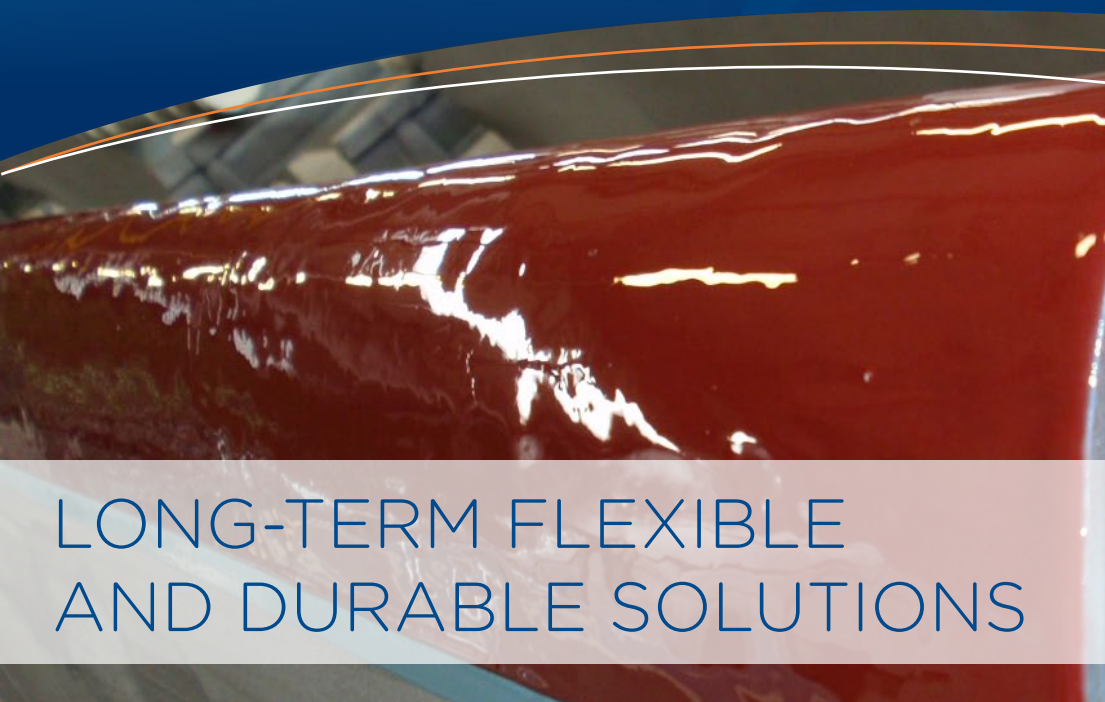


IN FOCUS: Flexible Repairs



LONG-TERM FLEXIBLE AND DURABLE SOLUTIONS

In abrasive and corrosive environments common to most industries including power generation, mining, wastewater treatment, oil and gas, and marine, it is inevitable that at some point, rubber components and linings on machinery and equipment will require some form of repair and maintenance. Rubber components and parts such as conveyor belts and floating hoses are regularly subjected to wear, rips and tears, which can render the equipment inoperable if not addressed promptly. Rubber lined equipment like pumps and tanks, and rubber coatings in areas such as riser splash zones, can also encounter severe damage due to erosion and corrosion, as well as chemical attack.

Any repair solution needs to be able to provide an outstanding level of protection and resistance to the abrasive media, even within harsh, erosive and corrosive environments. Not only this, but the repair method itself needs to incur as minimal downtime as possible.

Conventional solutions

Vulcanising refers to a conventional repair method often used to restore damaged rubber

components and linings on machinery and equipment. This process involves the addition of heat and pressure onto the damaged rubber, which is compressed between two metal plates and results in a chemical bond. Although this method may improve the asset's mechanical properties, it also incurs a number of drawbacks. Special and heavy equipment is required, which can not only be problematic to install on site, but time-consuming too. In addition, as chemicals and heat are integral to this process, this means the application environment may be susceptible to a variety of potential hazards, jeopardising the safety of personnel and increasing downtime due to health and safety procedures.

