

## SOLUTIONS FOR WEAR PROTECTION IN IRON AND STEEL INDUSTRY



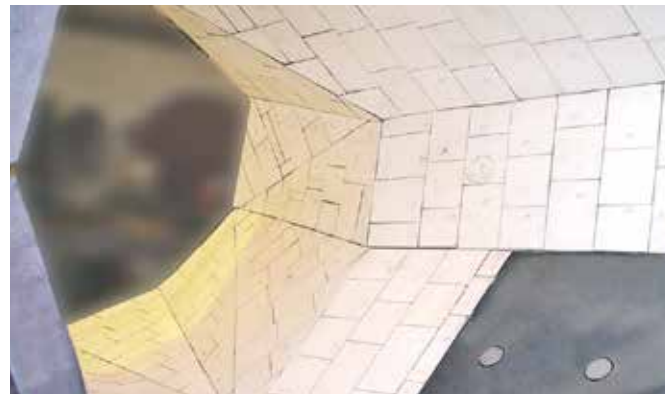
# WORK WITH KALENBORN FOR YOUR OPTIMAL SOLUTION

Reduce Costs and Avoid Downtimes

Large quantities of bulk material are handled in the conveying and storing systems of the iron and steel industry.

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 slide promotion. Interruptions of material flow inside of bunkers and silos m



Octagonal hopper with three-dimensionally cut shaped elements made of KALOCER high-alumina ceramics and KALCAST hard casting, each 50 mm thick

## Advantages of Lining Materials:

### Ceramic Wear Protection

- Very good abrasion resistance
- Tile, cylindrical or jointless lining
- Temperatures up to 1,250 °C/2,282 °F

### Metallic Wear Protection

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

### Technical Plastic Lining

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

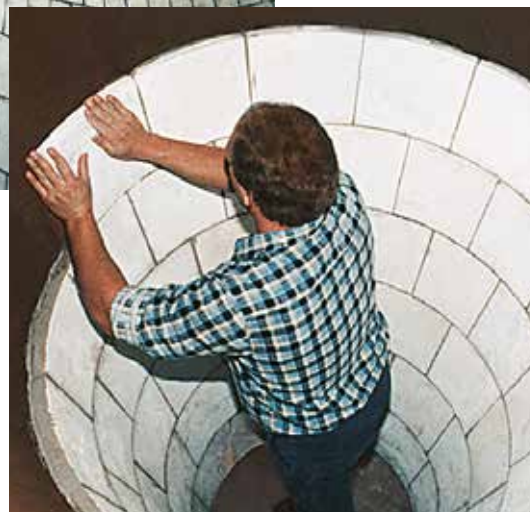
### Material Combinations

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



Bunkers for blast furnace charging are effectively lined with KALOCER

Tailor-made cast shaped elements of KALCOR zirconium corundum warrant reliable wear protection in the cone of a dust collector, even at high temperature and heavy thermal cycles.



# PIPES, COMPONENTS AND SERVICE

Optimal Solution for every Plant Component

On average, 60 tonnes of coal with grain sizes from 0.5 to 13 mm pass through the dense media cyclone in an hour.

This equates to a speed of 3 m per second. Due to the high throughput of material and the density of material impacting on the cyclone walls, there is a high degree of wear on them.

In conjunction with optimized overall design the cyclone consists of lining with KALCOR S cones with inside radius of 600 mm.

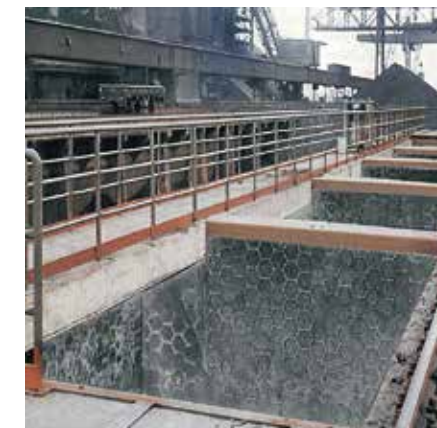


## Wear protection in the iron and steel industry increases the lifetime of plant components

Plant components are at risk in all sections of the iron and steel industry, especially in raw material storage and processing, sintering and coking plant, blastfurnace operation and slag handling. Comprehensive wear protection is an absolute must for steel production systems and rolling mills as well.



