

Logistics as a factor in the growth of competitiveness of regional enterprises of the construction industry

Olga V. Maksimchuk
Volgograd State Technical University
Institute of Architecture and Construction
Volgograd, Russia
olga_maksimchuk@mail.ru

Valery A. Chevanin
Kamyshin Institute of Technology
Volgograd, Russia
eiu@kti.ru

Vladislav V. Klyushin
Volgograd State Technical University
Institute of Architecture and Construction
Volgograd, Russia
vladislav-klushin@yandex.ru

Vakhtang N. Sordia
Volgograd State Technical University
Institute of Architecture and Construction
Volgograd, Russia
4005557@gmail.com

Oksana A. Baulina
Volgograd State Technical University
Institute of Architecture and Construction
Volgograd, Russia
baulina-oksana@yandex.ru

Abstract — In the conditions of the market economy, the main purpose of regional enterprises is to retain positions in the market, to make a profit and to optimize costs. In the conditions of the modern Russian economy, the most important indicator of the development of regional enterprises of the construction industry, which influence the competitiveness of the region as a whole, is their competitiveness, that is the ability of goods and services to match all the requirements which are necessary for the competitive market. The logistic approach to the activities of the regional enterprises of the construction industry includes, in particular, the presence and separation of the logistics service, the purpose of which is to manage material flows at all stages of their movement.

Volgograd region has a unique resource potential, which can be considered as a natural competitive advantage, which largely determines the economic specialization of the region. Thus, considering the fact that the construction material industry of the Volgograd region is almost entirely based on local raw materials, we believe that the production of construction materials is the most perspective branch of specialization in the Volgograd region, which is the most important factor in the growth of competitiveness of the regional economy.

It should be noted that the sphere of logistics of the construction industry enterprises is permanently risky due to unexpected losses, costs, in other words, risks of various origins, which directly or indirectly influence the quality (and finally the cost) of the final product, works and services. Logistics focuses on the prevention of these risks and the optimization of logistics. In the building a highly efficient logistics system, it is necessary to correctly identify strategic priorities and develop approaches to

building interactions not only in the system of relations between suppliers and the enterprise, but also transactions between the internal environment of construction companies, which determines the relevance, as well as the scientific and practical significance of this article.

Keywords — *strategic, priority, logistics, construction industry, factor, competitiveness, regional economy*

I. INTRODUCTION

In modern conditions, the role and importance of logistics as an integral element of the production management of enterprises of the construction industry has changed significantly and increased. The organization of logistics has a direct impact on the effectiveness of enterprises in the construction industry, since it determines the conditions and possibilities for the production of high-quality products, works, services and the ability of an enterprise to operate in the specified parameters of labor productivity, cost and profit. Logistics is one of the most important components of the construction industry enterprises. Logistics is a form of distribution of the means of production on the basis of organizational relations and contractual relations between suppliers and consumers of products directly or with intermediary.

In the process of transition to a market economy, there were cardinal changes, as a result of which the functions of state distribution of material resources in the market, including construction materials, were lost.

Every year the importance of logistics problems increases, which is associated with the high costs of construction companies for their acquisition and storage. At present, the turnover of industrial-technical products is based on the market relation of effective demand and supply, acquiring the features of market distribution. A well-established system of company supply is the key to success.

In addition, it should be noted that the area of logistics of enterprises of the construction industry is permanently risky, due to unpredictable losses, costs, in other words, risks of various origins that directly or indirectly influence the quality (and finally the cost) of the final products, works and services. Logistics focuses on the prevention of these risks and the optimization of logistics. In the building a highly efficient logistic system, it is necessary to correctly determine strategic priorities and develop approaches to building interactions not only in the system of relations between suppliers and the enterprise, but also transactions between the internal environment of construction enterprises, which determines relevance, as well as scientific and practical significance of this article.

II. MATERIALS AND METHODS (MODEL)

The competitive potential of the Volgograd region is determined by the existing industry specialization of the region, the combination of available resources and trends emerging in the external and internal markets, which will determine the demand for the products and services. Volgograd region has a unique resource potential, which can be regarded as a natural competitive advantage, which determines in many aspects the economic specialization of the region. Thus, taking into account the fact that the construction materials industry of the Volgograd region is almost entirely based on local raw materials, we believe that the production of construction materials is the most perspective branch of specialization of the Volgograd region, which is the most important factor in the growth of competitiveness of the regional economy.

