

IN FOCUS: Pipe Wraps

WRAP IT UP WITH BELZONA

A major battle faced by asset owners and operators is to maintain the integrity of pipework. As main conduits of processed fluids, pipework is susceptible to suffer corrosion, erosion or mechanical damage (see Fig 1). If these problems are not addressed in time, there is a high probability that environmental and safety hazards, incidents and high costs can occur. The question of how to reduce the likelihood of these events in the long term represents a major challenge for the industry.

Historically, damaged pipework was repaired by cutting out the affected section and replacing it with a new welded section. This requires production to be stopped and involves hot work which can lead to metallurgical problems, hazards to the safety of applicators and serious environmental issues if risks are not carefully managed (see Fig 2).

Hence, coating and composites manufacturers worldwide have been developing new repair technologies that avoid hot work and shutdowns, improve safety and protect assets

against corrosion for the long term. Composite repairs have gained greater acceptance because they provide an engineered, durable and affordable solution which is easy to apply thus saving time. Recognising these issues, Belzona Polymerics Ltd., a manufacturer of high performance composites and industrial coatings, has developed cold curing wrap systems designed for pipework repair.

Cold curing composite wraps

Composite repair systems are composed of a polymer binder and fibrous reinforcement. The fibrous reinforcement provides structural strength to the polymer, which itself provides corrosion resistance and adhesion to the substrate.

Epoxies are convenient materials to be used as they have outstanding adhesion and excellent mechanical properties compared to other non-metallic systems such as polyurethane, methacrylate, alkyd, vinyl and polyester-based polymers. ▶▶



Fig 1: Erosion, corrosion and pitting damage
Through wall damage resulting in leaks



Fig 2: Stress cracking on a weld

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INTERNATIONAL STANDARDS COMPLIANCE

ASME PCC-2 standard, "Repair of Pressure Equipment and Piping"

This Standard provides methods for repair of equipment and piping within the scope of ASME Pressure Technology Codes and Standards after it has been placed in service. These repair methods include relevant design, fabrication, examination, and testing practices and may be temporary or permanent, depending on the circumstances. The methods provided in this Standard address the repair of components when repair is deemed necessary based on appropriate inspection and flaw assessment.



ISO/TS 24817 Standard, "Petroleum, petrochemical and natural gas industries-composite repairs for pipework-qualification and design, installation, testing and inspection"

This Standard gives requirements and recommendations for the qualification and design, installation, testing and inspection for the external application of composite repairs to corroded or damaged pipework used in the petroleum, petrochemical and natural gas industries.

Application Procedure

The reinforcement sheet provides strength to the repair after being embedded within the polymer. Reinforcement sheet is usually made out of carbon or glass fibres, or a combination of both.

Risks associated with welded repairs

Welding would need to be carried out in a more controlled environment ensuring that the atmosphere is free from hydrocarbons due to the explosion risk associated with hot work.

Benefits of wraps

Compared to that, wraps can be applied in situ and online, they are cold curing and the pipework will not require stress relieving. In addition, a typical repair takes only a few hours to complete.

Finally, composite repairs can be considered as a permanent type of repair system, international standards enable a design life of up to 20 years with some systems, which, if there is no natural degradation mechanism, can be extended following a suitable review.

System selection

Depending on the application situation different base materials can be specified. Belzona 1161 (Super UW-Metal) is recommended when the substrate is contaminated with water or oil. Where chemical resistance is required, Belzona 4301 (Magma CR1 Hi-Build) offers outstanding protection to a wide range and concentration of chemicals. Depending on the size of repair area, cure time may be extended with Belzona 1121 (Super XL-Metal) or shortened with 1212, a fast-curing composite. Application to a hot pipe (70°C – 150°C/158°F – 302°F) requires a heat activated material – Belzona 1251 (HA-Metal). Belzona 1221 adheres to certain plastic substrates such as PP (polypropylene) and PE (polyethylene). Finally, Belzona SuperWrap II, one of the strongest wrap systems on the market, can be used to return strength back to the pipe.

Compliant composite technologies

Compliant composite repairs differ from other traditional non-compliant repair systems mainly in that they rely on a pre-qualified material, pre-defined mathematical design and require validated application craftsmanship. These technologies experienced growth and acceptance of use in the industrial sector after the publication of two international standards in 2007. These are:

- ISO/TS 24817 –Composite repairs for pipework – qualification and design, installation, testing and inspection; and,
- ASME PCC-2 Article 4.1 –Non-metallic composite repair systems for pipelines and pipework: high risk applications.

These govern all aspects related to composite repairs, from the pre-qualification of materials and repair systems, to the design of a repair, specific and 'fit for purpose' for the individual pipe defect that it is to be repaired. They also include applicator training and validation by the manufacturer of the composite system. ■



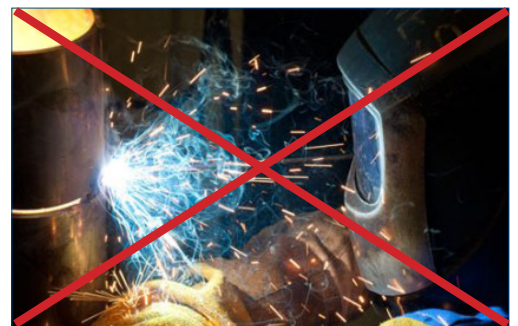
Thin-wall defect repaired



T-piece wrap



Encapsulated flange



Hot work is not necessary



Belzona 1221 can be used for the permanent bonding, repairing or rebuilding of PE and PP substrates

RISING TO THE OCCASION

Belzona SuperWrap II repairs thin-wall damage

A 15.3 cm (6-inch) diameter riser on a Gulf of Mexico oil and gas platform suffered corrosion due to salt spray and weathering. The riser was operating at 25°C (77°F) and 10.2 MPa (1,480 psi). The wall thickness of the pipe just above the first flange was dramatically reduced to over 50% of its original thickness. An engineered composite wrap repair solution was chosen by the platform operator to restore the strength of the damaged riser, thereby extending its working life.

