Spring 6/15/22 Meeting

Wednesday, June 15, 2022 7:52 AM

Residual Stress Relaxation

- James Pinault (Proto XRD) presented on the work with the T-sample fatigue cycling versus residual stress relaxation
- Question from Rick Lopez was have we considered a DOE to study the size of hysteresis loop, material hardness (Conle plot), initial residual stress level, and R-ratio (Goldak comment)
  - Will discuss at next FD&E RSC meeting
- Note about surface condition effect on the parts due to grinding
  - Surface results are skewed

Residual Stress Sub-committee Overview

- Casey Gales from John Deere presented on current activities
- Rick Lopez asked…I believe that transmission electron microscopy (TEM) would be the true evaluation of atomic spacing, and if team wants a referee test to compare your three sets of results against, then TEM would likely be valuable. I've always been curious if measurement on carburized samples is skewed by faulty lattice spacing info - you're driving carbon atoms into interstitials to strain the lattice, but I'm not sure if typical XRD equipment copes correctly with that.
- Al Conle asked if we had fatigue properties for the cast steel
  - Ralph Stephens had worked on both the fatigue properties and crack growth
  - Tom Prucha might also have the data available
- Casey solicited the group for predictions on the Cast Steel Samples
- Casey also asked the group to consider abstracts for ICF-15 RS workshop

T-sample Scan and Fatigue Analysis

- Brad Cook from CAT presented on the work
- James asked for clarification about the load; 12.1 kN R=0.1
  - Would be interested in the RS relaxation at this load
- Jan Papuga asked about the method as it relates to the IIW method
- Vladimir Pokras asked about the sample's radius for IIW since default is R=1.0 mm
  - Brad modified S-N curve for different radius

Review of ASTM E739 on Statistical Analysis of Fatigue Data

- Dan Lingenfelser of HBK presented on E739 meaning and future
- In need of an update
- Is being used by medical industry
- Expressed its importance and exemplified the need for keeping it recent
- Future data might be plotted with cycles (N) on vertical access
- E739 is going to be balloted for withdrawal within 6 months within ASTM E08
  - If you have an interest it sustaining you will need to express your interest to ASTM
    - You can communicate your intention through Dan Lingenfelser

Fuch's Award: Fatigue Design and Behaviour of Carburized Steel

- Carol Liang (academia) presented on her thesis work

Residual Stress Technical Committee of ASM Outreach

- Reach out to Beth Snipes if you're interested in ASM Residual Stress activities

When is a Crack a Crack?

- Discussion on when is a crack a crack led by Bill DePorter
- Rick Lopez asked if Magnatomic detection of crack detection using NDE would be physically possible
- Ralph Larson with Magna commented on inclusion based initiation sites being typical and being related to the crack size initiation
  - Linear mathematics with a critical size element has been studied (i.e. Colorado School of Mines)
  - Agreed that J-integral would apply for the A36 material
- Dan Lingenfelser commented on this concept originating all the way back in 1985
  - Dr. Glinka's work on Uni-Grow has taking this concept from a near zero state of crack "existence" that just grows until load carrying capability isn't possible
- Dr. John Goldak had brought up the nuclear industry and there nucleation materials understanding
  - This nucleation creates a inclusion which is mathematically definable
  - Fatigue of Materials by S. Suresh is a good book to get started on this topic
- Mike Bujold brought up some gear failure issues experienced in the trucking industry
  - Had to do some statistics with supply chain for cleanliness of steel supplies

Area of Future Work

- Crack propagation Data
  - Really hard steels
    - Crack propagation growth is short
  - Negative R-ratio steels (with significant compression)
- Next meeting discussion