However, it should be considered that the production of construction materials is included in the group of industries with volatile demand - these are the sectors whose development is most dependent on the situation. When implementing a favorable development of the economy, these sectors can show good results and even be as significant drivers of economic growth, but a crisis development of industries is also possible. The Volgograd region, like most regions of Russia, is characterized by a mismatch of the level of development of various types of infrastructure with modern requirements. In particular, we can note the unsatisfactory condition of a part of the engineering infrastructure, the "narrow" places on the transport network, the relatively low provision of housing stock to the population. If the government succeeds in creating the conditions for the infrastructure boom policy by attracting budgetary and extra-budgetary funds to the industry through innovative financing mechanisms, the demand for produced materials will increase and the industry will become one of the drivers of economic

growth. However, we cannot exclude the crisis of a fall in demand for the industry's products due to a lack of financial resources from the state, a decline in interest in Russia from institutional investors and a decline in demand for housing construction due to the continuing fall in incomes of population. It is possible that the development of the construction industry in this period will be characterized by the turnover of growth periods and crisis periods.

It is necessary to consider our conclusions about the current state of the construction industry of the Volgograd region. More than 200 enterprises of the non-metallic mineral products and construction materials industry work in the region, including: 20 large and medium-sized enterprises, 7 of which are included in the list of strategic companies of regional importance: OJSC "Sebryakovsky Asbestos-Cement Products Combine", JSC "Kamyshin Glass Container Plant", OJSC "Sebryakovcement", LLC "VOLMA", OJSC "VATT", OJSC "Volzhsky Abrasive Plant", OJSC "Volgograd Ceramic Plant".

The number of people employed in the construction industry of the Volgograd region is about 15 thousand people. Such enterprises occupy more than 6% in the volume of shipped products, 4% in the volume of industrial production (fig. 1).

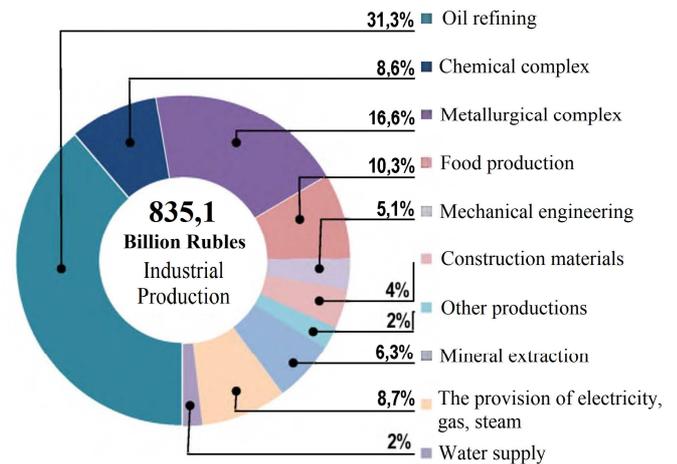


Fig. 1. The share of construction industry in Volgograd region in the total volume of industrial production (2017)

The construction materials industry of the Volgograd region is almost entirely based on local raw materials. In each area of the region there is building clay, in many areas - building sand. Within the region, up to 130 deposits of chalk and marl are known - raw materials for cement production. There are reserves of sandstone and gravel. 53 deposits of construction materials are on the balance sheet and are in the development, or they are being prepared for mastering.

The volume of shipped goods of own production in 2018 amounted to 20342.7 million rubles. In 2018, the volume of production of cement, concrete products, gypsum and cement increased (74%) has the largest share in the structure of shipped products (tab. 1).

