should range from 1.0 to 1.2, as such a level enables quick payment of current liabilities.

Cash ratio expresses the ratio of solvency. Its level may change as the receipts from contractors are irregular. It determines the cash resources to current liabilities ratio. It is commonly believed that financial means should account for minimum one fifth of short-term liabilities; therefore, the cash ratio should range from 0.1 to 0.2.

Due to liquidity, the management of inventories should lead to their possibly quickest rotation [2]. An excessively low level of stocks results in the increased costs of their maintenance, whereas their loo low level can cause shortages and interrupt the production continuity [14]. The cycle of stocks is a period between the purchasing of materials and raw materials and the time of finished products sale. In other words, this cycle is equivalent to the frequency (the number of days) of renewing the inventories by an enterprise, with a specified cost [10] (or with a specified sale [12]). The length of an inventory cycle is determined by the length of the production cycle, the period of maintaining raw material and material stocks as well as the time necessary to sell finished products [1]. A low level of inventory cycle is usually favourable, as it is tantamount to a short period of cash freeze. The liquidity of an enterprise can also become threatened. Such a situation is caused by irrational purchases due to the lack of financing sources. In the case of finished products stocks, the low level of inventory cycle informs about a considerable demand for the products, a short storage period and ease of sale [6].

COSTS OF INVENTORY MANAGEMENT IN AN ENTERPRISE

The problem of inventory management is important mainly in production and trading enterprises, having a relatively little importance in service-providing companies. The goal of inventory management is to conduct business with the costs kept to a minimum. Hence, inventory management in an enterprise includes decisions related to: the size of stocks purchased or produced at a given time as well as the moment of ordering (producing) the stocks. Due to liquidity, the management of inventories should lead to their quickest possible rotation [10]. An excessively low level of stocks increases the costs of their maintenance, whereas their too low level may cause shortages and interrupt the continuity of production [14]. The problem of inventory management comes down to answering the question about the quantities and the frequency of stock replenishment. An optimal level of stocks should be ensured, so that it will not cause any disturbances in the process of sale and production and the costs of stocks maintenance will be kept to a minimum [7]. Excessive freezing of financial means in stocks results in costs related to lost opportunities (limitation of company development). On the other hand, inventory shortages disturb the process of order fulfilment [20].

In general, inventory management is aimed at ensuring the accessibility of stocks necessary to conduct business activity of a unit and keep the costs of storing and replenishing the stocks at a lowest possible level [16].

One of the major goals of inventory management in a unit is to maintain their lowest possible level due to the fact that the maintenance of stocks is related to cash freeze, which causes increased costs of business financing and, in consequence, lowers the unit's market value. Unfortunately, an excessively low level of stocks may have an

adverse impact on the level of revenues from sales. This is related to downtimes in the production process and decreased sales level. As a result, the real cash flows are reduced, which in turn negatively affects the value of the unit [17, 18].

A very important issue is to identify all the costs related to the purchase and maintenance of stocks in an enterprise. These costs include the below characterised groups.

Maintenance costs are the costs growing proportionally to the average size of stocks, e.g. capital costs, storage costs, the costs of stocks transfer and reloading, the costs related to stocks aging and wearing as well as insurance costs.

Capital costs are the costs of lost capital profits. By maintaining stocks, an enterprise freezes some of its resources. Inventories themselves do not generate a profit. Capital costs define the so-called alternative cost of stocks maintenance, i.e., they show the profit that the company would obtain if it earmarked the resources for another profitable enterprise. Capital costs are a theoretical cost, which is not reported in the profit and loss account.

Storage costs include among others: depreciation of warehouse buildings and transport devices, warehouse staff remunerations, the costs of maintenance and repairs, consumption of auxiliary materials.

The costs of stocks transfer include the costs of labour force and mechanical machinery.

The costs involved in stocks aging include the costs of physical aging of stocks, related to the loss of original functional properties of the products and the costs of stocks' economic aging, related to the pace of technical development. On the other hand, insurance costs are the unit's expenses related to stocks insurance against the risk of flooding, fire, theft and other acts of God [20].

The costs of ordering arise as a result of placing and processing the orders and are related to the placement and receipt of orders, the receipt of consignments, company's internal correspondence etc. For the sake of simplicity, the costs of ordering are treated as fixed costs. Stockout costs and costs involved in the loss of discounts on the volume of order are similar to order costs [21].

