

# 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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**Key words:** design process, design solution, functional design, structural design;

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  $FZ = \{U_a I_s, U_a v_s, I_s v_s\}$ .

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

$$Y \cong M + [E_{Ua[-1]} \quad E_{Ua[+1]}] U_a + [E_{Is[-1]} \quad E_{Is[+1]}] I_s + [E_{vs[-1]} \quad E_{vs[+1]}] v_s + [E_{ve[-1]} \quad E_{ve[+1]}] v_e + U_a^T \begin{bmatrix} I(U_a - I_s -) & I(U_a - I_s +) \\ I(U_a + I_s -) & I(U_a + I_s +) \end{bmatrix} I_s + U_a^T \begin{bmatrix} I(U_a - v_s -) & I(U_a - v_s +) \\ I(U_a + v_s -) & I(U_a + v_s +) \end{bmatrix} v_s + I_s^T \begin{bmatrix} I(I_{s_a} - v_s -) & I(I_{s_a} - v_s +) \\ I(I_{s_a} + v_s -) & I(I_{s_a} + v_s +) \end{bmatrix} v_s$$

Where:  $Y = h_p$ ;  $M$  – is the arithmetical average of the answers;  $E_{Ua[-1]} \dots$  are the effects of FC on the answers;  $I(U_a - I_s -) \dots$  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:

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

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