

OILMAN

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COMPOSITE SOLUTION RESTORES ERODED PETROCHEMICAL PLANT LINE

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Scheduled plant turnarounds allow owners to take an entire process unit offstream for maintenance, providing time for damaged and worn equipment and systems to be refurbished or replaced. When maintenance can be scheduled and planned, owners can make smart decisions about how to make repairs and improvements to get the best results at the lowest cost.

When inspections turn up damage between scheduled turnarounds, there is less time to prepare and often more urgency in making important decisions. Asset owners must determine quickly how best to address the potential risks and what actions to take to achieve the appropriate level of operational safety. In situations where it is not possible to wait for the next planned turnaround, owners need to have reliable and proven solutions at their fingertips to rapidly restore asset integrity, and ideally, they want results that will not break the bank.

Advances in composite technology are introducing a growing range of options for repairing damage in petrochemical plants. As materials, designs, and capabilities progress and more installations are successfully carried out, there is mounting trust in the effectiveness of composite repairs, and there are more products available to asset owners.

One of the most compelling reasons for selecting a composite solution is that in many cases, the line can remain in use while repairs are being made. Unlike other repair methods that require welding, most composite installations require no hot work, and because the components used for these repairs generally are not heavy, there is no need for heavy-lifting equipment. The combined appeal of minimal operational disruption and the reduction of risk has led asset owners to use composites more frequently for critical repairs.

Putting Composites to Work

When inspections in a petrochemical plant uncovered a section of 254-mm (10-in) carbon steel pipework that had experienced significant wall loss resulting from external erosion, the plant owner wanted an immediate repair. The inspection revealed that approximately 60 percent of the exterior of a line transporting butane had eroded in 13 locations along a 23-m (75.5-ft) section.

Because the pipework was essential to plant operations, the owner needed a repair solution that would not require the line to be taken out of service. Having successfully implemented repairs in the past using products from ClockSpring|NRI,

the owner looked to the company for guidance.

Experienced engineers evaluated the damage and determined that the best solution would be to use the proprietary Contour composite solution as a pressure reinforcement and containment repair. Especially effective in plants and refineries, Contour is an engineered repair system featuring quad-axial stitched fiberglass cloth applied in a wet-lay system with two-part epoxy and a filler material. This system is ideal for repairs that involve complicated geometry such as tees, flanges, and varying diameter pipe and is used to repair a range of pipe defects, including leaks, in plants, refineries, tank farms, terminals, and offshore locations. Available in multiple kit sizes to fit any diameter pipe, the stitched cloth minimizes creep and can be installed with negligible disruption to operations. Installation is simple and generally requires only a cold-work permit because no cutting or welding is required.

Working to the ISO 24817:2017 standard, which outlines requirements and recommendations for the qualification, design, installation, testing and inspection of externally applied composite repair systems to corroded or damaged pipework, pipelines, tanks and vessels used in the petroleum, petrochemical and natural gas industries, the engineering team developed an engineered composite repair (ECR) to deliver 20 years (lifetime) of service at 27 bar (391 psi) pressure and 53.7°C (128.6°F) temperature. When installed, the repair would share the load with the substrate, assuming an average remaining wall thickness of 4 mm (0.16 in).

With the decision made to address the damage using the ECR, trained and certified technicians were ready to begin the installation. Because the damaged pipeline was between other lines, access to the damaged areas was restricted. While this would have been an obstacle for other types of repairs, the ECR used in this application is designed for just such conditions.

Working between the pipes, a team of five trained and certified installers prepared the pipeline for repair to SA2.5/NACE#3, removing all rust, coating, and mill scale to produce a near-white surface. With the surface appropriately prepared, the installation team washed it with solvent before inspecting the lines to determine the location of the defects. The next step was to apply the composite repair.

Applying the quad-axial stitched fiberglass cloth by hand, the team covered the damaged areas with



Photo courtesy of ClockSpring | NRI

eight layers of the ECR. The entire repair was completed over the course of two weeks, restoring the line to safety without interrupting operations and delivering a safe and reliable permanent solution within a demanding project schedule.

Working in tight quarters, installers applied the Contour engineered composite repair by hand, installing a safe and reliable permanent solution in two weeks and restoring the line to safety without having to interrupt operations.

A Proven Alternative

The extensive testing that has gone into composite technology development has produced reliable solutions that have been proven over three decades in a broad range of applications. Ongoing R&D efforts continue to push the boundaries of this technology, and as more repairs are carried out in the field, there is more evidence that composite technology is not only a reliable alternative to “cut-and-replace” repairs, but a solution that can be applied safely and effectively without negatively impacting operations.



Andrew Patrick's career spans more than 30 years and encompasses all aspects of pipeline engineering, from construction to inspection to repair. He

entered the industry working in offshore pipeline construction and has extensive experience with repairs in refineries and petrochemical plants and on midstream projects. Andrew began his 20-year career with ClockSpring|NRI as its sole sales executive for the western hemisphere and now manages the global sales team as executive vice president, strategic opportunities. ☐