



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 in Mechanical Engineering
(Design and Production Engineering)
Faculty of Engineering, Ain Shams University, 2010

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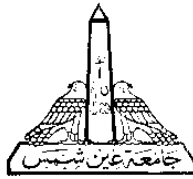
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Statement

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.

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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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Table of Contents

Chapter one	13
1. Introduction.....	13
Chapter two.....	17
2. Literature Review.....	17
2.1. Fusion Welding Processes of Al- Alloys	18
2.2. Solid state welding	20
2.2.1. Tool geometry	22
2.2.2. Welding parameters	23
2.2.3. Design of tool shoulder.....	24
2.2.4. Shoulder effect	25
2.2.5. Design of tool pins	26
2.2.6. Effects of tool pin diameter.....	26
2.2.7. FSW joints	28
2.2.8. Advantages of FSW:.....	29
2.2.9. Limitations in FSW:.....	30
2.3 Stationary shoulder friction stir welding concept.....	31
2.4. SSFSW tool design	32
2.5. Different designs of SSFSW mechanism.....	33
2.6. Related studies on stationary shoulder friction stir welding	34
2.7. Comparison of welded zones by SSFSW and FSW.....	36
Chapter three.....	37
3. Stationary shoulder friction stir weld setup design and manufacturing	37
3.1 Design procedure of SSFSW.....	37
3.2 Suggested design	39

3.3	Stress analysis	39
3.4	Design development	41
3.5	Assembly	44
3.6	Simulation	46
3.7	Manufacturing	48
3.8	Implementation and assembly of SSFSW setup on the machine ...	49
3.9	Stationary shoulder friction stir welding tools	51
3.10	Fixations and jigs used with SSFSW set up	55
3.11	Pre-trial experts for making SSFSW welding to check setup	56
Chapter four		58
4.	Welding experiments using stationary shoulder friction stir welding ..	58
4.1.	Material AA 7075-T6	58
4.2.	Material and sheet preparation	59
4.3.	Welding parameters	60
4.3.1.	Apply SSFSW on AA1100 and FSP on AA7075-T6	60
4.3.2.	Using different Z- forces and constant other parameters	61
4.3.3.	Using different rotation speeds and constant other parameters.	61
4.3.4.	Using different welding speeds	62
4.4.	Evaluation of SSFSW joints	63
4.5.	Macroscopic and microscopic investigation	63
4.6.	Tensile test:	64
4.7.	Hardness test	65
Chapter five		67
Results and Discussion		67
5.1.	Evaluation of the SSFSW set up	67
5.1.1.	Material flow	68

5.2.	Butt joints of AA1100	69
5.3.	Butt joints of AA7075-T6	71
5.4.	Visual inspection of AA7075-T6 SSFSW butt joints	72
5.4.1.	SSFSW butt joints of AA 7075-T6 using constant rotation speed & welding speed and different Z-force.	72
5.4.2.	SSFSW butt joints of AA7075-T6 using constant welding speed & Z-force and different rotation speed.	73
5.4.3.	Butt joints of AA7075-T6 using different welding speeds.	74
5.5.	Macrostructure of AA7075-T6 SSFSW butt joints.....	75
5.5.1.	Macrostructure of AA 7075-T6 using constant rotation speed & welding speed and different Z-force	75
5.5.2.	Macrostructure of SSFSW butt joints using constant welding speed & Z-force and different rotational speeds.....	77
5.5.3.	Macrostructure of SSFSW butt joints using different welding speeds.....	78
5.6.	Hardness results of AA7075-T6 SSFSW butt joints.....	79
5.6.1.	Hardness test of AA 7075-T6 using constant rotational speed, welding speed and different Z-force	79
5.6.2.	Hardness results of SSFSW butt joints using constant welding speed, Z-force and different rotational speeds.....	81
5.6.3.	Hardness results of SSFSW butt joints using different welding speeds.....	82
5.7.	Tensile strength and elongation of AA 7075-T6 SSFSW butt joint.....	84
5.7.1.	Tensile strength and elongation of AA 7075-T6 SSFSW butt joints using constant rotation speed & welding speed and different Z-force.....	84
5.7.2.	Tensile strength of SSFSW butt joints using different welding speeds.....	85
5.8.	Microstructure characterisation of AA7075-T6 SSFSW butt joints.....	87

