

WEAR PROTECTION

Minimum wear meets
maximum efficiency

ALOTEC®
Customised Ceramic
Solutions for Wear
Protection

Uncompromising wear protection – from consultation to manufacture and installation

Why ceramics for wear protection solutions?

As humanity's material footprint continues to grow, wear protection is becoming increasingly important as a synonym for material efficiency and resource conservation. Industrial plant operators, OEMs and end users are no longer focused solely on cost-effectiveness and efficiency, but also on sustainable solutions that reduce environmental impact. Tailor-made wear protection solutions made from high-performance materials are particularly in demand. These can help to minimise the extent of wear on equipment components and limit the economic and environmental effects wear and corrosion.

Due to their specific properties such as hardness, toughness, chemical durability or temperature resistance, ceramic solutions can make a significant contribution to reducing or even neutralising wear, depending on the application. Compared to other materials such as metal or plastic, ceramics therefore opens up great performance potential and can help to achieve a wide range of application-specific competitive advantages.



Applications for ceramic wear protection solutions

- Raw materials industry
- Steel industry
- Chemical industry
- Food and animal feed industry
- Energy, processing, recycling and environmental protection technology
- Process industry
- Construction industry



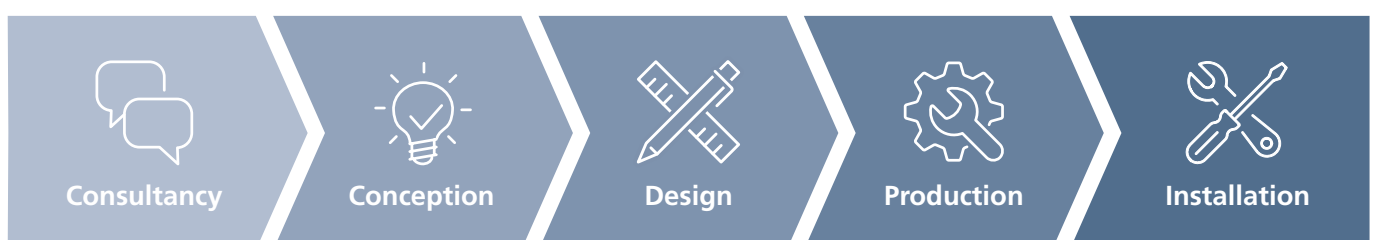
Customised ceramic solutions for wear protection applications

With more than 120 years of production and development experience, CeramTec is one of the world's leading suppliers of high-performance ceramics. Based on our comprehensive materials expertise and application know-how, we offer our customers globally networked engineering and solution competence. From automotive, chemicals and mechanical engineering to plant engineering and medical technology – leading global customers rely on our unique competence and capabilities to develop highly customized solutions for demanding industry application needs. Numerous industrial customers of CeramTec-ETEC (part of the CeramTec Group since 2008) also rely on our expertise. We have successfully implemented more than 10,000 different tailor-made and reliable wear protection solutions for them over the course of several decades.

