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FEATURES OF PROCESSING NON-FERROUS METALS ON DRILLING MACHINES. MATERIAL PROPERTIES, PROCESSING PROBLEMS AND WAYS TO SOLVE THEM.

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Annotation: *The article reveals the features and positive aspects of non-ferrous metals, the predominant qualities that prevail over ferrous metals in the production of many parts. The relevance of this topic on the example of a wide range of non-ferrous metals*

Keywords: *Non-ferrous metals, copper, brass, bronze, aluminum, metalworking, heat treatment, machining.*

Today, the volume of processing of non-ferrous metals is growing strongly. For example, we will use aluminum, which is the second most popular metal.

Non-ferrous alloys are widely used and dominated by their capabilities:

transport: cars, trucks, buses and trains, where the use of aluminum reduces weight. Cylinder blocks, pistons and radiators are made from it.

Mechanical engineering: production of various structures, including from specially designed profiles.

Aluminum alloys are used in electromechanical devices, construction and as a packaging material.

The reason for this is the attractive combination of low density, high strength, good conductivity and ease of disposal.

Non-ferrous alloys, with their lightness, have a good margin of safety. According to the criterion of specific strength (the ratio of the strength parameter to the mass of the metal), they surpass even some steel grades. In simple terms, a part of greater strength can be made from a kilogram of a non-ferrous alloy than from a kilogram of steel.

Also, non-ferrous metal alloys are practically not subject to corrosion. An impenetrable oxide film quickly forms on the surface of the parts, which is chemically inert and protects the metal from atmospheric action.

Non-ferrous metals are a soft and ductile material that lends itself well to machining (milling, drilling, turning, etc.). The cutting conditions in this case can be much higher than when machining structural steels. This is due to lower loads during chip removal, as well as a high coefficient of thermal conductivity of non-ferrous metals, due to which heat is well removed from the cutting zone along with chips without overheating the tool.

Metalworking of non-ferrous metals and alloys is carried out taking into account the following factors:

High thermal conductivity and specific heat capacity.

A sharp decrease in mechanical properties when heated, which can lead to easy destruction from impact.

Chemical interaction with environmental gases during heating.

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Taking into account these and other factors, thermal and mechanical processing of non-ferrous metals is carried out in a special mode, according to the developed technological scheme. When metalworking on machine tools, the optimal rotation speed and a special tool are selected.

Metal cutting is the process of cutting a metal layer in the form of chips from the surface of a workpiece with a cutting tool to obtain the required geometric shape, dimensional accuracy, relative position and roughness of the workpiece surfaces. In order to cut a layer of metal from a workpiece, it is necessary for the cutting tool and the workpiece to communicate relative movements. Therefore, the tool and the workpiece are installed and fixed in the working bodies of the machines that provide these relative movements: in the spindle, on the table, in the turret, in the tool magazine. The movements of the working bodies of machine tools are divided into cutting movements, installation and auxiliary. Movements that cause a layer of metal to be sheared from the workpiece are called cutting movements. These include the main cutting motion Dr and the feed motion Ds. The main motion determines the rate of deformation and chip separation, and the feed motion ensures the continuous penetration of the cutting edge of the tool into the workpiece material. These movements can be continuous, intermittent, rotational, translational, but the main movement is always one, and there can be several feed movements. The speed of the main cutting movement is designated V, the feed movement speed is Vs. Movements that ensure the relative position of the tool and the workpiece for cutting off a given layer of material from it are called installation movements. Auxiliary movements include fixing the workpiece and tool, fast movement of the working bodies of the machine, switching the speed of cutting movements, transporting the workpiece, etc. and the position of the tool relative to the workpiece, as well as the cutting movements and their nature, for example, rotational, reciprocating (Fig. 5.1). The method of fixing the workpiece is shown semi-constructively or by conventional signs. When cutting on a workpiece, a workpiece surface is distinguished from which the allowance is cut off; the machined surface from which the allowance is cut; and a cutting surface formed during machining by the main cutting edge of the tool.

Particular attention is required to protect parts from environmental influences. Non-ferrous metals are resistant to corrosion, but are destroyed over time by the action of oxygen. One of the best protection options is the use of paintwork materials. For this, three categories of products have been created - paints, primers and universal protective materials.

Primer formulations provide excellent protection against atmospheric oxidation. Before painting, one- or two-layer priming is carried out. In addition to the protective properties, this also increases the adhesion of the paint to the base. To protect parts made of aluminum and alloys based on it, special zinc-based primers or urethane paints are widely used.

On non-ferrous metals and alloys such as copper, brass or bronze, protective paint coatings are usually not applied. The parts and products made from them are delivered with factory processing, which plays both a protective and aesthetic role. Copper develops a noble patina over time, which protects the surface and enhances the beauty of the product. Moreover, in certain cases, artificial aging technologies are also used to give the products a greenish patina layer.

Sometimes, when processing alloys from non-ferrous metals, negative effects also occur.

The first is the high viscosity of some alloys. In this case, there is a tendency to form long chips that wind around the tool and clog the flutes, resulting in breakage of the cutter or drill. Therefore, on a tool for processing non-ferrous alloys, large chip grooves are made. Although this limits the number of teeth on the cutter to two or three.

The second negative effect is outgrowth. This is a phenomenon in which there is a spot welding of the material being processed on the cutting edge of the tool in the cutting zone. The

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consequence of this is the blunting of the cutting edge and an increase in the load on the tool, as well as difficult chip flow due to the deterioration of the roughness of the front surface of the tool. Tool manufacturers combat this phenomenon by increasing the smoothness of the front surface (for example, by additional polishing or applying an ultra-smooth coating), and by setting specific rake and relief angles.

When the material is deposited, the groove becomes clogged, which leads to an unbalance of the tool. When the cutting edge becomes dull, the tool overheats, which can lead to jamming and, as a result, to breakage of an expensive tool. The degree and depth of surfacing of the material is affected by cutting conditions, the geometry of the cutting tool, the degree of its blunting, i.e. all factors that determine the flow of plastic deformation in the cutting zone.

Increasing the cutting speed affects the decrease in the depth and degree of surfacing, and the feed and depth of cut - to increase them.

Thus, non-ferrous metals are being explored more and more opportunities open up in many areas of production. Today, this topic is relevant for further study and discovery of even greater advantages of these metals, its melting, processing and manufacturing of parts.

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