Extended service life of plant components



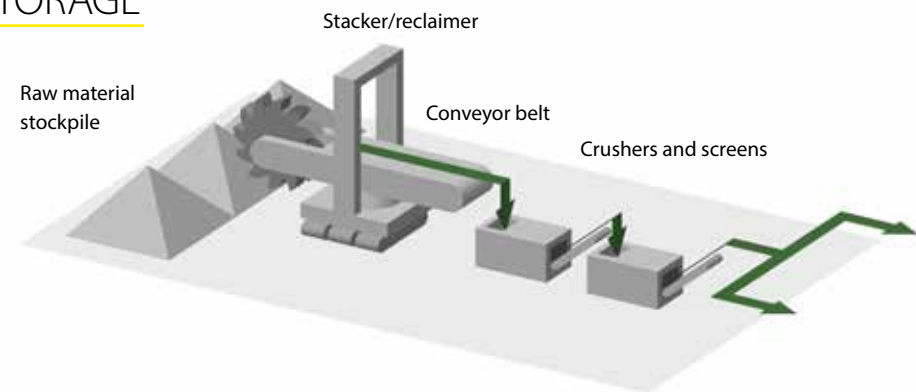
Hydraulic and pneumatic pipes



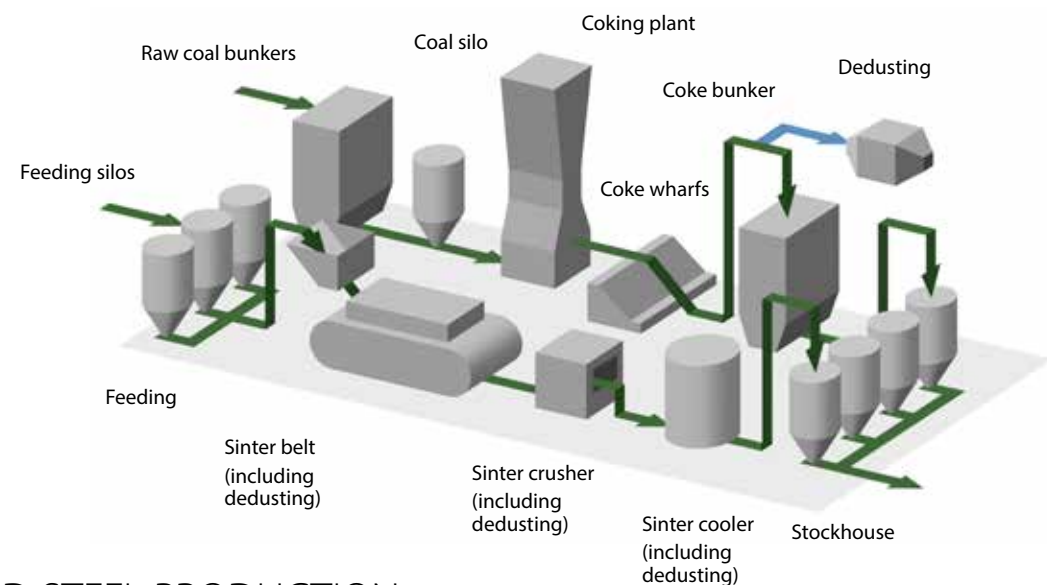
Kalenborn service solves wear problems on site

