IN FOCUS: Abrasion

BELZONA®
Repair • Protect • Improve

LONG-LASTING POLYMER TECHNOLOGY

The aggressive nature of abrasive media causes significant wear and friction within extracting, handling and processing equipment utilised by heavy industries, such as mining, metal processing and pulp and paper. Although wear represents a minor portion of the operating expenses, it is uppermost in the minds of maintenance personnel, due to its recurring nature. Because of this, those responsible for the purchase and replacement of wear consumables are always watchful for new abrasion protection materials that will last longer, be easier to install, and are more cost-effective than those currently in use.

Mitigating abrasive wear conditions

Of the predominant abrasive wear conditions, low-stress abrasion and erosion-corrosion can be successfully mitigated with the use of sacrificial lining technology. If left unprotected or if protection is not suitable for the service environment, then equipment could incur costly repairs or replacement may be in order.

Material selection is primarily influenced by impingement angles. At 10° to 30° impingement angles, hard, brittle materials usually perform better, whereas elastomeric materials cut and tear more readily, leading to increases in wear rates. At high impingement angles (60° to 90°), brittle materials typically experience elevated wear rates, resulting from increased fragmentation and spalling. Elastomeric materials are more effective under these conditions because much of the impact energy can be dissipated through elastic deformation.

Belzona Solutions

Established in 1952, Belzona manufactures coatings and composites for repair and protection of machinery and equipment in heavy industries. Belzona solutions are continuously subjected to rigorous testing and have stood the test of time in service.

With a versatile product range specifically designed to repair and prevent various abrasive wear conditions, Belzona has become the solution of choice for many mines, metal processing plants, pulp and paper plants and other facilities, where abrasion is an issue.

Failed rubber lining

Floatation cell damaged by erosion-corrosion

Issue 108

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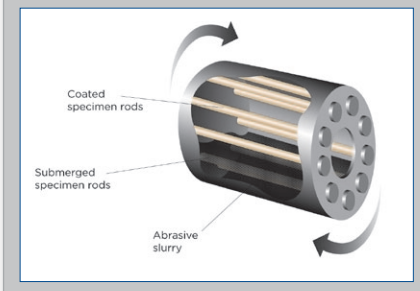
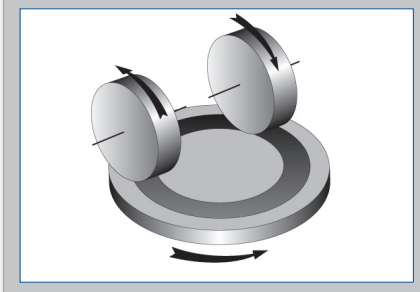
Maintenance-free period extended

TESTING RESISTANCE TO ABRASION

There are numerous test methods available to determine the wear resistance of a material. Belzona materials are extensively tested using the Taber Abrasion (ASTM D4060) and Slurry Abrasion (ASTM G6) tests to name a few.

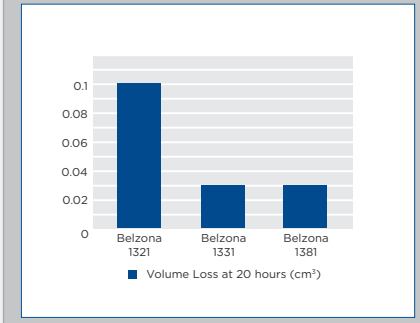


Slurry Abrasion Testing according to ASTM G6



Taber Abrasion Testing according to ASTM 4060

As well as these standard tests, Belzona goes even further and has conducted bespoke testing with the University of Leeds to aggressively test specimens in simulated service environments using the 'Jet Impingement' test method. Samples are held immersed in solution and blasted with grit and water for several hours. This testing has proven the erosion resistance of Belzona ceramic filled epoxies as well as highlighting the improvements in erosion resistance using the new polymer alloy fillers found in Belzona 1331 and Belzona 1381.



Ductile erosion – low angle of impact

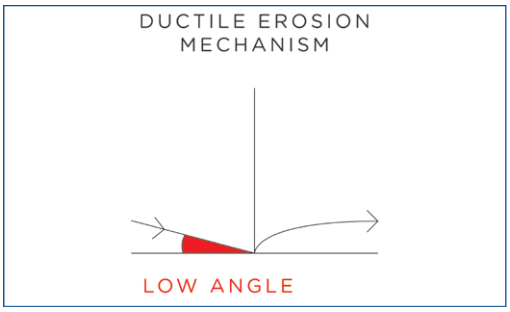
In order to combat ductile erosion, a hard coating is often prescribed. Belzona supply a range of hard wearing lining options optimised for dry abrasion and for immersed situations.

