

Mechanical and Metallurgical Characterization of HSLA X70 Welded Pipeline Steel Subjected to Successive Repairs

Bouzid MAAMACHE, Mabrouk BOUABDALLAH, Abdelhalim Brahim, Youcef Yahmi, Billel CHENITI, Brahim MEHDI

Abstract: The aim of this work is to study the influence of successive weld repairs on the microstructure and the mechanical behavior of the heat-affected zone (HAZ) of an HSLA X70 steel. Detailed microstructural examination combined to grain size measurement showed that beyond the second weld repair, the microstructure of the HAZ undergoes significant change in the grain morphology and grain growth. The results of the X-ray diffraction analyzed using MAUD software indicated an increase in the crystallite size and a decrease in the dislocation density according to the number of weld repair operations. Consequently, a loss of mechanical properties, namely the yield strength and the toughness with the number of weld repairs, was recorded. Beyond the second weld repair operation, the properties of the welded joint do not fulfill the standards applied in piping industry.

Keywords : HSLA X70 steel; Successive weld repair; Heat affected zone; Dislocation density