CONTRIBUTIONS ON THE INFLUENCE OF THE PROCESSING PARAMETERS ON THE PENETRATION OF THE WELDING SEAM TO THE OPEN JOINT OF SHEETS BY FLUXSHIELDED ARC WELDING

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The paper presents the influence of the processing parameters (the welding arc voltage U_a, the welding current strength I_s, the rate of welding v_s and the feed rate of electrode $v_{e.}$) on the penetration of the welding seam h_p, using the Taguchi method.

The researches goal was to optimize in the Taguchi's way, the dismantled assemble process through automatic electrical welding using flux layers. The experimental researches have been done on a L8 Taguchi plan (7 parameters and 2 levels).

For the measurement units avoidance, there has been made a procedure to establish levels and parameters codes of control FC = {U_a, I_s, v_s, v_e}, as well as noise factors FZ = {U_aI_s, U_av_s, I_sv_s}.

Following this analisys, we established a matrix equation as follows:

$$Y \cong M + \begin{bmatrix} E_{Ua[-1]} & E_{Ua[+1]} \end{bmatrix} U_a + \begin{bmatrix} E_{Is[-1]} & E_{Is[+1]} \end{bmatrix} Is + \begin{bmatrix} E_{Vs[-1]} & E_{Vs[+1]} \end{bmatrix} v_s +$$

$$+ \begin{bmatrix} E_{Ve[-1]} & E_{Ve[+1]} \end{bmatrix} v_e + U_a^T \begin{bmatrix} I(U_a - I_s -) & I(U_a - I_s +) \\ I(U_a + I_s -) & I(U_a + I_s +) \end{bmatrix} I_s +$$

$$+ U_a^T \begin{bmatrix} I(U_a - V_s -) & I(U_a - V_s +) \\ I(U_a + V_s -) & I(U_a + V_s +) \end{bmatrix} v_s + I_s^T \begin{bmatrix} I(I_{s_a} - V_s -) & I(I_{s_a} - V_s +) \\ I(I_{s_a} + V_s -) & I(I_{s_a} + V_s +) \end{bmatrix} v_s$$

Where: Y= h_p; M – is the arithmetical average of the answers; $E_{Ua[-1]}$…..are the effects of FC on the answers; I(U_a-Is-)….. are the FZ interactions effects on the answers.

The technological parameters vectors are:

$$U_a = \begin{bmatrix} U_a(-1) \\ U_a(+1) \end{bmatrix}, \quad I_s = \begin{bmatrix} I_s(-1) \\ I_s(+1) \end{bmatrix}, \quad v_s = \begin{bmatrix} v_s(-1) \\ v_s(+1) \end{bmatrix}, \quad v_e = \begin{bmatrix} v_e(-1) \\ v_e(+1) \end{bmatrix}.$$

The optimal values are easily established by choosing one of the equation solutions, for which the values ratio is maximum:

$$\boldsymbol{S} / \boldsymbol{Z} = -10 \cdot \log\left(\frac{1}{\bar{\boldsymbol{y}}^2}\right) \times \left(1 + \frac{3\boldsymbol{s}^2}{\bar{\boldsymbol{y}}^2}\right)$$ (Signal/Noise).

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