

## Seminar 10

### Topic: Manufacturing logistics

Questions:

1. The concept of production logistics
2. Types of production
3. Principles of production organization.
4. Traditional and logistic concepts of production organization
5. Push and pull systems for material flow management in logistics systems
6. Production planning management

#### 1. The concept of production logistics

The material flow on its way from the primary source of raw materials to the final consumer passes through a number of production links. The management of the material flow at this stage has its own peculiarity and is called production logistics.

**Production logistics covers the planning, management, execution and control of all material flows and the information flows belonging to them.** Production logistics regulates the supply of production equipment, ensures "transfer" between departments (intra-production transport and intermediate storage) and distribution.

*Example* : the layout of production equipment in a workshop is planned in such a way that, if possible, there are shorter routes for raw materials and semi-finished products.

**The goal of production logistics** is to optimize material flows within enterprises that create material values or provide such material services as storage, packaging, weighing, etc. A characteristic feature of the objects of study in

production logistics is their territorial compactness. In the literature, they are sometimes called "island logistics objects."

**Logistic systems** considered by production logistics are called intra-production logistics systems. These include: industrial enterprise;

- ✓ wholesale enterprise,
- ✓ having storage facilities;
- ✓ junction freight station;
- ✓ hub seaport, etc.

Intra-production systems can be considered at the macro and micro levels. At the macro level, intra-production logistics systems act as elements of macro-logistics systems. They set the rhythm of these systems and are sources of material flows. At the micro level, intra-production logistics systems are a number of subsystems. These subsystems (purchasing, warehouses, production maintenance, transport, information, sales and personnel) ensure the entry of material flow into the enterprise, its passage within it and the exit from the system.

**Enterprise logistics must ensure the possibility of constant coordination and mutual adjustment of the actions of supply, production and sales links within the enterprise.**

## **2. Types of production**

The organization of production processes, the choice of methods of preparation, planning and control largely depend on the type of production at the enterprise.

**Type of production** is a comprehensive characteristic of the technical, organizational and economic features of production, determined by the degree of specialization, complexity and stability of the manufactured range of products, the

size and repeatability of the output. There are three main types of production - single, serial and mass.

**Single-piece production** is the production of a wide range of products with different purposes but similar design features. These products are produced in limited quantities. An example of such production is the production of products by fashion designers and designers or the production of warehouse equipment to order. But even in the production of individual products, individual processes can be organized on a serial basis (warehouse equipment, for example, is an exclusive product, and fasteners for racks are serial).

**Serial production** is a process in which a product of a relatively limited range is cyclically manufactured in quantities determined by a batch (series). A series should be understood as a certain number of structurally identical products.

**Mass production** is characterized by a continuous process of manufacturing a large number of goods of a narrow range. Mass production enterprises provide a high level of specialization of workplaces.

### **3. Principles of production organization.**

Modern production, especially of a fairly large scale, is the subject of detailed study from a theoretical point of view. Observation, subsequent analysis and generalization of the obtained results of the work of real enterprises allow us to formulate in general terms a number of principles for organizing highly effective production processes:

1. *Proportionality* – the productivity per unit of time of all production units of the enterprise (shops, sections) and individual workplaces must be proportional.
2. *Differentiation* – division of the production process of manufacturing identical products between separate divisions of the enterprise (for example, according to technological characteristics).

3. *Combination* – unification of all or part of different processes for the production of a certain type of product within one section, workshop, or production facility.

4. *Concentration* – concentration of the execution of certain production operations for the manufacture of technologically homogeneous products or the execution of functionally homogeneous work in separate areas and workplaces.

5. *Specialization* – assignment of a limited range of operations and products to each division of the enterprise.

6. *Universalization* – a certain workplace or production unit is engaged in the production of a wide range of products and parts or the performance of various production operations.

7. *Standardization* is the development, establishment and application of uniform conditions that ensure the best possible flow of the production process.

8. *Parallelism* – simultaneous execution of the technological process at all or some of its operations. The implementation of this principle significantly reduces the production cycle of the product.

9. *Straightness* is the requirement for the straight-line movement of objects of labor along the technological process, that is, along the shortest path for the product to pass through all phases of the production process without returns in its movement.

10. *Continuity* – minimizing all interruptions in the production process of a particular product.

11. *Rhythm* – release of equal quantities of products at equal intervals of time.

12. *Automation* is the maximum possible and economically feasible liberation of the worker from manual labor costs based on the use of automatic equipment.

The organization and maintenance of effective rhythmic work of each enterprise and its production units in accordance with the specified principles allows eliminating traditional losses of resources of working time of workers and equipment for organizational and technical reasons and provides competitive advantages due to leadership in terms of minimum costs.

#### **4. Traditional and logistic concepts of production organization**

**The logistics concept** of production organization includes the following **main provisions** :

- ✓ refusal of excess stocks; refusal of excessive time for performing basic and transport and warehouse operations;
- ✓ refusal to manufacture series of parts for which there are no customer orders;
- ✓ elimination of equipment downtime; mandatory elimination of defects; elimination of irrational intra-plant transportation;
- ✓ transforming suppliers from adversaries into friendly partners.

