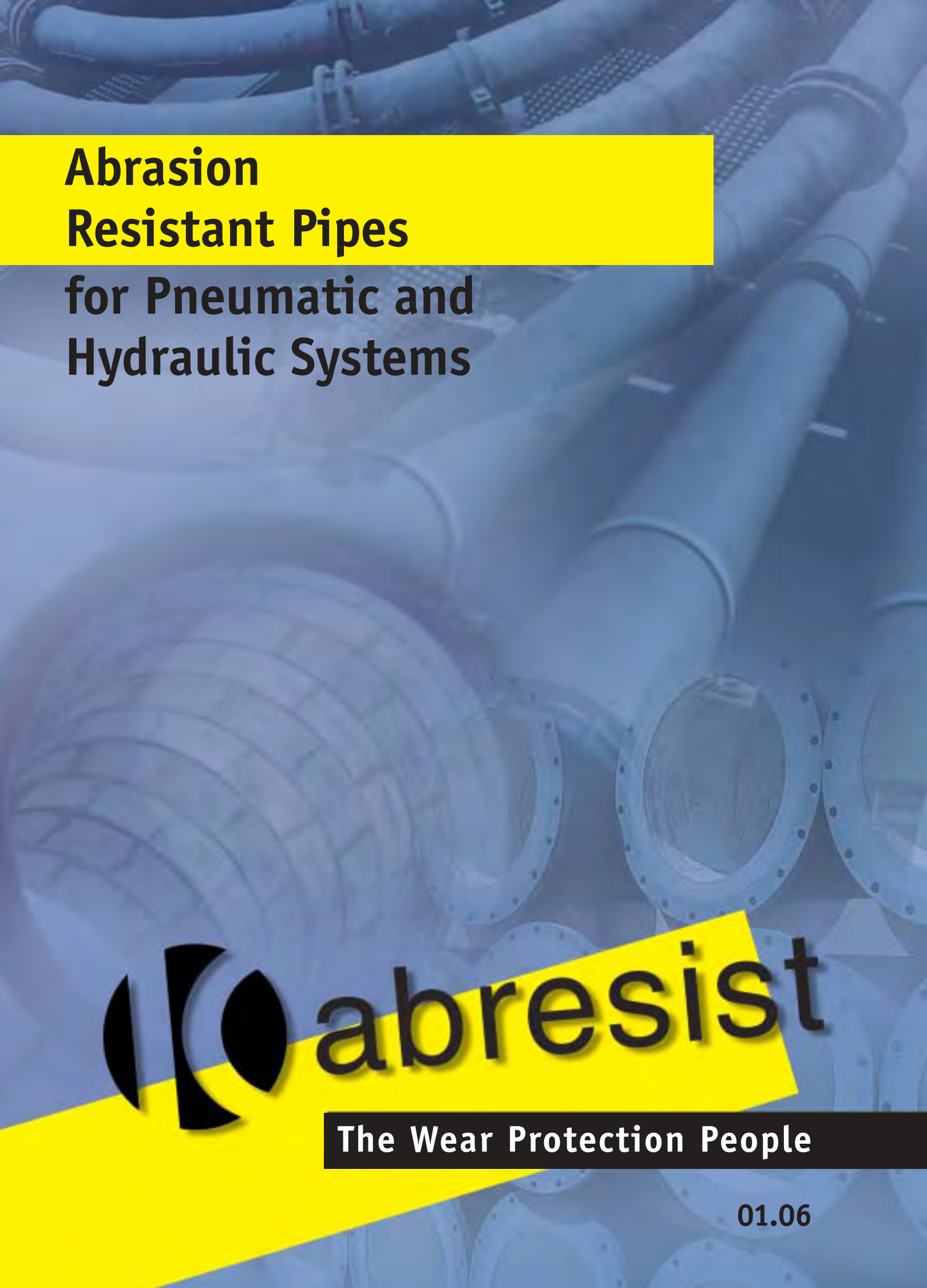




Abrasion Resistant Pipes for Pneumatic and Hydraulic Systems



abresist

The Wear Protection People

01.06

The High Cost of Abrasion

Material Replacements, extra Labor and Lost Production can be Avoided



Pneumatic and hydraulic conveying has many advantages. But, many of the users of these conveying systems face the same problem: high levels of abrasion within the pipelines.

Because of the high abrasiveness of many bulk materials conveyed, the pipes can be severely worn. Even thick walled steel or cast iron pipes are worn through in a short period of time.

This results in unscheduled shut-downs, pollution of the plant and environment as well as the high cost of materials and labor for repairs and replacements.

Quite often the problems of abrasion are accepted as unavoidable. Piping systems may be supplied with thicker walls and marginally better materials, but this just delays the inevitable at unreasonable costs.