TABLE I. THE PRODUCTION OF THE INDIVIDUAL TYPES GOODS BY THE SECTOR OF THE CONSTRUCTION INDUSTRY IN VOLGOGRAD REGION

Product name	2015	2016	2017	2018
1. Building brick, million bricks	217.3	275.4	311.6	172.2
2. Structures and products prefabricated iron-concrete, thousand cubic meters	296.1	346.7	395.4	216.9
3. Concrete mix, thousand cubic meters	275.9	215.5	229.6	134.1
4. Mortar construction, thousand cubic meters	33.2	30.1	37.7	22.0
5. Asphalt concrete mixes road, airfield and asphalt concrete (hot and warm), thousand tons	395.4	399.0	590.8	362.1
6. Technological lime, thousand tons	165.6	186.9	198.7	125.2

Over the past 3-4 years, many enterprises of the industry have implemented plans for the development of the production of new materials or the modernization of existing industries.

In the Volgograd region, the production of construction materials was organized, which had not previously been produced or were produced in insignificant volumes, more production began to be made that match modern requirements and match the quality of world analogues.

Due to the slowdown in the construction of housing in the region in the enterprises of the construction industry there was a decrease in production volumes. The volume of production capacity for the production of wall materials and prefabricated reinforced concrete structures and parts for 2018 by enterprises of the building materials industry of the Volgograd region is lower than the same indicator in 2017 by 23.4% and is 27.1%, respectively (tab. 2).

TABLE II. THE LEVEL OF USE OF AVERAGE ANNUAL PRODUCTION CAPACITY OF RELEASED SEPARATE TYPES OF CONSTRUCTION PRODUCTS (PERCENT)

Product name	2015	2016	2017	2018
Wall materials	43.9	52.7	57.3	33.9
Prefabricated reinforced concrete structures and parts	42.5	55.8	63.0	35.9

In the industry import-substituting products has been shipped more than 2.3 billion rubles. Among enterprises introducing import substitution programs there are: OJSC "Volgograd Ceramic Plant" (ceramic tiles, ceramic sanitary-building products); LLC "Zika" (quick-hardening cement-based compositions and anchoring compositions on cement base and polymer base). The products of these enterprises entered into the Order of the Ministry of Industry and Trade of Russia dated July 13, 2016 No. 2380 approving the action plan for import substitution in the industry of construction materials (products) and building structures of the Russian Federation.

In the production of construction materials (other non-metallic mineral products) of the Volgograd Region, investment projects costing more than 7.5 billion rubles are currently being implemented.

In 2017, the implementation of the following projects continues: OJSC "Volgograd Ceramic Plant" - a project to organize the production of porcelain stoneware with a capacity of about 2.5 million square meters per year; LLC "Izobud-Yug" - the construction of a new modern line for the production of panels from polyisocyanurate foam; JSC "Sebryakovcement" - reconstruction of the rotary kiln №7 with transfer to the "dry" method of production.

Despite the existence of its own construction industry, in 2017, according to the Volgogradstat, based on reports from

medium and large enterprises, construction materials and products costing 15015 million rubles were imported into the Volgograd region. Importation into the region of significant volumes of construction materials and products leads to higher prices for buildings and structures under construction.

Thus, on the territory of the Volgograd region there is need to study the problems of logistics, as well as the creation of modern production of construction materials and products in order to parity exports, as well as in order to further increase the competitiveness of the regional economy.

The concept of logistics is very broad, and includes determining the need for materials of the required quantity and quality, the conditions of their storage, use of secondary resources in the production, the development of subsidiary farming, as well as the acquisition, storage and most rational use of machinery and equipment. An important aspect of logistics is to determine the company need for the means of labor (production) necessary for the operation and to determine the mode of their functioning that will be the most rational and least costly. Determination of the need for certain logistics is implemented by the use the following methods: 1) regulatory, based on the use of progressive and technically justified norms for the consumption of materials; 2) a dynamic method based on statistical calculations of the volume of logistics for future periods, taking into account changes at this particular moment in production; 3) the method of forecasting, based on the calculation of a statistically necessary amount of resources in certain intervals, taking into account their dynamics.

The key point in problems of logistics is the management of material flows, in other words, logistics. In relation to the logistics system, the material flow can be: external, internal, input and output. The most important in the logistics of material flows is the creation of a system of interactions of all parts of the construction companies, taking into account all the features of the production process. Logistics of material flow influence production process, from the choice of suppliers, ending with the delivery of manufactured products. Currently, construction companies are working closely with regular suppliers, making every effort to preserve the established relations in order to obtain favorable conditions and privileges from the supplier.

