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Processing methods with imposing of electric field at low-waste division of materials

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Abstract. Due to everything extending practice of electrochemical processing of firm alloys the important role is got by studying of their electrochemical behavior. Management of the combined process of probably independent change of parameters of a chemical and mechanical component with restrictions of their limiting values.

1. Introduction

Procuring operations on division of all types of materials include manual and machine cutting on the equipment of different function. Are for this purpose used as traditional ways (the press, the metal-cutting equipment with the metal and abrasive tool, etc.) and new types of processing (the laser is sharp, electroerosive division, ultrasonic processes). In mechanical engineering there is a reliable information about the mastered methods, their limiting possibilities and shortcomings. With increase in a share of expenses at materials there was a problem of research of new types of division of materials, especially it concerned scarce and expensive alloys of type of precious metals, tungsten, magnetic alloys, fragile semiconductors where the exit of suitable details after processing became less than a half of initial weight, and the defects brought in a blanket at cutoff, remained in a product and reduced its characteristics

In world practice division of materials generally carry out the reinforced disks, an electroerosion, an ultrasonic method, the laser. However, such methods don't allow to provide demanded rather high requirements for accuracy, quality of a blanket, productivity, decrease in losses of a material. Besides, the majority of applied methods causes environmental pollution (a dust when using an abrasive, etc.)

Combination of various impacts on object of processing allows to design the combined methods, in particular electroabrasive (electrodiamond). These methods are applied for are sharp when receiving preparations with the subsequent processing which in some cases (manufacturing of details of devices, radio engineering, control facilities) is undesirable since leads to unjustified losses of a material, to secondary errors and defects, sharply increases cost of products. Establishment of unequivocal communications between properties of processed materials, a combination of impacts of the combined process allows to create the modern automated equipment with management of a mechanical, chemical, erosive component in the uniform process, providing receiving after division of materials of ready details 30 microns with a margin error aren't higher and with a roughness 0,32 microns aren’t higher. Negative impacts on environment are thus eliminated and to 2 times the cycle of manufacturing of details is accelerated.

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Use of similar processes accelerates creation of new competitive products, expands technological possibilities of production, promotes decrease in deficiency and costs of materials. It is actual for modern mechanical engineering and meets world requirements to new production.

The combined methods of processing are directed on an intensification of process of anode dissolution. Speed will eat metal and accuracy of a formoobrazovaniye at electrochemical processing depend on that, there will be how fast a reaction of transition of a material of preparation in шлам. Speed of anode dissolution is limited to existence of the film passivating a surface, and thickness of a diffusive layer which is overcome by deleted products of processing.

At electroabrasive grinding (abrasive grains or a filler) eliminate firm particles a film, activating thereby process of electrochemical processing. The sizes of abrasive grains defining an interelectrode gap, as a rule, don't exceed the tenth shares of millimeter. At such small gaps the density of a current will be much more, than in case of dimensional electrochemical processing. Speed metal sharply increases in an area of coverage of abrasive grains of the tool. Besides, the part of an allowance is removed mechanical grinding. Unlike usual grinding at anode and abrasive processing on a surface of preparation stronger riveted layer isn't formed, and productivity of grinding raises. Therefore, intensity removal metal at anode dissolution increases owing to mechanical removal of a passivating film and acceleration of process of carrying out of products of processing from an interval, and electrochemical dissolution of a part of metal, in turn, promotes increase of speed of mechanical grinding. Except the specified components removal at small gaps electroerosive process can take place. At the small sizes of a gap the part of metal of preparation is removed at the expense of an electric erosion [2].

For more complete use of advantages of electrochemical processing it is necessary to project details taking into account features of process of anode dissolution of alloys. It is necessary to consider that at electrochemical processing there is no division into draft and fair operations - at any mode to electrochemical processing the height of roughnesses corresponds to fair operations of machining, and with increase of speed removal metal the roughness of a surface decreases. Unlike machining technological indicators to electrochemical processing even raise with increase in hardness of a material of preparation. Besides, at electrochemical processing the tool either doesn't wear out at all, or wears out inappreciable (at the combined way of processing).

Dimensional electrochemical processing considerably expands technological possibilities of manufacturing of details. Thanks to it it is possible to receive forms of the surfaces which creation by other ways or is impossible, or it is unprofitable.

Applied methods of division of metals allow, generally to carry out procuring operations where high precision and quality of a blanket which are provided at the subsequent stages of processing demanding considerable allowances on process, having high labor input and specific power consumption isn't required.

The analysis of known processes and the equipment shows that it is possible to reach high precision of details at division at the expense of establishment of regularities of process under variable conditions of processing, creation of automated control systems by process with adaptation of parameters, in particular tool giving – a disk, managements of its condition at are sharp, control and correction of provision of a cutting part in a groove.

The second effective direction of researches on decrease in losses of scarce materials is equipment use with deduction of details before the completion of calibration of lateral surfaces of a groove.

Prospects of use of results of work in other branches applying precious and scarce materials (a medical technology, stomatology, control facilities devices, electric sockets, etc.) where the economy from elimination of losses of metals can make the considerable sum are opened.

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material of preparation. Besides, at electrochemical processing the tool either doesn't wear out at all, or wears out slightly (at the combined way of processing).

2. Conclusions

Thus, increase of accuracy of processing at the minimum losses of a material at division is possible when using regularities of process of division by disk tools with settlement geometrical parameters at adaptive management on several coordinates, creation of new ways of management by the provision of various parts of the tool and groove calibration after preparation division with the minimum allowance.

The exception of the subsequent operations on processing of places of division of details allows to accelerate several times processing process, considerably to increase accuracy and quality of details, to lower an expense of scarce materials.

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