

Fundamentals of Machine Production and Assembly Technology

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Abstract:

The article contains brief information about the basics of machine production and assembly technology, the factors required for the types of machine production and assembly technology, the problems in them, their solutions and constructions are written, the tasks of production, assembly, calculation and design of road construction, transport and technological machines are seen. The article covers the main principles and general conditions of machine production and assembly technology, which is necessary for students to master the course of machine production and assembly technology, and further improve their knowledge. Development and assembly technologies of road construction lifting-carrying machines and issues of structure design for surface problems are covered.

Keywords: machine tool, differential, technological process, productivity, component product, detail, equipment, production rhythm.

Introduction

The contribution of machines performing technological processes plays an important role in the development of economic sectors. In particular, earthmoving and road construction machines are used on a large scale in the construction of the elements of the structure of highways, in particular, the foundation, road foundation, road surface base and pavements. At the same time, the use of this type of machines in mining, hydrotechnical constructions and railway construction serves to finish the construction works on time and ensure economic efficiency indicators in the use of the machine.

The uniqueness of mechanical engineering technology is that it has developed as a science from relatively recent times, and its formation is related to practical necessity, but at the same time, it can be shown that it has absorbed the foundations of many theoretical sciences.

Mechanical engineering is the basis for the creation of means of production, and is one of the important technical directions indicating the level of development of the state. For these reasons, the development of the machine-building industry in Uzbekistan is considered one of the important elements of the state policy.

Facilitating Factors in Curriculum Implementation

Within a short period of time after the independence of Uzbekistan, a number of machine-building enterprises equipped with modern technologies and equipment were launched in our country. As a result, our country became one of the countries that moved from a country producing raw materials to the path of industrial development with modern machine-building enterprises.

A technological process is a part of the production process and consists of a set of operations that depend on the change of the state of the product. The technological process may include mechanical processing, heat treatment, welding, assembly, and similar technological methods.

A technological operation is a complete part of a technological process and is performed at one place of work.

In machine tool cutting, the operation includes the operation of the worker on the machine tool and other worker and equipment movements, from the time the part is removed from the machine tool.

For example, processing of cylindrical surfaces of two outer parts of the shaft can be done in one or two operations. If a part is processed on one machine first on one side and then on the other side, this is considered one operation. If one side of the detail is performed on the first machine and the other side on the second machine, this will be two operations.

Technological operation serves as the basic unit in the calculation of technological processes. The type and number of devices, the cost of part preparation, unit or complete assembly of the product largely depends on the method of organization of operations.

Operations can be differentiated or centralized depending on the organization.

Differentiated technological process consists of a set of technological operations, which complete processing of details or assembly process are performed separately. The complete processing of the detail is carried out on separate machines, when using this method, the technological chain includes a large number of machines, and the part is placed many times during the processing period. The organization of the technological process in this system is convenient when the product is produced in small quantities, and the flexibility of the technological chain is high, that is, the equipment can be adapted to the production of another product in a short time. It does not take much time to adapt the technological chain to produce another product.

A centralized technological process is a technological process of detail processing, which consists of the transformation of a number of simple technological operations into one complex operation. In particular, it is possible to give an example of simultaneous processing of several surfaces of the part with the help of a large number of cutting tools. A high level of centralization of the technological process leads to a decrease in labor costs of operations, an increase in work productivity and processing accuracy.

Centralization of operations can be done in three different ways: serial, parallel and mixed.

In the technological process of serial concentration, the shearing devices are activated sequentially, and in parallel, they work in series at the same time. When there is a mix, both series and parallel operation of cutting tools are observed.

Installation is a work that is performed by locking the detail in one position, which is part of the operation. In the example given above, the machining operation of the two sides of the shaft in one machine is performed in two setups.

Positioning is the fixed position of the part being processed with respect to the fixed part of the equipment together with the device it is covered with. For example, processing on a 6-spindle semi-automatic lathe can be demonstrated. In this operation, the part is moved by 60 degrees to move from one state to another in 6 states. So, the work performed on this machine consists of 6 positions.

Methodology

The fewer the installations and the more cases in the technological process, the higher the processing accuracy and productivity.

Technological (perechod) transition is a complete part of a technological operation, which is carried out in a continuous technological procedure (mode) in one installation using one technological tool and tool. A change in any of these conditions will trigger a new transition. For example, when making a precise hole, it is processed first with a drill, then with a countersink and a reamer, so it counts as 3 passes; when processed with each tool, a new surface is formed and is characterized by its own roughness. The technological transition can be carried out in one or several working cycles.

Working stroke (shaft) is a part of a technological transition and is determined by a one-time shift of the tool relative to the detail. The shape, size, quality and material properties of the detail surface may change during the working process.

