



>> Solutions for Wear Protection in Power Plants



>> Reduce Costs and Avoid Downtime

Kalenborn offers a complete array of wear protection materials

Large quantities of bulk material are handled in the conveying and storing systems of coal fired power plants. Unless they are suitably protected these systems will experience frequent failure, requiring repair or replacement. Kalenborn offers a complete array of wear protection materials, including not only ceramic and metallic materials, but also plastics and rubber.

In addition, Kalenborn has extensive experience in the field of slide promotion. Interruptions of material flow inside of bunkers and silos must be avoided. We can supply you a tailor-made solution for your particular problem from the entire material range of plastics as well as metallic and ceramic materials. Our experts are prepared to assist.



A typical application in power plants is pulverized fuel piping.



Rebuilding a grinding table with KALMETALL W100.

Advantages of Lining Materials:

Ceramic Wear Protection

- Very good abrasion resistance
- Tile, cylindrical or jointless lining
- Temperatures up to 1,000 °C/1,832 °F

Metallic Wear Protection

- Good resistance against sliding and impact wear
- Thin walls, self-supporting structures
- Good thermal shock resistance

Technical Plastic Lining

- Excellent slide promotion for many application
- Good resistance against impact wear
- Low weight

Material Combinations

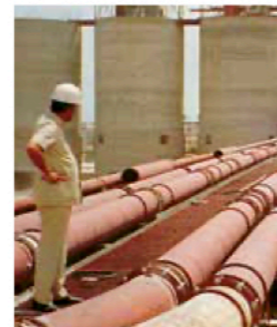
- Optimal wear protection for every application
- Optimized lining cost
- Optimized weight



Reliable wear protection is of particular importance for trouble-free continuous operation of the pulverised coal burners.



Fly ash pipes are among the plant components that are particularly endangered by wear. Kalenborn offers a variety of materials to ensure optimal service lifetimes: ABRESIST fused cast basalt, KALCOR zirconium corundum and KALOCER high alumina ceramics.



ABRESIST fused cast basalt is the accepted standard for piping in wet ash pipe systems all over the world. The picture shows a plant in India.

>> Pipes, Components and Service

Optimal solutions for every plant component



Wear protection for hydraulic and pneumatic pipes



Extended service life of plant components



Kalenborn field service solves wear problems on site

Plant components are a risk in all power plant systems, especially in coal storage and coal transport. This includes coal pulverizing and injection into the boiler, dust collection and ash removal including fly ash and wet ash. The situation is similar for limestone and gypsum handling systems.

Service life of many years is often achieved with the following materials:

- ABRESIST fused cast basalt
- KALCOR zirconium corundum
- KALCOR S sintered zirconium corundum
- KALOCER high alumina ceramics
- KALCERAM hard ceramics
- KALCRET hard compound
- KALSICA silicon carbide ceramics
- KALCAST hard casting
- KALMETALL hard overlay welding
- KALEN slide promotion plastics

In addition, material combinations have been very successful in practice. They enable both technically and economically optimal solutions.

Wear Protected Components

Components	Lining Material
Cyclones	ABRESIST, KALCOR, KALOCER, KALSICA, KALMETALL
Fan housings	KALOCER, KALCRET, KALMETALL, KALCAST
Fan rotors	KALOCER, KALMETALL
Gates	KALOCER, KALCOR, KALSICA, KALMETALL, KALCRET
Hydraulic pipes	ABRESIST, KALCOR, KALOCER, KALCRET
Mechanical pipes	ABRESIST, KALOCER, KALCRET, KALMETALL, KALCAST
Nozzles	KALOCER, KALSICA
Pneumatic pipes	ABRESIST, KALCOR, KALOCER, KALCRET
Pumps	KALSICA
Separators	ABRESIST, KALCOR, KALOCER, KALSICA, KALMETALL
Transfer chutes	ABRESIST, KALOCER, KALMETALL
Valves and fittings	KALOCER