Unlike the logistics concept, **the traditional concept** of production organization assumes:

- ✓ never stop the main equipment and maintain a high utilization rate;
- ✓ manufacture products in the largest possible batches; have the largest possible stock of material resources.

**The traditional concept is most** suitable for the conditions of a "seller's market", and **the logistics concept** is most suitable for the conditions of a "buyer's market". When demand exceeds supply, you can be sure that the manufactured batch of products will be sold, so the equipment is loaded to the maximum. Moreover, the larger the manufactured batch, the lower the cost price of a single product. The task of sales is not the first priority.

The situation changes with the arrival of the buyer's "dictatorship" on the market. The task of selling the manufactured product in a competitive environment

comes to the fore. The inconstancy and unpredictability of market demand make it inappropriate to create and maintain large stocks. At the same time, the manufacturer no longer has the right to miss a single order. This creates the need for flexible production capacities capable of quickly responding to emerging demand.

Production in a market environment can survive only if it is able to quickly change the range and quantity of manufactured products. Until the 1970s, the entire world solved this problem by having finished product stocks in warehouses. Today, logistics offers to adapt to changes in demand by having a reserve of production capacity. A reserve of production capacity arises when there is qualitative and quantitative flexibility in production systems. Qualitative flexibility is ensured by having universal service personnel and flexible production. Quantitative flexibility can be ensured by having a reserve of equipment and labor. For example, at some Japanese enterprises, the main personnel makes up no more than 20% of the maximum number of workers, the remaining 80% are temporary workers.

## **5. Push and pull systems for material flow management in logistics systems**

The management of material flows within the framework of intra-production logistics systems can be carried out in various **ways** , of which **two main ones are distinguished : pushing and pulling.**

**The first option is called a “push system”** and is a production organization system in which items of labor arriving at a production site are not directly ordered by that site from the previous technological link.

The material flow is "pushed" to the recipient by a command received by the transmitting link from the central production control system. The pushing system controls the output of products through the main production plan and, depending on

it, consistently determines the volumes of stocks of unfinished production. The pulling system, on the contrary, controls stocks of unfinished production and controls the output of products.

**Push models of production management are typical for traditional methods of production organization.** The possibility of their application for the logistics organization of production appeared in connection with the mass distribution of computer technology and corporate information systems (MRP and MRP II). These systems allow coordinating and promptly adjusting plans and actions of all divisions of the enterprise taking into account constant changes in real time.

The push system tries to anticipate the future and release the product when the product is planned to emerge. In this case, the master production plan is broken down into master production plans for individual components of the final product. As a rule, a recurrent (return) mechanism for planning batch sizes and production schedules is used. It is implemented using complex information systems.

**The pull method of organizing logistics processes** in production is based on a fundamentally different method of managing the material flow and is a production organization system in which parts and semi-finished products are fed to the subsequent technological operation as needed. Here, the central control system does not interfere with the exchange of material flows between different sections of the enterprise and does not set current production tasks for them.

The production program of a separate technological link is determined by the size of the order of the subsequent link. The central control system sets the task only for the final link of the production technological chain.

**The pull system** reacts to the reduction of stocks in the warehouse or at a certain stage of the product production to a certain level. The recurrent planning system is replaced in this case by the adjustment of production processes, which, as a rule, are very flexible and adjusted to demand.

**The pull system** does not require a complex planning mechanism, which can be easily done during production with the help of.

In other words, the pushing system is a counteraction system (works in the pulling mode), and the pulling system is a response system (works in the pulling mode).

*Example.* An enterprise has received an order to manufacture 10 units of products. The control system transfers this order to the assembly shop. The assembly shop requests 10 parts from shop #1 to fulfill the order. Having transferred 10 parts from its stock, shop #1 orders 10 blanks from shop #2 to replenish the stock. In turn, shop #2, having transferred 10 blanks, orders materials from the raw materials warehouse to manufacture the transferred number of blanks, also to restore the stock. Thus, the material flow is “pulled” by each subsequent link. Moreover, the personnel of an individual shop is able to take into account many more specific factors that determine the size of the optimal stock than the central control system could. In practice, the Kanban system developed by Toyota is considered a pulling intra-production system.

It is known that 95-98% of the time during which the material is at the manufacturing plant is spent on loading and unloading and transport and storage operations. This determines their significant share in the cost of finished products.

A logistic approach to managing material flows at an enterprise allows for maximum optimization of the execution of a set of logistic operations. According to Western European companies, a 1% reduction in expenses for executing logistic operations had the same effect as a 10% increase in sales volume.

**The components of the overall effect from the application of the logistics approach** to managing the material flow at the enterprise are as follows:

- ✓ production is market-oriented; an effective transition to small-scale and individual production becomes possible;
- ✓ partnerships with suppliers are being established;



- ✓ equipment downtime is reduced. This is ensured by the fact that the work places have the materials necessary for the work;
- ✓ the quality of manufactured products is improved;
- ✓ the production cycle is reduced and costs are minimized.

## **6. Production planning management**

Effective organization of production processes, the choice of methods of preparation, planning and control largely depends on the activities of the logistics service at the enterprise.

