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DEVELOPMENT OF A MATERIAL MANAGEMENT METHOD FOR AN INDUSTRIAL CONSTRUCTION PROJECT

Abstract. The paper deals with the problem of providing material resources for industrial projects. The proposed material management method based on the integration of plans integration and storage of resources, which allows to get the most rational savings from purchases at wholesale prices.

Keywords: project management, material resource, industrial facility, construction.

The construction of new industrial facilities today is the key to the successful and promising development of the production sectors of the economy in any country. The development of industrial infrastructure contributes to an increase in the number of jobs, wage growth, which increases the level of well-being of the population, and also, due to the innovative component of new industrial facilities, the level of competitiveness of the industry and the state as a whole grows.

In connection with the increasing relevance of the issues of creating new industrial facilities, there is a need for science-based and economically viable

methods for building industrial enterprises. This forms the purpose of this paper, which is to develop a method for managing the material resources of industrial construction projects.

Industrial construction projects (ICP) have an unconventional life cycle [1, 11]. First of all, this is due to their promising type of activity, since it is on what type of innovative production the company will choose and the unique equipment that will ensure the output depends. As a rule, this equipment is made to order, has a long production time, and is purchased under prepaid contracts, payments for which are made even before the start of the start-up

schedule. These projects are also distinguished by scale and, depending on the functional purpose of an industrial facility, consist of a complex of design (planning) and construction works of separate structures: industrial buildings, workshops and factories (main and auxiliary); energy buildings (CHP, boiler, transformer substations); transport and storage buildings and structures (warehouses, terminals, locomotive depots); administrative and household buildings (engineering, laboratory buildings of industrial enterprises); plumbing installations for the maintenance of water supply and sewage (pumping, water towers). That is, many both specific and unified (of the same type) resources, which are acquired at different times and under different conditions, is required for the implementation of ISP, which requires special attention when planning purchases and coordinating their volumes [1, 12].

Many studies are devoted to procurement logistics management issues, among which [2–5], but all of them are tied to the production process, which is cyclical in nature, and not to the project activity, which is unique and has known time constraints. That requires the refinement of existing procurement logistics methods in terms of their applicability to meet the requirements of ISP.

To ensure the implementation of ISP appropriate to use the software. Now, the most widely used in construction has been the Microsoft Project software, which is recommended by the authors of the paper. Thus, for the classification of project resources, it is proposed to use the structure presented in [6, 20], namely, to allocate labor, cost and material resources. Due to the specificity of the resource base, it is necessary to introduce additional gradation for material resources, namely, to divide them into unique, specific and unified resources. The first group consists of unique resources, as mentioned above, they are manufactured for a long time, made to order, have a high cost, are prepaid before the start of the project. Specific – it provides resources that can be made to order, but, as a rule, have several al-

ternatives and different payment systems. Unified – this kind of resources is available in large quantities, at any time, from any suppliers and under different contracts. What forms a large pool of alternative scenarios for the procurement of material resources. As a rule, when purchasing unified materials in large quantities, the price per unit of production decreases, which creates an additional source of savings. However, there is not always a place to store purchased resources in enough quantities. The way out of this situation is the use of the stream construction method and the use of the erected sections of facilities for storage facilities.

Thus, we present the steps of the proposed method for the management of material resources of the ISP. The first step is to determine milestones of the PCP, the delivery and installation dates of unified and specific resources, and also to add them to the Gantt chart in Microsoft Project. The next step, based on the obtained milestones, is the ISP network schedule. A pool of necessary resources is formed, and resources are assigned to tasks. After the appointment, a resource schedule is formed, that is, the required daily amount of each type of resource is determined.

To use the construction site for the needs of storage of resources, it is necessary, as the next step, to divide the area into sections, then determine which sections for which needs and for which period can be used. Based on these data, a calendar schedule of available storage areas at the construction site is formed, with an indication of their qualitative and quantitative characteristics.

The next step in the ISP material management method is the allocation of those resources, the purchase of which cannot be moved in time and the volumes are changed. It is also necessary, if necessary, to “book” in the calendar schedule a place on the construction site for these resources.

It then reviews the remaining storage sites and the remaining resources. Resources are ranked depending on the size of the savings that 1 m³ of space brings when purchasing this resource at a wholesale price.

The next step is to fill the storage areas at the construction site in such a way as to, firstly, ensure the uninterrupted supply of the necessary resources for construction. Secondly, to ensure the purchase and storage of the maximum amount of resources, with the greatest savings of 1 m³ of space. And, thirdly, to reduce as simple as possible the plots that can be used for the needs of storing material resources for ISP after the materials from this site have already been used for construction. When distributing purchases in this way, it is also advisable to pay attention to the possibility of moving non-critical project tasks, which allow for a more flexible use of the material resources of the ISP.

The finally stage of the method is the formation of a unified plan for the procurement and storage of material resources for the implementation of ISP based on the received calendar data on their purpose, procurement, delivery and use.

Thus, the paper describes the ISP material management method, which, unlike the existing methods, is based on the specifics of the life cycle of these projects, takes into account the gradation of material resources to specific, unique and unified, includes an analysis of the construction site sections from the point of view of its use for storage needs material resources and has a basic outgoing document a single

plan for the procurement and storage of material resources for the implementation of ISP.

The advantage of this method is the integration of the ISP base plan – the project procurement plan for material resources and the storage plan for these resources. Also, the priorities of the method include the possibility of choosing the optimal variant of ISP at cost due to the purchase of standardized products at a wholesale price.

The disadvantages of the method include many stages strictly regulated in the order of implementation, which, subject to lack of information in one of them, reduces the quality of the results. Also, a negative fact is the impossibility of performing operations in one software product, which leads to the need to import large amounts of data, which increases the possibility of various kinds of errors.

Further study and refinement require the classification of construction sites, with the aim of grading them according to the storage conditions of various types of material resources, developing a change management method related to providing ISP material resources, as well as automating the proposed method to increase the number of obtained potential ISP implementation scenarios by reducing the time to implement the steps of the method and simplify data import processes.

References:

1. Сухонос М. К. Модель життєвого циклу проєктів будівництва промислових об'єктів / М. К. Сухонос, В. В. Шеветовський, А. Ю. Старостіна // Науково-технічний збірник «Комунальне господарство міст». Серія: технічні науки та архітектура. 2017. – № 193 – С. 10–14.
2. El Khayyam Y. Integrated production and logistics planning / El Khayyam Y., Herrou B. // International Journal of Online Engineering. 2018. – Vol. 14. – Iss. 12. – P. 84–96.
3. Díaz-Madroño M. A mathematical programming model for integrating production and procurement transport decisions / M. Díaz-Madroño, J. Mula, D. Peidro // Applied Mathematical Modelling. 2017. – No. 52 – P. 527–543.
4. Absi N. The multi-item capacitated lot-sizing problem with setup times and shortage costs / N. Absi, S. Kedad-Sidhoum // European Journal of Operational Research. 2008. – No. 185(3) – P. 1351–1374.
5. Prostea G. Logistics scenario for wind turbine assembly based on ERP / G. Prostea, C. Vasar, A. Badea // Advances in Intelligent Systems and Computing. 2018. – No. 634 – P. 194–200.
6. Богданов В. В. Управление проектами в Microsoft Project 2017. Учебный курс(+CD) – СПб.: 2018. – 595 с. с ил.