CONTEMPORARY METHODS APPLLIED IN INVENTORY MANAGEMENT

Effective cost management contributes to a reduced level of costs.

Numerous methods are applied to optimize the level of inventories in an economic unit, among others:

- ABC – this method is based on the division of stocks maintained in a unit into three groups, which are marked as A, B and C. Group A contains inventories of greatest importance to an average unit. These stocks are related to the biggest investments, which means that their shortage involves high costs and risks. Group B includes intermediate stocks, whereas group C includes stocks which are easy or cheap to replace [19].
- The red line method – involves storing the materials in an appropriate room and decreasing their level as they are used. When the stocks are considerably depleted, there appears a red line, signalling the necessity to place an order.
- The two-bin method – consists in putting the materials into two bins. When one of them is empty, an order should be placed. The stocks in the second bin are a reserve [6].
- XYZ – is the reverse of ABC. It involves dividing the stocks into three groups in which the user's structures are described. The expected level of inventories in the company is considered from the point of view of forecast accuracy and regularity of demand [13].
- The economic order quantity model EOQ,
- The two-component model of inventories.

The last two of the above mentioned models will be characterised in more detail in the further part of the article.

The economic order quantity model EOQ is widely used in the management of material and commodity inventories [20]. As the order size increases, the level of average stocks also grows. On the other hand, if the frequency of orders increases, the quantity of average stocks is decreased and the costs of maintenance are reduced. The economic order quantity model assumes that the costs involved in the maintenance of stocks are changeable and increase proportionally to the average size of stocks. Therefore, inventory maintenance stocks depend on average stocks and the unit cost of stocks maintenance. The remaining costs related to stocks are the costs of ordering. They do not increase proportionally to the size of deliveries and are not dependent on it [7]. Total inventory costs are the sum of total costs of inventory maintenance and ordering [3].

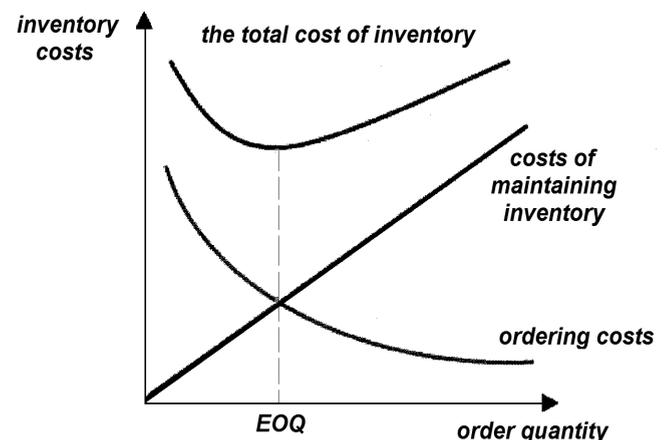Fig. 1 presents the costs involved in the maintaining and ordering of inventories.

Fig. 1 A model of total inventory costs
Source: [2]

An increase in stocks is accompanied by an increase in the costs of stocks maintenance, whereas the ordering costs decrease. Therefore, there is an optimal order quantity, which minimises the total cost of stocks. This optimal quantity depends on the frequency of placing orders and on their size. Bigger orders mean a higher average level of stocks and, in consequence, bigger costs of their maintenance.

The costs of ordering decrease with bigger stocks. The intersection of cost curves is the minimum on the total stocks cost. Determining an optimal order consists in finding the minimum of total inventory costs.

An optimal order size is the quantity of stocks being the subject of a single order, which minimises the total costs of having stocks [7].

The economic order quantity model is based on certain assumptions, according to which:

− the demand for a particular product is known and constant over time,

− there are no discounts due to purchase quantity,

− the sale is smooth throughout the year [5].

According to the two-component model of stocks, a unit should maintain a certain safety margin for the ordered products so as to prevent inventory depletion. This involves additional stocks, which are stored as a reserve in case the pace of sale changes or there are transport and production delays [3].

Determining the safety margin in a correct way makes it necessary to take into consideration the costs of shortage (stockout costs) and the required safety level. The level of safety is the probability that the consumption of stock during a delivery will not exceed the stock. Factors which increase an optimal safety margin include the probability of delayed deliveries, the uncertainty of demand forecasts and the costs of stocks shortages (the costs of lost reputation and sale) [5].

