Peening Confirmatory Research

Materials Meeting

May 2017

Peening Background

- 3 Aspects
  - Peening may be conducted under 50.59
  - MRP335 Rev 3-A provides basis for inspection relief for peened components
  - Inspection relief authorized based on plant specific request which documents conditions of MRP-335 are met

Peening Background

- Safety Evaluation for MRP-335
  - Does not address uncertainty of residual stress measurements
  - Proposes confirmatory research
- Confirmatory research is not
  - Comprehensive review of peening
  - Revisiting findings in the safety evaluation
  - Delaying review of plant specific requests

Peening Background

- NRC staff is in receipt of industry comments on peening program
  - Comments are being considered

Research Program

- 4 components
  - Evaluate existing information on
    - Crack initiation of peened components
    - Uncertainty of residual stress measurements
  - Experimentally assess peening effect on NDE
  - Experimentally assess uncertainty of residual stress measurements
  - Experimentally assess crack initiation in peened components

Existing Information Review

- Conduct review of existing information on crack initiation and residual stress measurement uncertainty
  - Assessment across industry
  - Confirmatory review of related reports
  - Discussions with external stakeholders
  - Will be used to help define specifics and extent experimental program

Effect of Peening on NDE

- Existing dissimilar metal weld with implanted flaws
  - Examine with UT and ET
  - Peen
  - Examine with UT and ET
  - Identify differences in response if any
- Primary interest is ET

Residual Stress Uncertainty

- Uncertainty of residual stress measurement specifically excluded from MRP-335 SE
- X ray diffraction is technique of choice
  - Potential high uncertainty especially for welds
  - Potentially less representative of truth state than some other methods

Residual Stress Uncertainty

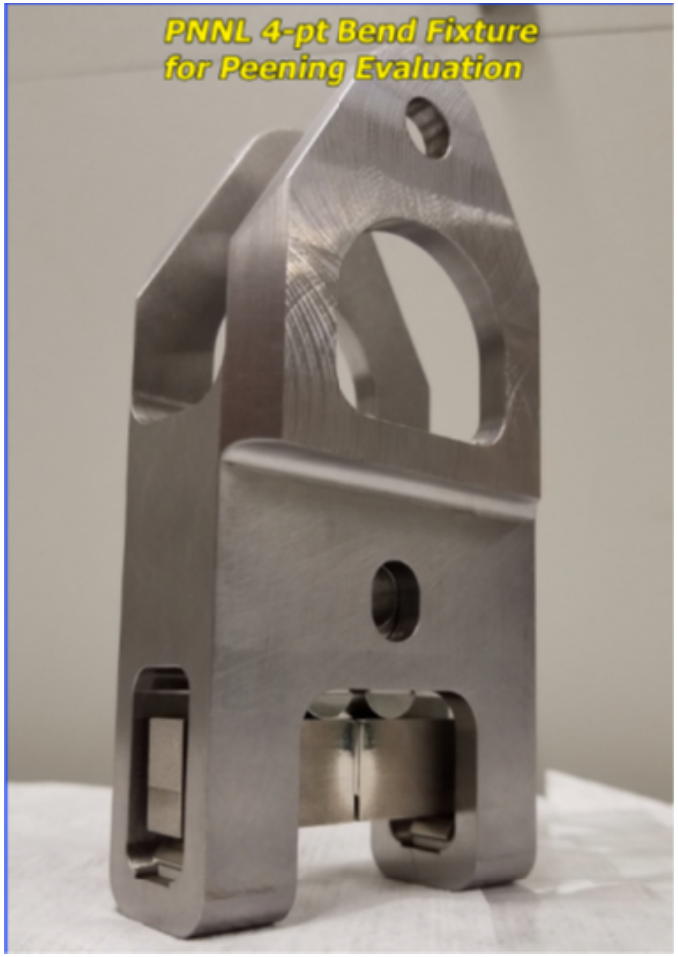
- Experimental program will investigate:
  - Uncertainty
    - Many measurements of peened weld on plate
  - Comparison
    - Many measurements of peened weld on plate using hole drilling
    - Compare mean values with x ray

Crack Initiation

- Peening has long history of success for fatigue
- Peening has less history for PWSCC
- Experimental program
  - Compare crack initiation of peened and unpeened samples
  - In realistic environment (autoclave)
  - Replicate samples
  - Multiple samples tested simultaneously

Crack Initiation

- 4 point bend specimens
- Comments solicited to define test plan
  - Public meeting?
- Initiation not expected
  - If observed will seek public input on significance



Conclusion

- Program
  - Confirms specific aspects of safety evaluation
  - Does not revisit conclusions of safety evaluation
  - Does not delay relief requests
  - Is still under development
- Industry comments under review
- Additional comments appreciated