>> Coal Handling, Coal Pulverizing to Coal Injection

Typical applications for wear protection

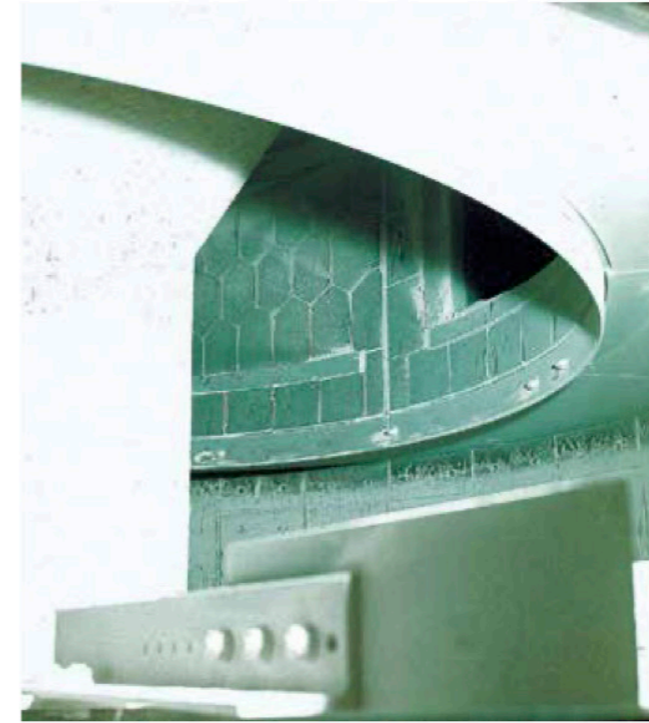


Coal transfer equipment is protected with ABRESIST fused cast basalt or KALOCER high alumina ceramics (example: Philippines).

Impact coal pulverizers operate in lignite fired power plants; the impact plates are made of KALMETALL W100.

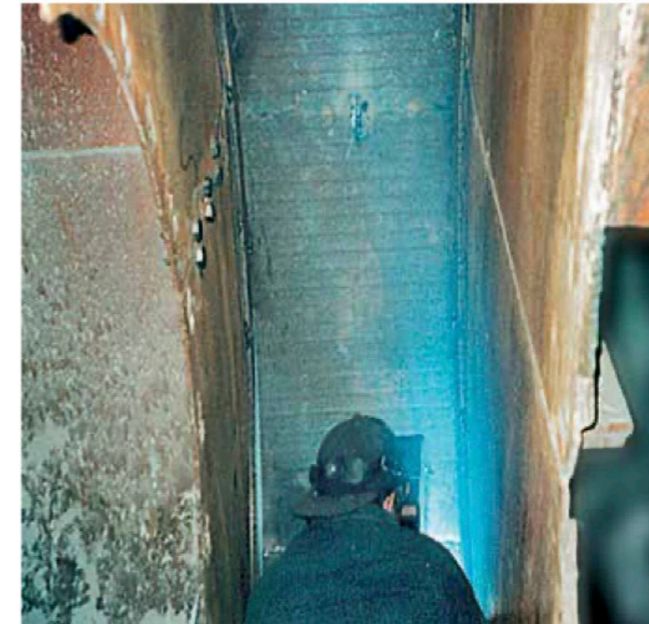
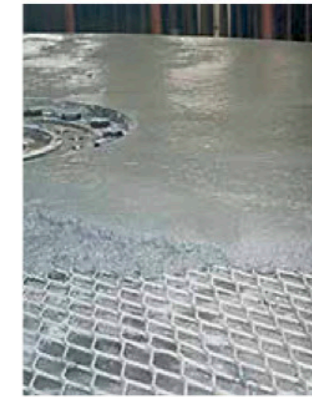


Kalenborn also supplies grinding rolls and grinding tables for coal pulverizing; the picture on the left shows regeneration of a worn grinding roll with KALMETALL W100; the cast grinding roll made of KALCAST C155 on the right is a new piece.



With references all over the world, ABRESIST fused cast basalt is time-tested wear protection material for separators set up in coal pulverizing systems.

Separators are frequently protected by KALMETALL hard overlay welding or by KALCRET hard compound (pictures) installed without joints.



Housing of a pulverized coal fan protected with KALMETALL W100.



