DESIGN OF A MECHANICAL WORKSHOP FOR THE MANUFACTURE OF PARTS OF THE "BODY" TYPE ON CNC MACHINES

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Abstract: This article contains the official purpose of the body part, its manufacturability, the use of modern CNC machines, the stages of manufacturing the part, the design stages of the machine shop, the calculation formulas

Key words: Hull, manufacturability, CNC, manufacturing process steps, type of production, load factor, machine shop.

The “Body” part is a casting, in which a number of surfaces are subject to processing - planes, holes, ends, internal threaded surfaces. The shape of the part resembles a complex-shaped bracket with many stiffening ribs and critical surfaces. the casting is made of SCh 18 gray cast iron and is a casting of the II complexity group of the III class of accuracy (casting "into the ground").

The part itself is very technologically advanced, since it does not have hard-to-reach surfaces. However, the requirements for accuracy and surface roughness of this part are very strict and high, since the part is the main part of the assembly unit and wears out, and that is why it is important to meet the requirements for surface roughness.

All representatives of the engineering field know that, with the advent of CNC machines, human work has become much easier, but along with this, the quality of parts processing has also increased.

For the manufacture of parts, there are basic steps:

I. Analysis of initial data;

II. The choice of workpiece and its economic justification;

III. Designing a technological processing route;

IV. Choice of technological equipment;

V. Filling in technological documentation;

VI. Rationing of technological processes;

VII. Design of technological equipment;

VIII. Evaluation of the economic efficiency of the developed technological process.

This is how the design of the technological process for manufacturing a part in mechanical engineering looks like. But in order to get to the design of the manufacturing process of the part,. It is necessary to design a mechanical workshop in which the entire manufacturing process of this part will take place directly. This process will be more laborious and long.

First of all, the structure of the workshop will depend on the type of production, the nature of the design of the part being produced, the weight of the part, and, of course, the conditional number of metal-cutting machines.

The stages of designing a machine shop can generally be divided into the following:

I. Development of a task for the design of the workshop, based on the production program of the plant, drawings, descriptions of structures, technical conditions.

II. Development of the technological process of mechanical processing, depending on the type of production and its organizational form.

III. Determination of the number of machines and their load factor.

IV. Determining the needs of the shop for electricity, gas, steam, water, compressed air.

V. Determination of the required working composition of the workshop and its number.

VI. Development of a plan for the location of equipment and determination of the production area.

VII. Determination of the amount of equipment and areas of auxiliary departments of service and amenity premises.

VIII. Selecting the type of transport and lifting equipment and determining their number.

IX. Layout of the workshop, determination of the main dimensions.

X. Development of a scheme of organization, management and technical guidance.

Based on the above points, it is required to calculate the production program:

Based on the data obtained, the type of production is determined.

$$Кз.о. = \frac{Fд \cdot 60}{N \cdot Tшт_{ср} \cdot Ky}$$

In serial production, universal and specialized machines, CNC machines equipped with both special and universal and universal assembly fixtures are used, which makes it possible to reduce the labor intensity and cost of manufacturing the product, as well as quickly reconfigure the machines for the production of another batch of parts. Turret turning, multi-cutting and multi-spindle machines are widely used.

The development of the technological process includes the entire process of manufacturing the body part, starting from the sketches of the workpiece, machining and ending with the final product that meets all the requirements.

Determining the amount of equipment on the site.

In serial production, the operational estimated number of machines is determined by the formula:

$$Cp = \frac{\sum T_{ШТ-К} N}{60 \cdot F_{Д}}$$

where ΣТШТ-К - piece-calculation time of operations performed on the machine of this model, min;

N - annual output of the part, pcs;

FД - the actual annual fund of the production time of the equipment, hour;

The estimated amount of equipment is always rounded up to a whole number.

The number of production workers for each workplace is individually determined by the formula:

$$P_{см} = \frac{\sum T_{шт-к} \cdot N}{60 \cdot F_{др}}$$

The equipment on the site plan is located by type of processing. In addition, on the site there is a place for a master, a place for an inspector, a workbench for metalwork, a washing machine, containers for blanks and finished parts.

To determine the area occupied by machines:

$$S=S^1+S^2+S^3+\ldots+Sn \text{ м}^2$$

The article describes only a summary of the stages of a large project, ultimately the project, there is a machine shop with CNC equipment for the complete processing of a body part from base processing to the very final product in the form of a body that meets all requirements. As a result of the use of CNC machines, the need for workers is much reduced and not as labor intensive as in conventional machines. That saves on labor costs

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