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Сборник содержит научные статьи отечественных и зарубежных авторов по экономическим, техническим, философским, юридическим и другим наукам.

Миссия научно-образовательного электронного журнала «ОБРАЗОВАНИЕ И НАУКА В XXI ВЕКЕ» состоит в поддержке интереса читателей к оригинальным исследованиям и инновационным подходам в различных тематических направлениях, которые способствуют распространению лучшей отечественной и зарубежной практики в интернет пространстве.

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Материалы публикуются в авторской редакции. За соблюдение законов об интеллектуальной собственности и за содержание статей ответственность несут авторы статей. Мнение редакции может не совпадать с мнением авторов статей. При использовании и заимствовании материалов ссылка на издание обязательна.

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Advantages of Metrological supply:

* Improve product quality.

* Reduce burning. * Transfer storage time.

* Optimize energy consumption.

* Provide security.

* Certification and standardization of products. Metrology education is important to ensure quality and burn in the field of fruit and vegetable preservation.

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Название публикации: «METHODS OF PREHEATING METAL AND METAL ANNEALING BEFORE PRESSURE TREATMENT»

Annotation in this article, the directions for reducing resistance to deformation related to pressure treatment are mentioned , there is a temperature range for each metal, it is suggested that working with pressure at these temperatures will be much more effective, and, alternatively, for carbon steels, for example, the maximum heating temperature is given, proposals have been made to adopt a chemically ordered steel with a melting temperature (1100-13000S when working with, a number of proposals to improve its plasticity is given in a series of step-by-step.
Key words. Metal, pressure, temperature, deformation, machining, feature, carbon, machining;
Introduction . The purpose of heating metal before pressure treatment is to reduce resistance to deformation and increase its ductility.

For each metal, there is a temperature range, at which it is most effective to work with pressure. The temperature range is determined by the difference between the beginning of pressure treatment (to which the metal heats up) and the final temperature at which deformation is completed. For carbon steels, for example, the maximum heating temperature is taken to be 150-2000C below the melting temperature of the steel of a given chemical composition (1100-13000C). This is due to the rapid increase in grain size due to the admixture of small and large grains when heating the metal to high temperatures. This phenomenon is called “overheating”. Overheated metal has low impact resistance (low viscosity), cracks may appear in the metal during plastic deformation. The structure of overheated metal can be corrected by grain refinement. To do this, the metal must first be cooled, then heated to a certain temperature and softened. When the metal is heated to higher temperatures (i.e., the melting point), not only grain growth occurs, but also oxidation at the grain boundaries, which causes cracks to form between the grains and the mechanical bond between them to break.

This phenomenon is called "perejog" - "burning out". Burnt metal breaks into pieces during deformation. Burnt metal cannot be straightened by heating and softening, the burnt metal must be sent for remelting. The final temperature at which the deformation of the metal is completed is determined based on the following. Firstly, the final temperature of the working with pressure should be such that the recrystallization process during the deformation of the metal has time to pass, that is, no nucleation occurs, in which case the plasticity decreases and cracks may appear in the metal. Secondly, it is also not advisable to deform the metal at high temperatures, since after deformation the metal grains have time to grow, the metal structure becomes coarse-grained, and this, in turn, leads to low mechanical properties of the metal. Accordingly, the final working temperature for carbon steels is set in the range of 760-800 0C. Steel is often worked with pressure while hot. For working with steel while hot, the heating temperature is much higher than its recrystallization temperature. The stress that appears in such steel disappears by itself as a result of recrystallization. This means that steel does not experience any shrinkage when subjected to pressure due to heating.

The heating temperature should be chosen in such a way that it is necessary to achieve the desired result. If the steel is heated too much, the metal will burn. If it is not heated enough, hardening will be difficult.

The choice of heating temperature for pressure processing of carbon steels is determined by the carbon content in the steel.

