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OPERATION EFFICIENCY INCREASING OF A LOGISTIC CENTER

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Summary: The article considers the efficiency increasing of a logistic center operation and its disadvantages. Shown the analysis of theoretical foundations of the logistics centers' operation

Key words: logistic center operation, disadvantages, theoretical foundation

Анотація: У статті розглядаються ефективність збільшення дії центру логістики і його недоліки. Показаний аналіз теоретичної підстави дій центрів логістики.

Ключові слова: дія центру логістики, недоліки, теоретична підстава

Аннотация: В статье рассматривается эффективность увеличения действия центра логистики и его недостатки. Показан анализ теоретического основания действий центров логистики.

Ключевые слова: действие центра логистики, недостатки, теоретическое основание.

In today's market environment, the process of improving logistics of supplying goods objectively leads to the integration of the enterprises taking part in this process. There is a need to regulate the entire goods supplying system while the efficiency of a different supply chain depends on the level of all trade participants' economic relationship. The effective forms of enterprises interaction and integration are presented as logistics centers and associations.

Study of the problem of the logistics centers operation is particular important nowadays, because the logistics is often identified with the transportation and storage operations. That is efficiency increase of a logistics centers' operation can provide the consumer with a lower cost of goods and ensure their continuous supplying.

Analysis of theoretical foundations of the logistics centers' operation resulted in performing and sharing a producer-consumer logistics chain.

Disadvantages of logistics centers operation are the following:

- downtime;
- terminal capacity;
- high resources costs;
- small range of services;

The purpose of this research is to determine a rational number of terminal resources in order to improve its efficiency.

The technology of goods processing will be selected according to customer requirements, technical provision of a logistics center will be selected to minimize the product processing costs, and the optimal amount of material and human resources will be calculated.

Network planning was selected as a modeling method, because it displays all operations performed at the logistics center the most clearly and completely.

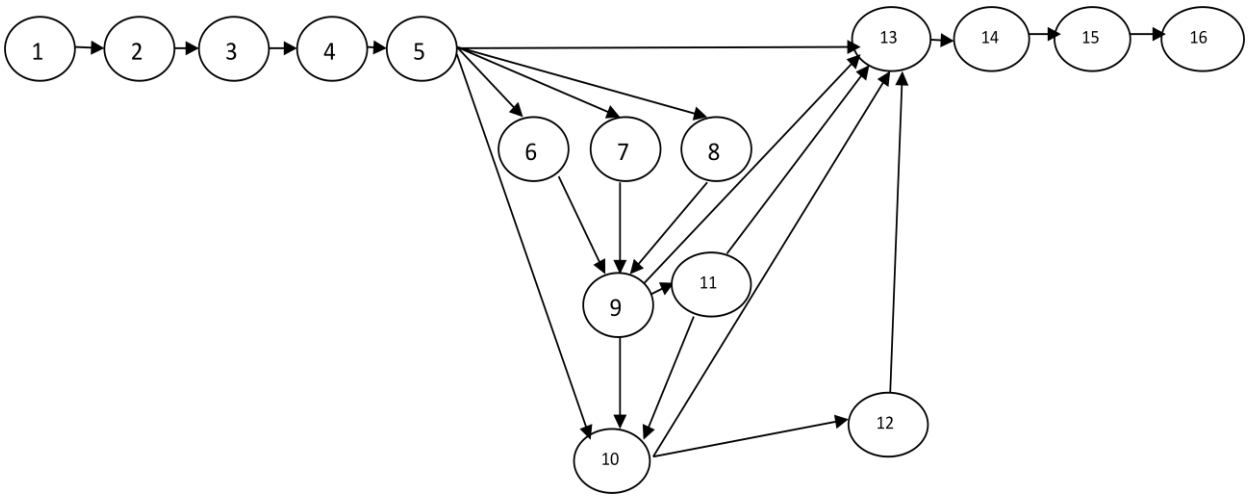

Fig. 1. The scheme of logistics center technological process

The network graph shows the following operations:

$t_{1\text{-}2}$ – primary integrity test;

$t_{2\text{-}3}$ – primary quantity test;

$t_{3\text{-}4}$ – unloading;

$t_{4\text{-}5}$ – paper work;

$t_{5\text{-}6}$ – packing;

$t_{5\text{-}7}$ – marking;

$t_{5\text{-}8}$ – lot enlargement;

$t_{6\text{-}9}$, $t_{7\text{-}9,}$ $t_{8\text{-}9}$ – sorting;

$t_{5\text{-}10,}$ $t_{9\text{-}10,}$ $t_{11\text{-}10}$ – storing;

$t_{9\text{-}11}$ – custom operations;

$t_{10\text{-}12}$ – picking the whole packet or its part;

$t_{5\text{-}13,}$ $t_{9\text{-}13,}$ $t_{10\text{-}13,}$ $t_{11\text{-}13,}$ $t_{12\text{-}13}$ – moving to the dispatch;

$t_{13\text{-}14}$ – paper work;

$t_{14\text{-}15}$ – shipping;

$t_{15\text{-}16}$ – taking off the accounting.

