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TECHNICAL PROCESSES IN LOGISTICS AT INDUSTRIAL ENTERPRISES OF UKRAINE IN CHANGING CONDITIONS

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The article examines the technical processes that are the basis of logistics for the movement of material flows. It is also noted that in order to realize the delivery of goods «just in time», it is necessary to develop and implement such a single effective technical process for the entire production and transportation system of an industrial enterprise, which will facilitate the integration of production, transportation, and consumption. It is proved that the consumer should be a priority person, and therefore only in this way can the system be highly efficient. The author's vision of the technological process for the movement of material flows is presented. It is proved that the technological process in logistics at industrial enterprises is determined by the following technological and organizational requirements: transport, requirements for warehouse facilities. It is found that transportation requirements are based on transport logistics. The main tasks of transport logistics are identified, which are as follows: selection of the type of vehicle, planning of transport processes together with warehouse and production processes, various types of transport, ensuring technical integration of transport and component processes, determining rational delivery routes, digitalization of transport logistics and its processes. A single technological process, its tasks, components, and development scheme are considered. It is proved that the unified technical process is developed by a commission headed by the chief engineer and consisting of representatives of operational, planning, freight, and track engineers of the locomotive industry. Particular attention is paid to the stage of stock formation in the warehouse, technological processes and loading and unloading operations. The main components of control over the implementation of technical processes are defined, namely: a clear division of responsibilities between employees, strict adherence to the norms of the internal distribution, production, and economic system, timely planning and informing about the need for vehicles.

ТЕХНІЧНІ ПРОЦЕСИ В ЛОГІСТИЦІ НА ПРОМИСЛОВИХ ПІДПРИЄМСТВАХ УКРАЇНИ В МІНЛИВИХ УМОВАХ

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логістичні процеси,
технологічний процес,
транспортні вимоги,
вимоги до складських
приміщень, планування,
цифровізація,
механізація вантажних робіт,
контроль

В статті розглянуто технічні процеси, що виступають основою логістики для руху матеріальних потоків. Зазначено також для того, щоб реалізувати доставку товарів «точно в строк» потрібно розробити й впровадити такий єдиний ефективний технічний процес для всієї виробничо-транспортної системи промислового підприємства, який буде сприяти інтеграції виробництва, транспорту, споживанню. Доведено, що споживач повинен бути пріоритетною персоною, а тому тільки таким чином можна отримати високу ефективність системи. Надано авторське бачення технологічного процесу для руху матеріальних потоків. Доведено, що технологічний процес у логістиці на промислових підприємствах визначається такими технологічними та організаційними вимогами: транспортними, вимогами до складових

приміщень. З’ясовано, що транспортні вимоги базуються на транспортній логістиці. Виявлено основні завдання транспортної логістики, які полягають у наступному: вибір типу транспортного засобу, планування транспортних процесів разом зі складськими та виробничими, різними видами транспорту, забезпечення технічної інтеграції транспортних і складових процесів, визначення раціональних маршрутів доставки, цифровізація транспортної логістики та її процесів. Розглянуто єдиний технологічний процес, його завдання, складові, схема розробки. Доведено, що єдиний технічний процес розробляється комісією, яку очолює головний інженер, а до її складу входять представники експлуатаційного, планового, вантажного, колійного інженерів локомотивного господарства. Особливу увагу приділено етапу формування запасів на складі, технологічним процесам вантажно-розвантажувальним роботам. Визначено основні компоненти контролю за виконанням технічних процесів, а саме: чіткий розподіл обов’язків між працівниками, суворе дотримання норм внутрішньої розподільчої, виробничої, економічної системи, своєчасне планування й інформування про потребу в транспортних засобах.

Statement of the problem

Technical processes in logistics for the movement of material flows always need to be perfectly defined. In modern conditions at industrial enterprises, they are changing under the influence of new technologies, equipment, rapid technological progress, and technical flows at enterprises. Each industrial enterprise faces the task of improving the main technological processes in logistics, creating such processes in production that meet the requirements of a changing environment and ensure the competitiveness of the enterprise, both in the domestic and foreign markets.

Analysis of the latest research and publications

This issue always arouses scientific interest among economists, the scientific community and practitioners of industrial enterprises, both domestic and foreign. The scientific works of foreign economists are devoted to this issue: Busher J. [11], Coyle J. [12], Murphy P. [13] and domestic economists: Zaborska N., Zhukovska L. [1], Kyslyy V., Bilovodska O., Olefirenko O., Solianyuk O. [2], Mishchuk I. [4], Rudkivskyi O., Gongalo Y. [10] and others.

