The effect of repeated repair welding on microstructure and mechanical properties of quenched and tempered steel A517

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(Received 7 August 2016 ; Accepted 1 November 2016)
Abstract

A517 is a low alloy high-strength steels that due to its high strength, toughness and weldability is used in ship building and submarine hulks. The welded areas of this steel often require repairs. In this study, the effect of number of welding repair on microstructure and mechanical properties of A517 steel is studied. Four samples (samples without repair, once repaired, twice repaired, and three times repaired) were welded by SMAW welding. Microstructural studies were carried out by using optical and scanning electron (SEM) microscopes. The effect of the number of repairs on mechanical properties of samples were investigated by using tensile, bending, impact and hardness The profile of hardness illustrated that the hardness in the heat affected zone near the base metal increased by repeated repairs while the hardness of this zone reduced in the third repaired sample. By repeating the welding repair, tensile and yield strengths of the welding areas were reduced and fracture impact toughness of heat affected zone at -51°C was increased. Generally, the results of tensile tests of second and third repaired indicated that the strength of these samples were not meet the ASME IX standard requirements, so welding steel A517 in the second and third repairs is not acceptable.

Keywords: high-strength steel, SMAW, welding repair, A517.