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LOGISTIC ASPECTS OF INVENTORY MANAGEMENT AT AN INDUSTRIAL ENTERPRISE

Inventory management is crucial for business efficiency and profitability. Effective inventory management improves operational efficiency and financial strategies. Poor management can lead to financial losses, inventory imbalances, delayed order fulfillment, and customer dissatisfaction. This work examines the fundamentals of inventory management, focusing on goals, methods, and best practices. The main goal is to balance overstocking and inventory shortages by providing sufficient working capital and optimizing costs. The paper discusses various inventory management methods aimed at effective inventory control and management.

Keywords: *supply chain management, inventory management, economic efficiency*

In modern economic conditions, with a high level of competition among manufacturers and suppliers, one of the most important tasks facing organizations to maintain a high level of sales and a stable financial position is to optimize the process of commodity movement and improve the inventory management system. In order to ensure the stability of the assortment, implement a flexible pricing policy, and increase the level of customer demand satisfaction, it is necessary to maintain an optimal stock level at each enterprise.

Stocks are one of the most important factors in ensuring the constancy and continuity of reproduction. Enterprises strive to increase inventory turnover in order to obtain the largest sales volume and, consequently, profit with a smaller warehouse area and minimal inventory maintenance costs. Of course, the ideal sale would be "off the wheels", without any storage, but such trade in many types of goods is impossible, therefore, inventory turnover is an important criterion that is carefully analyzed by the heads of organizations. Since the turnover of stocks is directly dependent on the volume of sales, it is necessary to use all possible techniques and methods to stimulate and expand sales.

In a generalized form, stocks are materials and products, an integral part of the company's working capital, reflected in the balance sheet asset (includes raw materials, auxiliary materials, semi–finished products, finished products, etc.), not currently used in production, stored in warehouses or other places and intended for subsequent use. Inventories are a way of reserving resources to ensure the continuity of production and circulation, reducing the risk of downtime in the production cycle and sales [1].

Types of stocks:

1. According to the time of accounting.

The maximum desirable stock determines the level of stock that is economically feasible in a given inventory management system;

the stock threshold level is used to determine the time when the next order is issued;

the current stock corresponds to the stock level at any time of accounting. It may coincide with the maximum desired level, threshold level, or warranty margin;

the warranty stock (or insurance stock) is intended for continuous supply to the consumer in case of unforeseen circumstances;

illiquid stocks are the so—called long-unused production and commodity stocks. They are formed as a result of deterioration in the quality of goods during storage, as well as obsolescence.

2. By functional affiliation.

Supply (raw materials and supplies);
production (work in progress);
sales (finished products).
3. In the direction of movement.
External;
internal.
4. By volume.
Retail;
Wholesale.
5. According to the indicators.
In terms of value;
In kind;
In days of stock.

The creation of reserves in a manufacturing enterprise is a strategic decision aimed at ensuring the stability and efficiency of operational activities. The main objectives include:

1) improving production efficiency;
2) efficient customer service;
3) insurance of supply failures;
4) protection against price increases;
5) saving on wholesale discounts;
6) saving on transportation;
7) Scarcity of resources.

The negative role of stock formation mainly lies in the fact that stocks freeze significant financial resources. Inventory-related costs include: storage, administration, transportation, manufacturing, order processing, cost of lost sales, frozen costs, product quality control costs, loading and unloading costs [2]. Inventory management is balancing between two goals that are mutually exclusive at their polar points: reducing the total costs of maintaining stocks and ensuring maximum reliability of the production process (Fig. 1). This statement allows us to highlight the rule of inventory management: increasing stocks is advisable as long as the estimated savings exceed the cost of maintenance additional reserves and diversion of working capital.

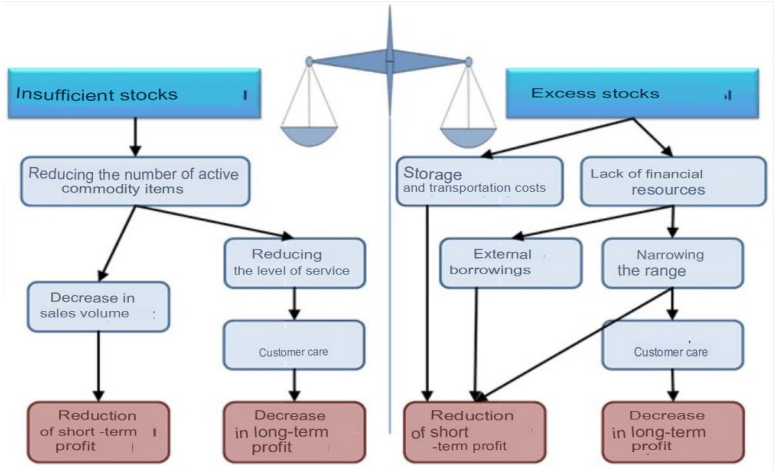

Fig.1. The dilemma of inventory management

Three historically formed approaches (or concepts) to inventory management, namely:

1. The concept of maximizing stocks.

The concept of maximizing reserves involves the accumulation of large material resources. A high level of reserves is justified if the level of consumption is unknown, as well as in conditions

where a shortage is unacceptable under any circumstances. Excess stocks are formed to ensure the continuity of the production process and insurance of supply failures, to increase the level of customer service, in order to save on wholesale discounts and transportation, for speculative purposes. At the same time, the negative aspects of storing excess stocks are not taken into account. This concept was typical for the 19th century, during the period of the most intensive industrialization.