When studying technical processes in logistics, we always find new pressing issues in today’s changing environment. They appear on the basis of the digitalization of the logistics process, in the context of a pandemic, crisis, war and other situations, and therefore are always relevant and require careful research.

Objectives of the article

To study technical processes in logistics: to define technical and organizational requirements, identify the main tasks of transport logistics, develop a technical process

scheme for cargo stations and cargo processing stations, and form components of control over the implementation of technical processes in logistics.

The main research material of the research

Technical processes are the basis for the movement of material flows. To realize the basic logistics principle of just-in-time delivery, it is necessary to develop and implement a single technical process for the entire production and transportation system based on the integration of production, transportation and consumption so that the consumer is a priority and the system’s high efficiency is fully achieved. This is how it should be.

A technological process is a chain consisting of logistics tasks and operations, additional methods and special conditions for their implementation, which require daily and dimensional support of basic production technologies through the digitalization of processes Fig. 1.

The technological process in logistics is determined by certain technical and organizational requirements.

These include, in particular, the following [5]:

1. Transportation requirements. These include: optimization of the type and kind of vehicle, type and nature of the transported cargo, volume and distance of transportation, use of advanced vehicles for transporting cargo in packages, containers and pallets, use of complex mechanization and, on this basis, automation of loading and unloading operations, ensuring a minimum number of overloads, maintaining the quantity and quality of transported materials, determining the synchronization of production rhythms to provide workshops with semi-finished products and materials.

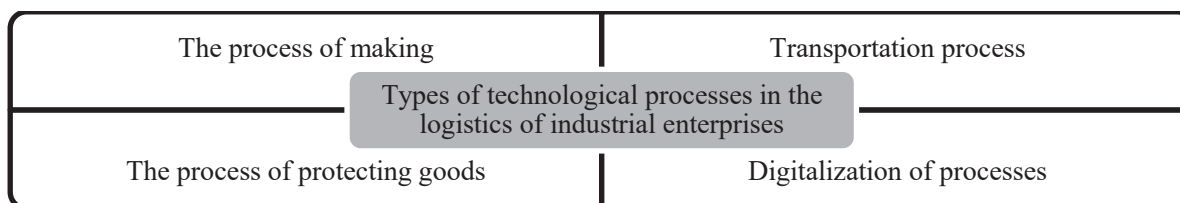


Fig. 1 – Types of technological processes in logistics

Source: based on the authors’ materials [6; 7; 8]

2. Warehouse requirements aimed at simplifying warehouse operations and reducing costs through the efficient use of warehouse space, equipment and labor. The successful use of all warehouse operations requires not only a highly organized warehouse system, but also the rational development of technological processes. When developing technical processes, a list of necessary tasks is determined in accordance with the nature of the goods.

Transportation requirements are met by transport logistics (including freight transportation).

The main goal of transport logistics is to provide the necessary transportation services in the areas of procurement, sales and waste disposal at minimum cost, with a focus on continuously reducing transportation needs. The main tasks of transport logistics can be defined as follows:

- selecting the type of vehicle;
- planning of transportation processes together with warehouse and production processes;
- planning of transportation processes together with different types of transport;
- ensuring the technical integration of transportation and warehousing processes;
- determination of rational delivery routes [7].

A unified technical process in transport logistics can be understood as a rational system for organizing the operation of transshipment stations and sidings of industrial enterprises. It links the technology of handling trains and wagons at transshipment stations and sidings and ensures that the production process of industrial enterprises is in line with a single transport rhythm. This involves the application of efficient labor methods and the sharing of technical equipment in the transport departments of enterprises and at railway stations. This process is reflected in a document that establishes the procedure for the operation of tracks and stations connecting them. It is aimed at ensuring the most rational use of technical means of transport units of enterprises and branch stations and increasing the turnover of vehicles at stations and branch stations [8].

The main task of operating under a single technological process is to accelerate the turnover of vehicles and transportation using internal resources, which is an obligation specified in the railway line operation agreement.

The unified technical process is developed by a commission consisting of the chief engineer of the section (chairman), representatives of operational, planning, freight and track engineers of the locomotive department and representatives of the company that owns the siding. In its work, the commission is guided by the provisions of the Railways Charter, transportation rules and recommendations for the development of unified technological processes for the operation of sidings, junction and interchange stations.

The technical process for freight and cargo handling stations is an integral part of the overall technical process. At large freight stations, container and marshalling yards, independent (separate) technological processes can be developed for station technology, cargo loading time and freight car cleaning.

Technical processes include the sequence and duration of commercial operations performed at the freight yard and in the cargo office.