Thus, it can be concluded that the priority problems in the logistics of material flows of the construction industry are: the possibility of timely replenishment of used resources; minimizing the storage time of material flows; optimization of production for the purpose of resource saving and the introduction of a lean production system; improving the quality of products and reducing the level of defect.

III. RESULTS AND DISCUSSION

The activities of the logistics services are aimed at systematic, integrated and rhythmic provision of production associations, enterprises, workshops, sites, and workplaces with all necessary types of resources, which ultimately increases the efficiency and rhythm of the enterprise in all areas of activity. And precisely those enterprises which could

realize this harmonious supply mechanism will have the greatest competitive advantage.

However, it is necessary to consider that even the best supply apparatus of the enterprise will not give the required effect if it is not provided with quality management of the appropriate level of decision making (strategic, tactical and operational). In this regard, it should be noted that the efficiency of the whole enterprise depends on the quality of work of the services which are responsible for logistics.

The organization of activity of these structural divisions includes the following main directions: selection of personnel, the organization of methods of stimulation, information support, introduction in work of logistics. In this case, the construction of the organizational structure of the logistics service should take into account a number of circumstances that can be grouped into the following directions: technical; economic; organization of production.

The technical group's factors include: the influence of technology, technology and industry structure, the purpose, complexity and quantity of products and resources consumed in the production process, as well as the equipment of transport and storage facilities.

The economic factors that influence the organizational structure of the enterprise logistic service include: market conditions, the level of demand for products manufactured by construction companies, production and consumed resources, forms of payment for purchased resources, etc.

Factors of organization of production include the type of production (individual, small-scale, serial, large-scale, mass), the territorial location of production and warehouses and the level of specialization.

The variety of influencing factors on the structure of commercial services, leads to a very significant number of types of organizational structure schemes of logistics services.

Until the 1970s, a decentralized form of logistics organization was widespread in market economy countries. Each enterprise independently provided itself with all necessary resources. At the same time, the supply process was carried out within the production activity of the enterprise. Starting in the 1970s the decentralized provision of industrial enterprises was eventually replaced by centralized.

Among western industrial firms in the 1980s a new material management concept has become popular, which included the establishment of unified management and coordination of the procurement of materials, their delivery to the enterprise, and inventory control. A characteristic feature of the organization of procurement management of material and technical resources on the basis of a new concept was the creation of so-called "materials managers", or logistics managers.

The functions of the materials manager included: transportation of material and technical resources to enterprises that were previously controlled by the production apparatus. As a result of this reorganization, the following positive effects began to be traced at construction enterprises: improved operational management, reduced delivery times for material resources, reduced reserves and increased turnover.

As for the domestic practice of logistic development, it is necessary to note that the production and technical prerequisites for the development of logistics in the USSR were various technologies developed within the centralized state structures of the USSR, such as Gosstab, Gosstroy, Goskomnefteprodukt, Gosagroprom, and others. Quite serious results were achieved in the USSR in the management of transport hubs, which are important elements of logistics chains. In Leningrad in the 1970s, the technology of the transport hub was developed, where there was the interaction of kinds of transport. In the 1980s, there was the attempt to introduce the inter-industry delivery technology "Rhythm", which combined train schedules, work stations, enterprises - senders and recipients of goods, i.e. it is functioned on the principles of logistics.

In modern Russia, logistics systems, which are essentially analogous to western models of industrial logistics, have begun to carry the name of internal logistics systems. At the same time, internal logistics systems are considered at the macro and micro levels. At the macro level, internal logistics systems act as elements of micrologistical systems. They set the rhythm of these systems, they are sources of material flows. The ability of micrologistical systems to adapt to environmental changes is largely determined by the ability of their internal logistics systems to quickly change the qualitative and quantitative composition of the output material flow, i.e. the range and quantity of products.

As for the micro level of the enterprise, the logistics intra-production system here is implemented through a number of subsystems that are closely related to each other, forming the integrity and unity of the entire system.

Such subsystems include the following: purchase, warehouse, reserves, production service, transport, information, sales and personnel. All of them serve to ensure the entrance of a material flow into the system, as well as its passage inside it and exit from the system. Based on the principles of the concept of logistics systems, for ensuring continuous coordination and mutual adjustment of plans and various production activities, it is necessary to ensure systemic communication between the enterprise subsystems.