Another conventional solution commonly employed is the complete replacement of a damaged component or lining. Using the same material to replace a damaged material may solve the issue for the short-term, but will not prevent the same problem occurring again. Not to mention the high cost implications created when completely removing and replacing a damaged lining or component. ▶▶



Torn rubber fender



Deteriorated joint on HVAC unit

Issue 112

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No need for replacement

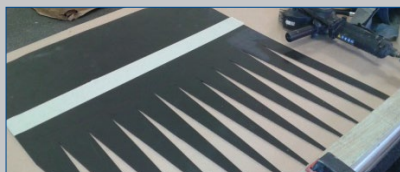
CONVEYOR BELT SPLICING

Belzona's 2000 Series range of Elastomers have very high tensile strength compared with original belt substrates and therefore can be used to successfully join and splice conveyor belts or re-bond filler strips in vulcanised joints. These flexible fluid grade materials have the ability to resurface worn areas on-site and in-situ, in a fraction of the time that it would take to perform a conventional repair.

The images below show how Belzona 2131 (D&A Fluid Elastomer) can be used to repair a severed conveyor belt.



1. Split belt



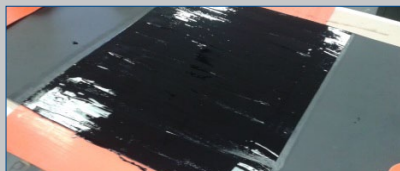
2. Belt clamped for preparation



3. Preparation of belt



4. Wetting out the fingers



5. Fingers wetted out and joined



6. Finishing top coat applied

Belzona flexible repair solutions

For over 44 years, Belzona's range of cold-applied Elastomers has been proven to repair and protect damaged rubber components and linings for the long-term without the limitations found with other solutions.

Belzona Elastomers are complex fluid and thixotropic grade materials that exhibit unique combinations of useful performance and application properties, the most important being elasticity and resilience. They are able to deform substantially by stretching, compression or torsion and then return to their original shape. This process occurs due to the long chains of atoms, mainly carbon, hydrogen and oxygen, which have a degree of cross-linking with their neighbouring chains. It is these crosslinking bonds that pull the Elastomer back into shape when the deforming force is removed. This elasticity makes them the ideal solution for challenging application environments, ensuring machinery and equipment will remain robust and intact even when attacked by erosion and cavitation, therefore protecting the underlying metallic substrate against corrosion. Indeed, Belzona Elastomers can resist cavitation at ultra-high velocities, making them the perfect option for aggressive marine environments.

In addition to excellent elasticity, Belzona Elastomers also exhibit outstanding mechanical properties and high abrasion resistance, helping to extend the life of equipment even when subjected to extremely aggressive conditions. High tensile and flexural strength enable the Elastomer to withstand extreme stress and to flex accordingly without permanent distortion or damage.

Quick, simple and safe

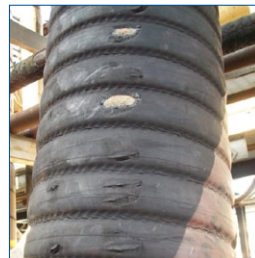
To apply an Elastomer, minimal equipment and manpower is required. With simple mixing ratios and no need to install heavy equipment, small and large applications can be completed in just one operation with simple tools. As all Belzona systems are cold-applied and cold-curing, this omits the need for hot work, eliminating many potential hazards and consequently creating a safer application environment.

Repair, rebuilding and moulding

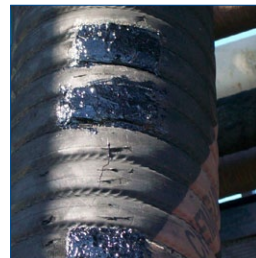
Belzona flexible rubber repair and rebuilding materials are specially designed for applications where high build, durability, elasticity, high abrasion and tear resistance are required. Belzona Elastomers will accurately restore lost profiles, cast flexible moulds and rubber components, bond and join parts and their excellent electrical insulation properties also enable them to be used in potting cable applications. These versatile systems can be installed without inducing stress or creating problems of bi-metallic corrosion.



