

# Synergism Between Fatigue and Cyclic-Stress Corrosion-Cracking

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## Abstract

For 50 years, researchers have considered how time-dependent environmental effects can be included in cycle-dependent corrosion fatigue (CF) crack growth rate (CGR) models. Common assumptions are that cycle- and time-dependent contributions are separable, operate in parallel, are non-interacting and that total environmental CGR can be obtained by linear summation of cycle-dependent fatigue and time-dependent (SCC) CGRs. However, considered here are data and analyses that show that environmental CGRs may be greater than predicted by superposition models. A phenomenological model is developed to quantify the effect of crack-tip strain-rate due to fatigue stress-cycles on electrochemical activity at a crack tip and thereby synergistically increase crack growth rates by a cyclic-stress corrosion-cracking (C-SCC) mechanism.

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