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Enhancing Welded Joint Integrity through MIG Welding Parameter Optimization

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Abstract: The present work, failure case of welded joint for energy storage device is analyzed. The energy storage devices are made up of AISI 1040 steel cases or boxes. Bulging effects in these boxes exerts tensile load on welded joint and breaks them. Root cause analysis is done and found the root cause as improper throat thickness of weld. To find out the solution, problem is analyzed theoretically by using strength equation also it is simulated in ANSYS R18.1 software for a constant tensile load of 16 KN. Simulation shows that there is a linear correlation between strength of welded joint and throat thickness. These results are validated in actual experimentation by taking tensile test on the sample specimens. The design of experiment by Taguchi is done on three variables VIZ weld current, arc voltage and wire feed rate. The results of experimentation are compared with the result from ANSYS and previous result. Throat thickness of welded joints at value 5mm gives required solution. Samples are also tested for liquid penetration test, microstructure test and hardness test to validate the optimized parameters and to check the quality of welded joints. Finally Optimized parameters are implemented for the welding of boxes. Performance of the device under modified parameters are examined, presented and discussed in this project report.

Keywords: MIG Welding, Tensile Test, Mini Tab, Taguchi Test

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