Analysis Influence of Plate Thick And Weld Current To Angle Distortion At Flat Plat Multilayer Welding With Pulsa Type Transfer Metal

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ABSTRACT

Steel AISI 1045 welding often met angle distortion at result of welding which harming in process repair of machine component. Angle distortion emerge effect of thermal contraction influenced by volume weld metal deposit caused by base metal thickness and heat input caused by weld current. Require to be conducted research to know how far influence of plate thickness (t) and weld current (I) to angle distortion on longitude direction and transversal direction.

Experiment research device compiled in formation model CCD (Composite Central Design) by 13 intake of data. Process variable used that plate thickness (X₁) and weld current (X₂) with angle distortion respon. Level used at plate thick that is 8 mm, 13 mm, and 20 mm. Level used at weld current that is 125 A, 150 A and 175 A. Steel AISI 1045 welded with electrode of AWS A/sfa 5.18 ER. 70S-6 using GMAW by manual. Welding position is flat. Measurement of deviation of height done at 36 point at each workpiece. Difference deviation of height (dH) transformed into angle distortion (βº) by using formulation $\beta = \arcsin \left( \frac{dH}{r} \right)$. System model modeled into quadratic equation.

From research result found influence of thick plate (X₁) and weld current (X₂) to angle distortion. Biggest angle distortion caused by plate thickness effect happened at thick 20 mm. Thick increase of plate (X₁) and interaction between plate thickness with weld current (X₁X₂) can improve the happening of angle distortion equal to 45% for the longitude direction and 50% for transversal direction at weld current level 125 A. Biggest angle distortion of strong effect of current happened at usage of weld current 125 A. Increase of weld current (X₂) and interaction between plate thickness with weld current (X₁X₂) can degrade angle distortion equal to 48% for the direction of longitude and 50% for the direction of transversal at thick level 20 mm. Angle distortion that happened at longitude direction tend to linear at thick of plate 8 mm, 13 mm and 20 mm. Angle distortion instruct transversal in form of curve happened at thick of plate 8 mm and 13 mm, while at thick 20 mm angle distortion that happened linear, where biggest curvature happened at thick 8 mm. Result of data validasi is statistically met a model process in the form of equation of kuadratik at longitude direction and of transversal direction with $R^2 = 98.1\%$ (longitude direction) and $R^2 = 97.91\%$ (transversal direction).
Keyword: weld parameter, multilayer system, manual welding, angle distortion, design composite central (CCD = 5%), test of residual error, and test of statistic.