The optimal safety margin decreases when the cost of additional stocks maintenance increases.

The two-component model of inventories consists in leaving a safety stock by an enterprise and placing orders when the stocks drop below a specified level. This method is presented in Fig. 2.
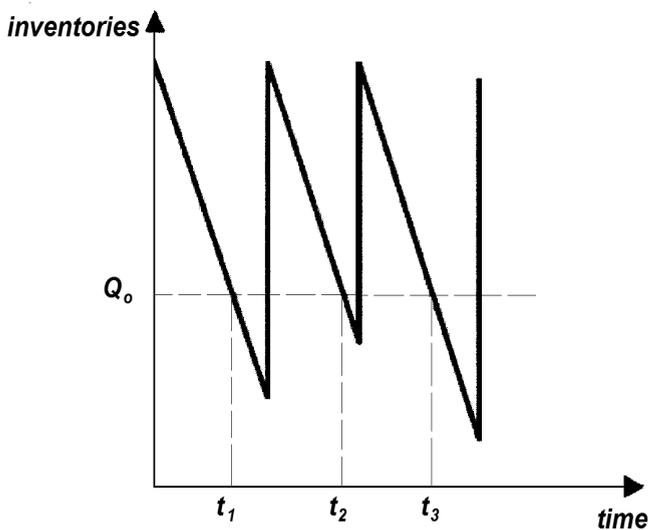

Fig. 2 The two-component stocks model
Source: [2]

A unit decides to place an order each time when the level of stocks drops below a specified level, determined by Q_o, points t_1, t_2, t_3 are the moments of ordering the products. In case of any doubts about the time and consumption of a product delivery, the level of stocks replenishment is calculated from the following formula [5]:

ROP = consumption in the delivery period + safety stock
= average delivery time · consumption per a unit of time + safety stock

Safety stock maintenance involves additional costs, mainly the costs of stocks maintenance as their average quantity is higher − EOQ/2 + safety stock.

INVENTORY MANAGEMENT ANALYSIS USING THE EXAMPLE OF THE EXAMINED ENTERPRISE

Enterprise „X" is a well-known joint-stock company in the clothing branch, which started its activity in 1995, focusing mainly on a small production of suits. The dynamically developing company is currently producing a wide range of products, gaining a competitive advantage on the market, which is guaranteed by the production of lasting, good quality items. The products are sold mainly in major cities in Poland (e.g. Cracow, Wrocław, Warsaw), but also in other countries, i.e. Germany, France, Italy or Spain. The company's flagship are first of all men's suits. The products are transported chiefly via courier companies. The enterprise is planning to start business also in other countries, i.e. Brazil, Czech Republic, Norway, Sweden and Austria. It has also signed many contracts, among others with major shopping centres.

An important element of the company's financial policy is inventory management. The analysis of the level of stocks in the enterprise has been conducted on the basis of the following indicators (Table 1).

Table 1
Indicators showing the management of inventories

Current ratio	Current assets/current liabilities
Quick ratio	(current assets − stocks − prepayments and accruals)/ current liabilities
Cash ratio	Financial means / current liabilities
Net working capital	Working capital / Assets
Stocks cycle	$\dfrac{Z \cdot n}{S}$ Z – average stocks, n – number of days in a period S – value characterising stocks turnover (sale or costs)
Stocks maintenance cost	$K_z = \dfrac{Q}{2} \cdot k_j$ K_z – cost of stocks maintenance Q – single order size Q/2 – average quantity of stock k_j – stocks maintenance unit cost
Stocks ordering cost	$K_s = k_s \cdot n$ K_s – steady stocks costs k_s – steady unit cost of delivery n – number of deliveries
Total costs of stocks	$K_c = K_z + K_s$
Total costs of stocks	$K_c = \dfrac{Q}{2} \cdot k_j + \dfrac{S}{Q}$ S/Q– number of deliveries
Optimal size of order	$EOQ = \sqrt{\dfrac{2 \cdot k_s \cdot s}{k_j}}$ s – planned volume of sale in a year

Source: [2]

In the examined enterprise the level of stocks is maintained on a similar level. In 2011 the company's inventories amounted to PLN 207100000, whereas in the year 2012 they reached PLN 210450000. In 2011 they accounted for 64% current assets, and in 2012 − 65% of current assets. The share of material stocks in total stocks was 68% in the year 2011 and 60% in 2012 respectively. The enterprise limited the quantity of material stocks, optimising their level and reducing the costs of their maintenance. In 2011 and 2012 the products accounted for nearly 2% of total

stocks, which confirms the fact that the company has no problems with selling its products.