2. The concept of inventory optimization.

The concept of stock optimization began to take shape at the end of the 19th century. The concept is based on the so-called "scientific" approach to inventory management, which implies optimizing the inventory level in warehouses according to the criterion of minimizing the total cost of creating and maintaining stocks. This concept is the most commonly used.

3. The concept of inventory minimization.

The concept of inventory minimization. The idea of the concept is that material resources must be acquired as the need arises and in the amount that satisfies the emerging need. Surpluses of material resources are not acceptable and indicate shortcomings in the organization of the production process. Within the framework of this concept, appropriate logistics systems and technologies began to develop to minimize the level of stocks stored in warehouses: MRP (Material Requirement Planning), JIT (Just In Time), VMI and many others, some of which will be discussed below.

MRP (Material Requirement Planning) is a production resource planning system that combines production, marketing, financial planning and logistics operations. Plans are developed based on forecast information about demand, data on available orders and information about changes in the product line. The system responds quickly to changes, allows you to work in real time, and provides daily database updates. The task of the MRP system is to form an optimal material flow of materials, semi-finished products, both in the supply system and in production, as well as to optimize the flow of finished products. Modern MRP systems allow the integration of all major logistics processes within the enterprise.

JIT (Just-in-time) is a concept (technology) for building a logistics system or organizing a logistics process in a separate functional area, ensuring the delivery of material resources, work in progress, finished products in the right quantity, to the right place and exactly on time. The use of the "just-in-time" concept allows you to reduce inventories, reduce production and warehouse space, improve product quality, shorten production time, use equipment efficiently, and reduce the number of non-production operations

VMI (Vendor Managed Inventory) is an improved version of the supplier's inventory management system based on new information technologies. Instead of placing orders, the consumer (and it can be not only a trading company, but also a manufacturing enterprise) exchanges information about demand, sales, and product promotion with the supplier. The supplier undertakes to replenish the consumer's stocks and maintain them at the required level. In this case, the supplier does not receive an order, but only an indication from the buyer regarding the upper and lower limits of the inventory size that are desirable for him [3].

MRP is best suited for enterprises with multi-component production and complex supply chains, where careful planning based on forecasts and analysis of current needs is required. JIT is effective for companies seeking to minimize inventory and increase flexibility, but requires a high level of synchronization and reliability of suppliers. VMI provides advantages by transferring responsibility for inventory to the supplier, which reduces the burden on the consumer, but requires high levels of trust and coordination.

Efficient inventory management is a cornerstone of any successful enterprise, ensuring the smooth flow of materials and products throughout the supply chain. It involves strategic planning, precise execution, and continuous monitoring to balance supply and demand effectively. The process encompasses several interconnected stages, each contributing to the overall goal of minimizing

costs while maintaining optimal stock levels. Below, we outline the key stages of the inventory management process, highlighting their significance and role in achieving operational excellence.

The inventory management process includes several stages:

1) determining the volume of stock requirements;

2) determining the composition of cost items related to the creation and maintenance of reserves;

3) calculation of the optimal size of the order replenishing the stock;

4) coordination of the terms of replenishment of the stock;

5) designing an inventory management algorithm;

Let's illustrate the basic inventory management systems (Fig.2-4).

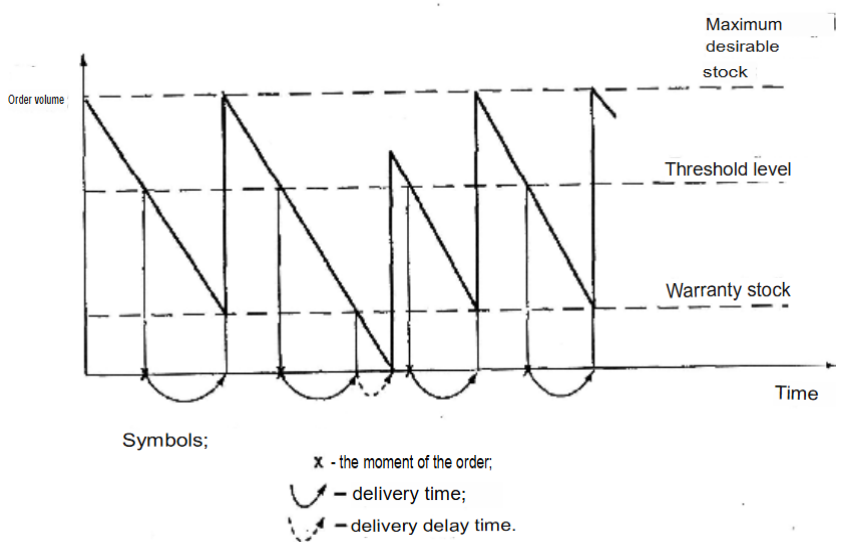

Fig.2. Inventory management system with a fixed order size [2]

The formula is used to determine the optimal order size Wilson:

$$EOQ = \sqrt{\frac{2 * 31 * V}{3x}}, \quad (1)$$

where: EOQ – the optimal order size, pcs.