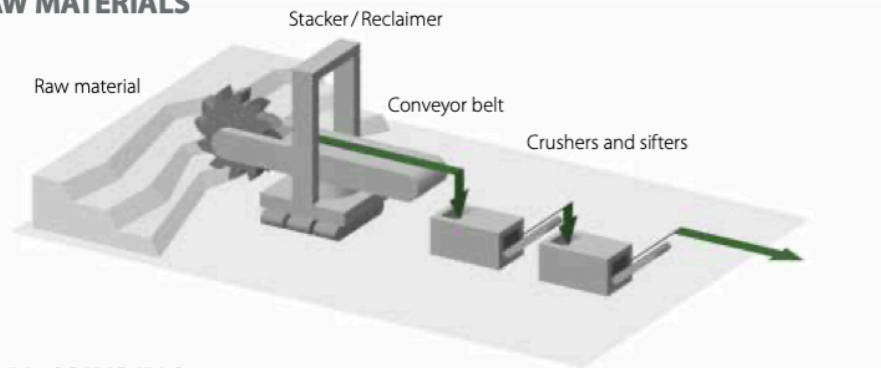
Pulverized coal burner made with parts of KALMETALL W100 hard overlay welding ready for installation.



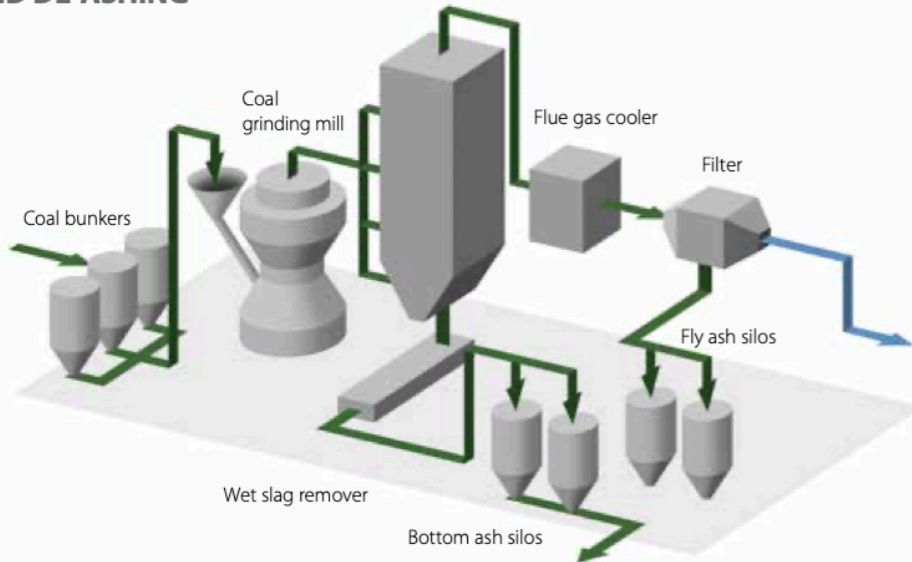
Weight saving design of a separator cage with KALSICA A silicon carbide ceramics; alternative linings are KALMETALL and KALOCER tiles.

