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A Literature Review on the Influence of Small-Amplitude Cyclic Loading on Stress-Corrosion Cracking in Alloys

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Stress-corrosion cracking (SCC) is a cracking process caused by the conjoint action of stress and a corrodent. Traditionally, the stress that causes SCC has been regarded as a sustained tensile stress. When corrosion-assisted cracking is caused by cyclic stress, the problem is termed corrosion fatigue. Thus, test methods for SCC rely upon static (or quasi-static) tensile loading. However, in recent years researchers have developed new information showing that, at least in certain instances, small-amplitude cyclic loading superimposed on high tensile loads (ripple-loading) can have a significant influence on SCC behavior. The trend revealed is that ripple-loading reduces the apparent SCC stress or stress-intensity threshold and accelerates time-to-failure for stresses or stress-intensities above threshold levels. The implication of these findings is that traditional static tests for SCC may, in fact, be non-conservative. The mechanism of ripple-load cracking is thought to involve film rupture at active SCC sites. The recent literature on ripple-loading has been identified and reviewed. Several notable examples have been cited and discussed. Directions for further study are delineated.

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