

Robot laser hardening and the problem of overlapping laser beam

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ABSTRACT

Since 1970, many studies of various laser machining processes and their applications have been published. This paper describes some of our experience in laser surface remelting, consolidating, and hardening of steels. We focus on the problem of robot laser hardening of metals with overlapping of the hardened zone. The process of laser hardening with remelting of the surface layer allows us to very accurately determine the depth of modified layers. In this procedure, we know the exact energy input into the material. Heating above the melting temperature and then rapidly cooling causes microstructural changes in materials, which affect the increase in hardness. We identify the relationship between hardness and width of overlapping. We describe the results of previous work, research, and experience in robot laser hardening of metals. We also show the results of laser processing techniques with the problem of overlapping. Our tests were carried out on materials of DIN standard 1.2379 and 1.7225, and measurements were performed in the hardened zone of overlapping at 2 mm, 3 mm, 4 mm, 6 mm, and 10 mm. We show relationship between hardness and width of overlap for material of DIN standard 1.2379 and 1.7225. The modeling of the relationship was obtained by the 3 layers artificial neural network.

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