

CONSTRUCTIVE METHODS TO ENSURE THE ACCURACY OF TECHNOLOGICAL-QUALITY INDICATORS GEARS

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Abstract: : One of the problems of modern engineering is to increase the reliability of critical machine parts, which is largely determined by their performance characteristics and quality of the surface layer.

Due to the increasing quality requirements of such devices increasingly important in the final stage of the process giving zagatovki smearing, allotment of her material handling, heat, etc.

The efficiency process of machining metals the wear of cutting tools, surface quality and other characteristics of the accompanying process of cutting depends on the properties of the environment in which the cutting. Forced changes in the properties of this medium - a way to manage the process of cutting and wear of cutting tools, optimization of the machining of metals.

The technological environment has lubricating, cleaning and cooling action. The value of each of these steps depends on the properties of materials and details of the tool and the type of machining operation.

Key words: *processing, increase the reliability, lubricating coolant.*

1. INTRODUCTION

Most processes in the metalworking industries involving cutting or pressure, it is impossible to imagine without coolant lubricant. This grinding, milling, drilling of ferrous and nonferrous metals, iron and alloys, rolling, stamping, burnishing, etc. For all of these processes are characterized by high dynamic and static thermal load on the rolling, cutting equipment and other tools.

Therefore, the main requirements for lubricating fluids are reduced to the ability of cooling cutting tools, reduce technological processing parameters (power, etc.) to prevent premature wear of the rollers and die machines, providing high quality machined surfaces.

The use of lubricating fluids and greases others not only helps to minimize manufacturing defects, increase productivity, industrial machinery, but also reduce the production chain by reducing the number of operations, and provide better working conditions for workers of industrial plants.

On the composition of the whole range of lubricating fluids are classified as follows:

1. Liquid (water miscible, instant).

2. Oil (base - mineral oil) with anti-friction, anti-foam, fog additives and corrosion inhibitors, etc. [4]

Oils without additives suitable for the treatment of carbon steel, brass, bronze and copper, but only in limited mode of cutting metal. It is difficult processed metals and alloys are cooled enriched compositions.

As for the performance of a coolant, the principal are considered, as the name implies, lubricating and cooling properties. Oil liquid has an excellent performance, but at the same time, have a higher volatility and flammability.

In aqueous lubricating compositions has its advantages - first of all, it's a higher cooling capacity, fire safety and relatively low price. On the other hand, the water miscible liquids is characterized by more foam and less resistance to microorganisms. In addition, we have to solve the problem of disposal of the waste composition.

Here's why, when choosing a lubricating coolant should be based on specific technical problems and conditions that will be operated by a liquid.

It was first developed a set of water-based lubricants and process for casting aluminum alloys under pressure. [5] Designed on a new level water - graphite coolant for hot metal forming processes - hot stamping, hot drawing of pipes, hot-rolling. The introduction of smokeless incombustible water coolant instead of oil lubricant for hot metal working processes has significantly improved environmental and sanitary conditions of the industry.

Also known magnetic coolant effectiveness of this kind of process fluids depends not only on their chemical composition, but also on the method of delivery to the processing zone. The most common coolant get into the processing zone in the form of a free-falling jet. In addition, in some cases using high-pressure jet cooling, where coolant is fed under pressure from 2 - 3 MPa to the back surface of the tool cutting a thin stream through a nozzle diameter of 0.3 - 0.5 mm. Relatively frequently used method of

cooling and lubrication of the treated area of liquid spray, while the jet is fed air-liquid mixture obtained in a special spray device.

On the mechanism of influence on the processing of magnetic coolants lubricants, apparently similar coolant, but unlike the latter magnetic coolant can be fed to the cutting area by using a magnetic field. Under his influence is enhanced by improving the cleaning effect of wettability, lubricating action intensifies, as conditions improve penetration of magnetic coolants on the contact surface of magnetic fluids have a greater cooling effect, because of the heat capacity and thermal conductivity greater than basis.

Magnetic fluids can be used when conventional coolant supply and how to apply, for example by using mechanized hand tools when working at high altitude, in a closed insulated space and other special conditions. In this regard, the use of magnetic fluids in metal can and should be considered as a new submission process fluid to the cutting area by using directional magnetic field.

Exceptional importance is the use of such fluids with the development of space research and space technology. Undoubtedly, in the near future there will need to perform such simple machining operations as drilling, deployment or calibration holes and thread them carving in high vacuum and weightlessness during installation, repair and restoration work on the orbiting station. In these circumstances, we should expect the difficulties associated with the possibility of cold welding (as in vacuum welding) tool with the material being treated. The fact that the distance from the surface pressure of the environment - air - falling sharply. Thus, at an altitude of 20 km it is about 5.9 - 103 Pa, and at an altitude of 200 km - only 3.8 10⁻⁴ Pa. The orbital space stations are orbiting far from the surface of the earth for 350 - 400 km, where the ambient pressure is even lower. Due to lack of oxygen required for the formation of the working surfaces of the instrument of protective oxide films, the adhesive is setting the friction surfaces and the formation of bridges of cold welding. The use of conventional coolant can not be sent because of the complexity of their delivery and collection of boiling and evaporation.

