

Numerical Simulation of Welding Residual Stress Distribution on T-joint Fillet Structure

Abstract

Fillet welding is widely used in the assembly of ships and offshore structures. The T-joint configuration is frequently reported to experience fatigue damage when a marine structure meets extreme loads such as storm loads. Fatigue damage is affected by the magnitude of residual stresses on the weld. Recently, many shipping registers and design guides have required that the fatigue strength assessment procedure of seagoing structures under wave-induced random loading and storm loading be compensated based on the effect of residual stresses. We propose a computational procedure to analyze the residual stresses in a T-joint. Residual stresses are measured by the X-ray diffraction (XRD) method, and a 3-D finite element analysis (FEA) is performed to obtain the residual stress profile in the T-joint. The proposed finite element model is validated by comparing experiments with computational results, and the characteristics of the residual stresses in the T-joint are discussed.