

Assessing the Effects of Corrosion on the Mechanical Integrity of a Pipeline Suspension Bridge

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NACE International 2007 Corrosion Conference & Exposition
March 11-15, 2007, Nashville, Tennessee
Paper No. 07148

ABSTRACT

Work was performed to assess corrosion damage on a pipeline suspension bridge transporting liquid products. Corrosion had been previously detected and characterized using in-line inspection methods. The inspection results were graded and it was noted that several regions had corrosion levels that were of concern. The pipeline company requested that an evaluation be performed on the pipeline bridge that had been constructed during the 1950s.

Evaluation involved construction of a detailed finite element model of the suspension bridge including details on the carrier pipe, an additional support pipe, primary catenary cable, and other supporting cables and wires. The analysis included variations in pipe wall thickness in relation to data collected from the in-line inspection tool run. Loading included gravity, internal pressure, and wind loads. Analysis stress results were then compared to design limit based on the rules of ASME B31.4. The final evaluation revealed that a very specific band of conditions (namely pressure and wind speed) were required to ensure the continued safe operation of the line. Recognizing the need to maintain the required operating pressure, coupled with the inability to control wind speed, led the pipeline company to make repairs to regions of the pipeline where stresses exceeded the code limits. This project was a clear demonstration of how inspection, analysis, and repair methods can work together to ensure the safe operation of pipelines.

Alexander, C.R., (March 2007), "Assessing the Effects of Corrosion on the Mechanical Integrity of a Pipeline Suspension Bridge," Paper No. 07148, NACE International 2007 Corrosion Conference & Exposition, March 11-15, 2007, Nashville, Tennessee