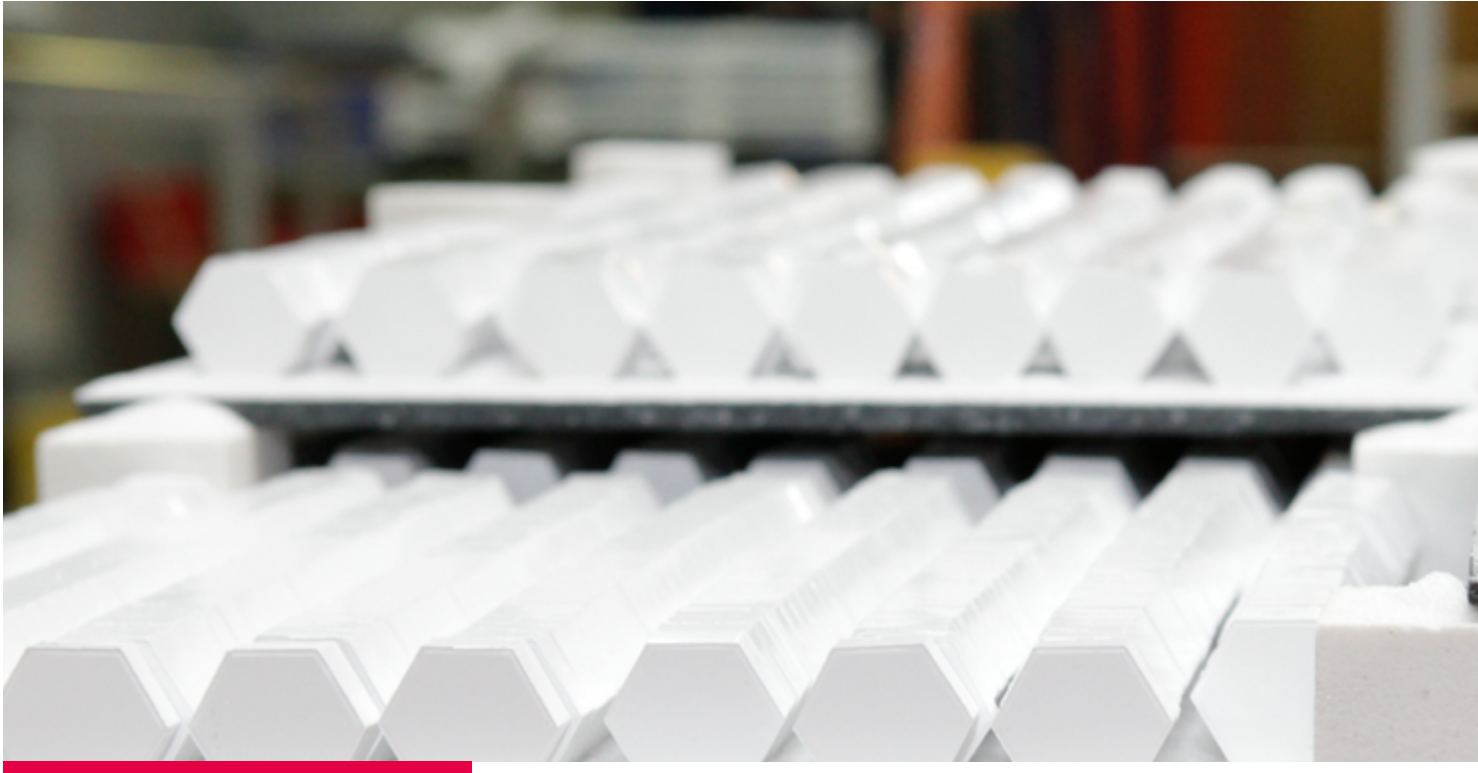
The benefits of CeramTec wear protection solutions

- Global ceramic expertise
- Broad understanding of your specific wear protection application
- Excellent wear and corrosion resistance of our materials
- In-house 3D printing technology that can be used in prototyping
- Proven engineering and design expertise
- Many years of process and project experience in wear protection
- Wear protection solutions made in Germany – from consultation to installation
- Increased process reliability and improved cost-efficiency

Our solutions expertise for your wear protection application



CeramTec is a system provider in the field of wear protection: from the individual ceramic plate to the fully installed wear protection system – everything is from a single source, along the entire value chain.



