

Assessing the Fatigue Life of Butt-Welded Joints under Oblique Loading by
Using Local Approaches

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Abstract

The fatigue life of butt-welded joint specimens under oblique loading was experimentally investigated. Five types of specimens with different oblique butt-welding angles were used for the fatigue tests and subjected to the fixed-directional loading to study the effect of oblique loading on fatigue strength of butt-welded structures. The finite element method was employed to obtain the local stress states at weld toes. Based on the finite element-simulated local stresses, four multiaxial fatigue prediction models - von Mises equivalent stress model, modified von Mises equivalent stress model, the Sines' model and the Findley' s critical plane model - were utilized to evaluate the fatigue life of studied specimens. Mean stress effect was also considered by the prediction models. The prediction results show that Findley' s parameter provides better prediction than the other three parameters. Furthermore, the observed critical locations are identical to those experiencing the maximum stress identified by the finite element analysis.

Keyword : Butt-welded joint; Fatigue; Oblique loading; Local stress approach; Critical

plane approach.