

# **FRICITION WELDING TO JOIN STAINLESS STEEL AND ALUMINUM MATERIALS**

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## **ABSTRACT**

The purpose of this work was to join and assess the development of solid state joints of dissimilar material AA6082 aluminium alloy and AISI 304 stainless steel, via continuous drive friction welding process, which combines the heat generated from friction between two surfaces and plastic deformation. Tests were conducted with different welding process parameters. The results were analyzed by means of tensile test, Vickers micro hardness test, fatigue test, Impact test, and SEM-EDX (energy dispersive X-ray) analysis in order to determine the phases that occurred during welding. The strength of the joints varied with increasing upset pressure and upset time keeping friction pressure and friction time constant. The joint strength increased, and then gradually decreased after reaching a maximum value, with increasing upset pressure and upset time. Joint strength depended on the size and shape of the tensile test piece. The process of friction welding between the aluminium alloy and the stainless steel is proposed to evolve as follows: welding progresses from the outer to the inner region; an unbounded region is retained at the centre of the weld interface with shorter upset time; longer upset time causes the formation of an intermetallic reaction layer at the weld interface; and the reaction layer grows as the upset time increases. Some of the welds had poor strength due to the accumulation of alloying elements at the joint interface. When the thickness of the reaction layer increased above a critical value, the joint was brittle and fractured at the weld interface. The joint was sound when there was no unbounded region and a thin reaction layer formed along the entire weld interface.

**KEYWORDS** Aluminium, Friction Welding, Stainless Steel, Welding Strength.