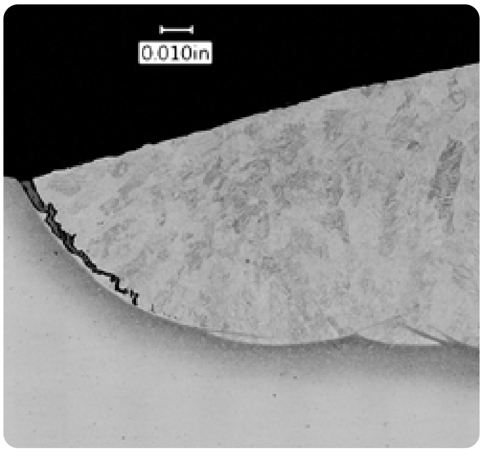
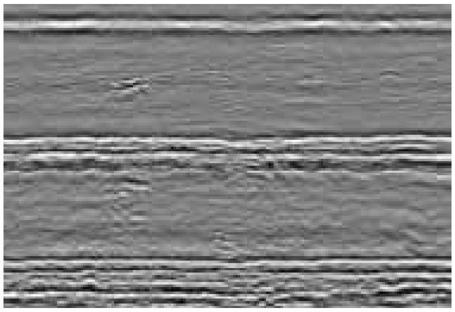
CREEP STRENGTH EVALUATION WHEN NDE IS INEFFECTIVE CORE SAMPLE CREEP TESTING

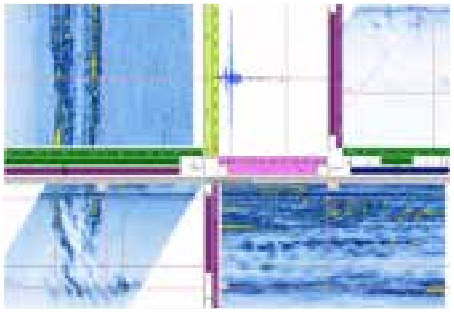


Nondestructive Evaluation (NDE) such as ultrasonic phased array or hardness testing can be ineffective because of factors such as excessive inclusions in the steel or uncertainties associated with surface-based measurements. To assess the current state of damage and resulting remaining life in such circumstances, SI has developed a Core Sample Creep Test method to provide component specific assessments. This avoids assumptions about properties and the state of damage that might otherwise result in overly conservative life estimates, and prohibitively short inspection intervals.

Example: Seam Welds



TOFD inspection data showing fabrication indications



Annular phased array inspection data showing indications

PROBLEM

Dense clusters of fabrication indications in seam welded components can mask creep damage and thereby limit the damage detection capability of high resolution ultrasonics, which cannot distinguish incipient service damage from dense inclusions. This can render these techniques ineffective in assessing the health of the weld.

SOLUTION

Without the benefit of definitive NDE to identify incipient creep damage, remaining life estimates rely on generic correlations for the creep strength of material. Because of the variability in strength, minimum values are often used, likely resulting in overly-conservative life estimates and reinspection intervals. To overcome this limitation, Structural Integrity has developed a specialized creep rupture test method to determine the component specific creep strength from core samples extracted from the component. This component specific data provides the most accurate assessment without the uncertainty and potential ultra-conservatism of using generic minimum properties.

Structural Integrity Associates, Inc.®

info@structint.com

www.structint.com

1-877-4SI-POWER
1-877-474-7693

5215 Hellyer Avenue Suite 210
San Jose, CA 95138

There are four steps for the **Core Sample Creep Test** method:

1. Identify relevant seams, locations and size for plug samples to be removed based on NDE, review of fabrication records and scoping life assessment calculations.
2. Perform metallurgical analysis to assess creep damage and fabrication indications, providing verification of prior NDE and establishing the metallurgical risk factors associated with the specific base and weld metals.
3. Carefully designed cross-weld creep samples are machined from the core sample and grips are welded on for creep testing. Sample specific analyses are used to correlate the small-scale sample results with a broad database of cross-weld creep tests.
4. Remaining life of the seam weld is then determined from a combination of the creep test results, metallurgical risk factors, prior NDE, and knowledge of component geometry (e.g. ovality or peaking for the seam).

VALUE

Remaining life calculations using component specific creep and metallurgical risk data eliminate the uncertainty in the use of reference material properties. This gives us the ability to confidently extend the inspection interval of components. Additionally, future fitness-for-service assessments can be performed with actual material properties rather than generic, conservative, properties resulting in improved life predictions.