ALOTEC® – the High-Performance Material for your Wear Protection Application

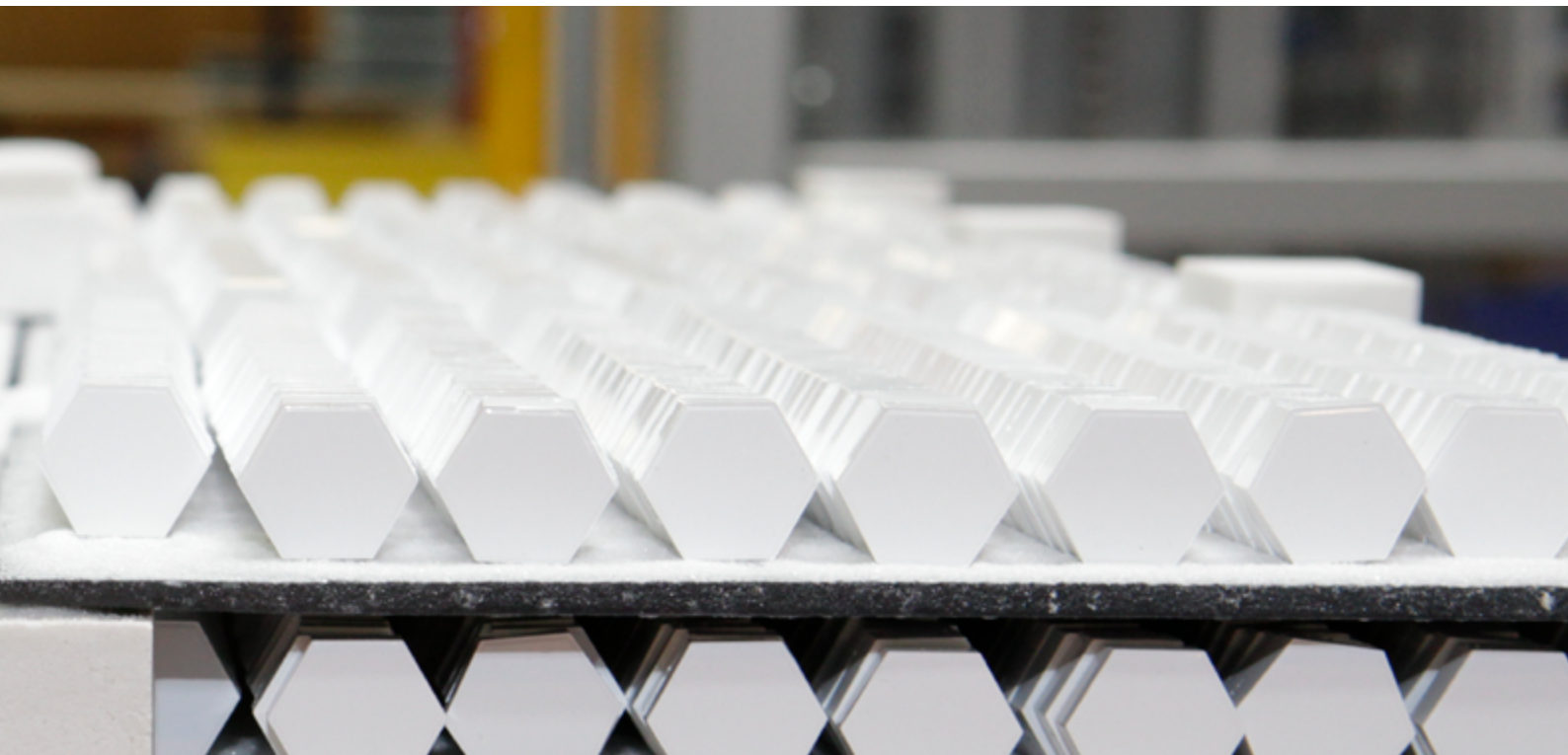
High-performance ceramics have excellent properties for wear and corrosion protection. The most widely used alumina ceramic (Al_2O_3) has proven itself as a base material. On this basis, CeramTec's ceramic experts have used their technical expertise to create the reliable material ALOTEC 92 (92% Al_2O_3) and are continuously developing it further. ALOTEC is also available in higher purity grades to meet specific application requirements.

Selection of the right raw material, precise processing and efficient tests and inspections all ensure the quality and safety of our wear protection solutions. Depending on the requirements and stresses of the application, ALOTEC forms the core of ceramic linings that are quickly and efficiently bonded, cemented, bolted or welded according to individual installation plans.