The company's liquidity ratios compared to other clothing branch enterprises have been presented in Table 2.

Table 2
Liquidity indicators for Enterprise X in comparison with other clothing branch enterprises in the year 2012

Name of indicator	Value of indicator for the sector	Enterprise X	Group LPP	Vistula Group S.A.
Current ratio	1.27	1.66	1.73	1.43
Quick ratio	0.53	0.56	0.62	0.23
Cash ratio	0.16	0.18	0.27	0.10
Share of working capital in assets	0.12	0.26	0.22	0.10

Source: own study on the basis of data provided by Enterprise X and other selected enterprises.

The current ratio reached the level of 1.66, which proves that the company has no problems with settling its current liabilities. The level of this indicator is higher than its value for the sector. The quick ratio reached 0.56, which means that the enterprise may have temporary problems with liquidity, but it is also higher than that for the sector. The cash ratio proves that the enterprise has no problems with cash solvency. Compared to other enterprises in the clothing branch, Enterprise X has developed more favourable results than e.g. Vistula Group S.A. The Enterprise does not have frozen financial means in stocks, which is proved by positive financial liquidity indicators. Therefore, the management of inventories in the unit should be positively assessed.

The economic order quantity EOQ has been chosen to optimise inventories for Enterprise „X".

Enterprise „X" is planning to sell 15000 pieces of its clothing products in the year 2013. The estimated cost of ordering one delivery of threads reached PLN 2700. The unit cost of storage in the warehouse is PLN 12.

In order to determine the optimal quantity of a single delivery, the following calculations have been made – they are contained in Table 3.

Therefore, a single delivery of threads should be 8216 pcs, so that the total cost of purchasing and storing

Table 3
Inventory management indicators on the basis of data provided by Enterprise X

Economic order quantity	$EOQ = \sqrt{\dfrac{2 \cdot 2700 \cdot 150000}{12}} = 8216 \text{pcs}$
Stocks maintenance cost	$K_z = 12 \cdot \dfrac{8216}{2} = 49294 \text{ PLN}$
Stocks ordering cost	$K_S = 2700 \cdot \dfrac{150000}{8216} = 49294 \text{ PLN}$
Total stocks costs	$K_C = K_z + K_S = 12 \cdot \dfrac{8216}{2} + 2700 \dfrac{150000}{8216} = 98590 \text{ PLN}$

[Own calculations on the basis of data provided by the enterprise]

throughout the year will be reduced to a minimum. This cost would reach PLN 98590.

The number of single deliveries of threads in the year organised by the unit should be:

$$n = \frac{S}{EOQ} = \frac{150000}{8216} = 18$$

Then the frequency of deliveries is:

$$\frac{360}{n} = \frac{360}{18} = 20 \text{ days}$$

Apart from that, Enterprise „X" would like to double the sale of its clothing goods in the year 2014. Then the sale would reach 300000 pcs.

In such a case the optimal quantity of a single delivery will reach:

$$EOQ = \sqrt{\frac{2 \cdot 2700 \cdot 300000}{12}} = 11619 \text{ pcs}$$

The average level of stocks will increase from 8216 to 11619 pieces, i.e. by ca 43.1%, with a 100% increase in sale. The increased sale results in an increase of stocks which is less than proportional. Therefore, the stocks-to-sale ratio will undoubtedly show a drop in stocks-related costs accompanying an increase in sale, which means the unit's development.

SUMMARY

In recent years companies have been tackling numerous problems, such as decreased liquidity, difficulties with product sale and, in consequence, with increasing the volume of production. The considerations contained in this article certainly do not exhaust the problem. A comparative analysis led to unambiguous conclusions. Proper inventory management contributes to maintain the continuity of production and enables enterprises to maintain financial liquidity. All the financial indicators had more favourable values for the examined company than for the whole sector. In comparison with other enterprises in the clothing branch, Enterprise X also achieved favourable results. Therefore, the hypothesis formulated in the introduction according to which proper inventory management is very important for the continuity of production and has an impact on a company's financial liquidity, has been proved. The conducted analyses and simulations also seem to confirm the thesis that inventory management is a very important element of enterprise policies.

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