0.1 Steels with % C up to 1200 ^{0}C

0.2 Steels with % C up to 1150 ^{0}C

0.3 Steels with % C up to 1100 ^{0}C

Steels with 0.6% C up to 1005 ^{0}C

The annealing temperature for each steel grade is determined from the iron-carbon phase diagram, depending on the chemical composition of the steel. It is known that the stress formed in the metal is eliminated by thermal processing. When a metal is hot-pressed, its structure and properties depend on the deformation regime, which depends on the heating temperature, the amount of deformation, the rate of deformation, and the cooling regime. As a rule, pure metals are more plastic than alloys. Some elements (R, S) in the alloy composition deteriorate the plasticity of the alloy and make it brittle. Especially if there is more S, it can crack at high temperatures. Various alloying elements can deteriorate or improve the plasticity of the alloy. As the temperature increases (up to 400 ^{0}C), the plasticity of some metals decreases slightly, then improves. For some other metals, the plasticity also increases with increasing temperature.

The quality and amount of deformation depends on the pattern of forces applied to it. Typically, metals are well-conditioned to deform when compressed.

When metals are worked under pressure, a tool touches the surface of the metal and a certain friction force is generated. This force is called external friction force. Various non-stick oils are used to reduce the friction force.

Cold pressing uses liquid oils, pastes and special coatings. It should also be noted that when working with metals under pressure, a lot of metal waste is generated. However, metal pressing is constantly growing and improving. Productivity is increasing, waste is decreasing, operations are being mechanized and automated. New operations are being introduced. The shape and size that cannot be achieved by pressing are achieved later by shearing or thermal processing.

Heating of metals in heating devices. When metals are heated under pressure, their plasticity improves. When the metal is heated, its resistance to deformation can decrease by 15-20 times. However, the time for heating and holding the metal to the required temperature should be such that the metal does not burn out. If the heating is incorrect, defects will appear in the metal (cracks, decarburization, excessive oxidation, the metal may burn out). The thermal conductivity of the metal plays a large role when it is heated. Because the surface of the metal can heat up easily, and the interior can heat up poorly. As a result him/her to heat for many time spending will be . Steel in the composition C % amount increase with heat conductivity decreases .

Example: The heat transfer coefficient of steel with 0.1% C is 46.5%, while that of steel with 1.5% C is 32%.
Alloyed steels have high thermal conductivity. The higher the percentage of alloying element (%), the better the thermal conductivity.
As the metal heats up, it expands in different layers. The surface layer of the metal expands more than the inner layer.
The expansion of the outer layer is somewhat inhibited by the inner layer and is forced to stretch due to the outer layer. As a result, internal stress is created. It is customary to consider such stress as thermal stress. These stresses can be greater or less depending on the temperature difference between the layers.
Sometimes large castings and parts can crack when heated. As a result of heating, the metal oxidizes, as a result of which soot forms on the surface of the steel, which leads to a decrease in the amount of metal. Sometimes, to obtain a part of the required shape, the billet is heated several times, and the waste reaches 5%. To reduce the release of metal into the soot, it is possible to use a low-air fuel, that is, use less pure oxygen-containing air, and heat the metal at a specified time and temperature.
If the oxidation of a metal at 900 ^{0}C is 1, then at 1000 ^{0}C and 1200 ^{0}C it is 5.
Heating the metal decarburizes it, which degrades the quality of the product. Sometimes, oxidation and sooting of the metal can be reduced by heating it in an oxide-free chamber.
When a metal is heated above its critical point, the grains in its structure begin to grow. As the temperature increases, the grains also grow larger. As a result, the mechanical properties of the steel decrease. This phenomenon is called superheating.
As a result of the increase in temperature, the bonding of grains in the metal structure is disrupted, and the steel becomes very brittle and breaks when stretched. This phenomenon is observed at temperatures 100-120 ^{0}C higher than normal.

Metal heating mode. Different grades of steel are heated at different temperatures when hot-working under pressure. Structural carbon steels are heated at 1200-1300 ^{0}C, tool steels are heated at 1050-1180 0 C to prevent carbon from burning out , and alloyed tool steels are heated at 1100-1200 ^{0}C.

Heating furnaces. When working with metals under pressure, heating is carried out in electric heaters using open flame liquid and gas. Since furnaces are universal, they are widespread, they can heat castings, billets and products of various sizes. There are chamber and methodical types of furnaces. The working chamber of chamber furnaces is rectangular, and the temperature is the same throughout the working volume.