5.8.1. Microstructure characterisation of AA7075-T6 SSFSW butt joints using constant rotation speed & welding speed and different Z-force.....	87
5.8.2. Microstructure characterisation of AA7075-T6 SSFSW butt joints using different welding speeds.....	89
5.9. Fracture characteristics of AA7075-T6 SSFSW butt joints	92
5.9.1. Fracture characteristics of SSFSW butt joints tensile specimens using constant rotation speed & welding speed and different Z-force .	92
5.9.2. Fracture characteristics of SSFSW butt joints tensile specimens using different welding speeds.....	93
5.10. General discussion.....	94
5.10.1. Comparison of Hardness test at the middle of all specimens.	94
Chapter six	96
6. Conclusions and Future Work	96
6.1. Conclusions	96
6.2. Future work	97
7. References	98

List of Figures

Figure 1-1 Thesis outlines and work strategy.	15
Figure 2-1 Illustrate the FSW process, friction tool, welding zone and terms in welding process. [2]	21
Figure 2-2 the friction stir tool illustrate the pin and shoulder	23
Figure 2-3 Geometry features of shoulder a) scrolled b) knurled c) ridged d) grooved e) concentric circles. [16].....	25
Figure 2-4 the effect of shoulder diameter on the peak temperature[18]	26
Figure 2-5 Effect of pin diameter on strength properties ($N = 1400$ rpm, $S = 60$ mm/min, $F = 8$ kN, $D = 15$ mm, and $H = 45$ HRc). [20]	27
Figure 2-6 Joint configurations for friction stir welding a) square butt b) edge butt c) T butt joint d) lap joint e) multiple lap joint f) T lap joint, and g) fillet joint. [2].....	28
Figure 2-7 Welding corner joint by CFSW[4]	31
Figure 2-8 SSFSW concept.....	32
Figure 2-9 Design principles for FSW tool and SSFSW tool have same dimensions (a) FSW tool (b) SSFSW tool. [23]	33
Figure 2-10 Stationary shoulder and tool: (a) schematic view and (b) picture of the welding process. [25].....	34
Figure 2-11 macroscopic weld cross section for AA7050-T7651 by (a) FSW at 700 rpm and 100mm/min (b) SSFSW at 1500rpm and 100mm/min. [23]	36
Figure 3-1 Friction stir welding machine at Suez University, Egypt.	38
Figure 3-2 First design concept consisting of two pieces have the flexibility of tight and remove welding tools.....	39
Figure 3-3 First part fixed to machine (a) 2D views (b) 3D view	42
Figure 3-4 Second part fixed to first part and carried third part (a) 2D views (b) 3D view	43
Figure 3-5 Third part (static shoulder) (a) 2D views (b) 3D view	44
Figure 3-6 Cross-Section view of assembled stationary shoulder setup mechanism.	45
Figure 3-7 SolidWorks simulation on first design (a) stresses (b) displacement.	46

Figure 3-8 Stress and displacement analysis for every part (a),(b) stresses and displacement for part one (c), (d) for part two (e), (f) for part three.	47
Figure 3-9 Stress and displacement analysis after assembly (a) stresses (b) displacement	48
Figure 3-10 parts after manufacturing (a) first part fixed to machine (b) second part fixed to first part (c) static shoulder (d) different static shoulder for corner joints.....	49
Figure 3-11 Fixation of the setup on the FSW machine	50
Figure 3-12 Tool shape and its dimensions (mm).	51
Figure 3-13 Wood sample of SSFSW to check the compatibility, Dimensions, and tolerances.....	52
Figure 3-14 Different of pin geometries like (a) cylindrical pin (b) threaded pin	53
Figure 3-15 Top view of jig setup for SSFSW after fixation at the machine	55
Figure 3-16 Jig used to weld corner joints.....	56
Figure 3-17 Trial friction process without shoulder.	57
Figure 3-18 First experiment using SSFSW setup.....	57
Figure 4-1 Olympus DP 73 used for microstructure characterization	64
Figure 4-2schematic of the tension test sample (ASTEM STANDARDS)..	65
Figure 4-3 (a) Picture of tensile test samples after cutting by wire cut machine (b) tensile test machine.	65
Figure 4-4 Determination of the hardness profile through the cross section of the welded joint.....	66
Figure 4-5 Vickers hardness test machine.	66
Figure 5-1 Picture of setup from different positions showing adjust between stationary shoulder and rotating pin after installation.....	68
Figure 5-2 (a) The initial diameter of the static shoulder (b) Final diameter after several using and failure of the pin during welding.	68
Figure 5-3 (a),(b) Ingress of material between rotating and fixed parts (c) initial hole at the beginning of the weld.....	69
Figure 5-4 Visual inspection of AA1100 butt welded joints at welding parameters of 300 rpm and 50 mm/min (a) ,(b) with using tilt angel 3° (c) using 0° tilt angel.	70
Figure 5-5 Visual inspection of FSP AA7075-T6 by using Rs 300 rpm and Ts 50 mm/min.....	72

