AIN SHAMS UNIVERSITY
FACULTY OF ENGINEERING
Design and Production Engineering

Development of Stationary Shoulder Friction Stir Welding Set Up to Obtain Different Shape Joints

A Thesis submitted in partial fulfillment of the requirements of the degree of

Master of Science in Mechanical Engineering

(Design and Production Engineering)

by

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Bachelor of Science inMechanical Engineering
(Design and Production Engineering)
Faculty of Engineering, Ain Shams University, 2010

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Statement

This thesis is submitted as a partial fulfilment of Master of Science in Mechanical Engineering, Faculty of Engineering, Ain shams University.

The author carried out the work included in this thesis, and no part of it has been submitted for a degree or a qualification at any other scientific entity.

Signature

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Date:

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Thesis Summary

Friction stir welding (FSW) has succeeded in welding materials which were known as non-weldable materials, There were some challenges in welding high-temperature materials with low thermal conductivity like titanium and stainless steel, welding of different joint configurations, as well as low heat input welding. Friction stir welding machines were designed mainly to apply FSW without the ability to overcome previous limitations. One of the novel techniques used to overcome those limitations is called stationary shoulder friction stir welding (SSFSW). The main purpose of SSFSW mechanism is to create non-rotating shoulder which keeps viscous material on without escaping.

SSFSW can improve mechanical properties, change welding zones dimension, and give uniform temperature distribution. The object of this research is to design SSFSW setup to use with the 1st Egyptian FSW machine at Suez University Labs without eliminating its original function of making conventional FSW joints, the setup was experimentally used for welding some samples of Al alloy AL7075-T651 which gave sound joints with excellent surface finish. Experiments were obtained at rotational speeds of 300, 600 and 900 rpm. Three welding speeds of 25, 50, 75 mm/min were applied. Different Z-force values were performed on constant parameters. The results showed that a sound weld joints were obtained, small heat distribution area around the nugget zone and no effect of the heat under the static shoulder. Maximum

tensile strength of 418.7 MPa at a rotational speed of 600 rpm, a welding speed of 50 mm/min and 49.5 KN z-force was achieved.

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