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Performance of Equipment and Means of Internal Transport and Efficiency of Implementation of Warehouse Processes

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Abstract

In the article was presented the issue of performance of equipment and means of internal transport and its impact on the implementation of warehouse processes. In this aspect was presented the role of warehouse in the supply chain and its importance in the effective flow of material goods. Been identified design requirements for warehouse facilities and the issues of efficiency of functioning of warehouses in terms of implementation of warehouse processes. Was presented a procedure for selection of equipment and means of internal transport, as a function of realized warehouse processes and were made characteristics of performance parameters of equipment and loading machines. In the last stage of this research is presented a case study concerning the examination of dependence of the impact of the value of the correction coefficients on the number of means of internal transport in the zone of admissions and the value of efficiency ratio of exploitation at a given supply structure.

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Keywords: supply chain, warehouse, performance of equipment and loading machines

1. Introduction

Development of global economic networks and the nature of the occurring relationships and the specifics of the logistics processes make dynamic changes in the goods distribution systems.

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Shaping of the distribution systems is becoming increasingly important, making it an area where strategic decisions adopted by the company affect its financial results and market position.

An important element of the distribution systems, due to the implementation of tasks and functions are storage facilities [5], [10], [11]. The choice of the right variant of a warehouse design solution for a given distribution system is a complex problem. This is mainly due to the need to determine the boundary conditions and knowledge of the properties of each element of the whole system [8], [10]. Warehouse solution design is determined by the trade, by the nature of the distribution system as well as warehouse technical, technological and organizational parameters [2], [9]. An important aspect of the storage facility design is its equipment and organization of the logistics processes.

The aim of the article is to present the relationship between the organization of logistic processes and the indicator of the efficiency of operation of equipment and means of internal transport.

2. Place of warehouse facility in the logistics network

Hierarchy of supply network causes that in the structure of the network, there are many intermediate elements involved in the physical flows of material goods. In many cases, these elements are places of concentration and distribution of material goods, having the interpretation of warehouses.

In the literature [1], [5], [6], [8] when designing warehouse facilities are important, among others, aspects such as the design plan of spatial object and selection of warehousing infrastructure, cardinality and structure of the products and methods of system of process management of the flow, the functional and technical specification of the facility and the choice of internal means of transport, requirements and design solutions of boundary conditions specification, determining inventory levels and requirements of spatial tasks of functional areas, and other.

According to the procedure of designing warehouse facilities, creating solutions for a particular warehouse facility requires, among others [6], [9]: formulation of logistics task, shaping the functional areas of the warehouse and dimensioning of process of flow of goods due to: performance, expenditures and annual operating costs.

Warehouses are engineering structures designed for storage of material stocks. The design maximally takes into account vulnerability of stocks. Storage facilities are characterized by high diversity resulting from following grounds [2], [4]: types of materials and their vulnerability for handling and storage, storage period (inventory turnover), readiness for mechanized handling, mechanization and automation of warehouse processes.

Thus, each warehouse facility is characterized by specific: design parameters – including dimensions, permissible loads, shape or functional layout, operational parameters – disposed surface and volume of space (total, for storage or handling) capacity, productivity, specified internal transport technologies.

Apart from features warehouse facilities can be divided also according to the following [2], [4]:

- technical and construction solutions and the vulnerability of warehouse inventories: open storages (storage yards), semi-open storages (shelters, sheds, etc.), closed storages: on-ground (storey or multi-storey buildings, low, medium and high storage, with or without loading ramps), underground (basements, bunkers), special warehouses for flammable and explosives materials, cold stores, silos, etc.,
- the level of warehousing processes mechanization: non-mechanized (manual), mechanized and automatic,
- functions and economic destination.

Creating effective solutions to warehouse facilities depends on, among others, the industry, the nature of the supply chain and established technical, technological and organizational parameters, as well as the scope of the transformation. Thus, the efficiency of warehouse processes is determined by performance of devices and means of internal transport used [2], [3], [4]. An important aspect to be taken into account when assessing the efficiency of the functioning of warehouse facilities is to minimize the time of order fulfillment and improving customer service levels. Important role is played by the execution time of individual activities mapped on cards of process flow and transport cycles. This time is determined by the appropriate selection of equipment and means of internal transport in the context of realized warehouse processes.

Efficiency is a property of the system, which takes into account the impact of the most significant features of the system and the environment on the results of its operation. It expresses the rational abilities of systems to satisfy