RELATIVITY HIGH SPEED MACHINING WITH ADDITIONAL ENERGY FLOW TO THE CUTTING AREA

Kabulov Mukhammadali Ergashalievich
Associate Professor of Namangan Institute of Engineering Technology
Email: kabulov1961@mail.ru
Tel: +998913609052

Juraeva Gulkhayo Ravshanbekovna
Assistant of Namangan Institute of Engineering Technology
Email: juraeva89@list.ru
Tel:+998994066711

Abstract:	Keywords:
The article analyzes the advantages of high-speed processing with the supply of additional energy to the cutting zone on the processed steel parts of technological machines and equipment.	**cutting zone, deformation, hardened steel, energy flow, heat quantity, dies, molds, cutting zone, residual stress.**

In modern production, refined steels are widely used in mechanical processing, in particular in the production of dies and molds. Very high requirements are imposed on the quality of their working surfaces, and achieving this at a low cost remains an urgent problem at the moment.

Because steels have high hardness and brittleness after machining, their machining presents some difficulties, including poor stability of the cutting tool, slow cutting speed and unsatisfactory surface quality, which in most cases must be corrected by additional highly skilled workers. However, due to defects in the working surfaces, the reliability of the axes is not very high. All of the above disadvantages can be overcome by using highly efficient processing methods. In recent years, high speed blade machining has been widely used in the production of refined steel parts.

In 1931, Karl Salomon first proposed high-speed machining of refined steels. He proposed increasing the cutting speed by 5-10 times compared to machining at normal cutting speeds, with a decrease in the amount of heat transferred from the shaft to the cutting tool.

Due to the lack of high-speed equipment and low corrosion resistance of the tool material, it has not been possible to introduce high-speed machining into production for a long period of time. Currently, with the advent of new generation equipment, the cutting speed can be increased to 500-5000 m / min, and high-precision machining is widespread, mainly in the United States, Europe and Japan. However, the process that allows you to control the cutting modes is RDB. The problem of low stability of the cutting tool is solved by the creation of new modern tool materials (cubic boron nitride, new types of diamonds and alloys with improved properties).

The goal of high speed machining is to transition to cutting at very high speeds [1]. As the speed Vkr increases, the cutting temperature decreases, and at the same time the shear separation process changes. Instead of the plastic separation that occurs when the material is separated from the cut layer, brittle separation occurs.

As a result of the high temperature in the cutting zone, the friction coefficient of the cutting tool against the workpiece decreases.

High-frequency vibration occurs in the technological system. As a result of plastic deformation, the broken chips turn into elementary chips.

Thus, with the introduction of high-speed processing, it is divided into several advantages at once: Achieved reduction of technological time for processing parts; the appearance of elementary scrap makes it easier to automate production work; the quality of the surface layer of the part is higher than with other methods (due to the low cutting force and low cutting speed).

High speed cutting (HSC - High Speed Cutting) is a special term for modern production technologies. In principle, it is fundamentally different from conventional milling. In it, using a rotating cutting tool (milling machine), a layer of material is cut from the workpiece. However, the cutting speed and thrust values for high speed milling are 5-10 times higher than for conventional milling. For materials such as steel, their value ranges from 500 to 1500 min-1. This high cutting speed is controlled by a high pushing speed. High speed milling also cuts processing time 5-10 times compared to traditional milling.

One of the main advantages of high-speed milling is a decrease in heat generation during cutting and, firstly, high heat transfer - impermeability of the cutting tool to wear, and secondly, it negatively affects the quality of the surface layer of the part.

It is known that the temperature of the cutting surface also affects the magnitude and sign of the residual stress in the part. High thermal loads cause tensile stresses that lead to fatigue cracks on the surface.

The problems of high-speed machining are little studied in different countries, especially in Russia. This topic is relevant mainly for Germany, France and the United States. Belo w we briefly describe the researchers who conduct research in this area and their achievements.

In his scientific work "High-speed milling (on Hermle materials)" Galika AG proved that the bulk of the heat is transferred to the shaft during high-speed machining, where the axial thrust rate is higher than the thermal conductivity of the material being processed.

T.Skopesek, Y.Svoboda and P.Hoffmann [2] described in their articles the results of experimental milling of refined steels. They concluded that the effect of the thrust rate on some of the heat dissipation would be slightly higher than the shear rate.