Figure 5-6 Macrostructure cross section for FSP AA 7075-T6 by using Rs 300 rpm and Ts 50 mm/min.....	72
Figure 5-7 Visual inspection for SSFSW AA7075-T6 butt joints using Rs 600rpm & Ts 50mm/min and Z-force (a) 49.5 (b) 24.5 (c) 19.6 KN	73
Figure 5-8 Visual inspection for SSFSW AA7075-T6 butt joints using TS 50 mm/min & 24.5 KN Z-force and Rs of (a) 600 rpm (b) 900 rpm.....	74
Figure 5-9 Visual inspection for SSFSW AA7075-T6 butt joints using Rs 600rpm & Ts (a)Ts 25 mm /min , 34.3 KN Z-force (b) Ts 50 mm/min, 19.6 KN Z-force (c) Ts 75 mm/min, 29.4 Z-force.....	75
Figure 5-10 Macrostructure cross section of AA7075-T6 butt joints at Rs 600 rpm & Ts 50 mm/min and and Z-force (a) 49.5 KN (b) 24.5 KN (c) 19.6 KN.	77
Figure 5-11 Macrostructure cross section for SSFSW AA7075-T6 butt joints using TS 50 mm/min & 24.5 KN Z-force and Rs of (a) 600 rpm (b) 900 rpm.	78
Figure 5-12 Macrostructure cross section for SSFSW AA7075-T6 butt joints using Rs 600rpm (a)Ts 25 mm /min , 34.3 KN Z-force (b) Ts 50 mm/min, 19.6 KN Z-force (c) Ts 75 mm/min, 29.4 Z-force.....	78
Figure 5-13 Hardness distribution for weld with parameters of 600 rpm, 50 mm/min and 49.5 KN Z-force	80
Figure 5-14 Hardness map for SSFSW butt joints welded at Rs 600 rpm, Ts 50 mm/min and Z-force (a) 49.5 (b) 24.5 (c) 19.6 KN.....	81
Figure 5-15 Hardness results of SSFSW butt joints using TS 50 mm/min, 24.5 KN Z-force and Rs of (a) 600 rpm (b) 900 rpm.	82
Figure 5-16 Vickers hardness map for SSFSW AA7075-T6 butt joints using Rs 600 rpm (a)Ts 25 mm /min , 34.3 KN Z-force (b) Ts 50 mm/min, 19.6 KN Z-force (c) Ts 75 mm/min, 29.4 Z-force.....	83
Figure 5-17 Stress strain diagram for SSFSW butt joints welded at Rs 600 rpm & Ts 50 mm/min and different Z-forces , 49.5, 24.5, 19.6 KN.....	85
Figure 5-18 Stress strain diagram for SSFSW AA7075-T6 butt joints using different welding speeds 25, 50, 75 mm/min.....	86
Figure 5-19 Effect of welding speed on the ultimate tensile stress for SSFSW AA7075-T6 butt joints using Rs 600rpm, Ts (a) 50 mm/min, 19.6 KN Z-force (b) Ts 75 mm/min, 29.4 Z-force (c) 25 mm /min , 34.3 Z-force.	87