INVESTIGATION ON MICROSTRUCTURE AND MECHANICAL PROPERTIES OF E36-3 STEEL WELDED JOINT

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ABSTRACT

The aim of the investigation was to find a liaison between materials chemical composition, microstructure and mechanical properties for the E36-3 low alloy high strength steel, also called low alloy structural steel. The base material widely used in fabrication of gear and cranes from the Algerian company CIG Constantine was welded with cored wire SG3 by the Gas Metal Arc Welding (GMAW) technique. The behaviour of E36-3 steel in terms of metallurgical modifications, hardness and Charpy V-notch impact in weld metal (WM), heat affected zone (HAZ) and base metal (BM) was investigated and discussed. The experimental results highlighted the impact of the welding process on the microstructure and mechanical properties. The effect of the thermal cycles developed during welding on the microstructure was reflected by the formation of various structures with various characteristics which, finally, have determined the mechanical properties of the welded joint. Besides, the influence of the number of passes on the fusion weld microstructure was studied. Inside the fusion weld, due to the effects produced by the repeated heating and cooling on the previous layers, a structure of pearlite and ferrite regenerated with fine grains was developed, while in the case of the outer passes, a combination of pearlite and acicular ferrite was obtained. The analysis of the fracture mechanism of the welded joints revealed the presence of ductile fracture, characterized by tearing of metal accompanied by appreciable global plastic deformation, at room temperature. A severe decrease of the plasticity properties of the joint was observed in the temperature range of (-20°C)...(-80°C).

KEYWORDS: E36-3 steel, GMAW, microstructure, mechanical testing, fracture.

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