A Belzona SuperWrap II composite repair system was designed in compliance to ISO 24817 in conjunction with a composite Belzona paste grade material for pit filling, Belzona 1121 (Super XL-Metal).

The application was completed in one day. Following grit blasting, cleaning and degreasing, Belzona 1121 was applied onto the entire corroded surface. This material was chosen due to its extended working life and the ability to effectively restore wall thickness. Then, 4 layers of Belzona SuperWrap II were applied reaching a total thickness of 8 mm and extending over 3 feet (990.6 mm). The whole repair was completed in the afternoon of that day. Upon curing, the Belzona SuperWrap II system was lightly blasted to receive a urethane ultraviolet resistant topcoat.



Riser blasted



Pits filled and wall thickness restored



Belzona SuperWrap II applied



UV-resistant top coat applied

ISO / ASME COMPLIANT COMPOSITE REPAIR SYSTEM



Suitable for the repair of corroded thin- and through-wall defects on various geometries of pipes, such as bends, straights, t-sections, reducers and flanges.



A combination of 100% solids epoxy and hybrid fibres ensures unparalleled adhesion and create one of the strongest wrap systems on the market.



Full training is provided to the Installers, Supervisors and Designers, enabling cost- and time-efficient applications anywhere across the globe.



Now introducing high temperature wrap operating up to 150°C/302°F

BELZONA SUPERWRAP

Permanent solution - can be engineered and designed for conditions that the repair in the pipework will encounter throughout its 20-year design life.

A downtime saving alternative to welding. The cold curing ability enables corrosion damaged components to be repaired online within 24 hours.



Can be designed and applied in accordance with ISO/TS 24817 and ASME PCC-2 Standards. Applied in situ to pipes and vessels, even in cases where operating pressures are up to 250 bar.

Allows applications to any geometry of pipework, including bends, tees and complex geometry, and resists a wide range of chemicals, oils and process fluids.



Belzona SuperWrap has been used by many Oil and Gas, Petrochemical and Power clients worldwide and has been in service for in excess of 35,000 hours.



BELZONA COLD CURING WRAPS SOLVE PIPEWORK PROBLEMS

A wrap can be specified to suit particular application situation and in-service conditions.

- » Internal corrosion
- » External erosion, corrosion
- » Pitting damage
- » Thin wall defects
- » Through wall defects
- » Leak sealing
- » Damage to elbows and T-pieces
- » Sealing flanges
- » Resist aggressive chemicals and process fluids



Belzona is not just a product manufacturer but strives to provide a complete supply and apply package through its Global Distribution network. This network was specifically created to provide clients with direct access to Belzona quality products, specialist application services, inspection services and supervision. It is Belzona's mission to meet specialist repair and maintenance needs in its target industries and markets worldwide.



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SOME LIKE IT COLD
No hot work – no problem

Pipework in a refinery was suffering from thin and through-wall defects, caused by severe external corrosion and pitting. Due to Health & Safety hazards blasting to prepare the surface was not an option, and the client required a fast solution to this problem with minimal service disruption. After all, every day of shutdown was costing them £1.5 million.

An application team worked without the necessity for shutdown, hence production could continue. Where leaks were present, a plate was bonded using Belzona 1221 (Super E-Metal) over a holed area. Temporary wrap was created around that area using the same material. Then the whole pipe was wrapped using Belzona 4301 (CR1), a material known for its excellent chemical resistance properties.

Belzona 1161 (Super UW-Metal) wrap was applied on top and also used to encapsulate the adjacent flange. This clever system was chosen for a reason. In case the metal underneath the Belzona wrap continued to deteriorate and a through-wall defect occurred, Belzona 4301 (CR1) would resist the contents of the pipe. Belzona 1161 (Super UW-Metal) in turn adds mechanical strength, while at the same time protecting the pipework from external damage.

Application took only 3 days to complete; no hot work, no replacement, no shutdown required. ■



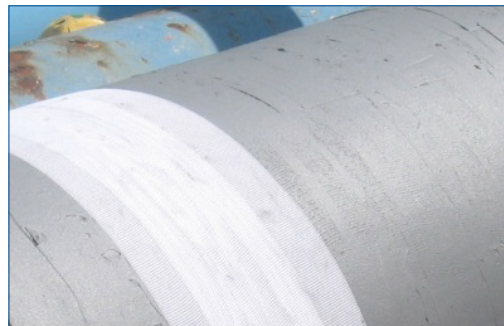
Damaged pipework



Temporary wrap to holed area



Belzona 4301 (CR1) for chemical resistance



Belzona 1161 (Super UW-Metal) final infill and wrap



Belzona 1161 (Super UW-Metal) flange sealing



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