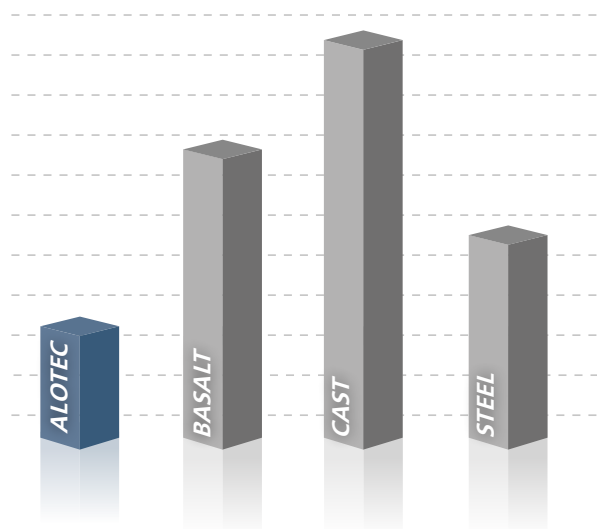
By taking a holistic view of the process chain, CeramTec can ensure the production of reproducible components of consistent quality that our customers can rely on when implementing their tailor-made wear protection solution.

ALOTEC can be used along the entire process chain of material preparation

- Transporting and conveying
- Crushing and grinding
- Classifying and separating
- Mixing and agitation

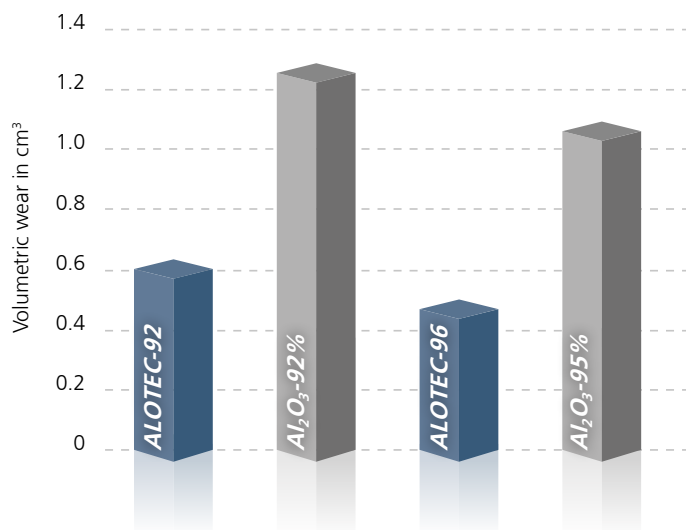


Comparison of wear protection materials



Volumetric wear of ALOTEC compared to other wear protection materials

Comparison of ceramic materials



A blast wear test can be used to evaluate different materials with regard to volumetric wear.

Transporting and Conveying

From the extraction of raw materials to the use of the finished product, there are many stages in the process industry where the transport of materials is essential. Depending on whether solid, liquid or gaseous products are being transported, different transport systems are used, such as pipe systems, bends or elbows, channels, troughs, hoppers or containers. Material can be conveyed pneumatically, mechanically (screw conveyors, conveyor belts) or by gravity.

Based on application know-how and the excellent material properties of ALOTEC, CeramTec develops and implements reliable wear protection solutions for various transport systems and transport system components exposed to wear. In many cases, a classic lining is an efficient, sustainable and economical solution for large pipes, channels, containers, etc. to minimise signs of wear.

Pneumatic piping systems are state of the art in industrial plants. Curved and straight pipes are complemented by compact bends and elbows, ball valves, etc.



