

Analysis of Friction Stir Welding Process for Joining Aluminum Alloy

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Abstract : Friction Stir Welding (FSW), a solid state joining technique, is widely being used for joining Al alloys for aerospace, marine automotive and many other applications of commercial importance. FSW were carried out using a vertical milling machine on Al 5083 alloy pipe. These pipe sections are relatively small in diameter, 5mm, and relatively thin walled, 2 mm. In this study, 5083 aluminum alloy pipe were welded as similar alloy joints using (FSW) process in order to investigate mechanical and microstructural properties .rotation speed 1400 r.p.m and weld speed 10,40,70 mm/min. In order to investigate the effect of welding speeds on mechanical properties, metallographic and mechanical tests were carried out on the welded areas. Vickers hardness profile and tensile tests of the joints as a metallurgical feasibility of friction stir welding for joining Al 6061 aluminum alloy welding was performed on pipe with different thickness 2, 3 and 4 mm, five rotational speeds (485,710,910,1120 and 1400) rpm and a traverse speed (4, 8 and 10)mm/min was applied. This work focuses on two methods such as artificial neural networks using software (pythia) and response surface methodology (RSM) to predict the tensile strength, the percentage of elongation and hardness of friction stir welded 6061 aluminum alloy. An artificial neural network (ANN) model was developed for the analysis of the friction stir welding parameters of 6061 pipe. The tensile strength, the percentage of elongation and hardness of weld joints were predicted by taking the parameters Tool rotation speed, material thickness and travel speed as a function. A comparison was made between measured and predicted data. Response surface methodology (RSM) also developed and the values obtained for the response Tensile strengths, the percentage of elongation and hardness are compared with measured values. The effect of FSW process parameter on mechanical properties of 6061 aluminum alloy has been analyzed in detail.

Keywords : friction stir welding (FSW), al alloys, mechanical properties, microstructure

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