

Abstract



Dissertation Title: ***Mechanical and microstructural behaviour of dissimilar AA2014-T6 and AA7075-T6 aluminium alloy plates joined by friction stir welding.***

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Presently, Enormously distinct properties of aluminium alloys which is applied for structural parts hold lightweight and good structural strength. Both automotive and aircrafts industries use different aluminium alloys (2XXX series and 7XXX series) met the light-weight materials which are essential for the manufacturing of aerospace firm and other many structural applications. Friction stir welding (FSW) is an appropriate solid-state joining technique which was innovated at TWI (the welding institute) in UK at 1991. The technology have been widely examined for primarily low melting point materials, i.e., Al, Cu, and Mg alloys. From the initiation, FSW has effectively joined any combination of dissimilar aluminium alloys and has remained the enormously accepted metal joining processes. The process has established a broad range of applications such as automobile, marine, aerospace, etc. Various research organization is financing steadily for the procedure.

Welding processes are used for fascinating, as there is an insistence on studying their potential as comparing towards the fusion welding process which is

mainly used for joining structural components but failed in dissimilar welds. Dissimilar welds are widely used in aerospace, automobile, and marine application to get the advantage of unusual properties of dissimilar alloys at distinct locations in the identical weldment.

The present work aims to study on the mechanical and microstructural evolution of dissimilar AA2014-T6, and AA7075-T6 Al alloys of 6 mm thick sheets of butt welded joined by FS welding with the joining line longitudinal to the rolling direction. FS Welding process needs a proper tool geometry and process parameters to join two dissimilar alloys. Therefore, the study is based on determining optimum parameters for joining of 6 mm thick FS butt welded sheets made up of AA 2014-T6 and AA 7075-T6 Al alloys in a various speed of tool rotation.

The diversity in the properties across the weld and its mixing behaviour were deliberated by resolving the thermal cycle, performing hardness test and microstructural analysis. The two different materials were welded with perpendicular rolling direction of dissimilar weld zone and after were examined in tension at room temp. in order to investigate the mechanical response and to noticed the distinct with the parent materials. Such advanced technology can capable to join the difficult welding materials because with conventional techniques it is difficult to join the 2XXX series alloys that show limited weldability and 7XXX series primarily employed in aerospace alloys applications are claimed to be not easily welded.

Keywords: Friction stir welding, Weld nugget hardness, Dissimilar materials, FSW micro-structure, Mechanical properties.