Belzona 1300 Series systems

Long established and recognised as being in the forefront of erosion corrosoin resistance, the Belzona 1300 Series of products are optimised for protection of equipment suffering from erosion-corrosion. Traditionally containing ceramic fillers to create a hard finished coating, Belzona's latest products, Belzona 1331 and Belzona 1381, incorporate new polymer alloy fillers providing even higher erosion resistance whilst facilitating spray application.

Belzona 1800 Series systems

For areas of extreme wear, the Belzona 1800 Series of products are recommended. Containing hard solid fillers, these systems are designed to be applied as thick wear layers ensuring continued operation of critical equipment. Belzona 9811 alumina tiles can be incorporated with the Belzona 1800 Series for situations with severe impact abrasion.

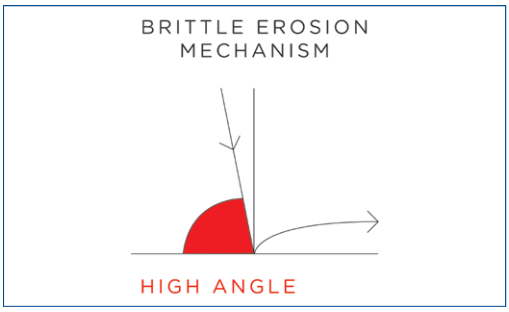


Brittle erosion – high angle of impact

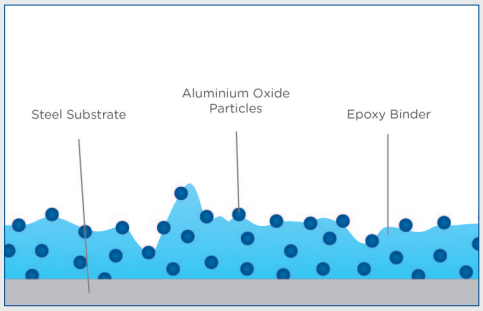
In the case of brittle erosion, due to higher impact angles, elastomeric type products are frequently specified. Tough, elastomeric materials will absorb the impact forces and deflect impacting materials.

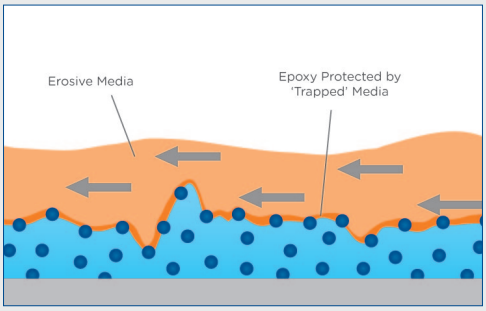
Belzona 2100 Series systems

Belzona's durable and abrasion (D&A) resistant elastomers are designed to withstand impact attack such as in brittle erosion. Used frequently to repair damage of existing linings, they are also regularly specified for protection of areas where heavy erosion mechanisms are present such as cavitation in fluid flow equipment.



Belzona 1800 Series abrasion resistant linings use hard aluminium oxide particles to resist wearing media. In certain situations where very fine media is passing over the surface such as dry cement, the hard particles actually trap the media in the spaces between the aluminium oxide particles. This trapped media then protects the protective coating layer underneath as more flowing material wears against itself and not the protective Belzona coating.





CONTACT US

RECLAIMED, PROTECTED AND STILL IN SERVICE

Concrete repair and protection against extreme abrasion

Belzona's abrasion resistant system was successfully applied to the concrete channels and sumps at a copper mine in Brazil. These areas presented widespread wear due to erosion caused by the flow of copper ore pulp leading to loss of thickness and profile. Due to the severity of the damage, the surfaces of the channels and sumps required major reconstruction.

The Belzona solution was specified due to its proven track record in repairing and withstanding abrasion damage. Surface preparation was carried out by thoroughly cleaning the substrate in order to remove the copper ore residue. Belzona 4911 (Magma TX Conditioner) was used to achieve maximum adhesion and the worn areas were then rebuilt with Belzona 4111 (Magma-Quartz) to their original design, bonding strongly to the existing concrete. After the repair, the recommended abrasion protective system consisting of Belzona 1321 (Ceramic S-Metal), Belzona 9811 alumina tiles and Belzona 1812 (Ceramic Carbide FP) was set in place. Belzona 1321, a ceramic filled polymer material, was used to bond Belzona 9811 strongly to the surface to create a hard wearing abrasion resistant lining contouring the sump and channel. Belzona 1812 was then used for grouting and lining the areas, providing extreme abrasion protection.

A previously used system required 96 hours to apply and failed every 3-4 months. The client was very satisfied with the results provided by the Belzona solution which is inspected every 2 years during planned turnarounds.

