IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 4, December 2025
Impact Factor: 7.67

A Study on the Joining Behavior Of Aluminium Alloys (Aa6061, Aa7075) and Aisi 304l Stainless Steel using Advanced Welding Techniques

Tarun Mittal
Lecturer, Department of Mechanical Engineering
Hindu College of Engineering, Sonipat

Abstract: *This present scholarly work of merit is studied from the perspective of the parametric effect on weld microstructural evolution and consequential mechanical properties alteration in precipitation-hardened aluminium (Al) AA6061-T6, AA7075-T651 and austenitic stainless steel (ASS) AISI 304L. The exploration of criticality and domain of weldability phenomena have been performed by adopting two advanced innovative joining technology; friction stir welding (FSW) and laser beam welding (LBW). Moderate strength AA6061-T6 and high strength AA7075-T651 are the most widely accepted alloys in many fabrication industries of commercial importance, particularly in different automobile, aerospace and military components industries. While ASS 304L are found with much diversified applications in thermal power plant, petrochemical, automotive, biomedical engineering and nuclear industries. On the other hand, being comparatively new technology, both FSW and LBW have gained wide recognitions among researchers and industries as a potentially powerful joining technology for aerospace, transportation, pipe joining and marine structural jobs. Going by the published research papers, it revealed that there have been difficulties for welding Al alloys by conventional welding such as gas tungsten arc welding (GTAW), gas metal arc welding (GMAW) processes, specifically precipitation-hardened AA6061 and AA7075 are facing defects related to solidification crack, distortion, porosity, micro-segregation and formation of brittle dendrite structure. There also revelation that the weldability of ASS can be challenging during conventional fusion welding process such as GTAW, GMAW due to higher possibility of sensitization, distortion and microstructural modification. Further, during joining of ASS with conventional welding, material softening at heat affected zone (HAZ) cannot be eradicated completely. So the proper selection of process implications could bring more integrity to the structural design. Bearing this in mind, the two novel techniques FSW and LBW have been tried to accomplish the structural joints for AA6061, AA7075 and AISI 304L*

Keywords*:* GTAW, GMAW, HAZ ASS 304L

DOI: 10.48175/568