

DiamondWrap® HP™ 8” Field Bend Corrosion Repair – USA

Customer: Natural Gas Transmission Operator

Location: USA

Pipe Diameter: 8”

Design Pressure: 800 psi MAOP

Pipe Contents: Natural Gas

Pipe Defect: Severe External Corrosion and Pitting

Development:

A natural gas transmission operator found severe external corrosion up to 71% wall loss on two field bends on each end of a river crossing. In addition to the corrosion, the weight of the pipe and the corresponding bending and axial forces were also of a concern to the operator. In this case, a welded sleeve could not be used because of the odd configuration of the pipe in the area, and it would have added hundreds of thousands of dollars of cost and down time to cut and replace the pipe. Pictures of the corroded pipe and the anomaly are below.





Design:

Citadel Technologies’ team of project engineers designed a permanent repair for the corrosion according to relevant equations in ASME PCC-2 Article 4.1, and recommended a DiamondWrap® HP™ repair solution. The customer required that the final design take into account the bending and axial forces, as well as the forces exerted due to thermal expansion and contraction. Once the analysis was completed, Citadel’s engineers determined that 4 layers of DiamondWrap® HP™ were required to permanently repair the defects based on the given conditions in the engineering assessment.

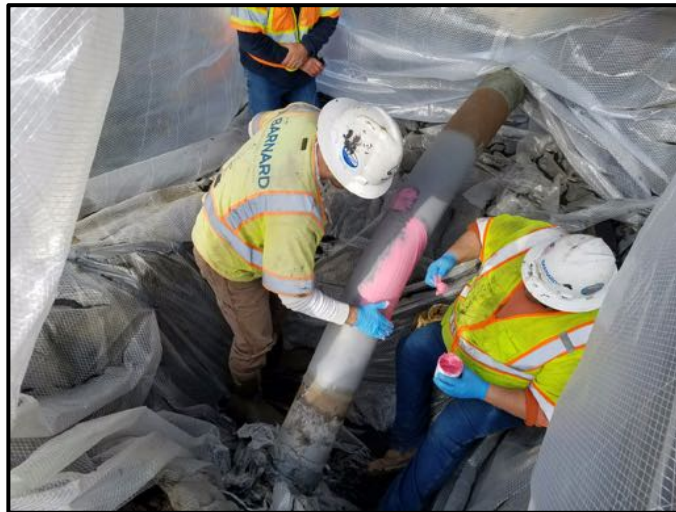
Installation:

Citadel mobilized a trainer to train the contractor’s personnel prior to installation of the product. This training was completed in ½ day, and included a classroom presentation, written test, and a hands-on application of the product.

When finally on-site, the high compressive modulus filler putty was installed to smooth any stress concentrations around the corroded area as a material to transfer the load from the pipe to the carbon fiber repair system. The primer was installed next to increase the bond between the repair and the pipe. 4 layers of carbon fiber were installed over a 2.5 foot repair length on one end of the river crossing, and a 4 foot repair length to repair the other end of the river crossing.

Two trained technicians were able to complete both installations within one day. No heavy equipment or hot work was required for the installation, and the line remained in operation during application. Each repair was installed and cured within a half of a day, allowing the pipeline operator to quickly and efficiently move on to future digs after completing both repairs in one day. Below are photos of the installation process and completed repair.

High compressive modulus load transfer epoxy used to smooth anomaly



Application of epoxy primer for corrosion protection and enhanced adhesion



Application of carbon fiber saturated with epoxy wet out



DiamondWrap® HP™ repair installed



Conclusion:

The operator’s pipeline remained in operation during the repair installation and curing. They were very happy with the fast design and installation implemented by Citadel. The repair did not require the high cost of welding labor, nor did it require shutdown and therefore was able to avoid costly production loss. As a result, DiamondWrap® HP™ has become the pipeline operator’s repair of choice for future pipeline anomalies.