

INDICATORS OF HARDNESS OF THE COATING OBTAINED BY ELECTROCONTACT WELDING COMPOSITE FILLER MATERIALS

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Keywords: electrical welding, coating hardness, harding, powder coating.

Abstract. The article provides a comparative analysis of the surface hardness of the coating depending on the electrical welding modes and the type of filler material.

ПОКАЗАТЕЛИ ТВЕРДОСТИ ПОКРЫТИЯ, ПОЛУЧЕННОГО ЭЛЕКТРОКОНТАКТНОЙ ПРИВАРКОЙ КОМПОЗИЦИОННЫХ ПРИСАДОЧНЫХ МАТЕРИАЛОВ

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Ключевые слова: электроконтактная приварка, твердость покрытия, закалка, порошковое покрытие.

Аннотация. В статье приводится сравнительный анализ твердости поверхности покрытия в зависимости от режимов электроконтактной приварки и вида присадочного материала.

When restoring worn-out machine parts, electrical welding (ECW) of powder materials remains a promising direction.

One of the main characteristics of the quality of remanufactured parts, which largely determines their performance and durability, is the hardness of the working surfaces. The hardness of the welded powder coatings depends on many factors. It is determined by the chemical composition of the powders themselves and the welding regimes.

As known, one of the advantages of the method of restoring ECW parts is the hardening of the filler material in the welding process.

At restoration of details like "shaft" ECW is made mutually overlapping points and rollers on a screw line (Fig. 1). As a result, when the already hardened area is reheated, the metal is released. It is because of this that the surface of the parts reconstructed by the ECW of the prisiding materials is characterized by a considerable structural heterogeneity, manifested in the fluctuation of hardness values. So with ECW powder PGS-27M, the hardness of the coating varied in the range of HRC 26 ... 57, and when using the powder PBH-6-2 HRC 20 ... 63. Such structural heterogeneity of the coating during operation under conditions of sliding friction leads to uneven wear of the surface with the formation of local areas with increased wear, which can hold additional lubrication. But on the other hand, this inhomogeneity leads to the appearance of structural stress concentrators, which reduce the fatigue strength of the material.

In the study of the hardness of powder coatings, samples of steel 45, 14 mm in diameter with welded PGS-27M, PBH-6-2 powders were used as the base metal of the part; steel tape (steel 45). EKP was performed in the following modes: spindle speed 1.6 min⁻¹; feed 5.6 mm / rev; the pressure of the roller electrodes according to the installation gauge 0.4 MPa; pulse time 0.06 seconds; pause time

0.1 sec. The current strength varied from 4.4 kA to 7.0 kA. The width of the roller electric 5 mm [4,5].

After ECW, all samples were polished to a size of up to Ø14.6-0.05 mm.

To estimate the distribution of hardness, measurements were carried out at points located uniformly in one plane perpendicular to the axis of the sample.