Construction companies are characterized by the use of the "pulling system" for flow control. The main characteristics of this system are - the supply of parts, assemblies, components and semi-finished products in accordance with production needs.

In addition, it should be noted that the purpose of the control center of this system is not monitoring the exchange of material flows between different parts. There is an independent direct connection, which determines the production task for the links, which are dependent on each other. The production program of a separate technological link is determined by of the order of the subsequent link. The function of the central system is only the formulation of the problem for the final link of the production technological chain. As a result, the production flow itself is "pulled out" by each subsequent link. Moreover, conditions are created for the personnel of a separate workshop (area) in which a large list of

specific factors is formed to make a decision about the optimal order, which allows determining the optimal order size. The most prominent examples of this system are Japanese enterprises with the so-called “Kanban” system, based on the “just in time” principle. The scheme of the “pulling system” is shown in Fig. 2. From this scheme it follows that the management system determines the so-called key production team (directive).

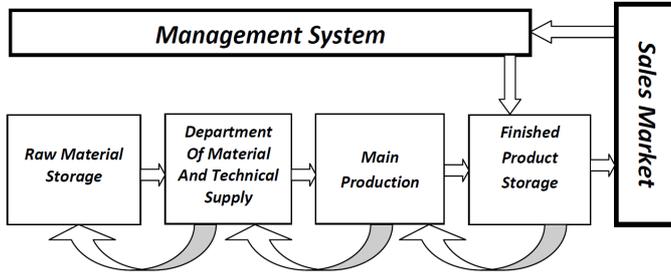


Fig. 2. “Pulling system” management of material flow in the enterprise of construction industry [8]

This command creates a task for the production of the required quantity of products for the final link of the technological chain of the enterprise. After that, the generated order for the required amount of materials goes to the logistics department, and then the experts send a notification to the raw material warehouse to provide the necessary volume of raw materials for production, which was determined during the process of matching production processes at all levels of the production process.

For the management of the material flow, the enterprise has a distribution logistics system that solves the tasks of managing the material flows specified in the enterprise system. As for the tasks of distribution logistics, they represent tasks of two levels. The first level is internal distribution logistics, the second level is external distribution logistics.

At the enterprise, for example of the construction industry, distribution logistics solves the following tasks: organizes the receipt and processing of orders; planning implementation processes; chooses the types of packaging, decide on the configuration, and also organizes the execution of other operations immediately preceding the shipment; organizes the process of shipment of finished products; organizes the delivery and control of transportation; organizes post-sales service.

At the external level, the main tasks of distribution logistics include: making the choice of distribution channel architecture; carrying out organizational work with participants of distribution channels (resellers); selection of distribution strategies for finished products; implementation of pricing strategies; organization of events to promote the company's products on the market; monitoring the state of product markets for enterprises and analyzing product positions on target segments; work with customers and organizations providing after-sales service. The solution of all tasks of distribution logistics at a construction industry enterprise is assigned to the sales and procurement department, as well as the marketing department [5-7].

Distribution channels of final consumption of goods may have a very different structure. For example, at the enterprise distribution channels may not be formed from the very beginning. Therefore, the production plan will subsequently be based on the contracts concluded with customers at the time of the beginning of the planning period and the entire sales policy will be implemented directly, using the “enterprise-to-customer” system. Subsequently, a situation may occur in which capacities that are not previously involved in the production process and which may serve to increase the stocks of finished products will be involved. And even then, direct sales will remain the main method of product sales. For the implementation of over-contractual products, as a rule, enterprises open the acceptance of orders from additional persons wishing to buy a small batch of products at current prices. The practical implementation of this logistic model is implemented on the example of a large enterprise of the construction industry of the Volgograd region – JSC “ZHBI-6 Firm”. We calculate the optimal variant of long-term business relations. In determining the optimal variant of long-term business relationships, you should use the following formula:

$$C_{total} = (P_i + G_i) \cdot V_i^{nom} + \sum_{k=1}^m (V_{ik}^{sup} - V_k) \cdot \frac{R}{m} + \sum_{k=1}^m (V_k - V_{ik}^{sup}) \cdot \frac{D}{m} \Rightarrow \min \quad (1)$$

where C_{total} – total costs and losses at the conclusion of the supply contract for the year with the i -th supplier;