Damaged areas of the concrete sump

Worn reinforced concrete channel

Belzona 9811 being applied on a channel

Completed application on a channel

INTRODUCING SPRAY FRIENDLY EXTREME EROSION RESISTANT LININGS

Belzona 1331 & Belzona 1381

High molecular weight polymer composite

- Applied in a single coat
- Flexibility and impact resistance superior to conventional epoxy linings

Belzona 1331 resists temperatures of up to 50°C (122°F) and Belzona 1381 – up to 95°C (203°F).

EQUIPMENT COMMONLY SUFFERING FROM ABRASION

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

Pipes/Pipe elbows:
- XXIII, no. 76 – Mining Plant
- XXVII, no. 36 – Steel Plant

Conveyor belts:
- XXVIII, no. 128 – Quarrying
- XXVIII, no. 201 – Coal terminal

Drive rollers:
- XVI, no. 29 – Sawmill
- XXVIII, no. 136 – Mine

Pumps:
- XXVIII, no. 141 – Mine
- XXVIII, no. 80 – Wastewater Treatment Plant

Screw conveyors:
- XXVI, no. 112 – Cement Producer
- XXIII, no. 9 – Paper Industry

Thickeners:
- XXV, no. 15 – Pharmaceutical Producer
- XXVIII, no. 35 – Mine

Chutes:
- XXIII, no. 74 – Corn Processing Plant
- XXIX, no 2 – Concrete Plant

Hoppers:
- Vol. XXVIII, no. 68 – Salt
- Vol. XXVIII, no. 129 – Mine

Fan blades:
- Vol. XXIX, no. 98 – HVAC
- Vol. XXIX, no. 77 – Mine

Cyclones:
- XVIII, no. 8 – Cement Company
- XXIX, no. 41 – Pulp and Paper

Chipper disc pockets:
- XVI, no. 30 – Pulp and Paper
- XXVIII, no. 245 – Pulp and Paper

ABRASION IN INDUSTRY

Belzona provides lasting repair and prevention solutions to abrasion in the following industries:

- Power
- Mining
- Pulp and Paper
- Water and Wastewater
- Food Industry
- Chemical Plants
- Steel Plants

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. This network was specifically 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.

BELZONA®
Repair • Protect • Improve

Issue No. 108

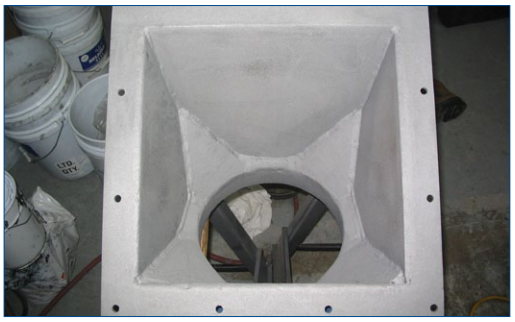
SHUTDOWN NO MORE

Hopper maintenance-free period quadrupled

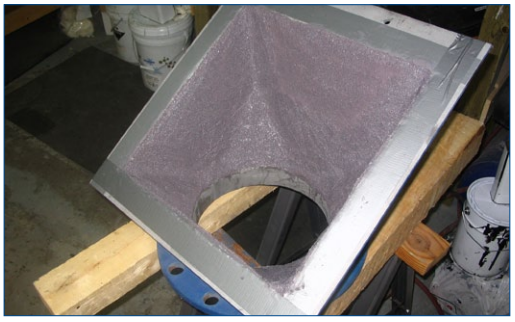
A Canadian manufacturer of asphalt shingles was faced with a recurring problem with its hoppers. Unloading of fine stone solids has created high abrasion on the inside surface of the hoppers. The hoppers were processing 22.5 tons of material per hour, operating 24 hours a day. Originally, the hopper's life expectancy was one month, increasing to up to seven months with the use of various linings. The customer was looking for a longer lasting solution as they were faced with 40 days of shutdown per annum.

Upon carefully reviewing the operating conditions of the hoppers, a durable and lasting Belzona system was specified, which consisted of Belzona 1812 (Ceramic Carbide FP) and Belzona 2111 (D&A Hi-Build Elastomer). Belzona 1812 was applied to profile the hopper before overcoating with Belzona 2111. Both the mild steel hopper substrate and Belzona 1812 were grit blasted before coating.

With the Belzona solution equipment now operates for a period of 18 to 24 months maintenance free. The client also approved Belzona 1812 as an inventory product, which is used in other applications.



Hopper grit blasted



Application of Belzona 1812

Hoppers lined with Belzona 2111

Click here to find your local Belzona Representative