They are usually developed according to the following scheme [9]:

- Comprehensive layout, specialization and dimensions (length, area, etc.) of lines and premises in the cargo yard.
- List of warehouses (open and closed), available space, and estimated capacity (tons).
- A list of means of mechanization of loading operations and their estimated capacity.
- List of warehouse mechanization and automation equipment and their performance.
- Warehouse layout, placement of machinery and equipment, reference materials, and work organization.
- The scope of commercial activities that are already being carried out and are planned to be carried out over the next two to three years.
- A list of existing and planned (probable) personnel at the loading dock and in the goods department, including loading and unloading operators and technical staff.
- A list of freight yard facilities (e. g., sorting platforms, container yards, railroad tracks) and their normal, holiday, and weekend operating hours (one or two shifts, 24-hour operation).
- Estimation of the need for vehicles for loading and unloading cargo on weekdays and weekends (by facility).
- The nature of the unevenness of cargo arrivals at the facility (minimum, maximum, and average) and the activities of the cargo department (by time of day).
- Schedules for accepting parcels and containers.
- Organizing direct and reloading of wagons loaded with parcels and containers.

The main task of the inventory formation stage is to provide the warehouse with goods and materials that are necessary and can be stored for a certain period of time. In doing so, it is necessary to coordinate the actual capabilities and deliveries of sales services and warehouses.

The main storage tasks are as follows [3].

- Unloading, sorting, unpacking, and preparing materials and products for acceptance from transportation.
- Placement of materials in the warehouse.
- Sorting materials, creating orders for sending materials to customers; packaging for shipment and placing them in containers.
- Loading into vehicles and delivery to consumers.

The organization of the logistics process in the warehouse and its stages are shown in Figure 2.

The organization of warehouse operations must meet the following requirements [6; 7]:

- warehouse operations should be performed in the shortest possible time and at the lowest possible cost;
- each operation should be performed in the smallest possible space, using the maximum possible warehouse area and not impeding the speed and quality of the operation;
- the entire operational process should be carried out systematically, and operations should be performed in a strict sequence to ensure timely transition from one operation to another;