Methodical furnaces have a long working phase, with the temperature decreasing in the direction of the fire. In such furnaces, the workpiece is pushed towards the fire and gradually brought into the fire.

The type of chamber furnace is a forging furnace, and the nozzle is installed in the working phase.

Mechanized furnaces are also available, in which the heavy work of loading the billet, turning it over, and removing the hot billet is partially and completely mechanized.

Electric ovens have a spiral built into the inner walls. When current is applied, the spiral heats up, heating the oven chamber and the workpiece in the oven.

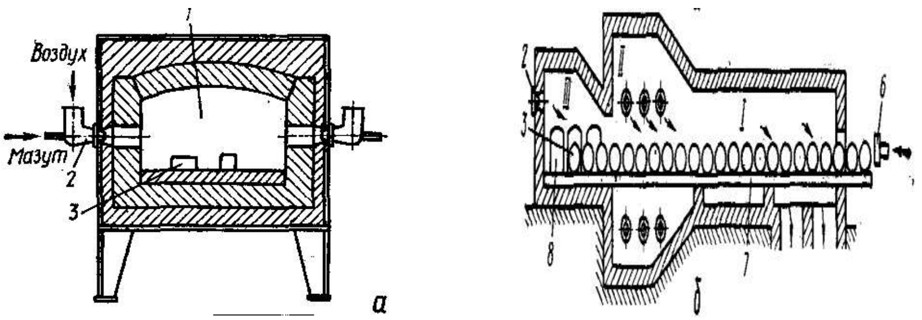

Figure 4. Heating furnaces: a) Chamber furnace b) Methodical furnace

There are also carousel-type furnaces, which consist of a disk or ring at the bottom of the furnace, which rotates using a special mechanism. The speed of rotation is determined by the length of the workpiece to be heated. In these furnaces, various types of products are heated (Figure 5).

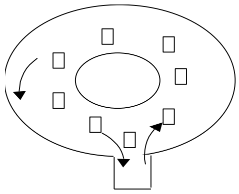

Figure 5.
Carousel oven

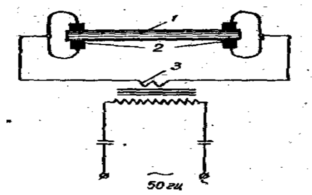

Figure 6 Contact

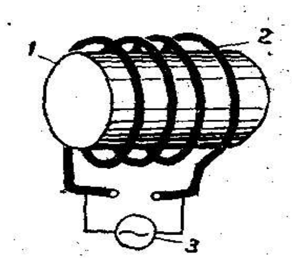

Figure 7: Schematic diagram of an

Large, bulky workpieces are heated in pit furnaces.

In these furnaces, the incoming air is heated by the hot air coming out of the furnace, resulting in a high heating effect.

In contact electric heaters, an alternating current with a voltage of 15 V is connected to the ends of the workpiece, and the metal is heated due to the resistance to the current passing through the parts. The electric energy consumption is 0.35-0.45 kW/h.

In induction electric heaters, the workpiece to be heated is loaded through the furnace loading window and heated as it passes through the induction chamber using a conveyor. The furnace chamber contains an inductor located in the copper tubes that are cooled, and the workpiece is heated by induction current.

Increasing the efficiency of furnaces is mainly achieved by heating the air supplied to the furnace. As is known, chamber furnaces operate with a very small FEC. Because the temperature of the gases formed during combustion ^{0} Cis 1200 and goes out through the chimney. The supplied air is heated due to the heat of these gases. If the air is heated to 200-400 ^{0} C, 12-22% fuel consumption can be saved and the temperature of the furnace increases rapidly. The second way to fully utilize the heat in the furnace chamber is to make the furnaces two-chamber, heated due to the heat of the gases to be heated in the furnace, and then transferred to the main furnace. This method can save up to 40% of the fuel consumed. Oxide-free heating in open-hearth furnaces is achieved mainly by underburning the fuel gas, i.e. adding air in an amount of 50% of that specified in theory, and heating the air to 800-1000 0 C.