In the implementation of technological operation and transitions, auxiliary transitions and walks are observed.

An auxiliary transition is a part of a technological operation, in which the characteristics of the product do not change as a result of the movement of people and equipment, but its execution is necessary for the execution of the technological transition (installation of the part, its hardening, tool change, etc.).

An auxiliary walk is a part of a technological transition, consists of one shift of the tool and is necessary for the implementation of the working walk.

A technological process can have a large number of operations and a small number of transitions in them, or vice versa, a small number of operations and a large number of transitions in them.

A product is a thing that is formed at the last stage of production, determined by number or copy. Depending on the nature of the production, it can be a product-machine, a machine element or a separate detail. For an automobile plant, the product is a car, and for a motor plant, it is an engine. Depending on the function of the manufactured product, they can be the main and additional production products. The first type of product includes products manufactured for sales and the foreign market, and the second type includes products manufactured to meet the personal needs of the enterprise.

A detail is a product made from the same material without the use of assembly operations. These include a one-piece shaft and cast body.

An assembly is a product (machine tool, engine, etc.) created by assembling its constituent elements. The constituents of the product can be individual parts, assembly units, and also parts with high complexity. Organizers are divided into three types. The organizers of the first order are directly part of the product. It consists of a separate detail, several second-order parts and details. The founders of the second order belong to the founders of the first degree. It is divided into details and third order organizers.

A semi-finished product is a product delivered by a supplier that requires further processing or assembly.

The component product is the component of the product prepared by the supplying company and produced by the company. Engine, transmission, bearings, and other aggregates and units produced in other factories can be shown as an organizer in the automotive industry.

Zagotovka is a production tool, which is turned into a detail by changing its shape, size, surface roughness, and material properties.

Production intensity (speed) is characterized by the tact and rhythm of preparation. The production cycle is the period of time during which the product is periodically released from the enterprise. The amount of tact can be calculated analytically as follows:

$$T = \frac{\Phi}{D};$$

where Φ -enterprise working time per year, s;

D is the amount of product produced during the year.

In many (mass) production enterprises, the time required to perform each operation must be equal to or a multiple of the production cycle, otherwise the synchronicity of execution of operations will be broken.

The rhythm of production refers to the amount of production of a certain type and size per unit of time. The volume of production is the amount of products planned to be produced in a specified period of time. Production program (program) - a document indicating the type, volume and production periods of the products to be produced.

A workplace is a place where workers performing work, technological equipment they serve, or a certain part of a conveyor are located as part of a production network.

Production process and its stages

The production process refers to the movement and influence of people and equipment in the production of a product in an enterprise.

The production process includes the following stages:

- ✓ creation of production means and environment;
- ✓ acquisition and storage of materials and semi-finished products;
- ✓ processing of details;
- ✓ assembly of assembly units;
- ✓ transportation of material, details, products;
- ✓ technical control at all stages of production;
- ✓ general assembly of the product;
- ✓ testing and control and maintenance;

Preparation of the production process:

- ✓ creating or obtaining a technical task;
- ✓ product design; - creation of technological documents;

- ✓ construction and equipment of the enterprise;
- ✓ selection and placement of personnel;
- ✓ creation and operation of the supply system;

Types of production enterprises.

will be as follows: - mass production;

- ✓ serial production; - mass production.

Bulk production enterprises are characterized by the production of many types of products in small quantities (several units per month or year).

These types of businesses include prototype machines, unique metal cutting machines, and similar low-run products.

Serial production enterprises are characterized by the fact that the types of production of products are periodically changed. Enterprises of this type, in turn, are divided into small, medium and large serial production enterprises.

Mass production enterprises are characterized by a small number of products and a large volume. Most of the enterprises that manufacture cars, tractors, refrigerators and similar products on a large scale belong to this type.

In mass production, most of the operations of preparation and assembly of details are carried out by the flow method.

In mechanical engineering, it is necessary to divide enterprises into types, and some production enterprises may have production methods belonging to different types of production in different departments at the same time.

Conclusion

Usually, the coefficient of connection of operations is used as a criterion for evaluating the type of production. This coefficient is determined by the ratio of all operations performed during the month to the number of jobs:

- ✓ for small series production enterprises, this indicator is $-20 < K_o < 40$;
- ✓ for medium mass production enterprises - $10 < K_o < 20$;
- ✓ mass production. for enterprises- $1 < K_o < 10$;
- ✓ for mass production enterprises – $K_o = 1$.

Product quality is a set of features of a product that serves to fulfill its intended function.

Several types of indicators have been adopted to evaluate the quality level of products: - task indicator - determines its field of application; - reliability indicator; - readiness (technological) indicator; - ergonomic indicators. (convenience); - indicator of compliance with the standard and generalization; - patent law indicators; - economic indicators; - safety indicators.

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