Conventional water-based coolant at such low pressures (vacuum) can not be used as a pressure about 600 Pa or less, water and fluids based on it can only be in a solid state (ice) or superheated steam. The magnetic fluid is heated in a vacuum does not work as usual, and coolant under normal conditions. They provide normal conditions for the cutting and collection of chips produced by the magnetic field, regardless of the magnetic properties of the material, which is especially important in the absence of gravitational forces.

In carrying out research on drilling holes in the titanium and aluminum alloys noticed an interesting

fact of the magnetic field at the nonmagnetic chips, baking magnetic fluid, the latter attracted to the magnetized and attracted to drill a non-magnetic chips.

The forces of adhesion between the chip and the liquid was enough to hold the drill at a relatively large number of chips (Figure 1). This phenomenon opens up new possibilities of using coolant.



Figure 1. Magnetized drill shavings from a nonmagnetic titanium alloy VT1 - 0, holding it by the magnetic fluid.

This type of coolant can be used, such as technological environments to collect non-magnetic materials. This material may not be the only chip non-magnetic metals, but also other non-magnetic objects such as industrial waste, garbage and more. You can collect such highly dispersed materials such as sludge and abrasive dust generated during abrasive machining of metals. Sputtering of magnetic coolants in a stream of air containing dust particles are moistened with a drop of liquid non-magnetic abrasive dust and make them magnetically prone to the influence of a magnetic field through which the flow of dusty air. In a magnetic field, the air is cleared, as the magnetic fluid wetted dust particles under the influence of non-uniform magnetic field of the IBC to the poles of magnets attract each other and settle on them.

In the magnetized drill magnetic coolant is kept in proportion to the magnetic field at a given point. Coolant is deposited on the drill and distributed by its cutting edges under the influence of a magnetic field with light contact drills with the top surface of the liquid in the tank, situated in a cone-shaped protrusions (Fig. 2) in areas with the largest magnetic field on the cutting edges of drills working on his part unstable layer thickness. Greater volume of coolant is

held in the intersection of main and auxiliary cutting edges and on the lintel.

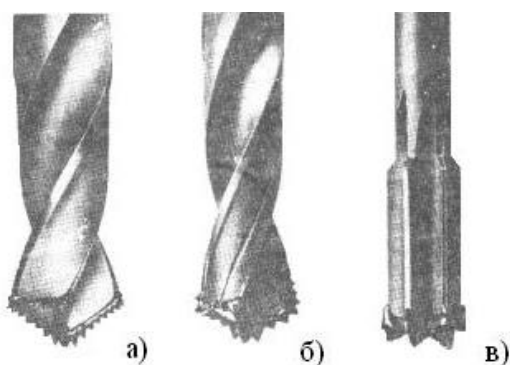


Figure 2. Drill (a, b) and Frequency (c) with magnetic coolants: a - at $B = 40$ mT, b - at $B = 30$ mT, in - at $B = 25$ mT.

Analysis of magnetic characteristics of the drill showed that the magnetic induction is maximal at the points of intersection of the cutting edges of tools, that is at the top of the drill - the points of intersection of the main cutting edge of the auxiliary and main and auxiliary rear surfaces of the surface flute drill. At these points, the magnetic induction is about the same and is 40 - 45 mT at the magnetomotive force (MMF) 1.5 kA. As the MMF on the tops of the magnetic induction, and at other points of the cutting edges increases (Figure 4). In the middle of the main cutting edge is smaller than at the edges and vertices. Along the length of the auxiliary cutting edge of the magnetic induction decreases with increasing distance from the top.

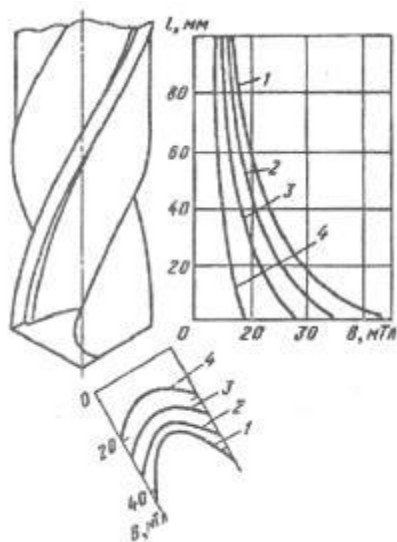


Figure 3. Distribution curves of magnetic induction in the field by the length l of the cutting edges of the magnetized bits at different MDS F : 1 - for $F = 1,5$ kA, 2 - with $F = 1,0$ kA, 3 - with $F = 0,5$ kA, 4 - at $F = 0$ (remanent magnetization).

