NITROCARBURIZING STEEL PARTS WITH THE USE OF THE ELECTRO-EROSIVE ALLOYING

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There is known a method of carburizing steel parts with the use of the electro-erosive alloying (CEEA), which has a number of advantages, the main of which are: providing 100% continuity for the strengthened surface layer, increasing the hardness of the surface layer of the part due to diffusion-quenching processes, alloying can be carried out in strictly specified areas with no protection of the rest of the surface of the part, lack of volumetric heating of the part and warpage associated therewith; simplicity of the technology application, flexible binding to existing equipment; strengthening process does not require special preparation and high qualification of the worker. At carburizing a steel part with the use of the electro-erosive alloying (EEA) method, the thickness of the strengthened layer depends on the discharge energy and alloying period of time (the process productivity). Increasing the values of discharge energy and alloying period of time results in increasing the thickness of the strengthened layer. And in doing so, there is increased the value of a surface roughness.

According to method, carrying out the process with the use of ionic nitriding (IN) method (either before the EEA method or after the same) provides eliminating of the zones of reduced hardness when using electrodes made of pure, hard, and wear resistant metals. In addition, a smooth change in the hardness of the strengthened layer and also increasing the total depth of the zone of the increased hardness are observed.

In this case, the CEEA stage by stage process performed before the IN process results in decreasing the microhardness in the heat-affected zone (i.e., a zone of reduced hardness can be formed under the layer of increased hardness), and the CEEA process performed after the IN process for a period of time sufficient to saturate the surface layer of the part with nitrogen to the depth of the thermal zone influence results in eliminating the hardness failure. In this case, two processes, namely, the CEEA process and nitriding one have been taking place simultaneously. Such a method is essentially a method of nitrocarburizing by the EEA method (NCEEA).

Having been carried out on the above mentioned conditions, the NCEEA process eliminates the characteristic "hardness dip", with a general increase and a gradual decrease of the values of hardness in the transition zone. The surface roughness reduction at the NCEEA process is explained by the protection of the alloying zone with a flow of nitrogen from the ambient air (oxidizing) environment.