Characterization of heterogeneous arc welds through miniature tensile testing and Vickers hardness mapping

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Basic fatigue properties

Two types of specimens are evaluated:

1) Round bar for S-N curve analysis:
   - Corrosive environment decreases fatigue life
   - Seawater is corrosive and accelerates the fatigue process. An environmental chamber was built to test fatigue in a realistic corrosive situation.

   Corrosion is a slow process and must be accelerated to allow an increased fatigue testing frequency.

2) ESE(t) for Fracture Mechanics analysis:
   - Variable amplitude (VA) analysis is more accurate
     - Offshore industry is growing fast. Since new generation steels and design techniques are not updated in the standards, designs can be over conservative.

   Corrosion might be the driven damage mechanism at low stress levels

Fatigue Analysis of Steels used in Offshore Structures Subjected to Variable Amplitude Load Conditions

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Variable amplitude loading

Corrosive environment

Variable amplitude (VA) analysis is more accurate

Wave spectrum

Structural response

Random

Low-High blocks

Easier to test and interpret

High-Low blocks

Easier to test and interpret

Analysis

Possible corrosion-fatigue interaction

Realistic test conditions give accurate predictions.

VA loading can accelerate/retard the CGR. Corrosion might be the driven damage mechanism at low stress levels

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