

# IN FOCUS: Pipe Wraps

Issue 2, Summer 2013

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## 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

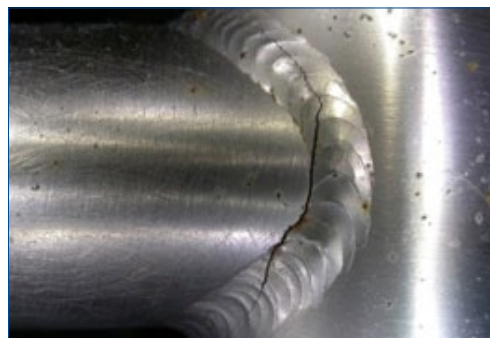


Fig 2: Stress cracking on a weld

## 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. It is important to point out that glass fibres are less rigid, less costly and easier to cut, design and apply in comparison to carbon fibres.

### 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. Additionally, welding can lead to metallurgical problems, such as stress cracking on a weld and localised corrosion.

### 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 1831 (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 Belzona 1221 (Super E-Metal). Application to a hot pipe (70°C – 150°C) requires a heat activated material – Belzona 1251 (HA-Metal). Finally, Belzona 1111 (Super Metal) may be suitable for general applications where time, temperature, contaminants and pipe contents are not an issue.

### 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. ■



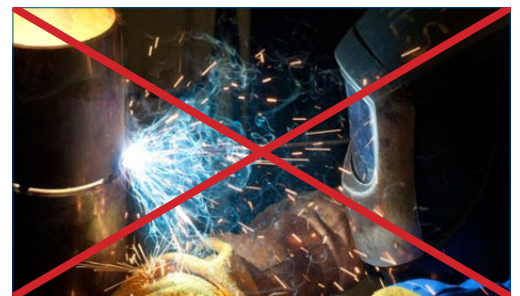
Polymer binder



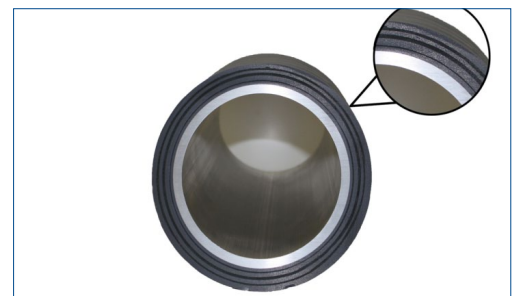
Fibrous reinforcement



Completed application



Hot work is not necessary



Three-component composite repair after completion

# THE ITALIAN JOB

## Oil and hydrocarbon transfer pipes back to service

Oil and hydrocarbon transfer pipes repaired while in service.

Oil and hydrocarbon transfer pipes at a fuel storage point company were suffering from external corrosion, which led to thin wall with minimum thickness in some places reaching 1.4mm, whereas the original wall thickness was 9.52mm.

The client required a composite repair compliant to ISO/TS 24817 that could be completed on both pipes within a limited timeframe and without the need for shutdown.

Belzona's fully compliant SuperWrap system was chosen and designed to Belzona's most stringent standards. The hydrocarbon pipe required two layers of material, whereas the oil transfer pipe was encapsulated using five layers. Application took place in June 2013 and the client was so satisfied with the outcome, they ordered for similar repairs to be carried out on the rest of the exposed pipework in the following months.

The expected service life of this application is a minimum of 10 years, which could be extended during a 2023 inspection. ■



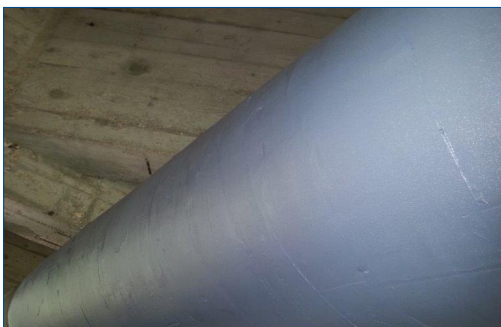
Applying polymer base



Reinforcing with resin soaked wrap



Wetting out the substrate



Smoothing out with a polymer base

### BELZONA SUPERWRAP

Permanent solution - 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.



Compliant 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.

In order to be specified and applied, the system must satisfy a range of requirements. The repair solution must be designed and approved by a validated designer and application carried out by a validated installer and controlled by a validated supervisor.

## SUPERWRAP VALIDATED TRAINING

### Raising application standards

Belzona has state of the art training facilities around the world in which we guarantee that our training is delivered to the highest standards. These training courses have been developed following internationally recognised Engineering Standards.

SuperWrap courses are designed to provide the experienced applicator with the theoretical and practical knowledge required to effectively and consistently apply a SuperWrap system to the required standard to repair and protect clients' assets.

Belzona offers SuperWrap Installer, Supervisor and Designer validation, ensuring high application standards. This allows us to control the quality of every application to ensure the client receives an approved cost-effective solution with a clear design life.

@ To find out more, email [globaltraining@belzona.com](mailto:globaltraining@belzona.com)

**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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02

**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 1831 (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 1831 (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 1831 (Super UW-Metal) final infill and wrap



Belzona 1831 (Super UV-Metal) flange sealing



Click here to find your local Belzona Representative