When developing a production planning management system, it is necessary to take into account the type of production and the specifics of the relationship between production and the sales department.

**Production and sales** are complex and multifaceted functions, informationally and technologically intensive, and the activities of these two departments may not be coordinated with each other due to the high workload of their employees. In this case, the logistics department becomes an intermediary between them. Logisticians perform the task of drawing up production plans and monitor their implementation.

When drawing up production plans, customer needs are taken into account in specific time periods to ensure a high level of customer service for the company. This means that logisticians determine at what time and in what quantities production areas need to produce products and monitor the implementation of plans. In the event of failure to fulfill production plans, the company incurs losses from unsold goods in the short term and from the possible loss of customers in the long term (in specialized literature, this is called a "deficit penalty").

Excess of goods also leads to additional costs for the enterprise, as there is a diversion of funds in stocks, finished products take up space and there is a possibility of loss of goods upon expiration of the shelf life (food products). All this

indicates the need for clear production planning to eliminate problems of shortages and large inventory balances during production.

In addition, only by knowing when the production of a product will begin and how much time it will take, what materials, parts, components, tools are needed, can logisticians organize their timely delivery. In case of untimely supply, it is impossible to ensure uninterrupted production. The production planning function of the logistics department can be provided effectively, since the incoming, internal and outgoing flows of the manufacturing enterprise are monitored. The production department or the marketing department are not able to ensure the efficiency of the planning function due to the specifics of their activities.

For example, sales and marketing prepared a forecast for the next month and gave it to the logistics department, which is responsible for shipping to customers and supplying the plant. The same sales forecast was received by production workers. But they, as a rule, do not see and do not understand the priority of products and release them in a sequence that is convenient for them. If logisticians do not influence when and which product will be ready, they cannot perform their main function - to ensure the management of the movement of material assets in order to meet customer needs.

**In the absence of production planning and control, it becomes necessary to create large safety stocks of finished products, since it is not known when the products will be manufactured - at the beginning or end of the month (for example, with a monthly production cycle, the safety stock must be at least a month). The same situation applies to raw materials and supplies, since their monthly stock must be delivered by the first of the month, because there is no exact production schedule. Consequently, independent planning of finished product release by the production department leads to increased costs. Before starting to change the existing situation, it is necessary to develop an algorithm**

**for transforming the relationships between the enterprise departments and the planning procedure. The changes must be step-by-step.**

**Stage one.** For effective production planning, it is first necessary to reach agreements with production and the sales department. First, for example, agree that production receives the sales plan not directly, but in the form of an order from the logistics department. Logisticians adjust the production plan indicators for the amount of stock in warehouses, since the marketing and sales departments, as a rule, do not take stock into account when drawing up a plan.

**Stage two.** Developing and implementing a monthly production plan taking into account priority items. This means compiling a list of product items that must be placed in the finished goods warehouse no later than certain dates. The logistics department will be able to better organize the work of supplies and warehouses, which will be able to contain a smaller stock of each product item.

**Stage three.** Introduction of a weekly breakdown of the production plan. To do this, the logistics specialist needs to know the daily productivity of machines and production routes (for example, the sequence of parts passing through the workshops), the possibilities of parallel production of different types of products, the number of workers, etc.

**Stage 4.** Daily planning and production schedule. For example, daily work assignment for each line and machine.

After launching the production management program, it is necessary to regularly monitor the implementation of plans and, if necessary, adjust them. If the organization has a controlling system, this is not difficult.

When a company sells a lot and there is not enough capacity, you cannot do without aggregate planning. An aggregate plan allows you to get a bird's eye view of how the company will act in the next quarter or year. In this case, it determines how the company will use its capacity to meet demand in the medium and long term.

The process of aggregated production planning allows us to answer the following questions:

- ✓ how much and when should be produced in the next three or more months;
- ✓ what capacities will be involved;
- ✓ how it will vary from month to month (seasonality);
- ✓ how many workers need to be hired to fulfill the plan.

As a rule, an aggregate plan is made for a period of three months to one and a half years. With longer terms, the error will be too great, so it is recommended to enlarge the time periods. It is considered normal to break it down into 10-20 segments, when planning for three months - into weeks, for a year and a half - into months, for 2-3 years - into quarters.

The next important point is the creation of product groups or families. Firstly, the aggregation of demand at the group level provides a more accurate forecast than at the item level. Secondly, a wide range is more difficult to plan. As a rule, products are combined into families based on marketing approaches, but they must also have common technological requirements, the same labor costs per unit of production and incoming materials.

**And finally, the most important component of any planning is sales forecasting.** The sales forecast is the most important initial information used in the planning system. Therefore, its quality is very important. As a rule, sales and marketing departments are engaged in forecasting. The logistics department already uses the finished result in its work. For example, without a sales forecast, it is impossible to plan the number of vehicles needed to deliver goods to the company's customers.

Thus, the most important link between the sales department and production is the logistics department. With high-quality planning and control of production plans, the logistics of the enterprise achieves the main goal in its activities -

accurate and timely provision of goods to the company's clients with a minimum of costs and losses for its own enterprise.