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ISSUES OF INCREASING THE EFFICIENCY OF THE MATERIAL CUTTING PROCESS

Akbarov Khatam
PhD in Engineering Science,
head of the department "Mechanical Engineering Technology" of the Andijan Machine Building Institute,
lpi1982@mail.ru, +998902538655

Yakhshiboeva Azizakhon
Graduate student of the department "Mechanical Engineering Technology" of the Andijan Machine Building Institute,
lpi1982@mail.ru, +998902538655

АННОТАЦИЯ

Кесувчи асбобларда ишлаш қобилятини ва жараён унумини аниқлаш учун умумий вазифалари хамда металларни силлиқлаб ишлов бериш имкониятларининг тахлили келтирилган. Жараён ва дастгоҳ уними курсаткичлари машинанинг ишлаб чиқаришда қўлланилишга яроқлилигини аниқлаш учун ўлчанган.

АННОТАЦИЯ

Представлен анализ общих функций режущего инструмента и возможностей шлифования металлов для определения обрабатываемости и производительности процесса. Измеряются выходные параметры процесса и машины, чтобы определить пригодность машины для производственного использования.

ANNOTATION

An analysis of general cutting tool functions and metal grinding capabilities is presented to determine the machinability and productivity of the process. Process and machine outputs are measured to determine the suitability of the machine for production use.

Калит сўзлар

Иш қисми, силлиқлаш металл, родс, ўқли бармоқ фрезалар, ишлов бериш, кесиш асбоблари, карбид, фрезалаш, кесиш тезлиги, сирт сифати, қайта ишланган материалларнинг физик-механик хусусиятлари.

Ключевые слова

Заготовка, шлифовка металла, стержни, фрезы осевые концевые, механическая обработка, режущий инструмент, твердый сплав, фреза, скорость резания, качество поверхности, физико-механические свойства обрабатываемых материалов.

Key words

Workpiece, grind metal, rods, mills are an axial blade tools, machining, cutting tools, carbide, milling cutter, cutting speed, surface quality, physical and mechanical properties of processed materials.

Types and classification of cutting tools are one of the most popular types of metal processing is cutting. This type of processing is used in the creation of aerospace equipment and for baby strollers. To grind metal, a cutting tool and special technological equipment are used.

Basic metal cutting tools for metal processing are classified by design and type of surface being processed. In addition, it is necessary to remember that each class is divided into varieties.

By design, blade tools are divided into:

- Turning cutters are divided into through, cutting, threading, and groove. In addition, left and right produce. Some are used with normal feed of a caliper with a cutter attached to it, others with reverse feed.
- Drills are an axial type tool. They can be manufactured with one or more blade edges. They are used to form holes in the workpiece. They are formed when the drill rotates around its axis and feeds it into the body of the workpiece. Drills are divided into right and left; the latter are used in mechanized drilling of parts. For example, when preparing holes in car engine housings. This class also includes reamers, countersinks, counterbores, etc. They are designed for processing holes after drilling. For example, with the help of reamers, the resulting holes are finished, that is, they are brought to the required size and surface roughness.
- Files are a tool in the form of rods or plates, on the surface of which a large number of cutting teeth are formed. Designed for manual work with metal. With their help, burrs and irregularities are removed from the product.
- Broaches are rods with blades applied to the surface. They are used to produce shaped holes, for example, keyway or splined grooves in pulleys or gears. The broach is a rod, the diameter of which gradually increases towards its tail.
- Mills are an axial blade tool designed for turning workpieces that are fixed on the work table and move with it relative to a rotating cutter. They are divided into cutters for general use, worm cutters, for producing gears, engraving cutters, key cutters, etc. They are used to produce complex surfaces, for example, in the production of molds or dies intended for metal forming.
- To obtain external and internal threads, two main types of cutting tools are used - taps and dies (dies). The tap is a steel rod on the surface of which there are longitudinal flats and grooves that form cutting edges. The die is a disk with cutting blades formed inside it. External threads are produced using dies. They produce two types of taps - manual and machine. The first ones are used for manual processing. The second ones are installed in machine tools. It should be noted that machine taps can also be used for manual processing of holes.
- For the production of gears, cutters, gear cutters, and shaver are used.
- Abrasive and grinding wheels are used for rough and finishing metal processing. This tool is a circle made of an abrasive material, such as silicon carbide. Small particles of abrasive remove a specified layer of metal. Such circles are used for cleaning surfaces from traces of corrosion and processing products after heat treatment.

The above is a general classification of cutting tools. Meanwhile, all tools produced in the country must comply with GOST requirements; there are standards for turning tools, taps and dies.

One of the main regulatory documents that defines some parameters of a cutting tool is GOST 25751-83. It defines terms used in industry and technology, which are common to all types of blade cutting tools, in addition, it defines terms and concepts related to metal-cutting tools.

All presented tools meet the accuracy standards defined in GOST and TU. In addition to them, some industries use tools manufactured on the basis of industry standards.

Cutters used for turning rotating bodies (turning), planning, used for processing flat work pieces, for example, for removing a layer of metal during major repairs of machine tools. During the formation of the work piece, the cutter moves along the axis of its rotation. The main characteristics of turning tools are the size of the holder. That is, the component on which the cutting plate is fixed has a functional purpose. The grade of material from which the cutting part is made also plays an important role. More we will discuss below.

In the process of cutting metals, the cutting tool is subjected to high pressure from the cut layer and heat, which causes its wear. Therefore, the main requirement for cutting tool materials is wear resistance at high heating temperatures for a long time. This requirement is ensured by the high hardness of the material in the heated state and its red resistance.

