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Abstract

Our study aims at developing an efficient quality monitoring system in small scale resistance spot welding based on dynamic resistance. The dynamic resistance variation was first related to weld nugget formation process. An initial resistance peak caused by asperity heating was detected. The second peak in dynamic resistance and single peak in dynamic voltage could be attributed to bulk material heating. An obvious interrelationship could be found between end resistance and weld quality. The features extracted from dynamic resistance curve were mainly influenced by welding current. The overall resistance level was dropped as welding current enlarged. The multiple linear regression analysis and back propagation neural network were then used to estimate the weld quality in combination with extracted features. Result of the regression analysis in quality prediction was basically satisfactory. The proposed neural network model showed a better performance than regression analysis regarding the maximum estimation error and mean square error. Accuracy of the neural network based quality estimation could be further improved combining quality level classification strategy. Combination of the dynamic resistance measurement with neural network model was supposed effective to achieve the quality monitoring purpose in small scale resistance spot welding.

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