

Influences of Plunge Speed on Axial Force and Temperature of Friction Stir Spot Welding in Thin Aluminum A1100

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Abstract : Friction Stir Welding (FSW) is a relatively new technique for joining metal. In some cases on aluminum joining, FSW gives better results compared with the arc welding processes, including the quality of welds and produces less distortion. FSW welding process for a light structure and thin materials requires small forces as possible, to avoid structure deflection. The joining process on FSW occurs because of melting temperature and compressive forces, the temperature generation of caused by material deformation and friction between the cutting tool and material. In this research, High speed rotation of spindle was expected to reduce the force required for deformation. The welding material was Aluminum A1100, with thickness of 0.4 mm. The tool was made of HSS material which was shaped by micro grinding process. Tool shoulder diameter is 4 mm, and the length of pin was 0.6 mm (with pin diameter= 1.5 mm). The parameters that varied were the plunge speed (2 mm/min, 3 mm/min, 4 mm/min). The tool speed is fixed at 33,000 rpm. Responses of FSSW parameters to analyze were Axial Force (Z-Force), Temperature and the Shear Strength of welds. Research found the optimum μ FSSW parameters, it can be concluded that the most important parameters in the μ FSSW process was plunge speed. lowest plunge speed (2 mm / min) causing the lowest axial force (110.40 Newton). The increases of plunge speed will increase the axial force (maximum Z-Force= 236.03 Newton), and decrease the shear strength of welds.

Keywords : friction stir spot welding, aluminum A1100, plunge speed, axial force, shear strength

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