P_i – the price per unit of the i -th supplier;

G_i – the cost of transportation per unit of output from the i -th supplier;

V_i^{sup} – annual supply volume from the i -th supplier;

V_{ik}^{sup} – volume of deliveries from the i -th supplier to k year;

m – quarter of the year (year);

R – losses associated with immobilization of working capital, thousand rubles per ton;

D – losses in production from the lack of material resources, thousand rubles per ton [7].

The calculation showed that the most preferred supplier of gravel is JSC “Kalininsky Crushed Stone Plant”, since the average price for this raw material, taking into account transportation costs, is much lower than that of JSC “Transstroy”. It is advisable to select the supply of chemical additives from the laboratory of LLC “SU-99”, due to lower costs for their purchase and delivery. Cooperation with these suppliers in the formation of long-term economic relations will be most beneficial for the enterprise. After selecting the best suppliers, the logistic department performs the following tasks: to conclude contracts; monitoring the performance of the contract; organization of the delivery of material resources; organization of storage of material resources. For the implementation of over-contractual products, it was opened the center to take orders from everyone who wanted to buy a small batch of concrete goods at list prices. The task of selling individual orders is assigned to the sales department. The planned amount of revenue due to the introduction of measures to improve the efficiency of logistics support will increase by 15%. The cost price is planned to be reduced by 5% due to more rational use of material and technical resources, increase in production (tab. 3).

TABLE III. THE ANALYSIS OF THE ECONOMIC EFFECT FOR JSC “ZHBI-6 FIRM” DUE TO THE IMPLEMENTATION OF LOGISTIC MEASURES

Name of the indicator	2017	2018	Change +/-
Revenue from the sale of goods, products, works, services, thousand rubles	426666	490665.9	63999.9
Cost price of sold goods, works and services, thousand rubles	378708	413738.5	35030.5
Sales profit, thousand rubles	47958	76927.4	28969.4
Profit before tax, thousand rubles	46164	75133.4	28969.4
Income tax, thousand rubles	9421	15026.68	5605.68
Net profit, thousand rubles	36788	60106.72	23318.72
Product profitability, %	9.7	14.53	4.83
Economic effect, thousand rubles	14676.285		
Payback period, months	5.9		

The payback period for the implementation of measures is determined by the formula:

$$PB = \frac{C}{E_a} \quad (2)$$

The coefficient of economic efficiency is equal to:

$$E = \frac{E_a}{C} \quad (3)$$

where PB - payback period, years;

C – costs of implementing the event (367.665+2% from cost price), thousand rubles;

E_a – annual economic effect, thousand rubles.

E – coefficient of economic efficiency;

$PB = 8642.435/14676.285 = 0.59 = 5.9$ months.

$E = 14676.285/8642.435 = 1.7$

Thus, using the logistic model, the optimal variant of long-term business relations was calculated. The scheme for the purchase of raw materials and components has been changed; its essence depends on a long-term agreement with an intermediary firm. It will speed up the delivery of materials. The effect of the proposed program is obvious. After the calculations, it can be noted that the cost of this measure will pay off in 6 months. Thus, measures to improve the efficiency of logistics based on the logistic model, led to a reduction in price cost, improved product quality and cost optimization of the company JSC “ZHBI-6 Firm”.

IV. CONCLUSION

In conclusion, it is necessary to note the following. Volgograd region has a unique resource potential, which can be regarded as a natural competitive advantage, which determines in many aspects the economic specialization of the region. Taking into account the fact that the construction materials industry of the Volgograd Region is almost entirely based on local raw materials, the production of construction materials is the most promising branch of specialization in the Volgograd region, which is the most important factor in the growth of competitiveness of the regional economy.

Our focus on resources for the logistics of a modern construction enterprise is the most important strategic priority with the basic principles:

1) information security – timely delivery in an accessible form of information about the development and implementation of solutions in the sphere of resource saving;

2) economic security - the formation of a purposeful fund for resource saving from the resulting economy from the implementation of resource saving solutions;

3) regulatory security - the development, dissemination and strengthening of the culture of resource conservation.