# KALENBORN SERVICE SOLVES WEAR PROBLEMS ON SITE

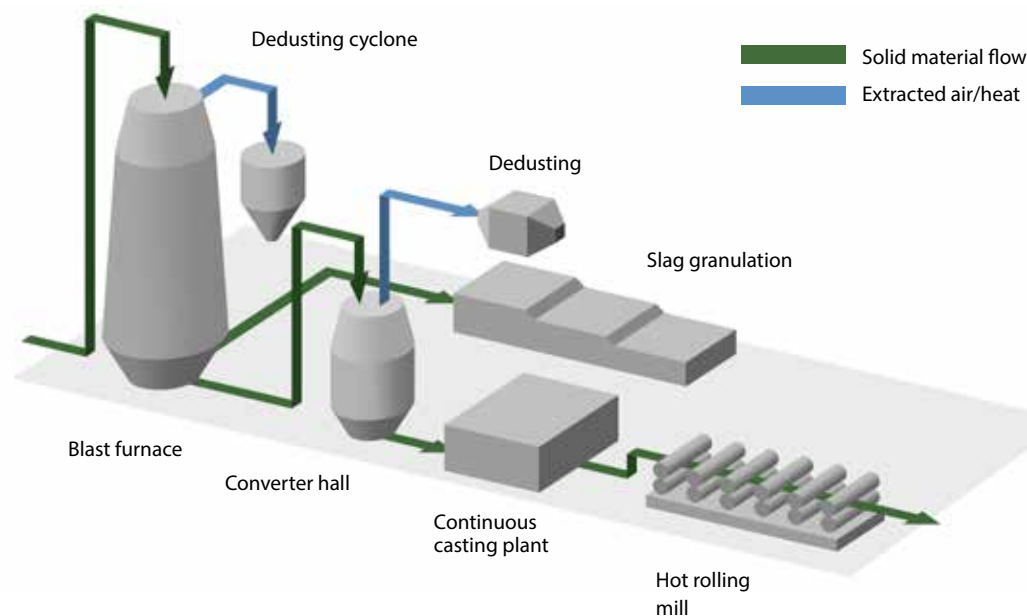
## RAW MATERIAL STORAGE



## COOKING PLANT SINTER PLANT



## PIG IRON AND STEEL PRODUCTION



### STORAGE

| Plant             | Components                             | Material for lining                          |
|-------------------|----------------------------------------|----------------------------------------------|
| Stacker/reclaimer | Bucket wheel, transfer chutes, bunkers | KALCAST, KALMETALL, KALOCER, ABRESIST, KALEN |
| Crushers/screens  | Housing, slides, transfer chutes       | KALCAST, KALMETALL, KALOCER, KALEN           |

### COKING PLANT

| Plant            | Components                         | Material for lining                                    |
|------------------|------------------------------------|--------------------------------------------------------|
| Raw coal bunkers | Transfer chutes, crushers, screens | KALEN, ABRESIST, KALCAST, KALMETALL, KALOCER           |
| Coal silo        | Transfer chutes                    | KALEN, ABRESIST, KALMETALL, KALOCER                    |
| Quenching tower  | Quenching cars                     | KALCRET, KALCOR, KALMETALL                             |
| Coke wharfs      | Discharge and extraction equipment | KALCERAM, KALCOR, KALSICA, KALCAST, KALMETALL, KALCRET |
| Coke bunker      | Transfer chutes, crushers, screens | ABRESIST, KALMETALL, KALOCER, KALCOR                   |
| Dedusting        | Hoods, ducts, pipelines            | KALCRET, ABRESIST, KALOCER                             |

### SINTER PLANT

| Plant          | Components                                               | Material for lining                  |
|----------------|----------------------------------------------------------|--------------------------------------|
| Feeding silos  | Discharge and extraction equipment, slides               | ABRESIST, KALOCER, KALCOR, KALMETALL |
| Sinter belt    | Feeding drum, wind boxes                                 | KALOCER, KALMETALL, KALCRET, KALCOR  |
| Sinter crusher | Crash deck, sinter crusher, pallet bars, chutes, screens | KALCAST, KALMETALL, KALCOR, KALCRET  |
| Sinter cooler  | Housing, chutes, screens                                 | KALMETALL, KALCOR, KALOCER, KALCRET  |

### PRODUCTION

| Plant                    | Components                                                     | Material for lining                           |
|--------------------------|----------------------------------------------------------------|-----------------------------------------------|
| Stockhouse               | Bunkers, discharge and extraction equipment, slides            | ABRESIST, KALCRET, KALOCER, KALMETALL         |
| Dedusting                | Hoods, ducts, pipelines                                        | KALCRET, ABRESIST, KALOCER, KALMETALL         |
| Blast furnace            | Skips, bell less top (BLT), pulverised coal injection          | KALOCER, KALCAST, KALMETALL, ABRESIST         |
| Dust catcher/cyclone     | Ducts, pipelines, discharge equipment                          | KALCRET, KALCOR, ABRESIST, KALMETALL          |
| Slag granulation         | Condensing tower, tanks, flumes, slag sand pipelines and silos | KALCRET, KALCOR, ABRESIST, KALOCER, KALMETALL |
| Converter hall           | Condensing tower, tanks, flumes, slag sand pipelines and silos | KALMETALL, KALOCER, ABRESIST, KALCRET         |
| Continuous casting plant | Scale flumes and scale water pipelines                         | ABRESIST, KALCRET                             |
| Hot rolling mill         | Descalers, scale flumes and scale water pipelines              | KALMETALL, KALOCER, ABRESIST                  |