Compact bend

The compact bend eliminates the problem of wear-prone tight bends in piping systems. Where previously impact absorbers or makeshift solutions were used, the compact bend provides reliable wear protection while maintaining a uniform nominal passage width throughout the piping system. The patented compact bend is designed for nominal widths ranging from DN 50 to DN 250 and radii from 200 to 500 mm. Its compact design allows it to be adapted to any existing pipe cross-section, and impact absorbers can be easily replaced on a 1:1 basis at any time.

When used to replace impact absorbers in pneumatic systems, the compact bend can achieve energy savings of up to 50 percent, while providing significant protection for the material being conveyed. In foundries, for example, the foundry sand can be reused multiple times.





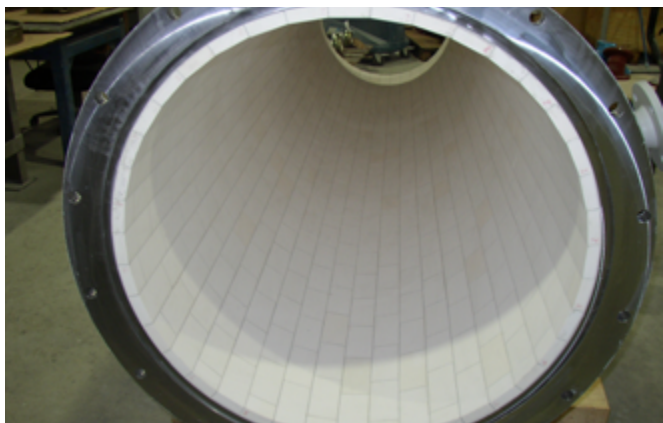
Ball valve

The ball valve combines the properties of two high-performance materials: The valve ball is made of steel, while the material passage area is protected by a wear-resistant ceramic casing. The synergy: the steel component effortlessly absorbs the adjustment forces, while the ceramic lining provides efficient wear protection.



ALOFLEX flexible tube bend

Specially shaped and flexibly connected ALOTEC elements provide maximum wear protection in the ALOFLEX tubing manifold. This makes it possible to protect wear-prone areas in flexible pipe sections, even with bend radii of up to 90°.



Linings

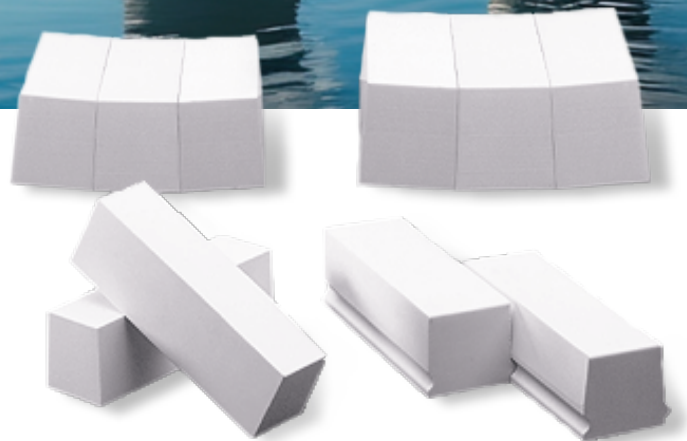
Ceramic lining tailored to the individual component. The specific arrangement of the ceramic plates provides optimum wear protection.



Crushing and Grinding

When grinding and crushing in industrial plants, it is particularly important that the product to be ground is not contaminated with abrasive particles from the mill or the grinding media. It is essential that the material to be ground has an exceptionally high degree of purity, especially when grinding food products or animal feed, pharmaceutical products, pigments or paints, but also raw materials for the glass and ceramics industry, for example. Ceramic linings are characterised by very low abrasion, which prevents contamination of the material being ground.

In terms of wear resistance, ALOTEC mill linings for drum mills outperform conventional lining materials in both



wet and dry grinding. They meet key requirements such as a high throughput rate with a high degree of grinding efficiency and long mill lining service life.

