

# **Use of Analytical and Experimental Monitoring Techniques in Assessing the Performance of a Cold Reheat Steam Line**

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## **ABSTRACT**

After a catastrophic failure that occurred in a 30-inch diameter cold reheat (CRH) steam line at the W. A. Parish Plant, Texas Genco requested that Stress Engineering Services, Inc. (SES) assist in determining the cause of the failure. The incident occurred at approximately 12:10 PM on July 15, 2003 and resulted in a catastrophic failure that scattered components around the plant in a radius of 1,200 feet. Reliant Resources and Texas Genco conducted their own failure investigation that involved metallographic examinations, inspection of the fracture surfaces, review of operating conditions at the time of failure, and studies related to the weld profile of the CRH line.

Stress Engineering Services' efforts included studies using computational fluid dynamics (CFD) to address how droplet sizes from the attemperator might impact downstream behavior of the piping system. Follow-on work involved conducting a mock-up testing as well as field monitoring using high temperature strain gages, accelerometers, and thermocouples. The data obtained from the field monitoring efforts, along with process data provided by Texas Genco, were used to perform finite element analyses. The finite element work involved the calculation of static stresses as well as transient stresses generated by cycling of the attemperator (thermal stresses) and vibration of the line (mechanical stresses). Fracture mechanics was used to determine the times required for crack initiation and propagation to failure.

The analysis and monitoring efforts clearly demonstrated the operating conditions that were required to produce the failure. Additionally, the failure reinforced the importance of regular inspection of piping systems; even those high energy piping systems such as the cold reheat lines not normally associated with catastrophic failures.

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