For the magnetization of the cutting tool can be mounted permanent magnets on the clamping or cutting parts, and the magnets must be protected from external influences. Case 2 (Figure 4) are made of

nonmagnetic material (steel 12X18H10T). Permanent magnets are placed in three cavities of the body 2 or in a container 12 (as of a nonmagnetic material). The magnetic flux from pole permanent magnet is applied to the cutting part of the magnetic core 6, made in the form of steel rods or four channels, which are densely filled with magnetic iron powder 5. Naturally, the channels of complex shape is better to fill the iron powder, and their output of short tightly closed steel rods (caps) 4 to avoid stretching of the magnetic powder of the channels by changing magnets or cutting blades.

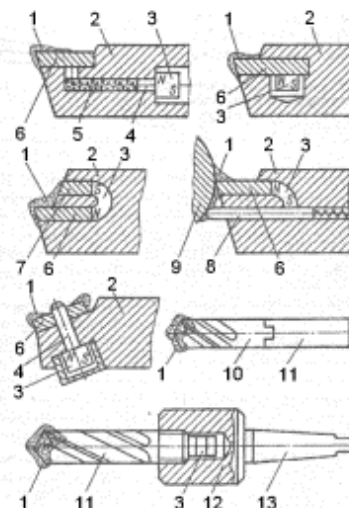


Figure 4. Options for creating a magnetic field on the cutting part of the instrument.

Permanent magnets can be mounted directly on the cutting tool plates with light conditions when the magnets are not subjected to high temperatures at which they lose their magnetic properties. In other cases, the permanent magnets should be placed in locations quite remote from the cutting zone and protected from the effects of high temperatures. The closure of the magnetic flux is not necessary but desirable for a more rational use of energy permanent magnets.

In the process of magnetic coolants, got on the working edge is moved through the channel in the area of greatest strength of the magnetic field under the MDC, aimed at the region of maximum field strength, and falls into the cutting zone - on the cutting edge. Under the action of heat in the cutting zone magnetic properties of the coolant deteriorate, so that it shall be made chips from the cutting zone. Chilled outside the cutting zone coolant recovers its magnetic properties and then drawn into the cutting zone under the action of the magnetic field.

Thus, the supply to the cutting area of magnetic cutting fluid and holding it to the cutting blade at any position the tool in a high vacuum and other harsh conditions increase the service life of cutting tools, reduce roughness and increase the quality of the machined surface.

2. LUBRICATING COOLANT

The rational selection and development of highly efficient coolant with a deep study of the possible nature of the interaction of components, which are complex multi-component composition of processed materials and tools during the cutting process. In the engineering industry in the processing of metal cutting fluids are used to reduce wear, increase the resistance of the treated tool, reducing the height of asperities. Adding the corresponding surface-active agents (surfactants) as additives to the coolant significantly improve their technological properties. Due to its cleaning, dispersing, wetting, foaming, and many other properties of the surfactants have become indispensable in many areas of food production. [6]

Until now widely used in machine oil or oil-cutting fluids and lubricants (up to 70-90% oil), adversely affecting the environment. In the course of repeated use in metal working coolant exhausted and lose their technological properties. When the continued use of the spent coolant is not possible, there is a need to remove it from the system and replace with fresh. Regeneration of spent coolant technology is complex and requires special equipment. Spills, splashes, chips and losses from the wipes, the lack of effective methods of recycling, just drain cutting fluids into drains lead to contamination of soil, water and air.

In addition, when used, due to burning of oil in the contact zone with the machined metal tools, the air of industrial premises oil mist is formed, which adversely affects the lungs working. Similar problems exist in other sectors and industries. Thus, in the construction industry for the manufacture of mold release of concrete products also use oil-emulsol, waste oils and petroleum lubricants, which are also a source of environmental hazard to the environment. In addition, when used in contamination of the surface of the concrete products. Speakers at the surface of the dark oil stains degrade the quality of subsequent finishing facilities under construction.

In engineering and other industries for cleaning, degreasing and reactivation surfaces of equipment and parts are widely used organic solvents and a variety of technical cleaning products. Known TCP is usually used in the heating mode of process solutions, due to the additional energy costs. Organic solvents are toxic and their disposal has its difficulties, and also a cost. At the enterprises, as a rule, quantitative account of such contamination is not made, and therefore not taking steps to reduce them. This situation, which resulted in creating environmental hazard, particularly true for cities such as Novosibirsk, which are focused multiple metalworking, machine-building enterprises. Called me a list of pollution sources indicates that the

reduction of environmental pollution requires radical solutions: non-oil-money, the replacement of organic solvents and other toxic assets.

3. CONCLUZII

1. Based on the analysis of completion of construction of the piece as it is proposed the technological indexes of the technological system construction gear.

2. The song is based indices tehnologicității a method of calculation of the technological indices of construction gear.

3. He developed a method for assessing the technological construction gear on at all stages of design.

4. CORRESPONDING ADDRESSES

For any type of problems please contact me on the following email address: s_mazuru@mail.utm.md (Professor Sergiu Mazuru, Ph.D).

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