

Composite Solution Restores Pipeline Explosion Damage

PIPE DETAIL

A 711-mm (28-inch) carbon steel pipeline that was transporting crude oil was damaged by an explosion

343 mm by 114 mm (13.5 by 4.5 inch) hole needed repair

10 bar (145 psi)
Operating Pressure

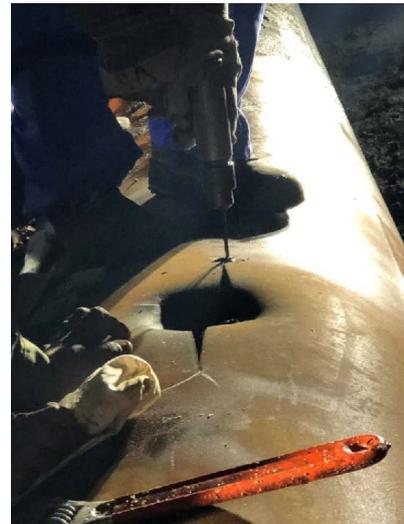
SUMMARY

- An explosion caused a 343 mm by 114 mm (13.5 by 4.5 inch) hole in a 711-mm (28-inch) carbon steel pipeline transporting crude oil
- 26 layers of carbon fiber were applied over 3 m (9.8 ft)
- 12 technicians completed the repair in less than 30 hours
- No hot work was required
- No negative environmental impact
- No need to completely shut down the refinery

In emergency situations, companies rely on dependable partners and proven solutions. When a refinery in Bahrain experienced line damage from an explosion, the immediate response following damage assessment was to contact ClockSpring|NRI for support.

The explosion had created a 343 mm by 114 mm (13.5 by 4.5 inch) hole in a 711-mm (28-inch) carbon steel pipeline that was transporting crude oil under 10 bar (145 psi) pressure, and the wall of the pipe was bent inward in an irregular shape. This pipe was crucial to operations because it was the only pipeline delivering crude to the refinery. Without this line, the refinery would have had to completely stop production.

Fortunately, MCSC WLL, a local ClockSpring|NRI distributor and one of the region's leading firms, had the materials on hand to promptly deliver a repair designed by the



The installation team prepares to plug the hole in the pipeline. (Photo courtesy of ClockSpring|NRI)

ClockSpring|NRI
engineering team.

As soon as the composite system was designed, MCSC WLL dispatched a team of 12 trained technicians to the refinery. Crude flow through the line was stopped while the team plugged the hole and began preparing the surface of the pipe for the composite repair, which was carried out with about 50% of the crude oil remaining in the line.



The installation team prepares to cover the damaged pipeline. (Photo courtesy of ClockSpring|NRI)

The repair designed for the pipeline was a DiamondWrap® system, which is made with a bidirectional weave of carbon fiber and a 100% solids epoxy that form a composite system that is stronger than steel. The structural system forms a pipe around a pipe, and each successive wrap increases the pressure rating. The bidirectional weave of the carbon fiber provides strength in both the hoop and axial directions, a design that practically eliminates creep, ensuring that there is no reduction in strength over time. This application was on a straight run of pipe, but because of its low profile, DiamondWrap® can be installed on tees and elbows and is ideal for

confined spaces and irregular surfaces that require structural reinforcement or leak containment.

Technicians installed 26 layers of DiamondWrap® over a 3-meter (9.8-ft) length of pipe. Working continuously, the team was able to complete the repair in 16 hours, working through the night to finish the installation as quickly as possible to restore the line integrity so refinery operations could recommence.

Work was completed in less than 30 hours from the incident that caused the damage, and the pipe was back in service within 48 hours.

This repair prevented a complete refinery shutdown and allowed the refinery owner to complete the repair without any environmental pollution.



Pipeline integrity was restored within 30 hours, and refinery operations resumed less than 48 hours after the explosion. (Photo courtesy of ClockSpring|NRI)