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LASER THERMAL STRENGTHENING OF PARTS

The successful solution of the problems associated with the reduction of the metal intensity of the structures, while improving their technical characteristics, necessitates the use of modern processing technologies and hardening of the surface of the parts in order to create strong, durable and corrosion-resistant layers on these surfaces. Treatment of surface layers with concentrated energy streams of laser beams, plasma jet allows to change the physical and mechanical properties of materials due to the modification of the structure of their surface layers. In addition, it gives the opportunity to obtain qualitatively new properties of these layers, which cannot be achieved by other methods of strengthening.

In recent years, the study of laser processing of parts of automotive engineering, engines, oil refining equipment have priority for scientists in England, Germany, USA, Bulgaria. Significant progress has been made in strengthening the responsible parts such as shafts, gears, cylinder liners and the like. The main areas of research for laser strengthening of parts are the wear characteristics of the surfaces. However, important is the ability to adjust and improve such characteristics of the responsible parts as durability.

In the works devoted to the study of the characteristics of the strength of steels after laser thermal strengthening, the possibility of both their increase and decrease. The results obtained are related primarily to the processing modes for specific materials and parts.

Laser thermal strengthening allows to increase the value of endurance limits. Laser treatment can reduce the characteristics of fatigue resistance. The change in fatigue resistance during laser treatment is related to structural changes in the treated area, its hardness, the residual stress that is formed, and the microrelief of the surface. These properties are related to the technological parameters of processing – the type of laser, the radiation power, the speed of processing, the geometry of application of the paths of hardening, the area of the treated surface, as well as the orientation of the working stress with respect to the direction of application of the paths of strengthening (due to the anisotropic effects laser track). In this regard, in order to obtain the endurance limits of materials and parts above the initial values, an analysis of the machining modes with respect to the specific operating conditions of the machine parts is required. To solve this problem, it is necessary to link the surface properties (residual stresses, hardness, roughness, and so on) with the technological modes and operational parameters [1].

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