>> Solutions for wear protection in power stations

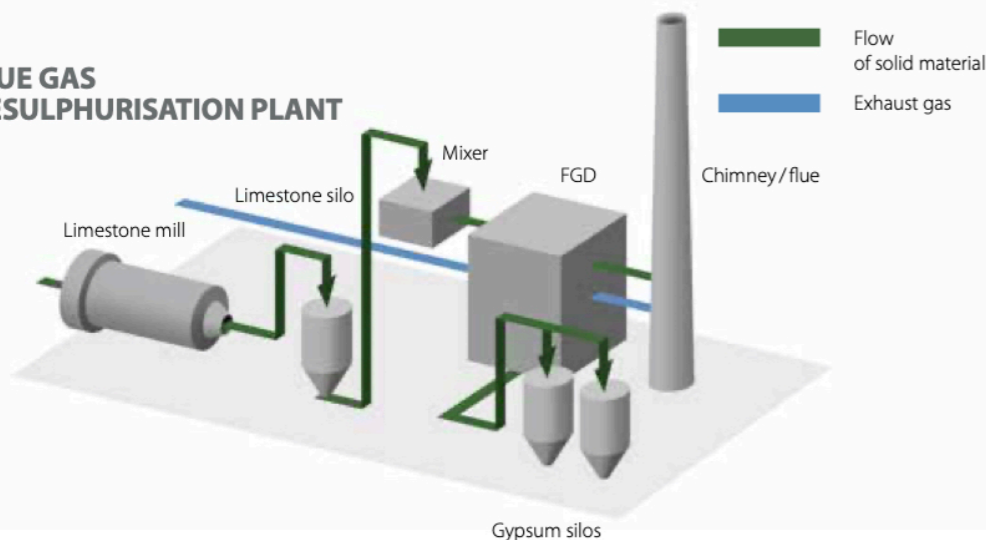
STORAGE OF RAW MATERIALS



COAL GRINDING AND DE-ASHING



FLUE GAS DESULPHURISATION PLANT



Plant	Components	Lining materials
Stackers/Reclaimers	Bucket wheel, transfer chutes, bunkers	KALMETALL, KALOCER, ABRESIST, KALEN
Crushers/Screens	Housings, chutes, transfer chutes	KALMETALL, KALOCER, KALEN, KALCAST

Plant	Components	Lining materials
Coal bunkers	Transfer chutes, crushers, sifters	KALEN, ABRESIST, KALMETALL, KALOCER, KALCAST
Coal pulverizers	Vertical mills, ball/pebble mills, separators, cyclones	KALMETALL, KALCAST, ABRESIST, KALCRET, KALOCER
Boilers	Pulverised coal lines, burners	KALMETALL, KALCAST, ABRESIST, KALCRET, KALOCER, KALSICA
Wet deslagger	Drop shafts, transfer chutes	ABRESIST, KALOCER, KALCRET, KALMETALL
Bottom ash silos	Mixers, hydraulic bottom ash piping	ABRESIST, KALOCER, KALCRET, KALMETALL
Flue gas coolers	Ducts, heat exchangers	KALCRET, KALCOR, KALSICA
Filters	Pneumatic fly ash piping	ABRESIST, KALOCER, KALCOR
Fly ash silos	Discharge equipment, injectors	KALEN, KALCERAM, ABRESIST, KALOCER, KALCOR

Plant	Components	Lining materials
Limestone mills	Raw material bunkers, transfer chutes	KALEN, KALCERAM, ABRESIST, KALCAST, KALMETALL
Limestone silos	Transfer chutes	KALEN, KALCERAM, ABRESIST
Mixers	Pumps, hydraulic conveyor piping	ABRESIST, KALOCER, KALCRET, KALCAST, KALMETALL
Gypsum silos	Chain conveyors, Transfer chutes	KALEN, ABRESIST, KALOCER, KALCRET, KALMETALL

>> Solutions for Pulverized Fuel Transport

Kalenborn has extensive experience and offers a complete range of solutions

Kalenborn offers a complete range of solutions for PF-pipe. With diameters between 400 and 800 mm many possible combinations of linings have been used in practice.

Depending on the specific operating conditions (such as particle size, ash content, capacity to be conveyed and transport velocity) successful designs have achieved service lifetimes of more than 10 years.



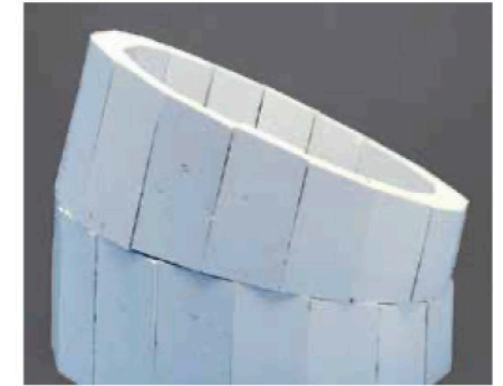
Jointless lining with KALCRET hard compound – also possible with asymmetric cross section.



Material combinations of KALCOR and ABRESIST provide economic wear solutions.



KALMETALL hard overlay welding enables the production of self-supporting structures for PF-bends without an additional lining.



PF-bends typical solution: KALOCER high alumina ceramics pipe-tiles.



Lining of an infeed coal pulverizer with KALCAST.



