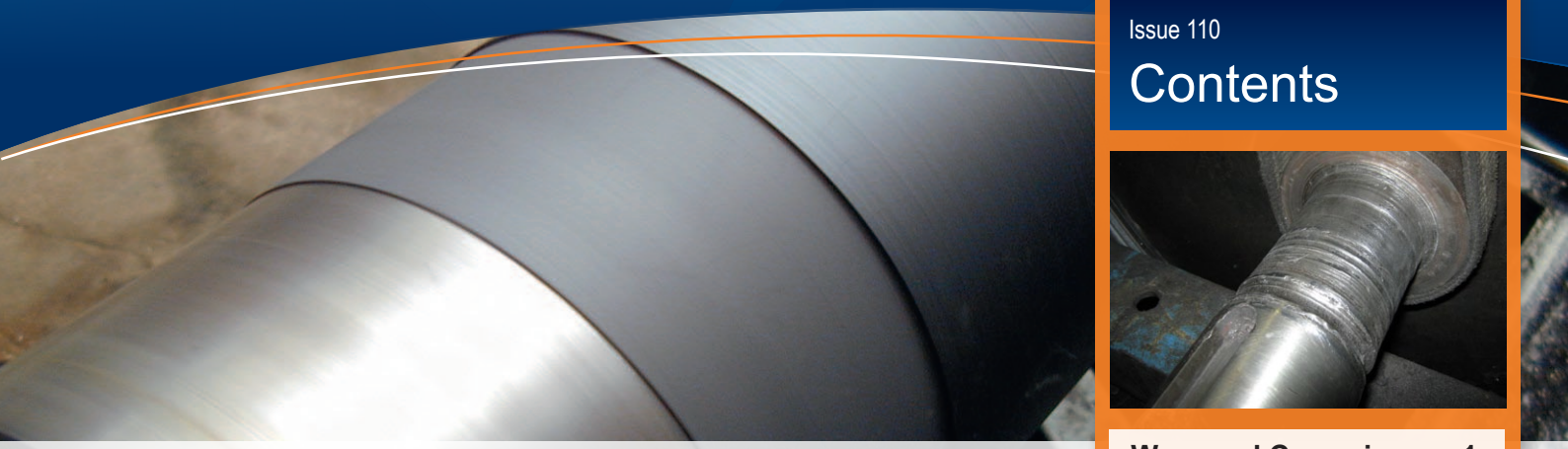
IN FOCUS:
Mechanical Repairs

BELZONA®
Repair • Protect • Improve



INNOVATIONS IN METAL REBUILDING

Unexpected shutdowns and subsequent downtime can be very costly to asset owners and operators. Ironically, the smallest parts can sometimes cause the biggest losses. Mechanical elements with close tolerances such as drive rollers, shafts, mechanical joints and bearing housings are susceptible to wear at accelerated rates, particularly when exposed to corrosion or dust and fine particles in the environment which become trapped between mating surfaces. Fatigue of metallic components sets in and premature failure can result in costly unexpected shutdowns.

Conventional solutions

Traditional repair methods such as welding and overlaying with fused metal alloy powders are used to reinstate the original metal condition, yet do not provide ongoing protection to prevent future failures. Additionally, hot work can rarely be done on site and definitely not without stripping the equipment. The amount of time associated with dismantling the asset, transporting the affected parts to the workshop, producing the repair including post-weld heat treatment (PWHT) and then reassembly adds up to many hours of lost production. Engineers and maintenance professionals therefore seek solutions that can satisfy several requirements including:

- In-situ applications
- Repairs completed without (or minimal) disassembling of the equipment
- Repair materials are easy to access, preferably stored on site
- Reduced application risks, such as distortion or cracking
- Equipment returned to service with minimal delay

Cold Applied Belzona Solutions

Cold curing paste grade materials have been designed to simplify mechanical repairs and prevent any further damage from reoccurring. Belzona's metallic repair compounds can be used to quickly reinstate failed or damaged equipment ensuring rapid return to service. Exact profiles can be restored with the use of forming or machining techniques. High adhesion and excellent mechanical properties such as compressive strength and resistance to erosion indicate that the products will significantly prolong equipment's life in service.

Damaged shaft

Conventional shaft weld repair

Issue 110

Contents

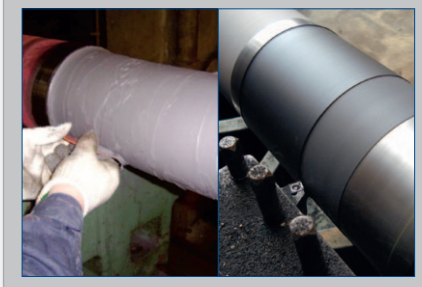
REBUILDING DAMAGED SHAFTS

Product and application technique selection should be made based on the cause and nature of the damage and the operating conditions of the equipment.

