

Numerical Analysis of Crack's Effects in a Dissimilar Welded Joint

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Abstract : The search for structural efficiency in mechanical systems has been strongly exerted with aim of economic optimization and structural safety. As soon, to understand the response of materials when submitted to adverse conditions is essential to design a safety project. This work investigates the presence of cracks in dissimilar welded joints (DWJ). Its fracture toughness responses depend upon the heterogeneity present in these joints. Thus, this work aim analyzing the behavior of the crack tip zone located in a butterfly dissimilar welded joint (ASTM A-36, Inconel, and AISI 8630 M) used in the union of pipes present in the offshore oil production lines. The crack was placed 1 mm from fusion line (FL) Inconel-AISI 8630 M toward the AISI 8630 M. Finite Element Method (FEM) was used to analyze stress and strain fields generated during the loading imposed on the specimen. It was possible observing critical stress area by the numerical tool as well as a preferential plastic flow was also observed in the sample of dissimilar welded joint, which can be considered a harbinger of the crack growth path. The results obtained through numerical analysis showed a convergent behavior in relation to the plastic flow, qualitatively and quantitatively, in agreement with previous performed.

Keywords : crack, dissimilar welded joint, numerical analysis, strain field, the stress field

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