Abstract

The doctoral dissertation is devoted to the technology of Plasma Transferred Arc using additional material in the form of powder (PPTAW - Powder Plasma Transferred Arc Welding). The work was aimed at expanding the area of application of the PPTAW process. For this purpose, four types of powders were selected for this implementation, which are used to obtain protecting overlays of the substrate from the wear: NiCrBSi, NiCrBSi + 35% wt. WC, 316L, and NiCrCuMo powder.

The research carried out as part of the work was divided into two stages:

• I - hardfacing weld single beads and their evaluation, select parameters of the overlays hardfacing process based on the evaluation results (verification of the beads geometry of shape and the welding compliance)

• II – hardfacing overlays and carrying out tests of the selected type of resistance to: abrasive-, electrochemical corrosion-, and cavitation erosion wear.

Nine single beads were obtained for each of the additional materials. Everyone had an assigned set of process parameters, and their number was determined using the 3k experimental plan. In both stages of work, a single-feeder machine type EuTronic Gap 3511 DC was used.

The results of the quality assessment of individual single beads were the basis for selecting the optimal parameters for obtaining the hardfacing layers. The tests performed in the II-nd stage verified their functional properties, such as abrasion resistance, resistance to cavitation erosion, and electrochemical corrosion. The actions taken allowed for the optimization of the PPTAW process for all four layers and the indication of a material resistant to more than one analyzed destructive factor.

The PhD dissertation was completed at the Department of Metal Forming, Welding, and Metrology of the Faculty of Mechanical Engineering of the Wrocław University of Science and Technology in cooperation with the Department of Welding of the Faculty of Mechanical Engineering of the Silesian University of Technology in Gliwice and Department of Materials Engineering of the Lublin University of Technology.