At the top of the stop, the part of the cutting heat transferred to the workpiece is proportionally reduced, while the surface temperature of the workpiece to be machined decreases. In addition, the surface of the workpiece is exposed to light heat loads during high-force machining. Hazardous residual voltages occur in small quantities. The outlook for high speed machining is high. High speed machining is what it is today. Machines, cutting tools, software are now being "improved". The mass introduction of high-speed

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processing into production is still an urgent problem due to the lack of virulence and low speed of existing equipment, as well as the lack of technology.

R.Vaurzynyak's article "The Continuing Debate Between High-Speed Machining and EDM in Press and Die Manufacturing" describes the difficult situation with equipment for the production of molds and dies in the United States.

Under pressure from Chinese competitors with their cheap labor force, American firms are forced to introduce highly efficient but expensive equipment, primarily for high-speed machining.

Analysis of the market for the production of dies and molds showed that high-speed machining replaces EDM equipment by making one part. Based on this, we can conclude that high-speed processing is a very promising process. Here are some ways to improve the situation in the future:

1). Increase the processing speed; 2) increase traction; 3) Improving processing precision and quality of the surface layer, thereby eliminating the need for final operations in the future and achieving durability and longevity of parts.

Based on the foregoing, it can be concluded that in the conditions of a further increase in the efficiency of high-speed processing in the manufacture of stamped dies, it is possible to control the quality of the surface layer of a part during high-speed processing of refined steels.

High-speed processing of the blade with an additional flow of energy into the cutting zone. With the development of technology, materials are widely used that are difficult to process with existing technology. Therefore, new highly efficient methods with additional energy in the cutting zone are being developed further. A number of research scientists are working on their creation. Researchers [3] classify these methods according to the appearance of energy, the method of its generation, the type of physical and mechanical impact and the formation scheme (fig. 1).

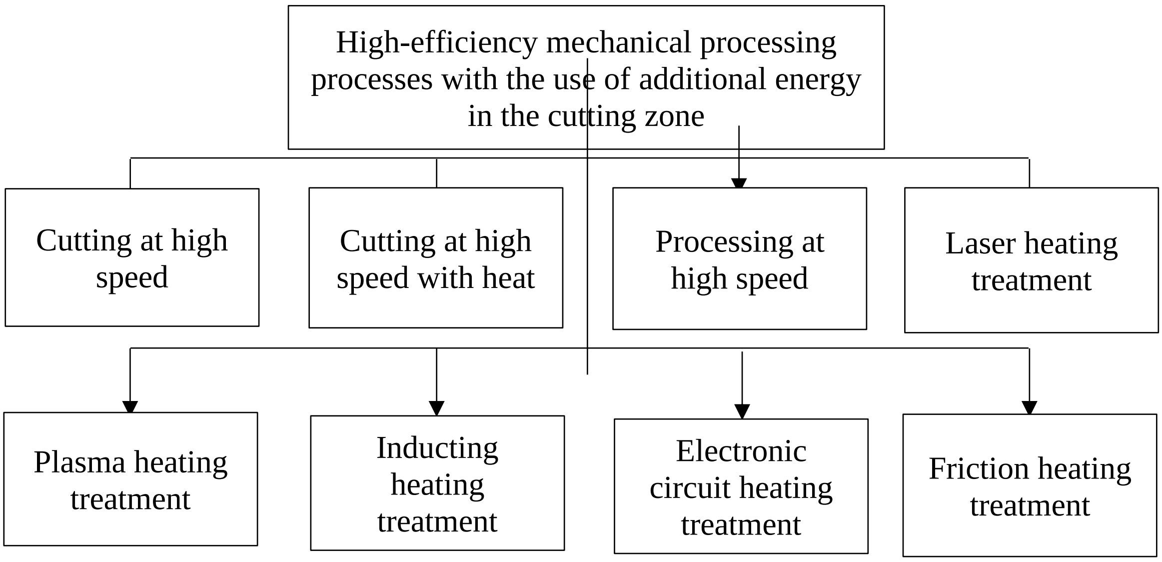

Figure 1. Highly efficient processing method diagram

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Conclusion

Thus, there are a large number of different methods of high performance machining, which have their own advantages and disadvantages. High-speed processing of blades of die and mold parts made of refined steels is efficient, provides the required quality of the surface layers of parts and does not require additional equipment or asbestos.

List of used Literature

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