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Methods Of Dimensional Finishing Of Stamps From Steel Type X12ф1

Umarova Mavludaxon Nazirovna
Ph.D., Associate Professor, Andijan Machine-Building Institute, Uzbekistan, Andijan

Xakimov Nodir Nurulloyevich
Assistant,Andijan Machine-Building Institute, Uzbekistan, Andijan

ABSTRACT

The metal marking specified in the article meets the standards of the CIS state.

Currently, the most commonly used process in metalworking is cold stamping of metals. This process involves the production of a large number of parts per unit of time and minimal consumption. The topic covered in the process is dedicated to improving the accuracy of stamps.

This article examines the dimensional annealing process of X12Ф1 grade steel. Due to the high content of carbide phase in the steel grade X12Ф1, its mechanical strength is lower. Therefore, X12Ф1 steel is used for the manufacture of tools that are less important, but simpler in construction. Therefore, the introduction of the optimal option of annealing methods in the heat treatment of steel grade X12 allows to obtain tools of complex shape from this type of steel.

KEYWORDS

Cold stamping, abrasion, tempering and tempering temperature, heating, spinnerets

INTRODUCTION

Stamping is a method of obtaining complex shaped objects by pressing with special stamps. They are divided into the following types:

1. **Heat stamping** - by heating the workpiece in special stamps are obtained items called stamping.

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2. Explosive stamping - in such stamping liquid or gas pressure is used, the sheet preparation takes the form of a matrix under this pressure.

3. Electro-hydraulic stamping - such stamping is similar to blast stamping, in which a shock wave is generated by an electric discharge generated in a liquid.

4. Cold stamping - in many production conditions this method is used in the production of various metal parts from steel, non-ferrous metals and their alloys.

There are pressure tools for heating metals and alloys, and pressure tools without cooling or heating. In this regard, there are heated, non-heated stamps. The hardness of non-hot stamped steels is NRC = 60-62. Carbon is made of steels (C10A, C11A, C12A) not less than 1%. Because the annealing depth of these steels is small, they are used to make simple shaped fine detail stamps that operate under relatively light conditions. Intricately shaped, heavy-duty stamps, which work in harsh conditions, are made of alloy steels with a large forging depth [1].

The most commonly used steel grades for dies are: 4XC, 6XC, 4XB2C, 6XB2C.

The following table shows the chemical composition of some of the above steel grades.

Steel grade	C, %	Мн, %	Си, %	Ср, %	B, %	Mo, %	W, %
4XC	0,35-0.45	0,4	1,2-1,6	1,3-1,6	_	_	_
6XC	0.6-0.7	0,4	0,6-1,0	1,0-1,3	_	_	_
4XB2C	0.35-0.44	0,2-0,4	0,6-0,9	1,0-1,3	_	_	2,0-2,5
6XB2C	0,55-0.65	0,2-0,4	0,5-0,8	1,0-1,3	_	_	2,2-2,7

The following requirements apply to stamping steels: fire resistance, heat resistance, deep quenching, impact strength, minimum brittleness during forging, no sticking, etc.

Dies that operate under relatively light conditions (low pressure) are made of carbon steel. Deformations that work in more severe conditions are made of alloy steels 5XHM, 5XГM, 5XHB, 5XHCB. [3].

Products (parts) made by stamping are widely used in various branches of the national economy.

In volumetric stamping, the metal tool is filled with liquid metal under pressure to form a hollow shape of the metal tool to form a blank of a certain shape. The main tool for stamping is die plates, which consist of two stages (lower and upper). Stamps can be open or closed [4].

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METHOD OF EXPERIMENT

Stamps are made of special steels and can be single-row (groove) or multi-barrelled (groove). For the production of a blank (part) of any shape, liquid metal is poured, forms are filled in the stamp and the corresponding form is formed.

Stamping is also one of the ways to process building materials under pressure, and the shape of the product to be formed is mainly formed by stamping.

