Bioved, 20(1,2) : 95—104, 2009

DEVELOPMENT OF MATHEMATICAL MODEL FOR IDENTIFYING BEAD GEOMETRY OF ARC WELDING FOR FABRICATION OF FARM MACHINES

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Received May 9, 2009 and Accepted July 12, 2009

ABSTRACT : This study was conducted to predict the weld geometry, mechanical properties and HAZ dimensions by developing mathematical models following statistical methods. The important process control variables of welding viz voltage, current and travel speed were regressed with bead characteristics like quality, penetration, reinforcement, bead width etc and the mechanical properties such as bead hardness, HAZ hardness etc. The purpose of such development of equation is to find the mathematical relation between the weld bead characteristics and mechanical properties with the welding parameters, as the dimensions and shape of the weld bead largely determine the strength of welded joint. For using automatic Submerged Arc Welding effectively, it is essential to develop equations that express mathematically the weld bead parameters in terms of process variables, the variation in HAZ dimensions and microstructure. The relationship between welding variables and weld feature like hardness, bead geometry and HAZ width also reduces the cost of weld procedure development by decreasing the number of trial runs. In order to ensure adequate weld bead quality it is necessary that various welding variables should be in proper balance. Therefore, it is essential to know the effect of the process variables individually and in combination on the resulting weld bead dimensions. These dimensions not only control the type of microstructure but also determine the stress carrying capacity of a welded joint. The developed mathematical models in which the data is represented can be programmed, fed to a computer and used to develop an expert welding system. Statistical Analysis Software and MS Excel were used for the complete analysis.

Key Words: Submerged arc welding, Statistical package for social Science, Regression analysis, Mathematical models.