EVALUATION OF TENSILE AND COMPRESSIVE STRENGTH OF LIGHT VEHICLE DISC MATERIALS

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Evaluation of tensile and compressive strength of light vehicle disc materials, evaluation of working environment and preparation conditions

In the 1930s and 1950s, aluminum wheels began to be installed on racing cars. Attempts to produce disks from aluminum, magnesium and titanium alloys in the domestic industry were made in the 1980s.

Today, more and more applications are found for aluminum alloys - stamped and cast discs, among which the largest assortment of cast discs is produced abroad, and almost all stamped discs are produced by Russian manufacturers.

Currently, the following technologies for the production of wheels from aluminum alloys are most common: forging and rolling; a combination of low-pressure casting and casting and deformation methods of obtaining elements, welding or bolting them.

One-piece or split-die gauge punch. Hot forging (forging) achieves the highest strength, because the structure of the metal becomes fibrous, and initially the direction of these fibers is determined

The process is carried out in several stages. At the first stage, a small cylindrical blank (castings from which wheel discs are made are in the form of cylindrical columns of different diameters, which are cut into blanks of the required length) is broken in the first press. Then this disk passes through several presses with different forces and gradually turns into the final blank. At a certain stage, during processing, a central hole is sewn.

Before each press, the workpiece and working matrices are heated to a temperature of several hundred degrees. Exhibitions, despite their relatively large volume (up to 20 thousand tons), gradually produce hot stamping. The low level of heating and deformation excludes the appearance of unwanted defects and cracks in the body of the workpiece.

The treated part is artificially aged. Then, after numerous inspections and selective quality control (fiber construction) of the workpiece, it is processed on milling machines, resulting in a finished product.

As a result of grinding the crystal lattice and eliminating internal microdefects, the metal hardens during plastic deformation. Thanks to this technology, with the appearance of a fiber structure in the metal, the strength of the wheel discs is 2.5 times higher than that of others, but only 20-30% lower. Walls can be made 20% thinner

than cast walls. As a result, the weight of such a disc is 15-20% less than a cast disc and 40-50% less than a stamped steel disc.

This technology has another significant drawback. During the forming process, only 30-40% of the original material becomes a wheel. The rest will burn in the ovens. This waste can be melted down and returned to production, but the cost will increase significantly. However, such discs withstand hills well during operation. It is almost impossible to separate a quality forged wheel rim.

The essence of this production method is to stamp the blanks, the blade with the adjacent flange and the cylindrical part before designing the center, and then forming the rim and the flange. The rim and flange are formed using a compressed roller larger than the calibration value. Flange calibration is carried out by calibration, whose surface profile is similar to the flange profile of the finished part.

The advantage of the rolling process over the stamping is that, as a result of the use of rotational local deformation, the finely dispersed structure of the disc is preserved, and it is possible to obtain discs of large diameter and complex shape without much effort.

An important advantage of low-pressure cast disc is that it is possible to obtain high-quality cast rods at minimum values of pressure, while reducing material, energy and labor costs in their production.

The disadvantage of this method is that the product is called free, unoriented crystallization. This forces designers to make the disc walls thick enough to provide the required mechanical strength.

Different batches of alloy wheel discs may differ slightly in their characteristics. Technologies, alloy composition, etc. may slightly change the properties of the finished product. Therefore, to monitor the quality of their products, manufacturers conduct 100% x-ray inspection of wheel discs and study the metal construction and properties of finished products.

The essence of low-pressure casting is that the cavity of the mold is filled with a solution and the solidification of the casting occurs under the influence of excess air pressure or inert gas. However, the excess pressure required to raise the solution and fill the mold is less than 0.1 MPa, which explains the use of the term "low pressure".

LND technology allows to fill the mold for expanded thin-walled structures, to regulate the speed of filling the mold with a solution in a wide range, to change the time of filling individual sections of the mold with a complex configuration. Variable wall thickness in order to control the heat transfer process between the melt and the mold, to ensure a reasonable sequence of solidification of individual parts of the casting.

"Krasnoyarsky kray" LLC, founded on November 22, 1991, is one of the largest and world's leading factories for the production of light alloy wheels in Russia.

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