

Evaluation of the W. A. Parish Cold Reheat Piping Failure

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GIVEN:

On July 15th the Cold Reheat Line of the Texas Genco's W. A. Parish Plant experienced a catastrophic failure that included significant collateral damage (no lives were lost or personal injuries occurred). After rebuilding the piping system Texas Genco and Reliant Resources contacted Stress Engineering Services to assist in a Root Cause Analysis (RCA). Concerns were raised about a damaged attemperator that could have contributed to the longitudinal seam failure. A Reliant Resources report indicated that the failure initiated from a toe crack on the non-ground longitudinal weld on the inside surface of the pipe.



Failure of Cold Reheat Line

REQUIRED:

Texas Genco was very specific in its request for SES: determine and rank the contributors to the failure. Eventually this required the use of the following tools and services:

- Model steam flow using computational fluid dynamics (CFD)
- Full-scale testing of the attemperator nozzles
- Finite element analysis (FEA) of piping including transient thermal analyses
- On-line field monitoring using high-temp strain gages and thermocouples
- Fracture mechanics and fatigue life assessment



SOLUTION:

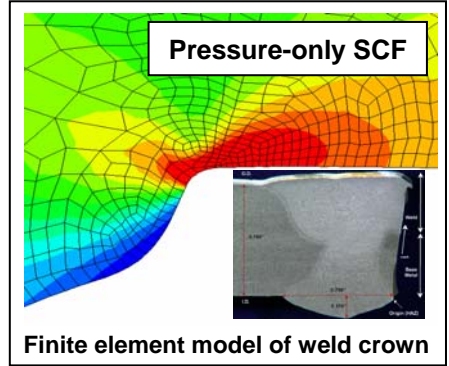
In working with Texas Genco, SES was able to develop a plan of attack to address all of the potential contributors to the failure. Using a combination of analytical techniques (CFD and FEA) and in situ field monitoring (strain gages and thermocouples), the following contributors to failure were ranked.

Primary and Secondary Contributors

1. Stress concentration factor associated with internal weld profile
2. Location of failure relative to elbow
3. Quenching effects associated with cycling of the attemperator
4. Vibration of the piping system

Tertiary Contributors

5. Performance of snubbers and spring hangers in vicinity of failure
6. Size of droplets ejected with attemperator spray nozzles (could contribute if flashing develops)



TRANSIENT ANALYSIS

10 seconds after quench

