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Optimization of Friction Stir Welding Parameters for Joining Aluminium Alloys using Response Surface Methodology and Artificial Neural Network

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Abstract : The objective of this work was to investigate the mechanical properties in order to demonstrate the feasibility of friction stir welding for joining Al 6061 aluminium alloys. 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 of 4mm/min. This work focuses on two methods which are artificial neural networks using software and Response Surface Methodology (RSM) to predict the tensile strength, the percentage of elongation and hardness of friction stir welded 6061 aluminium alloy. An Artificial Neural Network (ANN) model was developed for the analysis of the friction stir welding parameters of 6061 pipe. Tensile strength, the percentage of elongation and hardness of weld joints were predicted by taking the parameters tool rotation speed, material thickness and axial force as a function. A comparison was made between measured and predicted data. Response Surface Methodology (RSM) was also developed and the values obtained for the response tensile strength, the percentage of elongation and hardness are compared with measured values. The effect of FSW process parameters on mechanical properties of 6061 aluminium alloy has been analysed in detail.

Keywords : friction stir welding, aluminium alloy, response surface methodology, artificial neural network
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