ENERGY NORTHERN PERSPECTIVE

Composite Technology Restores Riser Integrity

Using rollers to apply adhesive, the installation team places and secures composite sleeves on the riser (photo: ClockSpring|NRI)

By Buddy Powers, ClockSpring|NRI

Aging offshore structures must be maintained to ensure continued safe service. There are many ways to address structural integrity, but the best solutions are those that can be carried out quickly without introducing additional risks. For many types of damage, including pitting and corrosion, composite technology provides viable and proven solutions.

Today's composites are the result of years of engineering efforts and extensive testing that have resulted in a cost-effective and expedient alternative that delivers robust, long-lasting repairs.

Damage was sustained on a section of pipe that had been welded, producing a surface that was not aligned (photo: ClockSpring|NRI)

Corrosion repair

On an oil platform offshore Africa, production risers had sustained corrosion damage and needed repair. The challenge was that the damaged section of pipe had been welded, producing a surface that was not aligned. The composite repair would have to contend with alignment and weld bridges in the course of addressing corrosion concerns.

Technicians prepare the surface of the riser using 7-inch (17.8-cm) grinding machines fitted with wire wheels for larger surface areas and 4-inch (10.2 cm) grinding machines for the weld area (photo: ClockSpring|NRI)

A team of trained and certified technicians began this complex project by positioning a clamp at the +10 riser location, which was required before the weld bridge could be created. A steel sleeve repair had been welded previously, creating two diameters at this point in the riser. While the differing diameters needed to be addressed, they would pose no impediment to the eventual installation of the composite repair sleeve.

The installation team used 7-inch (17.8-cm) grinding machines fitted with wire wheels to prepare large surface areas and 4-inch (10.2-cm) machines for the welds and areas that were more difficult to access. The surfaces were cleaned to a NACE 3 standard, producing a clean white metal surface with all contaminants removed. With the surface prepared, the riser was ready for composite repairs both above and below the welded steel sleeve.

During the complete installation process, the flanges were covered to prevent adhesive from falling into the flange web and bolts, which saved time in the final cleaning process.

Meeting challenges

Because there was no clamp in place at the +10 level, positioning and welding the new clamp was a straightforward process once the team prepared the severely corroded support structure so the doubler plate could be installed to reinforce the column and prevent panel zone shear failure. With the surface prepared, the team welded the clamp and tightened the holding bolts.

The riser is cleaned to remove all surface contaminants, revealing clean, white metal per NACE 3 surface preparation and is ready for the installation of the Clock Spring repair sleeve (photo: ClockSpring|NRI)

The clamp at the +25 level presented a different set of challenges. The existing clamp could not be removed until the new clamp was installed because removal would have compromised the stability of the riser.

The repair team prepared the surface above and below the existing clamp to a NACE 3 standard, then installed a Clock Spring repair sleeve above the existing support. Because welding was not possible at the time, the clamp remained open until it could be fully welded in place. Although the clamp was not completely installed, it would not impede the installation. Once the welding was completed, the bolts were tightened, the 45° structural support was welded in position, and the existing clamp removed. This sequence of activities prevented undue weight on the riser.

The completed repair with Clock Spring sleeves installed both below and on top of the welded steel sleeve (photo: ClockSpring|NRI)

There were two distinct deviations from the perpendicular because of the way the riser was constructed, with a maximum deviation on the extrados of 4 inches (10.2 cm). The riser was marked with a dry Clock Spring wrap to allow an onsite supervisor to assess the best position for the installation. Once the position was marked, the installation team put a support mechanism in place to prevent the composite wrap from slipping before the cure was complete.

Mind the gap

With the second Clock Spring repair sleeve installed, the gap between them was ready to be filled. The installation team applied filler over the two welds and affixed the molds, tightening them to force the filler into the natural circumference of the pipe. When the mold was removed, they sanded the cured filler and refilled the voids, allowing the new filler to cure. This created a new surface that would allow the composite sleeve to be installed without voids and cavities. This precaution allowed the Clock Spring to retain its hoop stress.

With the two weld bridges completed, the final stage of the installation was carried out. The team cleaned the repair sleeves in readiness for the corrosion coating and applied primer to the joints on the sleeves, allowing it to cure before applying the final coating. The flanges and both clamps also were coated to create a fully coated finished surface.

Extending field life

Composite repairs are becoming more common on offshore oil and gas assets because they are safe, effective and relatively simple to install. The speed, ease and effectiveness of composite repairs could change the way owners and operators extend the field life of offshore assets.

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