

The optimization of FSSW parameters for tensile resistance on AA2024 lap-joints.

A. M. S. Malafaia¹, M. T. Milan², G.M. Dias¹, M. F. de Oliveira¹, D. Spinelli¹

¹*Universidade de São Paulo, Campus São Carlos, SP, Brazil*

²*MIB, Materials Institute of Brazil, São Carlos, SP, Brazil*

The main aim of this work was to optimize the FSSW process parameters to join AA2024 alloys. Although the FSSW technique has been more studied for 5xxx and 6xxx aluminum alloys series (employed mostly for automotive alloys) [1], this work evaluated the feasibility of use this process in a 2xxx aluminum series alloy (used mainly in aeronautic systems) [2]. The aluminum sheets were 60x40x1.6 mm dimension, welded in a lap-joint configuration (overlap of 20 mm), with two FSSW points in each specimen. The first studied FSSW parameter was the depth penetration and the tool rotational speed, in nine different combinations, maintaining constants dwell time and dwell rate, 2 s and 2 mm/s respectively. After the determination of the effect for those two parameters, other combinations of parameters were evaluated, increasing the dwell time. The two better parameters combinations, based on the maximum peak load results, under tensile shear tests, were: 4000 RPM tool rotational speed, 2 mm/s dwell rate, 4 s dwell time, for 2.85 and 3.1 mm depth penetrations. The maximum observed peak loads were 5.45 and 4.95 kN for 2.85 and 3.1 mm depth penetration, respectively.

Keywords: FSSW, AA2024, tensile shear strength, welding parameters optimization

Work supported by FAPESP, CNPq and OPF-EESC-USP.

[1] S. Lathabai, M.J. Painter, G.M.D. Cantin, V.K. Tyagi, *Scripta Mat.* **55(10)**, 2006, 899-902.

[2] A.M.S Malafaia, M.T. Milan, M.F. Oliveira, D. Spinelli, *Procedia Engineering*, **2(1)**, 2010, 1823-1828.

arturm@sc.usp.br. Av. Trabalhador São Carlense, 400 - EESC-USP São Carlos, SP-Brazil.