This is a very economical method. Steam-air hammers, plank friction hammers, crane heating dies, horizontal impact hammers, friction presses and other construction machines are used for stamping materials.

Hot stamping is mainly used in the mass or multi-batch industry to produce high-precision molded and dimensional parts.

The technology of such stamping consists of the following operations: cutting metals into a billet, heating the billet, stamping, heat treatment, and painting the Polish in the required paint. This method can also be used for processing hard-to-deform alloys.

However, when hot stamping, it is important to accurately determine the amount of material to be stamped, because if the amount of material is less than necessary, the die gap will not be filled, the product will be defective, and if the amount of material is too large, the shape will be distorted.

The method of cold volumetric stamping is used in the manufacture of small-sized stampings. At the same time, stamping reduces various types of metal waste without reducing productivity, improves the quality of surfaces, and ensures high accuracy of product manufacturing. Having studied the above, we conducted research on parts made of steel X12Ф1 and methods of their hardening. X12Ф1 steel is used for cold forming, dies and punches with very good abrasion resistance, standard gears, wire mesh and other tools.

EXPERIMENTAL RESULTS

The steel used for making non-heated punches must be very hard, resistant to abrasion, and ductile (especially the steel used for making punches). The steel used for the production of hot stamps should be as resistant as possible to local heating, as cracks may form if the working part of the stamp, made of insufficiently plastic (viscous), for example, poorly loose steel, is heated.

In addition to the above properties, steels for the production of large-size dies must have a deeper strengthening property. As the annealing temperature increases, the hardness of the steel first increases, reaches a peak when the annealing temperature is 1075 ° C, and then decreases. Therefore, tools made of these steels are heated to a high temperature (1050-1150 °C), and then hardened. The discharge temperature depends on the curing temperature. If the steel is heated to 1075°C and then refined, its release temperature should not exceed 220 ° C to maintain the high hardness of the formed steel, since if the release temperature is higher than 220 ° C, the steel's hardness will decrease. If the steel is heated to a temperature of 1150 0C and then refined, that is, a large amount of residual austenite is formed in the steel, it is discharged at a temperature of 525-550 ° C to decompose the residual austenite and increase the hardness of the steel. If it is necessary to increase the hardness of polychrome steels, they are heated to 1150 ° C, then cleaned in oil to form a large amount (30-35%) of residual austenite, after which most of the residual austenite is decomposed by processing and unloading at negative temperatures. When steel is heat-treated, its Rockwell hardness exceeds 60. This heat treatment method is known to have been applied to high-strength steel, but it can also be applied to multi-chromium steels.

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Due to the high content of the carbide phase in steel grade X12Ф1, its mechanical strength is lower. Therefore, steel X12Ф1 is used for the manufacture of less important, but simpler in design tools. Thus, the introduction of the optimal variant of annealing methods in the heat treatment of X12 steel makes it possible to obtain tools of complex shape from this type of steel. Measurement of stamping parts (dies, dies) with a complex surface shape using measuring tools is a very difficult task. Especially after annealing and discharge operations, the measurement may go beyond the level of units (i.e., not fit into the joints). However, X12Ф1 type steels can be re-inserted (in size), releasing them into a given size range, with minimal change in its dimensions during air tempering. To do this, the stamp is produced at a temperature of 160 ℃ to remove thermal stresses after quenching the parts.

The dismembered parts are numbered, their dimensions are measured and prepared for unloading. If the dimensions are reduced after annealing, heat to 380 ° C, and the die size returns to its original position. If the stamp size is larger than normal, the reset is performed within 4200-4800 Seconds and returns to normal. Adding chromium to chromium steels reduces the critical cooling rate during annealing; increases abrasion resistance; and increases hardness.

CONCLUSIONS

As a result of research, it is possible to ensure that the size and shape of the die obtained as a result of dimensional annealing of steel X12Ф1 do not change. To do this, the stamp was unloaded at a temperature of 160 ℃ to remove thermal stresses after finishing the parts and the expected result was achieved.

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