Rebuilt rubber impeller

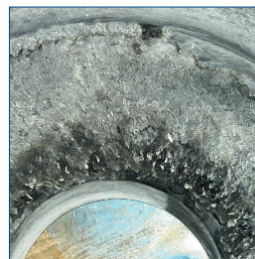


Repaired suction and discharge hose



Coating and sealing

The inherent flexible properties of Belzona Elastomers make them a natural choice for sealing applications and lining of equipment subjected to erosive and abrasive forces. They are designed to resist the pressure, motion and environment to which they are exposed in service. Their resilience makes them ideal for use as impact and wear resistant coatings, sealing and repairing damaged seals and cavitation protection. ■



Damaged pump casing rubber lining



Localised repairs performed



Sealing of cooling tower seams



Protection of agitator blade

Belzona's Elastomer range has been proven to:

- Reduce capital expenditure
- Lower maintenance costs
- Improve efficiency and safety
- Reduce downtime
- Simplify maintenance procedures
- Extend machinery and equipment life

ELASTOMERS RANGE	Belzona 2100 Series D&A Elastomers	Abrasion and erosion resistant flexible polyurethane systems for durable repair, rebuilding and coating applications
	Belzona 2200 Series MP Elastomers	Multi-purpose flexible polyurethane systems for repair, rebuilding, coating and casting applications
	Belzona 2300 Series Rapid Repair Elastomers	Fast-curing flexible polyurethanes for high speed emergency applications

EROSION-CORROSION PROTECTION OF HYDROPOWER WICKET GATES

A combination of cold-curing Belzona systems fortifies damaged assets for the long term

A turbine manufacturer in France required a long-term solution to protect 12 wicket gates which were suffering from severe corrosion and abrasion. The damage, located on the leading edge of the wicket gates, was caused by entrained solid particles carried in the water.

To repair the damaged areas, a combination of [Belzona 1341 \(Supermetalglide\)](#) and [Belzona 2121 \(D&A Hi-Coat Elastomer\)](#) was chosen. Belzona 1341 was selected as not only does this epoxy coating improve the efficiency of fluid handling equipment, but it also provides outstanding erosion and corrosion protection. As the leading edges were known to suffer from impact damage due to solids in the water, Belzona 2121 was specified to be applied in two coats (black and red) over Belzona 1341 to offer long-term impact protection in these specific areas. Belzona 2121 is specially designed for applications where durability, elasticity, high abrasion and tear resistance are required, making it the ideal solution to protect this harsh application area.

For the application, the entire surface was firstly grit blasted using an angular abrasive to give ISO 8501 Swedish Standard Sa2 ½ cleanliness ensuring a minimum 75 µ (3 mil) profile. Once the grit blasting was completed, the substrate was then washed using Belzona 9111 (Cleaner Degreaser) in order to remove any residual blasting debris. Next, the application of Belzona 1341 was carried out using a stiff, short bristled brush. Once cured, the two coats of Belzona 2121 were then applied using the same technique, ensuring the first layer had cured before application of the second layer.

This combination of Belzona systems ensured a robust protection mechanism was successfully achieved. As these materials offer long-term protection, even when the substrate is subjected to abrasive media, there has been a growing rise in the application of this system and is now in general use across France. ■



Wicket gates after blasting and initial application



Belzona 1341 applied



Belzona 2121 applied



Long-term erosion-corrosion protection of the leading edge

CAVITATION PROTECTION

Cavitation is a condition in which vapour or gas bubbles occur, normally in an area where there is a temperature change or reduction in pressure, which results in a collapse of the bubble and high local impact pressures. This can lead to localised surface erosion.

To combat cavitation, [Belzona 2141 \(ACR-Fluid Elastomer\)](#), a 2-part polyurethane resin designed for the coating of metal and rubber components, can offer long-term protection. This flexible elastomeric material is appropriate for coating extremely high localised pressure areas where abrasion, cavitation, erosion and corrosion resistance are required.

A series of cavitation resistance tests were carried out involving Belzona 2141 versus conventional metals, including stainless steel, cupro-nickel and DH36 Steel. During the tests, Belzona 2141 outperformed the metals, exhibiting little to no visual damage or deterioration and demonstrating the material's superior cavitation protection capabilities.

For more information about this test, please contact belzona@belzona.co.uk



DH36 Steel



Stainless Steel



Cupro-Nickel



Belzona 2141 (ACR-Fluid Elastomer)

CASE STUDIES

Belzona Elastomers have been used in countless situations to repair, rebuild, coat and seal machinery and equipment.

