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Modeling and prediction of HAZ using finite element and neural network modeling

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ABSTRACT

With the increasing demands for product variety and quality level the need to eliminate human operator from the feedback path for welding process correction is evident. Of the several manufacturing methods welding alone has defined true automation. Success of automation depends on effective and efficient decision making tools. Neural network is applied to intelligent weld control. In Submerged Arc Welding (SAW), selecting appropriate values for process variables is essential to control heat affected zone (HAZ) dimensions and get the required bead size and quality. Also, conditions must be selected that will ensure a predictable and reproducible weld bead. This paper proposes the modeling and prediction of dimensions of Heat-Affected Zone for SAW process using Finite Element Analysis (FEA) and Artificial Neural Network (ANN). The dimensions of HAZ for SAW are modeled are simulated using FEA using the process variables such as welding current, arc voltage, arc efficiency and welding speed and the results are used as the learning file for ANN model. The developed ANN model is forwarded to predict the dimensions of HAZ and the results are compared with simulated FEA results. The developed method is found to be time consuming, competent and cost effective.

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