# WEAR PROTECTION IN IRON AND STEEL INDUSTRY

## Reliable Operation in Coking Plants



Coke loading bay: the impact edge is protected by KALCAST C153 hard casting, the sliding surface with KALCERAM K hard ceramics and the temperature stressed sides with KALSICA P silicon carbide ceramics



A trouble-free material flow is ensured in coal bunkers by the use of KALEN slide promotion plastics

Kalenborn also successfully use KALCOR zirconium corundum and KALCRET hard compound in the area of coke loading bays



Discharge edge of a coke loading bay the KALCAST hard cast components are fixed mechanically



Pipe made of KALMETALL W100 hard overlay welding, inner diameter 500 mm

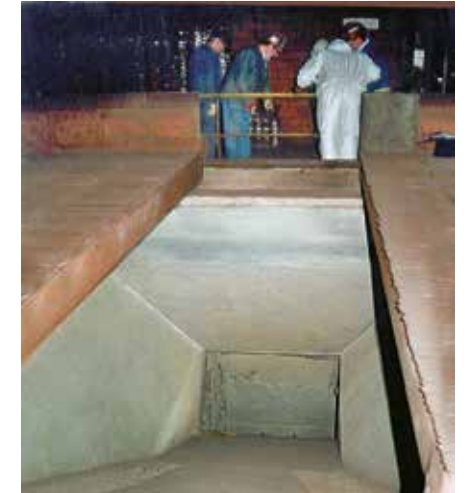


Proven wear protection material for bunkers in the coke handling is ABRESIST fused cast basalt

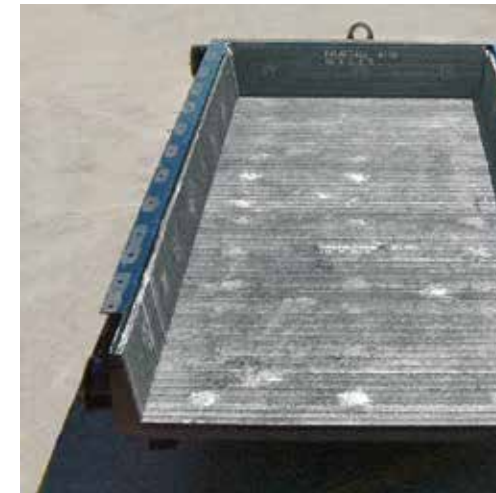
# LONG DUTY CYCLES IN SINTERING PLANTS



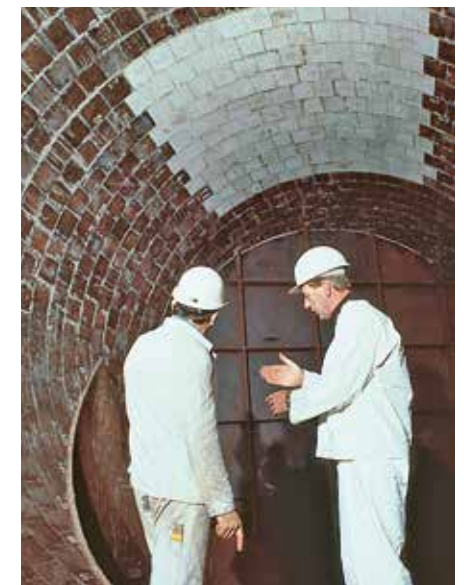
Collecting hopper being part of sintered material dust collection at 400° C / 752° F: effectively protected with KALCOR zirconium corundum



Quick installation of abrasion resistant lining for wind boxes, i.e. sprayed-on KALCRET BNS hard compound



Lining of a vibratory chute made of KALMETALL W143 hard overlay welding; the lined surface covers 10 m²



KALCOR zirconium corundum fitted to the deflection zone where abrasive sintered particles impinge at temperatures of 250°C/482 °F and high velocity, an economic solution when combined with ABRESIST fused cast basalt



Screens for hot sintered material made of KALMETALL W145; the screen surface is of herringbone pattern

# WEAR PROTECTION IN IRON AND STEEL INDUSTRY

Trouble-free Operation of the Blast Furnace



Pressure compensating pipe at the blast furnace; self-supporting structure of KALMETALL W100 30 + 6 hard overlay welding; 450 mm Ø