The smooth surfaces of the mill linings ensure smooth lifting and rolling of the grinding balls. Smooth mill linings have proven to be very effective for fine grinding. For coarse grinding, however, lifter and shaft profiles have a better effect on the material to be ground. Lifter and shaft profiles can also be customised to achieve the desired grinding result.





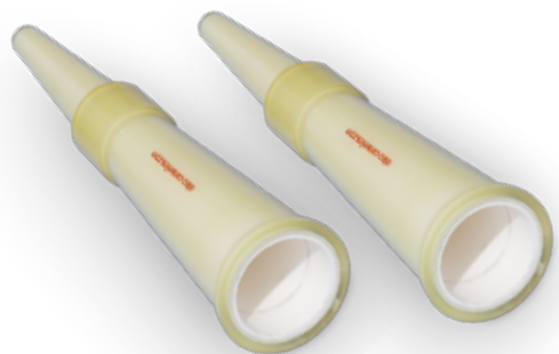
Classifying and Separating

Various methods such as sieving, cyclones or classifiers are used to classify materials in industrial production.

In fine grinding systems, classifiers are used to separate the finely ground material for subsequent production steps, while the coarse material is returned to the process. In classifiers, the parts that come into contact with the product, such as the housing, discs and wheels, can be protected with ALOTEC.

Classifier separators (aerocyclones) are mainly used in power stations, waste incineration plants and steelworks and are designed to ensure maximum separation of ultra-fine particles from the air stream. The dust-laden air passes through the cyclone at high speed. This results in considerable wear and tear, particularly on the inlets, cyclone surfaces and underflow nozzles.

In the polyurethane/ALOTEC composite, hydrocyclones offer a particularly high level of wear and corrosion resistance, are lighter than other solutions and are also impact-resistant due to the PU coating. They are currently used mainly in waste paper recycling and the separation of raw kaolin.





Did you know ...

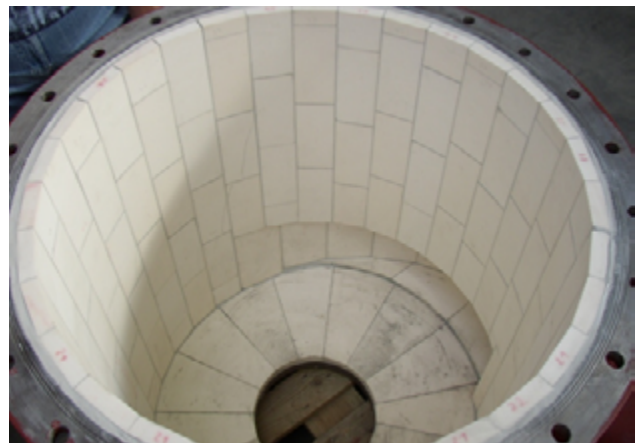
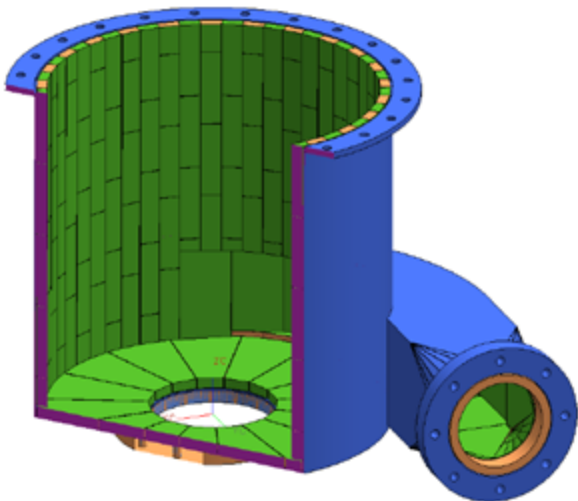
that extending product life by reducing wear is a major factor in decoupling economic growth from material consumption?



From initial design ... to finished wear protection solution

The 3D design of the ceramic lining is based on a drawing or measurements.

This is then transferred to the ceramic plates and finally installed in the steel component.



