

Contour Reinforces Corroded Cooling Water Line

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BENELUX

Summary

Internal corrosion on a cooling water system led to leaks in the header pipe and a connected nozzle elbow. The nozzle elbow was clamped but created a stress zone in the nozzle pipe connection to the header due to the clamp weight. A temporary repair clamp was installed on the header to mitigate the leak but left the pipe unreinforced and susceptible to failure. To mitigate both degradation modes, the nozzle clamp was transition with load transfer filler to the header and 14 layers of Contour were applied in accordance with design standards. On the downstream straight run of pipe, 9 layers of Contour were installed over the temporary clamp.

Pipe Details

- 610-mm (24-inch) diameter – 25.4-mm (1-inch) elbow
- 6 BarG (87 psi) design pressure
- 3.5 BarG (51 psi) operating pressure
- +12°C (+54°F) operating temperature
- 7.925 mm (0.31 inch) original wall thickness

Benefits

- Eliminated support rigging for heavy elbow clamp
- Addressed structural reinforcement and leak containment for both header and nozzle in one repair
- Use of quad-axial fabric structure ensured stress response was equivalent in all directions

Internal corrosion on a DN700 (24-inch) cooling water line in a refinery in Western Europe led to a loss of containment that required attention. The leak was stopped using a temporary leak sealing clamp, and a second leak on a DN 25 (1-inch) elbow from a nozzle off the DN700 pipe was addressed with a traditional leak box. The operator wanted the clamps to be wrapped with Contour to ensure the pipe would remain fit for purpose until the next planned shutdown for the cooling water system.

A composite solution was ideal for this pipeline because the remaining wall thickness was insufficient for a welded repair. The thin pipe wall posed a welding risk because of the danger of accidental burn through and creating a larger leak.

Having regularly used composites in the past to repair piping within the refinery, the owner turned to CSNRI for a solution.

After careful deliberation, the decision was made to repair the lines using Contour, an engineered wet applied repair system, featuring quad-axial stitched fiberglass cloth applied with two-part epoxy and a filler material.

CSNRI trained installers inspected the pipe surface and grit blasted the areas deemed sound for repair. A team of 2 technicians applied load transfer filler material around the clamps to ensure there were no voids under the repair, creating a geometry suitable for application of the composite repair and ensuring the loads from the pipe would be transferred to the composite that provides reinforcement. With the pipe prepared, the technicians applied 9 layers of Contour to the straight pipe and 14 layers at the tee. When the composite was completely cured 8 hours later, the installers painted over the repaired area to provide barrier protection from damage caused at soil-to-air interface locations.

The entire repair was completed in only 2 days, with the cooling water system in normal service.