A certain amount of resources is required for the goods processing with each technology , both technical and human resources:

$$N_j = max\left\{N_j^{min}\,;\,\frac{Q_i}{W_j}\cdot\eta\right\}\,, \qquad (1)$$

where N_j – is the number of j-type resources, units;

N_j^{min} – is the minimum number of j-type resources that provides continuous functioning process, units;

Q_i – is the volume of incoming goods, tones;

W_j – is the productivity of j-type resource unit;

η – is an index of the arrival irregularity (1.1...1.5).

Thus, it can be presented as an algorithm of selection of the logistics center rational resource amount:

1) calculation of the minimum number of resources for each technology;

2) calculation of Q_i cargo passage probability with the technology T_i;

3) analysis of Q_i cargo passage probabilities with the technology T_i;

4) calculation of the rational number of N_i resources for each kind of resources.

The total cost for maintenance and management of both human resources and freight storage ones is selected as a criterion of a logistics center's operation efficiency. It can be calculated with the following formula:

$$C = C_1 + C_2 + C_3 + C_4 \rightarrow min, \quad (2)$$

where C_1 – is the costs for *i*-kind resource maintenance, hrn;

C_2 – is the costs for *i*-kind resource operation, hrn;

C_3 – is the costs for a vehicle downtime to serve the cargo, hrn;

C_4 – is the costs for cargo storage, hrn.

In general, the model provides with the choice of a rational amount of N_i resources reducing the total costs calculated with the following formula:

$$C = \sum_{i=1}^{k} C_i^{maint} + \sum_{i=1}^{k} C_i^{oper} \cdot N_i + C_{dt}^{auto} \cdot t_{serv} + C_{storage} \cdot t_{proc} \rightarrow min \quad (3)$$

where i – is the kind of resource;

C_i^{maint} – is the costs for *i*-kind resource maintenance, hrn per unit.;

N_i – is the number of *i*-kind resources, units;

C_i^{oper} – is the costs for *i*-kind resource operation, hrn per unit;

C_{dt}^{auto} – is the costs for a vehicle downtime to serve the cargo, hrn per hour;

t_{serv} – is the time to service the cargo during its loading or unloading, hours.;

$C_{storage}$ – is the costs for cargo storage, hrn per hour.

t_{proc} – is the time fot complete cargo processing at a stock, hours.

According to the the chosen modeling method a network graph of logistics center operation was developed, time characteristics of different kinds of work such as duration and time reserves were defined. Also the critical way of fulfilling, a full range of the kinds of a logistics center work was found.

The criterion of efficiency was chosen that takes into account the total cost for logistics center resources maintenance and operation. On its basis the mathematical model was developed to determine the optimal resources number according to the cargo volume at the input and the total cost for logistics center resources maintenance and operation.

The expected duration of processing the load was found. The standard deviation of the full range of logistics center kinds of work fulfilling was determined to predict and plan the activities of a logistics center. It is proposed in terms of fulfilling works for the minimum time to fulfill works with the reserves in standard mode, which reduces costs.

References

1. Логистика: Учеб. пособие // Під ред. Б.А. Аникина. – 2-е изд., перераб. и доп. – М.:ИНФРА-М, 2001. – 352 с. 2. Гаджинський А.М. Сучасний склад. Організація. Технології. Управління. Логістика.: навч. посібн. – М.: ПРОСПЕКТ, 2005. – 175 с. 3. Гаджинський А.М. Логістика: посібник для вищих та середніх спец. навч. закл. – 3-є видання., перероб. та доп. – М., 2000. – 375с. 4. Маліков О.Б. Ділова логістика. – СПб.: Політехніка, 2003. – 223с. 5. Мельников А.В. Оптимізація товарних потоків регіонального логістичного центру. Автореферат. Єкатиринбург, 2004. – С. 18. 16. Міротин Л.Б.Особливості оптимізації витрат, пов’язаних із складською переробкою та зберіганням запасів // Логістика та управління поставками – № 4. – 2007. – С. 49.