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Modern Technology Of Surface Hardening Applied To Parts Of The Car

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Annotation: The article is devoted to solving the issues of modern surface hardening technologies used for car parts.

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Introduction

The performance of the machines depends greatly on the wear resistance of the parts. It has now been established that 70% of the failure of machines depends on the wear of parts, therefore, the strengthening of their working surfaces plays a special role in ensuring the resource of various products. The choice of the most effective hardening technology is based on identifying the performance properties that affect the service life of the part, assessing the range of its rewarding and determining the quality parameters of the surface layer that affect the performance of the part. To impart enhanced properties to the surface layer of a part in mechanical engineering, various types of chemical-thermal treatment are widely used: carburizing, nitrocarburizing, nitriding, boriding and other hardening methods [1-6].

Most car parts are carburized and nitro-carburized. The surface hardness of steel products after carburizing is less than 900HV, and after nitrocarburizing 1000HV due to the formation of complex carbon nitrides. The experience of using these methods of hardening shows that when it is necessary to give a large depth of the hardened layer, preference is given to carburizing. The thickness of the hardened layer is: when carburizing - 0.4 - 1.8 mm; with nitro carburizing - 0.2 - 0.8 mm. This is due to the fact that when nitrocarburizing steel to a depth of more than 0.8 mm, defects in the form of internal oxidation and a "dark" component appear in the hardened layer, which sharply reduce the hardness, endurance limit and contact strength. It should be noted that for small parts with a depth of nitro-cemented layer less than 0.8 mm, this method has an advantage over carburizing. Parts operating under intense friction wear, under conditions of alternating loads, but without the influence of the corrosive factor, are subjected to cementation of piston pins, camshaft cams, plunger pairs of pumps, pushers, etc. Shafts, axles, gear wheels, bushings, bolts, nuts are hardened with nitrocarburizing. [2].

Nitriding of steel products is mainly aimed at increasing the wear resistance of the surface and maintaining the geometric parameters of the part. A prerequisite for achieving high wear resistance of parts is the use of steel alloyed with aluminum, vanadium and molybdenum, which form strong nitrides in the surface layer during nitriding. Nitriding is applied to machine parts operating under conditions of friction and alternating loads, gear wheels, rollers, spindles, sleeves of motors and pumps, cams, and a measuring tool [3].

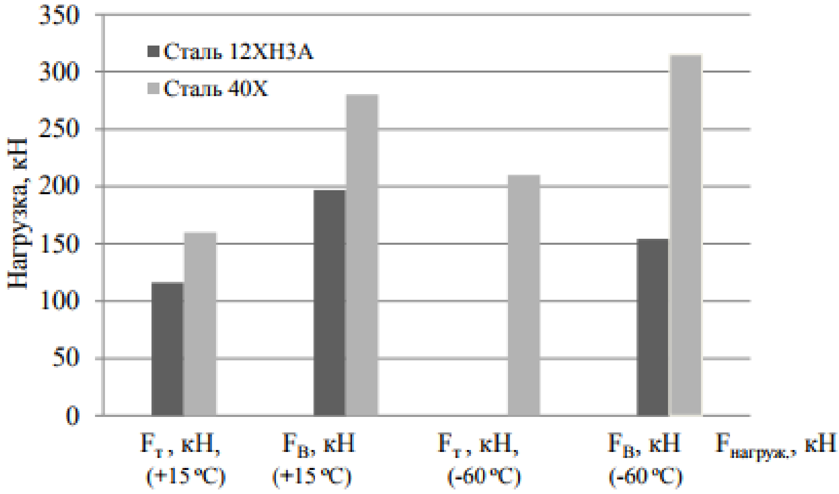
For individual parts of the car, a boring technology is recommended, which makes it possible to achieve a hardness on the surface of the product at the level of 1600 1800 HV. A significant disadvantage of this hardening method is the high brittleness of the borated layer, which excludes its use for parts experiencing shock loads during operation. In the case of work of the part in conditions of only abrasive wear, their resistance is 5 - 10 times higher than that of cement baths. It is known that the wear resistance of borated steel 45 under dry sliding friction is 4-6 times higher than that of cemented steel, 1.5-3 times nitro-cemented steel, 3-8 times higher than cyanidation and 4 times hardened low-tempered steel 45. Boring is used for hardening various machine parts, technological equipment and tools operating under conditions of intense wear [1, 4].