Forming

For this method of repair, suitable formers should be fabricated from rigid materials and split longitudinally. They should be of a suitable length to centralise the repair onto undamaged sections of the shaft. Vent holes and, where injection techniques are being utilised, injection ports should be drilled at strategic points.

Machining



When using this technique, the Belzona material is initially applied to the shaft, whilst slowly rotating, forcing it down into the prepared surface to ensure complete wetting and to prevent air entrapment. Further Belzona material is applied to create an overbuild, which when cured, can be machined to required dimensions. Fine emery cloth may be used to buff the Belzona to give the best finish.

Belzona product selection should be made on the basis of:

- the predominant problem
- the system operating temperature
- the percentage solids content and nature of the system fluid
- the shaft dimensions

Belzona materials are typically used to repair shafts, splined couplings, keyways, bearing housings, drive rollers, pin and bush housings and scored hydraulic rams amongst others. From small fan shaft repairs to restoring turntable bearings on enormous excavators, Belzona is equally effective at repairing the damage and preventing its further occurrences.

Belzona mechanical repairs

Equipment parts damaged by abrasion, erosion-corrosion or impact can be simply repaired in situ. Belzona materials can be stocked on site and easily accessed, so that a small amount can be measured and used when needed. Most products have a 5-year shelf life and their mixing ratios are simplified for small volume mixing.

Simple repair process

First, the Belzona material is selected based on the size of equipment, surface contaminants and operating conditions such as anticipated loading. Local Belzona representatives can recommend the right product and advise on the application. Every application typically starts with surface preparation, where the substrate needs to be as rough, clean and dry as possible. However, Belzona also offers materials that will also adhere to wet and oily surfaces.

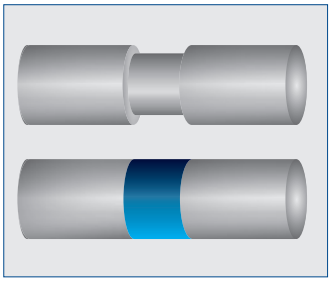
Once surface preparation is completed, the selected Belzona material is mixed in accordance with the relevant Belzona Instructions for Use and the rebuilding can then commence. Belzona has documented procedures for reinstating various parts and equipment, including shafts and keyways, bearing housings and many other mechanical elements.

Rebuilding options vary from in-situ applications using a custom made former or the mating part to machined repairs on a workshop lathe.

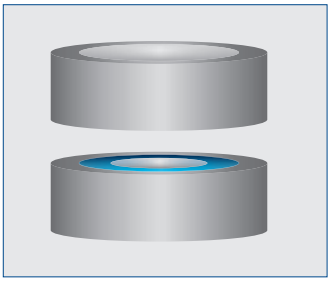
Longevity in service

Once completed, the Belzona solution does not only fix the problem, in many instances it stops it from reoccurring. Various testing has been carried out on Belzona materials typically used for mechanical repairs, which illustrate their in-service performance. In addition, case studies spanning several decades are a testament to Belzona's longevity. For instance, feedback received recently from a keyway repair application on a large punch press carried out in 1992, has confirmed the Belzona solution to be intact.

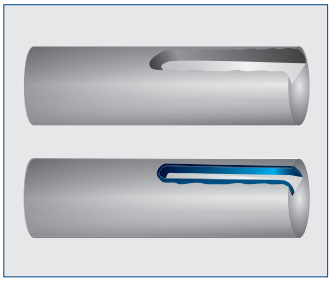
Belzona materials are corrosion resistant and suitable for use in a wide range of service environments including contact with a broad range of chemicals. Being electrical insulators, they also eliminate galvanic corrosion effects commonly found when dissimilar metals are in contact. Their high adhesion and ability to form perfect 100% contact surfaces ensures long service life when used in irregular load bearing shimming applications such as rebuilding bearing and bush housings. Additionally, being less ductile and more elastic than metals, they have excellent resistance to vibration and fatigue.



Shaft rebuilding



Housing repair



Keyway repair

CONTACT US

SHAFT RESTORED IN SITU

4 days of downtime avoided with a quick repair

A large shaft on a rotary filter at a wastewater station in Egypt got worn over the years, leading to significant metal loss. The client was initially considering a traditional welding repair, which would require for the shaft to be disassembled. Welding also presents risks due to potential metal bending and distortion. In addition, due to the length of the shaft a special lathe would need to be brought in for machining, which was not readily available.

The client ultimately decided to use a cold applied 100% solids epoxy paste, Belzona 1111 (Super Metal), to dramatically reduce costs and save at least 4 days in downtime.

