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Fatigue of Weld Ends under Combined Loading

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Abstract

The fatigue behaviour of weld ends, especially in thin sheet structures under multi-axial load conditions, has not yet been explored. A research project was initiated to gain more information on this topic which is of special interest to the automotive industry. In the present study fatigue tests on steel tube-tube joints were conducted. Notch stresses were calculated using an idealised weld end model. A numerical method combining the geometrical and statistical size effect into an integrated approach was used in order to take size effects into consideration. The out-of-phase effects on fatigue strength was covered using a multi-axial criterion. We propose a new approach combining the applied multi-axial criterion with the micro-support effect. That leads to a satisfactorily small scatter range of experimentally obtained fatigue lives around the $S-N$ curve from regression analysis.

Keywords: combined loading, multi-axial fatigue, notch stress concept, size effects, weld ends

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