Among the variety of hardening methods, the technologies of surface hardening of parts with heating by high-frequency currents are distinguished by the greatest efficiency and ease of implementation in production conditions. This high-performance, progressive method of heat treatment provides an increase in the mechanical properties of steel, including the yield point, fatigue and hardness, eliminates the possibility of decarburization, reduces the risk of oxidation of the surface of products and their deformation, creates the preconditions for comprehensive mechanization and automation of the hardening process. With a hardening depth of up to 5mm, micro hardness on the surface of the order of 750HV and more can be achieved. This method of hardening is advisable to use in large-scale and mass production and for parts when hardening its individual sections [5].

In most cases, car parts have structural and technological stress concentrators that do not allow the potential of steel properties to be realized. To ensure a high level of properties, it is advisable to subject such products to surface plastic deformation, for example, a shot rivet [6]. With optimal processing conditions and the use of strictly regulated materials, the endurance limit of parts increases by 1.5 - 3.0 times; and the durability at contact cyclic loads is 1.5 - 6.0 times. Such an increase in properties is achieved by increasing the microhardness to a depth of 1.0 mm and creating compressive stresses on the surface at the level of 600 - 900 MPa.

Shot peening is widely used to harden the surfaces of machine parts, especially those operating under conditions of cyclic bending and torsion; to increase the durability of twist drills, hot stamping punches, bending dies, dies, cutters, etc. The effect of shot peening on the relaxation process is of great importance. In the process of relaxation, part of the elastic deformations transforms into residual plastic deformations (especially in the case of springs). The hardening of such parts not only increases the endurance, but also ensures the reliability of the springs. Shot blasting increases the cyclic strength of the gears. Often, gear shot blasting is used with other types of processing - carburizing, cyanidation, etc. Special studies carried out on samples made of steels of 12XH3A grades; 18XHBA and gear wheels made of 18XHBA steel, showed a significant increase in the endurance limit as a result of the use of shot blasting, cemented and hardened surfaces. The combination of preliminary hardening thermal or chemical-thermal treatment with shot blasting increases the service life of welded seams by 3 times, crankshafts by 9 times.

For example, for a car part "Tie rod ball pin" of a KAMAZ car to achieve the required set of characteristics when using the improved steel 40X, as a hardening treatment, heat treatment is sufficient, consisting of quenching and high tempering; surface hardening with HFC heating and subsequent low tempering, and when using 12KhN3A steel, it is necessary to carry out expensive chemical-thermal treatment (carburizing), followed by quenching and low tempering. At the same time, in the course of bench tests, the advantage of using 40X steel in terms of strength indicators was established. For strength tests, the ball pin was installed on the stand in a special device simulating the operational loads on a car. During the tests, a smoothly increasing load (Fload) was applied to the center of the spherical part of the pin from zero to the moment of its destruction, while the diagram of pin deformation was recorded in the coordinates "Load, kN - deflection of the pin, mm". The deformation diagrams were used to determine the loads corresponding to the yield strength (Ft) and strength (Fw) of the parts. The results of bench tests are shown in Fig. 1.



Rice. 1. Comparative analysis of the strength characteristics of ball pins made of steel 40X and 12XH3A

Consequently, the search for effective strengthening technologies provides a multivariate solution and should be based on the operating conditions of the product, its configuration, steel grade and other factors.

References

1. Borisenok G.V. Chemical heat treatment of metals and alloys. Reference // G.V. Borisenok [and others]; ed. L.S. Lyakhovich. M .: Metallurgy, 2010 .-- 424p. 2. Kozlovsky I.S. Chemical heat treatment of gears. M .: Mechanical Engineering, 1970 .-- 232p.

3. Lakhtin Yu.M. Steel nitriding / Yu.M. Lakhtin, Ya.D. Kogan. - M .: Mechanical Engineering, 1976. - 256s.

4. Voroshnin L.G. Theory and technology of chemical-thermal treatment / L.G. Voroshnin, O. L. Mendeleev, V.A. Smyotkin. - Minsk: New knowledge, 2010. - 297p.

5. Shepelyakovsky K.Z. Hardening of machine parts by surface hardening during induction heating. - M .: Mechanical engineering. - 288p.

6. Kholmurodova D.K., Negmatov. S.S., Boydadaev M.B. Esearch influence of humidity of resined screw-polymer weight on parameters of physical and mechanical properties of composite wood and plastic plate materials. International Journal of Advanced Research in Science, Engineering and Technology, Vol.6, Issue 8, August 2019 ISSN:2350-0328.