The shaft remained in situ throughout the repair process and the application of Belzona 1111 was completed in less than 5 hours with the use of prefabricated formers. The surface was manually prepared, then Belzona applied and the formers fitted to restore exact surface profile. Belzona 1111 is 100% solids and does not shrink during cure, which makes it ideal for rapidly restoring metal loss in situ.

The repaired shaft has now been in service for over 7 years with no issues. In fact, Belzona repairs can last for 20 or more years depending on service conditions and have been known to outlast the original design life of the shaft.

Worn shaft

Former prepared

Belzona applied, former in place

Completed application

INTRODUCING BELZONA 1212

Surface tolerant epoxy composite for emergency in-situ metal repair of oil contaminated, wet and underwater substrates.

- Adheres to manually prepared surfaces
- Rapid cure even at low temperatures
- Emergency in-situ repair
- Excellent mechanical properties
- Multi-purpose material
- Ideal for repair kits

CASE STUDIES

Equipment commonly suffering from mechanical damage.

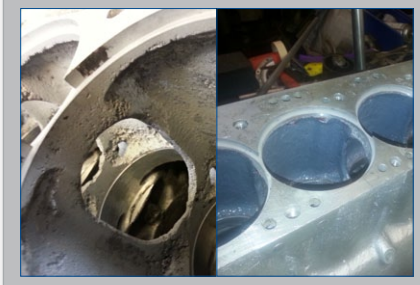
Visit khia.belzona.com to access a comprehensive database of Belzona case studies collected over the years.

Valves
- XXVIII, no. 3
- XII, no. 35
- XXII, no. 87

Shafts
- XXX, no. 31
- XII, no. 22
- XXVIII, no. 118

Keyways
- XX, no. 27
- XXII, no. 138
- XXIX, no. 16

Casings
- XXIII, no. 23
- XXVIII, no. 44
- XXVI, no. 64
- XXVI, no. 35



Bearings
- XXVIII, no. 233
- XI, no. 12
- XXVI, no. 4

Bushings
- XXVIII, no. 27
- XXVII, no. 48
- XXIX, no. 42

Hydraulic Rams
- XXVIII, no. 248
- XIX, no. 70
- XXVIII, no. 111

KNOWLEDGE AND EXPERIENCE

Since 1952, Belzona has been providing lasting repair solutions in the following industries:

- Power
- Mining
- Pulp and Paper
- Water and Wastewater
- Oil, Gas and Petrochemical
- Manufacturing
- Metal Processing
- and Marine among others

Visit Belzona.com to find out more about turnkey solutions Belzona can offer to minimise downtime and extend your maintenance-free periods.

Belzona strives to provide a complete supply and apply package through its Global Distribution network, created to provide clients with direct access to materials, specialist application services, supervision and inspection services. It is Belzona's mission to meet specialist repair and maintenance needs in its target industries and markets worldwide.

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Issue No. 110

PIN BUSH HOUSING REBUILT

Next day service for 1/10th of the cost

Belzona offered a cost- and time-saving alternative to conventional repair methods at a metals recycling facility in Missouri, USA. Wear affected the pin bush housing on a Komatsu Loader leading to metal loss and misalignment. These bushings are located where loader arms connect to the loader body. Conventional welding repair would require the loader to be out of service for a long period of time. The Belzona solution was chosen for its ability to minimise downtime, while also providing a lasting solution.

Belzona 1111 (Super Metal) was applied onto the steel substrate and the dummy shaft installed to ensure precise alignment. Repairs were completed for 1/10th the cost of welding and line boring, and the loader was returned to service the next day. The Belzona Technical Consultant was on site to provide training and supervise the repair carried out by the customer's maintenance crew. The client was pleased with the Belzona solution and continues to use Belzona materials for their maintenance needs.

Damaged pin bush housing

Surface preparation completed

Dummy shaft installed to maintain alignment

Finished application

PRODUCT SELECTOR		
	Belzona 1111 (Super Metal)	An epoxy-based composite for metal repair. Can be machined using conventional tools.
	Belzona 1121 (Super XL-Metal)	An epoxy-based repair composite with extended working life for metal repair.
	Belzona 1131 (Bearing Metal)	A self-lubricating epoxy metal repair composite for creation of low friction surfaces and protection of lubrication systems from wear and seizure.
	Belzona 1161 (Super UW-Metal)	Surface-tolerant epoxy composite for metal repair of oil contaminated, wet and underwater substrates.
	Belzona 1212	Surface-tolerant epoxy composite for emergency in-situ metal repair of oil contaminated, wet and underwater substrates.
	Belzona 1511 (Super HT-Metal)	High temperature epoxy repair composite for rebuilding equipment damaged by erosion and corrosion.

Click here to find your local Belzona Representative