KALCOR zirconium corundum lining and unlined transition elements; 488 mm diameter.



PF-distribution boxes protected with KALCOR for large area lining and KALOCER to ensure maximum wear resistance.



PF-burners reflectors protected by KALSICA N (photo) or KALMETALL.



KALCOR S allows the use of large lining segments, thin walls and homogeneous structure.



Long lifetimes at favorable costs are achieved with KALCAST hard casting; this example shows 518 mm diameter bends up to 700 kg weight.



PF-splitter made of KALSICA N silicon carbide ceramics.



PF-burner lined with KALMETALL.

>> Ash Handling & Flue-Gas Desulphurization

Wear protection in power plants

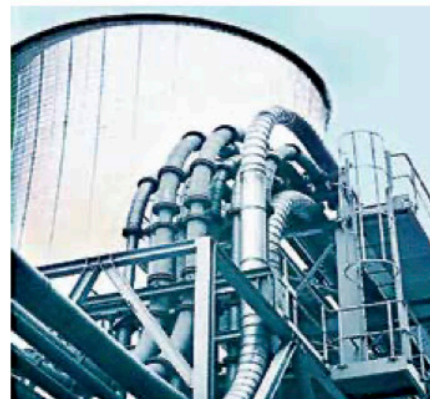
Solution adopted for economizers handling large quantities: tube protecting shapes made of KALSICA silicon carbide ceramics.



When particularly high dust loads occur, the waste gas ducts are protected by KALCRET hard compound or KALMETALL hard overlay welding.



Chain conveyors for wet ash removal are efficiently lined with ABRESIST fused cast basalt; KALCOR, KALOCER or KALMETALL can be used as well.



Time-tested materials for fly ash pipes: ABRESIST, KALCOR or KALOCER.



Limestone may have a very abrasive effect in FGD systems; a typical lining material is ABRESIST.

>> Specialist in Wet Ash Pipes

Kalenborn has supplied many thousands of meters of wet ash pipes to plants all over the world, normally lined with ABRESIST fused cast basalt. This material has proved to be an excellent choice for this particular application. ABRESIST combines the properties of high wear resistance and high corrosion resistance. The service lifetimes of these piping systems frequently cover more than 20 years. There is no other material that has reached similar service life in practice.

We offer wet ash pipes of many different configurations with inside diameters between 200 and 500 mm. The steel casing can also be efficiently protected against corrosion. The pipes are usually joined by flanges. However, any type of coupling is feasible. In addition, welded joints also have proven successful in practice.



Wet ash pipe in North America; the pipes are flanged together.



Installation of wet ash pipes in Malaysia (350 mm diameter).



Long pipes require the use of expansion joints for linear extension.



Pipes for several units running to the central disposal site in Brazil.

Wear Resistant Linings

Lining	Material Hardness		Process Parameters			Resistance		
	Mohs	Vickers HV 1	Max. conveying speed m/sec.	Max. temperature		Wear resistance	Thermal shock resistance	Impact resistance
				°C	°F			
ABRESIST fused cast basal	8	770	20	350	662	+++	+	+
KALOCER high alumina ceramics	9	1,050	30	1,000	1,832	++++	+	+
KALCOR zirconium corundum	9	900	30	1,000	1,832	++++	++	++
KALCOR S sintered zirconium corundum	9	970	25	1,200	2,192	+++	+++	++
KALSICA N silicon carbide ceramics	9	1,100	25	1,550	2,822	+++	++++	+
KALSICA S silicon carbide ceramics	9	1,600	35	1,250	2,282	++++	++++	++
KALCRET hard compound	8	1,250 *	20	1,200	2,192	++++	++	++
KALMETALL W100 hard overlay welding	7	700	20	350	662	++++	+++	+++
KALCAST C155 hard casting	7	700	20	350	662	++++	+++	++

* referred to the hard aggregate material

Slide Promotion Linings

Lining	Slide Promotion	Max. Temperature		Wear Resistance
		°C	°F	
KALEN slide promotion plastics	+++++	80	176	+
KALCERAM hard ceramic	+++	350	662	++
ABRESIST fused cast basalt	+++	350	662	+++

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