

ThermoWrap® MT Meets Challenge of Aging North Sea Pipeline System

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North Sea

Summary

The seas around the UK and its islands are rich in energy resources, with diverse geology and geography. The sea also supports more than 230 varieties of fish, dolphins and whales. Environmental sensitivity is an essential element of operation for the many pipeline owners and operators in the area. Harsh weather, microbiologically influenced corrosion (MIC), and a combination of damaging factors had degraded numerous areas of an aging pipeline system for a vital pipeline operator. Concern for safe, continued operation, along with environmental awareness and sensitivity, required the most judicious method of repair possible.

Complexity and size of repair, along with the need to complete the repair without disruption to operations, required a high-performance solution executed by the CSNRI UK team with [ThermoWrap® MT](#).

Benefits

- Extends the life of aging and corroded assets
- Seals leaks
- Restores pipe strength
- Prevents future external corrosion
- Designed for high-temperature, high-pressure environments.
- Eliminates unplanned down time for high-consequence piping
- Easy installation and rapid curing
- No pipe cutting or welding
- Minimal creep
- No VOCs

Aging Infrastructure

Much of the pipeline infrastructure in the North Sea faces age-related deterioration along with other damaging factors, including harsh weather and MIC. Additionally, pipelines in coastal areas are subject to internal abrasive conditions resulting from a destructive combination of crude, sand, shell and salt water in the lines, which, over time, damage and corrode pipe internally.

In compliance with the UK-based Health and Safety Executive (HSE), the operator engaged in an intensive inspection campaign of carbon steel pipeline throughout their extensive system. Over several months, a long-range, non-destructive scanning inspection using phased array ultrasonic technology was conducted. The inspection revealed corrosion, thinned walls, and other issues of concern, indicating a need for repair in several areas along three different sections of pipe, including 30-, 36- and 40-inch pipe, incorporating areas with complex geometries.

Damage was discovered over approximately 100 meters (328 feet) of pipeline. The inspection also revealed pockets of MIC in the 6 o'clock position over more than 30 meters (approximately 100 feet) of pipeline, with as much as 60% to 70% wall loss in some areas. A small, localized through-wall defect was also revealed in a 30-inch line.

Immediate repairs were required to ensure containment of any possible risks and restoration of pipeline integrity for future operation. Uninterrupted transport of raw materials downline for production and distribution of crude oil was also crucial. Welding was considered, but quickly dismissed due to possible hot work hazards. With a longstanding relationship with CSNRI, the operator called on the UK team to assess the situation and formulate an engineered composite repair solution to restore pipeline integrity.

The Solution

The repair solution was ThermoWrap® MT, an engineered field-saturated composite repair system. The custom-engineered system uses a high-modulus fiberglass architecture in conjunction with a patented two-epoxy system. Its thick, non-crimped, glass fiber architecture and nano-tube-enriched resin combine to yield high-strength characteristics. Temperature and chemical resistance, along with the ability to conform to complex geometry, positioned ThermoWrap MT as an exceptional choice for this multi-faceted repair. Product versatility, including material roll widths ranging from two to 12 inches, provided the options necessary to cover large areas quickly, especially in repairs with varying pipe sizes.



As a fiberglass wrap, ThermoWrap MT can be applied easily in areas of limited access. It also conforms well to complex geometries.



Habitats were built to protect the repair area and to maintain temperature to ensure the correct cure cycle of the ThermoWrap MT repair.

Application

Weather in the northern-most areas of the UK, which can include high winds and rain most of the year, combined with low temperatures, presented an additional challenge for repairs. Habitats had to be constructed for each work area for protection from the elements and to ensure that the correct temperature was maintained to install the ThermoWrap MT system and complete the required cure cycle.

A team of six CSNRI technicians, supported by onsite services, executed numerous repairs in an extended campaign to restore pipeline integrity. Local contractors grit-blasted the corroded areas in preparation for the repairs to various identified areas of 30-, 36- and 40-inch pipe. Additionally, EPN-101 was applied over welds and any corrosion to restore the original geometry of the line. The size and extent of most of the repairs required three to four days to complete each. More extensive repairs required up to three weeks to implement.

Depending on engineering recommendations for each area of repair, the ThermoWrap MT system was installed to the thickness and dimension specified. The repair was then coated with an epoxy to further protect the repair from exposure to harsh conditions. More than 350 kits (14,120 square feet) of ThermoWrap MT were required to complete the repairs.

Results

The use of ThermoWrap MT has extended the life of an aging portion of the North Sea pipeline system. Repairs to every pipe size were efficiently executed due to the versatile, advantageous characteristics of ThermoWrap MT. All damaged areas were restored to full functionality. The repair was successfully implemented without incident and with no disruption of operation.



As part of a two-part epoxy system, an exterior blue coat of epoxy is applied to protect the repair from exposure and future corrosion.