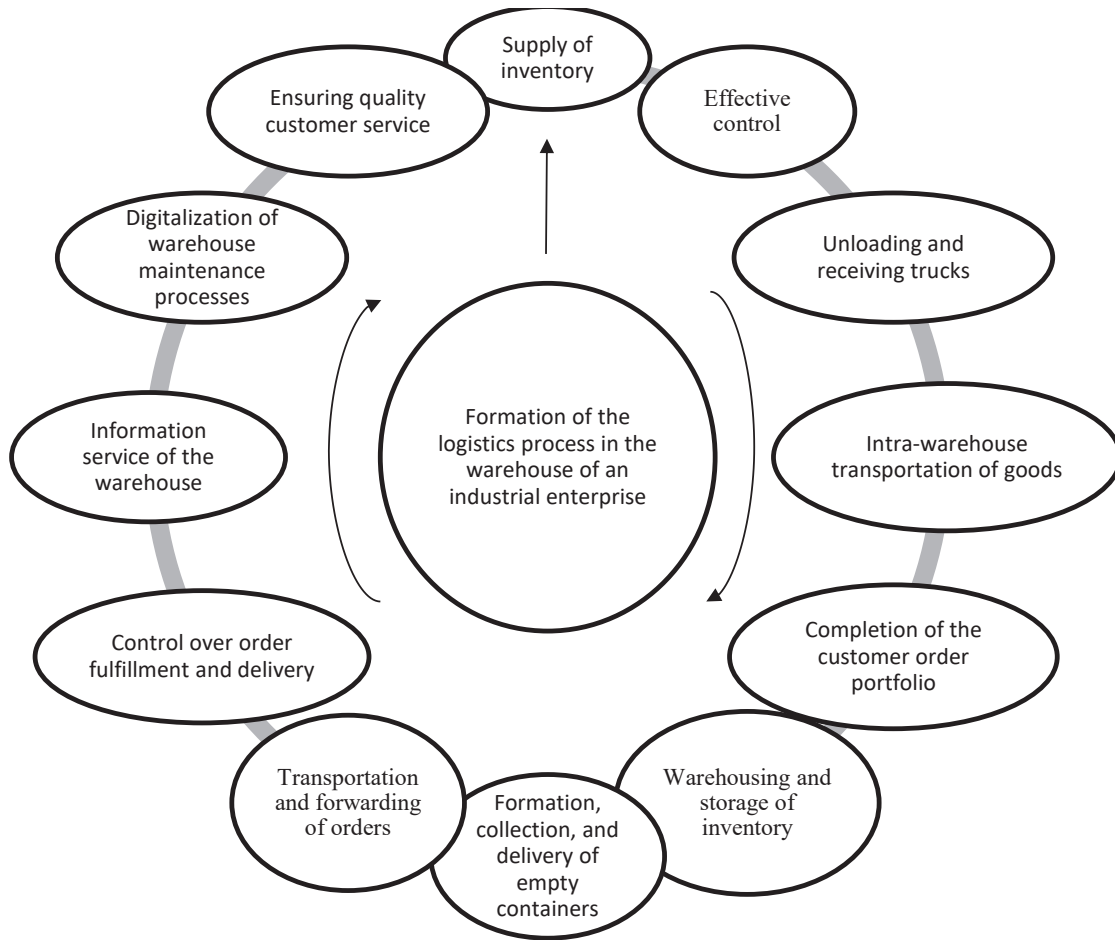


Fig. 2 – Organization of the logistics process in the warehouse and its stages

Source: [6]

- operations are carried out using modern equipment and means of mechanization and automation;
- storage and processing operations are carried out with minimal loss of raw materials and reduced product quality;
- the rational organization of technological processes should guarantee a reduction in storage costs and an increase in the quality of the company’s work.

Under certain conditions, the technological process of complex cargo mechanization is developed on the basis of a delivery and warehouse plan received from the supplier, a plan for a typical technological process of complex cargo mechanization, and the selection of lifting and handling equipment.

Before developing technological processes for loading and unloading operations, the following tasks should be performed [10]:

- study of technical processes of transportation, nomenclature of stored goods, standards, technical conditions of transportation, storage, management, packaging and labeling;
- familiarization with the structural features of the warehouse;
- analyzed the frequency of material deliveries, the volume of deliveries and the volume of shipments;

- development of technical plans for the supply of goods, reflecting the sequence of unloading and loading, transportation and warehouse operations;
- determining the required warehouse space and the number of lifting and handling and storage equipment;
- their optimal selection and size;
- calculation of the required number of warehouse containers and warehouse workers.

When developing technical processes under certain conditions, the scope of work is determined in accordance with the nature of the goods being processed.

Technical processes are documented in the form of flow charts, instructions, process maps, and schemes for the operation of machinery and lifting and handling equipment.

A flowchart defines the direction of goods movement, the number of technical tasks, the nature of each mechanization, and indicates the type and type of machinery or equipment used to perform a specific task. Flowcharts are used to create flowcharts and help organize technical processes. Unlike flowcharts, in addition to the sequence of technical operations, they contain a brief description of the equipment (specifications), time standards for each operation, and safety instructions.

One of the main documents is a material layout diagram. Technical instructions are drawn up for individual

operations that are distinguished by their own characteristics and particular complexity. This is particularly true for flammable and toxic cargo. Technical instructions provide a more detailed description of technical processes than flowcharts or diagrams. The instructions provide requirements and industry standards for production and handling operations and can improve the organization of warehouse operations. After the development of technical schemes and flow charts, a schedule for the operation of machinery and equipment is drawn up [1].

The specificity of calculations and the correct organization of the process is ensured by the development and use of contact schedules, which are drawn up on an hourly basis and provide information on the dynamics of hourly mutual contact of various transport, loading and unloading and technical means and changes in the material balance.

Schedules are drawn up on the basis of a certain amount of loading and unloading and warehouse operations to be performed per day or per shift for each unit in general and in particular, as well as taking into account hourly productivity [4].

The program determines the efficiency of using each type of equipment and the workload in different areas and operations. The graph shows the process of receiving and sending goods and their placement in the warehouse.

Control over the implementation of technical processes includes the following main components [2]:

- 1) a clear division of responsibilities between employees;
- 2) strict adherence to the norms of the internal distribution, production and economic system;
- 3) strict adherence to the content and sequence of operation of equipment, mechanisms and tools as defined by schedules, diagrams and maps;
- 4) ensuring timely planning and informing about the need for vehicles delivered to and taken from the depot, as well as strict compliance with the terms and procedure for accepting vehicles from the depot and executing the necessary documentation.

Conclusions

The technical processes in logistics facilitate the movement of material flows and are determined by a set of technical and organizational requirements. Transportation requirements are met by transport logistics, namely freight transportation. A single technological process helps to accelerate the turnover of vehicles and performs transportation using the internal resources of industrial enterprises. The formation of stocks at industrial enterprises encourages the organization of warehouse operations, which stimulates the digitalization of logistics processes at enterprises in today's changing conditions.

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