It gives management the opportunity to make the right managerial, economically sound management decisions in the field of resource conservation.

In our opinion, the introduction of a logistic system at the building industry enterprise of the Volgograd region JSC “ZHBI-6 Firm” will allow:

1. To improve the interaction between the company and suppliers of material resources, based on the expansion of economic independence and improvement of contractual relations

2. To optimize the production of works on terms, transaction costs, resource costs.

3. To streamline inventory management in procurement logistics, because the rhythmic work of the enterprise primarily depends on the availability and condition of the reserves.

The logistic approach will optimize the indicators of functioning of individual elements, ensuring an increase in the efficiency of the enterprise as a whole.

Summing up the strategic principles of logistics of a construction enterprise, it is necessary to note that the main purpose of logistics is currently related to the management concept of “lean production”, which aims to reduce all types of losses in the production process.

References

- [1] Sergeev, V. I. Logistika snabzheniya [Logistics of supply] / V.I. Sergeev, I.P. El'yashevich. - M.: Rid Grupp, 2017. - 416 p.
- [2] Tyapukhin, A. P. Logistika [Logistics] / A.P. Tyapukhin. - M.: Yurait, 2015. - 576 p.
- [3] Lukinskii, V. S. Logistika i upravlenie tsepyami postavok [Logistics and supply chain management] / V.S. Lukinskii, V.V. Lukinskii, N.G. Pletneva. - M.: Yurait, 2016. - 360 c.
- [4] Amirov, Magomed Edinaya transportnaya sistema [Unified transport system] / Magomed Amirov. - M.: KnoRus media, 2017. - 671 p.
- [5] Brodetskii, G. L. Sistemnyi analiz v logistike. Vybor v usloviyakh neopredelennosti [System analysis in logistics. Choice under uncertainty] / G.L. Brodetskii. - M.: Academia, 2016. - 336 p.
- [6] Brodetskii, G. L. Upravlenie riskami v logistike [Risk Management in logistics] / G.L. Brodetskii, D.A. Gusev, E.A. Elin. - M.: Akademiya, 2017. - 192 p.
- [7] Kanke, A. A. Logistika [Logistics] / A.A. Kanke, I.P. Koshevaya. - M.: Forum, Infra-M, 2015. - 384 p.
- [8] Nerush, Yu. M. Logistika. Uchebnik [Logistics. Textbook] / Yu.M. Nerush, A.Yu. Nerush. - M.: Yurait, 2014. - 560 p.
- [9] Prosvetov, G. I. Matematicheskie metody v logistike. Zadachi i resheniya [Mathematical methods in logistics. Problems and solutions] / G.I. Prosvetov. - M.: Al'fa-press, 2017. - 304 p.

- [10] Semenenko, A. I. Logistika. Osnovy teorii. Uchebnik [Logistics. Fundamentals of theory. Tutorial] / A.I. Semenenko, V.I. Sergeev. - M.: Soyuz, 2015. - 544 p.
- [11] Maksimchuk, O.V. Predposylki uluchsheniya material'no-tekhnicheskogo obespecheniya deyatelnosti predpriyatiya na osnove logisticheskoi modeli [Preconditions of improvement of material and technical support of activity of the enterprise on the basis of logistic model] / O.V. Maksimchuk, V.N. Sordiya // Nauka (materialy VI mezhdunarodnoi konferentsii "Dulatovskie chteniya 2014"). – 2014. – № 4/3. - Spetsvyp. Ekonomicheskie nauki. - S. 316-320.
- [12] Baulina, O. A., Klyushin, V. V., Shchukin, A. E. Methodological approaches to clusters identification in the conditions of economy globalization // Globalization and Its Socio-Economic Consequences : 16th International Scientific Conference (Rajecke Teplice, Slovak Republic, 5-6 October 2016) : Proceedings / ed. by Tomas Kliestik ; ZU – University of Zilina, The Faculty of Operation and Economics of Transport and Communications, Department of Economics. – Zilina (Slovak Republic), 2016. – Part I. – P. 127-134.