BlackDiamond®
24” Field Bend Dent Repair in USA

Customer: Gas Transmission and Distribution Pipeline Owner and Operator

Location: USA

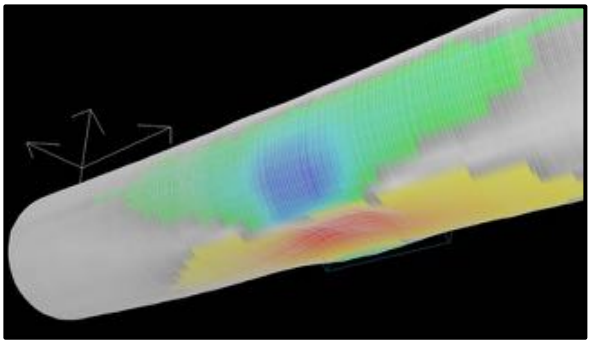
Pipe Diameter: 24”

Design Pressure: 720 psi MAOP

Pipe Contents: Natural Gas

Pipe Defect: Dent in Field Bend

Development:
An advanced In-Line Inspection (ILI) tool was passed through a 24” natural gas transmission pipeline in a mountainous terrain in the USA operating at 720 psi MAOP. The operator could not afford to shut down the line to cut and replace because of the high transport volume through the pipe. Additionally, 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. Pictures of the surrounding terrain and the anomaly are below.



Design:
Citadel Technologies’ team of project engineers designed a permanent repair for the dent according to relevant equations in ASME PCC-2 Article 4.1, and recommended a BlackDiamond® repair solution. 8 layers of BlackDiamond® were required to permanently repair the defect.

Installation:
Citadel mobilized a trainer to train the operator’s personnel prior to installation of the product. This training was completed in ½ day, and then the installers and trainer proceeded to site to install the repair system.

The high compressive modulus filler putty was installed to smooth any stress concentrations around the dented 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. 8 layers of carbon fiber were installed over a 5 foot repair length to repair the dent defect.

Three trained technicians were able to complete the installation within approximately 2 hours. No heavy equipment or hot work was required for the installation, and the line remained in operation during application. The repair was installed and cured within a half of a day, allowing the pipeline operator to quickly and efficiently move on to future digs. Below are photos of the repair 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

Before and after of repaired dented area

BlackDiamond® repair successfully installed and cured

Conclusion:
This natural gas transmission pipeline remained in operation during the repair installation and curing. The pipeline operator was 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, BlackDiamond® has become the pipeline operator’s repair of choice for future pipeline anomalies.