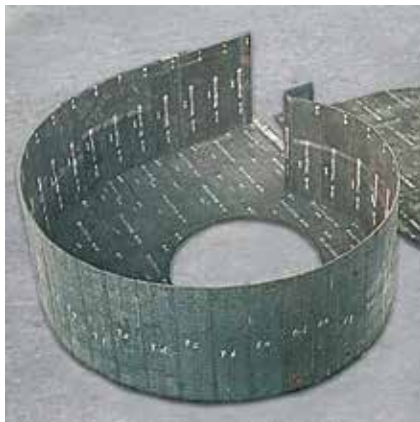


Distributor tilting chute being part of blast furnace lining fitted with KALOCER high-alumina ceramics, 50 mm thick



Feeding hopper integrated in the blast furnace with mechanically fixed KALOCER tiles

Octagonal hopper with KALOCER lining; for optimal adaptation the 50 mm thick shaped elements have been cut three-dimensionally



Wear protected fan housing of KALMETALL hard overlay welding, 2,000 mm Ø

# FROM FEEDING TO DUST COLLECTION



Cyclone separator cones of KALMETALL W100 6 + 4 fixed by means of bolt welding



Short lining times for a whirler are achieved with a combined lining of hard compound KALCRET BTS and zirconium corundum KALCOR. The high application rate of KALCRET BTS is 5 m<sup>2</sup>/h



KALCOR is a suitable lining material even at high temperatures and high thermal cycling

Depending on the specific plant design dust collection cyclones are protected either with ABRESIST fused cast basalt, KALCOR zirconium corundum, KALCRET hard compound or KALMETALL hard overlay welding



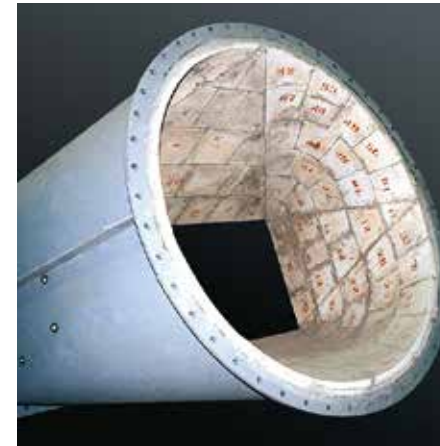
Dust collection cyclones for blast furnaces are effectively protected with combined linings

# WEAR PROTECTION IN IRON AND STEEL INDUSTRY

## Slag Handling and Other Applications



*KALCRET hard compound has stood the test as lining material in components of slag granulating systems. Depending on their specific geometry the plant components can be lined within a minimum of time by trowelling or by the spraying technique.*



*KALCOR zirconium corundum is the ideal wear protection material in case of high stress caused by wear, temperatures and temperature changes; not only lining of plant components but also of pipes is feasible*

*Time-proven in troughs of slag granulation: KALCRET hard compound*



*Brake box of a slag granulating system; in the zone of maximum wear the structure of KALMETALL has been lined with KALOCER tiles*



*Conveyor screw being part of a slag granulating system; screw flights lined with KALMETALL C155; the screw has a diameter of 1,200 mm*

# LONG DUTY CYCLES OF PLANT COMPONENTS



*KALFLEX pipe bends in practical operation; here shown as flexible connection between rigid connection points*

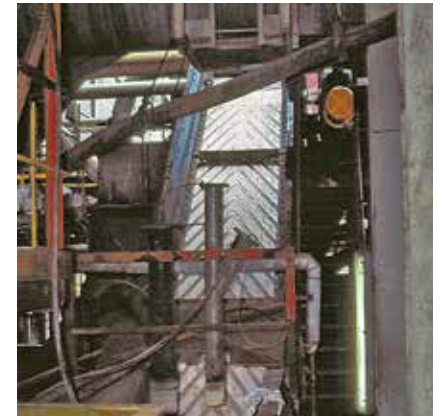


*Down pipes of a direct reduction line made of KALMETALL W151, 355 mm diameter; basic material 1.4829 of 12.8 mm*



*Scale launders are effectively lined with ABRESIST fused cast basalt*

*Chain conveyors are effectively protected with ABRESIST, KALOCER, KALMETALL or KALCRET.*



*KERAFLEX is a composite material that combines the hardness of KALOCER oxide ceramics with impact-resistant rubber*

*Prefabricated KALCRET guide vane for an agitator*



