Title:
Investigation of microstructure and mechanical properties of AISI304L Stainless Steel to ASTMA514 Steel joint by Gas Tungsten Arc Welding

Abstract:
In the present study, Dissimilar welding of austenitic stainless steel AISI 304L to Quenched-Tempered Steel ASTM A514 by gas tungsten arc welding process with direct current electrode negative polarity was investigated for this purpose, two filler metals including (ERNiCr-3) and austenitic stainless steel 309L (ER309L) were used. In order to achieve suitable structure and excellent mechanical properties in the mentioned joints, controlling of the input and pre-heat treatment were among the effective and controllable parameters after welding, the microstructure of the different zone in each joint, including weld metals, heat affected zone, inter face and unmixed zone (UMZ) equipped with energy disperse spectrometry (EDS) In order to addition, the mechanical properties including the bend test, ultimate strength, impact resistance, hardness and fractography of the specimen were investigated. The tensil strength quantity of the filler metal ERNiCr-3 has been 593MPa and filler metal ER309L has been 556MPa. The investigations showed completely austenitic structure as dendrite, the 309L weld metal was observed as the primary ferrite with austenitic matrix and also microstructure was seen as ferrite skillet morphology, all the specimen underwent ductile fracture in HAZ in the tension test. The average amount of absorbed energy by the filler metal ERNiCr-3, 117 jules and filler metal ER309L, 95 jules has been. The hardness maximum strength guntity of ERNiCr-3 was 156 vickers however minimum strength guntity of austenitic stainless steel filler metal ER309L was 127vickers. Finally, it can be concluded that for the joints, between the austenitic stainless steel AISI 304 L to Quenched-Tempered Steel ASTM A514. The ERNiCr-3 filler characteristics in terms of mechanical propertis, including tensile strength, bend strength, impact resistance and hardness provided the optimum qualities.

Keywords:
Dissimilar weld, Quenched-Tempered Steel, stainless steel, microstructure