Currently, in mechanical engineering, tool carbon, alloy and high-speed steels are used for the manufacture of cutting tools. In addition to the listed steels, plates of hard metal-ceramic and mineral-ceramic materials are also used.

Tool carbon steels currently have limited use due to their low red resistance. Although tools made from this steel have hardness after heat treatment of HRC 60 - 63, when heated to 200 - 250°C, the hardness drops sharply and the tool becomes dull.

Cutting tools operating at low cutting speeds (V ≤ 10 m/min), for example files, hacksaw blades, taps, dies, etc., are made from tool carbon steel grades У10А, У12А.

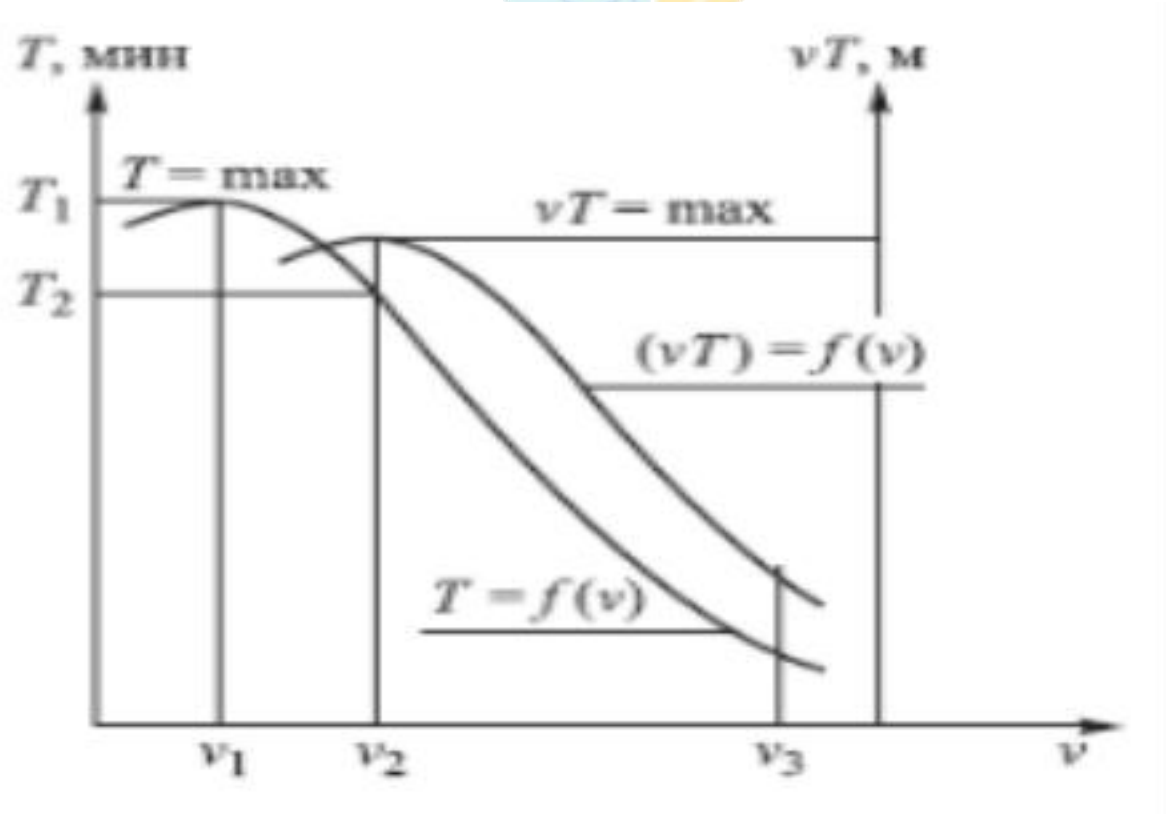
Let's in this part of this article we will introduce the concept of "operational life", in other words, the service life of a cutting tool, characterizing the operating time until the cutting tool fails, and taking into account the fact that restores ability is an integral part of the technical resource. Time to failure can be assessed by various indicators. The most commonly used indicator in metal cutting is the service life T. Service life T is the operating time of the tool until the tool wear reaches the established dullness criterion. Recommended values for the dullness and resistance criteria for these conditions are given in regulatory documents. Durability values are expressed in minutes of machine time. Operating time is characterized not by time, but by the amount of specific work performed during the durability period. Such work includes the length of the cutting path, the number of processed work pieces, etc. Let's consider the indicators for assessing tool life. It should be noted that the dependence of tool life on cutting speed T= f (v) in a wide range of cutting speeds has the form of extreme curves with a maximum in the region of low cutting speeds (picture 1). The formation of a maximum on the durability curves is due to the fact that during operation at given speeds, build-ups are formed on the cutting blade. Cutting speeds, where there is a maximum on the T= f(v) curves, are the most optimal, are recommended and used when processing tools with limited cutting speeds due to technological indicators and operational requirements.

Dependency graphs Efficiency indicators are characterized by dependencies that include vT (speed times durability). For example, the volume of metal Q removed from the work piece during turning can be calculated using the formula:

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$$Q = \frac{1000st(D - t)}{D}vT$$

where s is feed; t—depth; D—diameter of the work piece; v—cutting speed; T - tool life.



Picture 1.

Using the following formulas, you can calculate, respectively, the area of the machined surface A, the volume Q or the mass of metal m/p removed from the work piece, the total nominal length of the hole L, machined with axial tools:

A = 0,001vTs; Q = 10–6vTst; mp = 10–6ρ vTst;

$$L = \frac{1000s_0}{\pi D}vT$$

CONCLUSION

Thus, the stability of the cutting tool is determined based on the maximum productivity of the machine and the lowest cost of the part. Such stagnation is called economic stagnation, and the corresponding rate of shift is called the economic rate of shift.

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