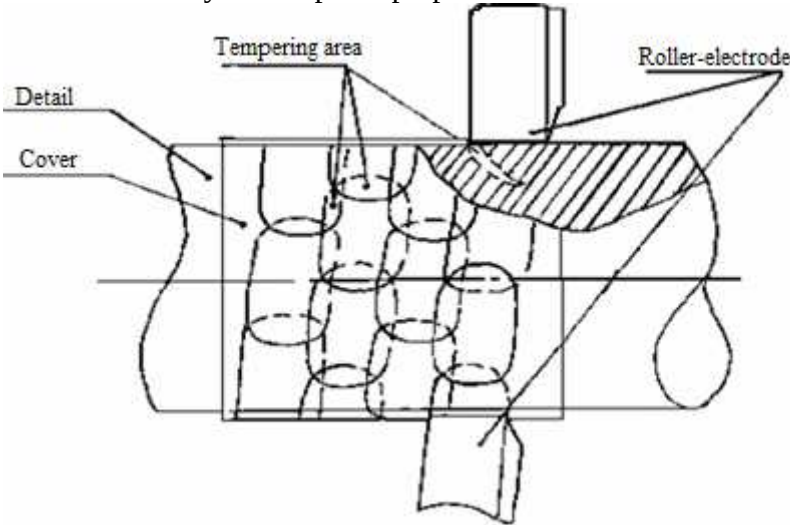


Fig. 1. Diagram of the formation of vacation and quenching zones at RPC

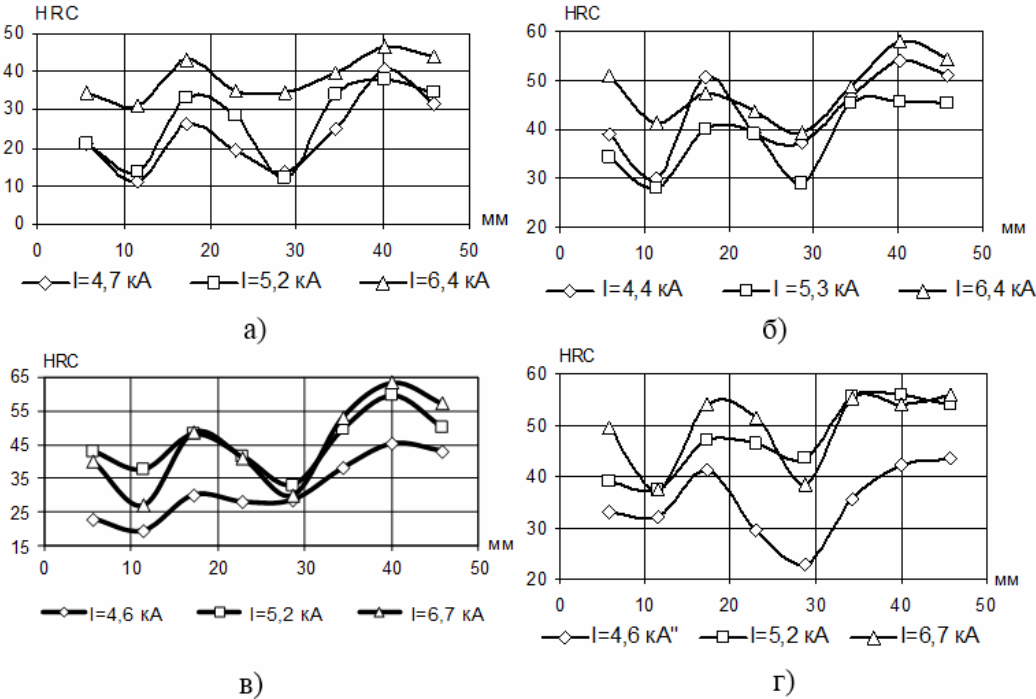


Fig. 2. The change in the hardness of the coating surface depending on the modes of ECW and the type of filler material: a) ribbon of steel 45; б) reinforced sintered tape (PGS-27M powder) [1]; c) reinforced sintered tape (powder FBH-6-2) [1]; г) powder FBH-6-2

To determine the tempering and hardening zones between the welding turns, the ECW was carried out with a continuous current pulse (2 sec.), A short pause (0.02 sec.) [3]. And abundant cooling of the welding zone. For a visual representation of the picture of the change in hardness with different ECW modes, the graphics were combined according to the maximum and minimum hardness, which are shown in Fig. 2. On the abscissa axis, equal intervals of 5.73 mm are laid along the sample circumference in the same vertical plane.

As can be seen from the above graphs, the hardness of the coatings fluctuates significantly, while quenching and tempering zones are clearly visible.

Compared to steel tape coating (steel 45), powder coatings have a higher hardness, which is primarily associated with a higher carbon content in these materials.

An increase in the strength of the welding current by 2 kA with ECW increases the average hardness of the coatings by about 5 ... 15 units, with a smaller increase in the current strength (by 1 kA), there is no significant difference between the average hardness of the coatings. With an increase in the strength of the welding current to 6.2 ... 7.0 kA, the filler material is squeezed out from under the roller electrodes due to significant heating.

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