Mixing and Agitation

Mixing is one of the most wear-intensive processes in processing technology. The types of mixers used in each industry are as varied as the applications themselves.

Based on our many years of experience with a wide range of industrial mixing equipment, we successfully design and implement customised wear protection solutions to meet your specific requirements – from on-site assessment and measurement, through material recommendations, to 3D design and finished production of the ceramic lining.

Continuous joints in the direction of stress are avoided thanks to a special installation technique. This, together with the narrow-jointed installation and specially cut parts for curved shapes, significantly reduces wear and results in a longer service life. Energy savings and reduced cleaning times can also be achieved. The low-friction mixing paths result in better product homogeneity and prevent the build-up of deposits. We always ensure that the agitators are optimally matched to the ceramic lining.



ALOTEC ceramic linings have proven to be effective for virtually all makes and types of agitator. The high wear resistance of the material ensures long life and increased efficiency.



Did you know ...

that tribological effects have an impact on at least six of the 17 global sustainability goals set by the United Nations in October 2017?

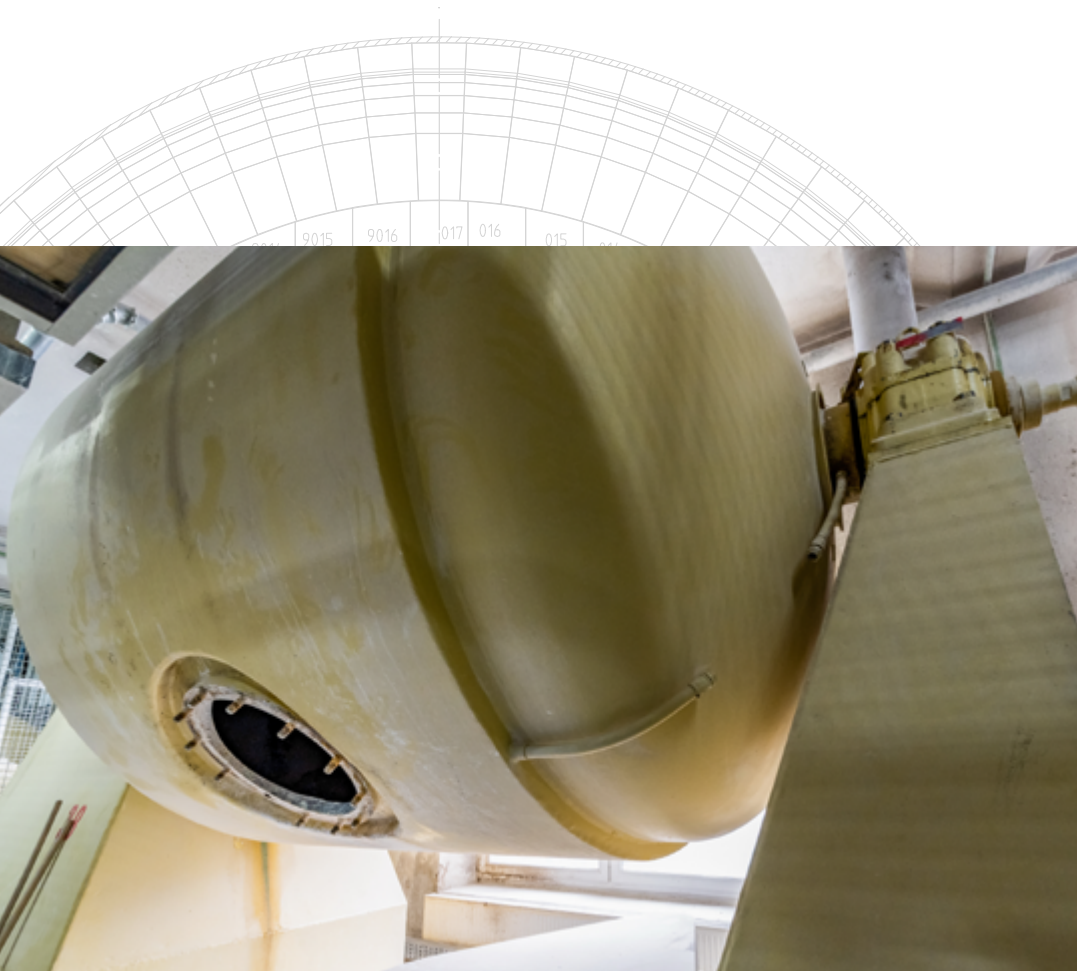


Wear protection solutions that beyond construction materials handling

Ceramic linings can also be used successfully and reliably in mixing systems for more demanding applications, for example where metallic abrasion is an issue, such as in battery production.

Special Applications Require Tailor-Made Wear Protection Solutions

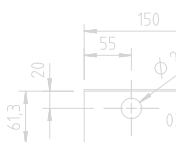
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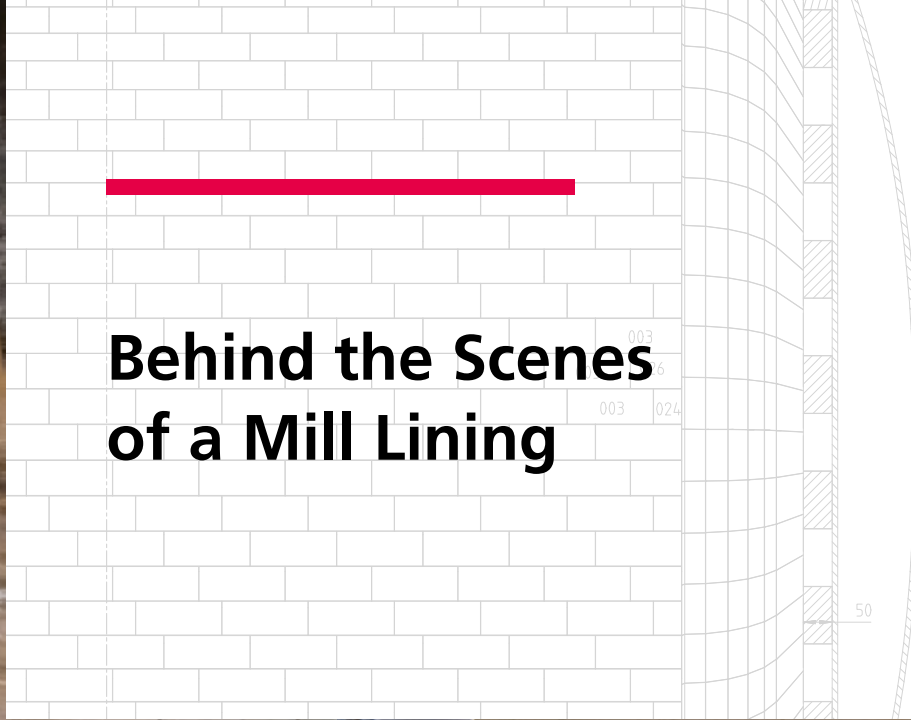
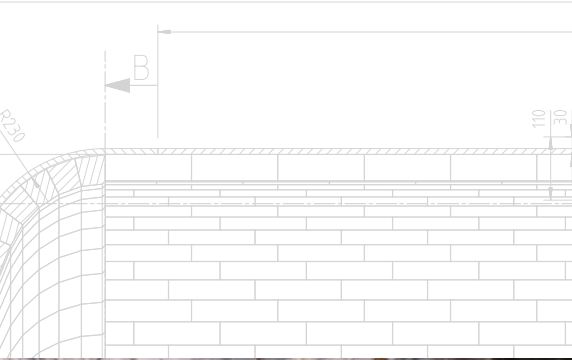


*Exciting
ceramics!*

Ready for your wear protection solution?

Get in touch with us. We look forward to discussing your specific application requirements with you.





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