Visit khia.belzona.com to access a comprehensive database of Belzona case studies collected over the years

Repair, Rebuilding and Moulding

- » Irrigation hose
[XXX, no. 146](#)
- » Impeller
[XXI, no. 18](#)
- » Conveyor belt clips
[XXVIII, no. 128](#)
- » Offloading hose
[XXX, no. 23](#)
- » Tyre
[XXIX, no. 22](#)
- » Impeller
[XXVIII, no. 216](#)
- » Fasteners on conveyor belt
[XXX, no. 144](#)

Coating and Sealing

- » Cooling tower seams
[XXX, no. 125](#)
- » FGD agitator blade
[XXX, no. 91](#)
- » Tail shaft
[XXX, no. 57](#)
- » Water media filter
[XX, no. 54](#)
- » Cation exchange vessel
[XX, no. 42](#)
- » Butterfly Valve
[XXX, no. 147](#)
- » Ship rudder
[XXVII, no. 89](#)
- » Mechanical movement joints
[XXVII, no. 85](#)

BELZONA UPGRADES FENDERS

Flexible and robust repair and rebuilding system bypasses the need for replacement

A national dredging company in Abu Dhabi, U.A.E required a flexible and robust repair solution to treat a number of fenders which had become worn and punctured over time. Although wrapped with the tyre net for protection, due to the extent of the damage, the fenders were in urgent need of a full service and, in more severe cases, complete replacement.

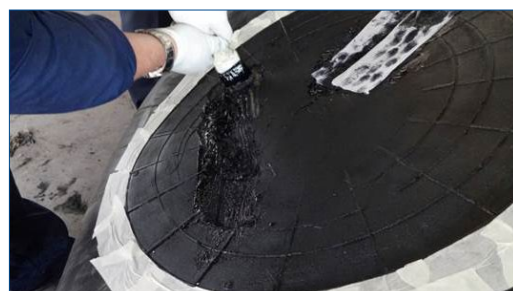
A flexible, abrasion resistant polyurethane elastomer, [Belzona 2111 \(D&A Hi-Build Elastomer\)](#), was chosen to repair and rebuild the damaged fenders. As this material exhibits high elasticity, it will successfully absorb any impact damage and dissipate the energy, fortifying the substrate with robust, long-term protection. Furthermore, the cold curing properties of Belzona 2111 will enable the company to bypass the need for vulcanisation, which can incur a number of hazards due to the hot work involved.

For the application, the surfaces were prepared by firstly removing any material loosely adhered to the substrate. This was done using a knife to leave a sound edge terminated square or undercut. For the next step, the complete area of damage plus an area of 75mm (3") around the damage was then abraded using a power wire brush to produce a woolly finish. Following this, the surface was then washed with Belzona 9111 in order to remove all dirt, grease and other surface contamination. After conditioning the areas, Belzona 2111 was applied in a thin film using a stiff bristle brush to the entire prepared area, pushing the product well into the prepared profile. To rebuild the damaged substrate, lengths of Belzona 9341 reinforcement tape were wetted out with the Belzona material and applied to the damaged areas. A final layer of Belzona 2111 was then applied to encapsulate the Belzona 9341 reinforcement tape, and the application was left to cure.

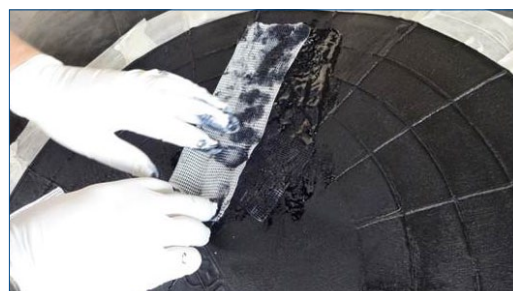
The complete Belzona package, including the polymeric system and its application, facilitated a quick and cost effective solution for the dredging company. This repair method enabled the company to simply restore and strengthen the existing fenders, rather than replacing them, saving valuable downtime and capital expenditure.



Initial inspection of deflated fender



Application of Belzona 2111



Application of Belzona 9341 into Belzona 2111



Flexible and durable repair



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