

عنوان مقاله:

Multi-Objective Optimization of Stress Concentration Factors for Fatigue Design of Internal Ring-Reinforced KT-Joints Undergoing Brace Axial Compression

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خلاصه مقاله:

Stress concentration factors are important to determine fatigue life based on the S-N curve methodology, where the lower the stress concentration factor, the higher the fatigue life. In this work, we developed internal ring-reinforced KT-joints, one of the most commonly used joints in the offshore industry, for the most practical ranges with the least stress concentration factors, followed by the formulation of a novel set of parametric equations for determining the stress concentration factors of internal ring-reinforced KT-joints. Using numerical investigation based on a finite element model and a response surface approach with  $\lambda$  parameters ( $\lambda$ ,  $\delta$ ,  $\psi$ ,  $\zeta$ ,  $\theta$ ,  $\tau$ ,  $\gamma$ , and  $\beta$ ) as input and eleven outputs (SCF  $0^\circ$  to SCF  $90^\circ$  and peak SCF), the stress at ten locations around the brace was evaluated, since efficient response surface methodology has been proven to give comprehensive and accurate predictions. The KT-joint with the following parameters:  $\lambda=0.951515$ ,  $\delta=0.2$ ,  $\psi=0.8$ ,  $\zeta=0.31$ ,  $\theta=45.15^\circ$ ,  $\tau=0.6$ ,  $\gamma=16.25$ , and  $\beta=0.4$  had the least stress concentration factor. The KT-joint with the optimized parameters was validated through finite element analysis. The resulting percentage difference was less than 6%, indicating the applicability of the response surface methodology with high accuracy. Doi: 10.28991/CEJ-2024-010-06-03 Full Text: PDF

کلمات کلیدی:

.KT-joint; Response Surface Methodology; Stress Concentration Factor; Ring-Stiffeners; Fatigue; Multi-Objective Optimization; Finite Element Analysis

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