31 – the cost of delivery of 1 piece of goods.

V – the need for the ordered product, pcs.

3x – the cost of storing 1 piece of goods [2].

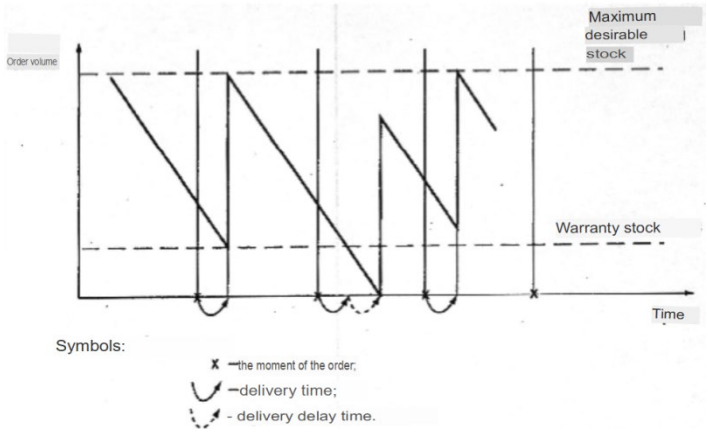

Fig.3. Inventory management system with a fixed time interval between orders [2]

The time interval between orders is calculated using the formula:

$$\frac{V}{EOQ} I = D, \quad (2)$$

where: I is the time interval between orders.

D – the number of working days.

V – the need for the ordered product, pcs.

EOQ – the optimal order size, pcs.

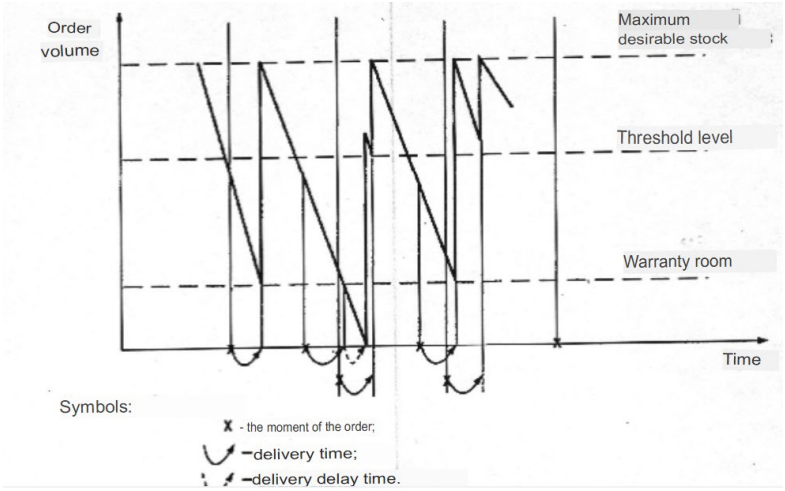

Fig.4. Inventory management system with replenishment of the stock to a constant level [2]

The calculation of the order size (pcs.) is performed in this case according to the formula:

$$OS = MDO – TL + EC, \quad (3)$$

where: OS – order size

MDO – the maximum desired order.

TL is the threshold level of the stock.

EC – expected consumption before delivery.

Inventory management is a critical component of effective logistics and overall business operations at industrial enterprises. The study highlights the importance of inventory management in achieving a balance between minimizing costs and ensuring the continuity of production and supply chains. By analyzing the principles, methods, and systems of inventory management, the paper underscores its impact on operational efficiency, customer satisfaction, and financial stability. In the modern competitive environment, organizations must adopt tailored inventory management approaches to maintain optimal stock levels and meet market demands. Traditional concepts, such as maximizing, optimizing, or minimizing inventory, provide valuable perspectives but require adaptation to align with specific enterprise needs and technological advancements. The implementation of advanced systems like MRP (Material Requirement Planning), JIT (Just-In-Time), and VMI (Vendor Managed Inventory) demonstrates how enterprises can leverage technology to enhance inventory turnover, reduce operational costs, and improve supply chain resilience. Each system offers unique advantages, and their selection should be based on the organization's operational model, industry requirements, and strategic goals. Ultimately, the key to effective inventory management lies in continuous optimization, leveraging data-driven insights, and maintaining flexibility to adapt to dynamic market conditions. By doing so, enterprises can achieve sustainable growth, operational excellence, and long-term profitability.

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