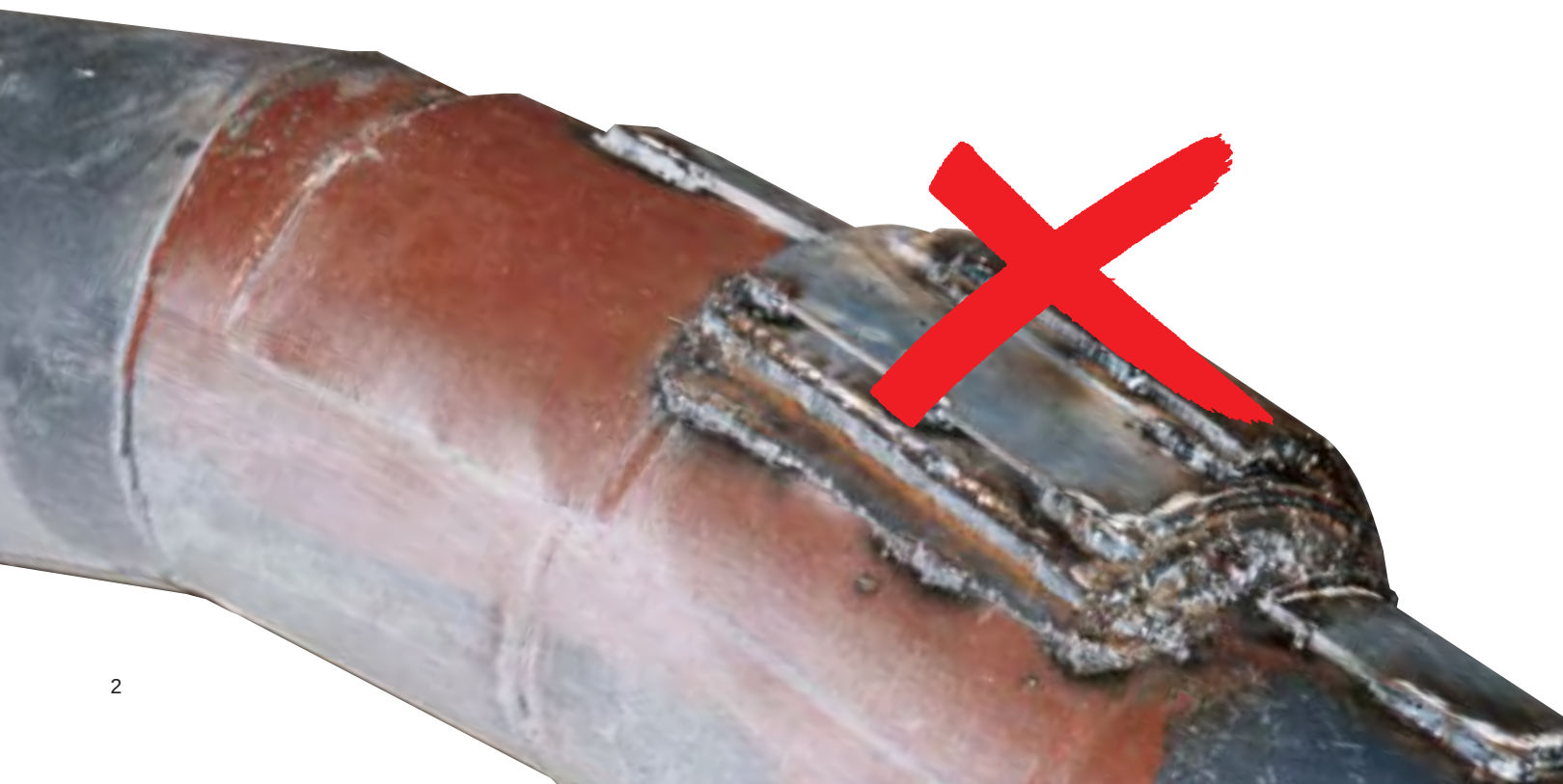
These practices are avoided in plants that want to operate economically and dependably.

This brochure will provide you with information on important aspects of abrasion protection. It will outline various possibilities for optimum plant utilization and cost savings through the use of abrasion resistant linings.

The highest cost in many situations is the lost production time due to unplanned outages. The money saved by using low cost steel piping components can result in a much higher cost later.

Abrasion resistant pipes and fittings save money as repair frequency is greatly reduced and production time is increased.

In some instances, a single avoided repair will pay for the added abrasion protection.



Simple Solutions Usually don't Last

Critical areas subject to abrasive failure exist in any plant transporting or processing bulk materials. Even materials that appear harmless are often abrasive since the quantities and velocities in which they are transported can destroy a system component within a short time.

The transport of bulk materials in many basic industries, e.g. coal-fired power stations, is associated with heavy wear of the system components. Not only is the original equipment investment lost, plant shutdowns and production loss combine to destroy the capital base of the company.

This is unacceptable in view of competitive pressure on the world markets.

The solution to this problem is reliable abrasion protection. Of vital importance is the selection of the appropriate material and its correct application.



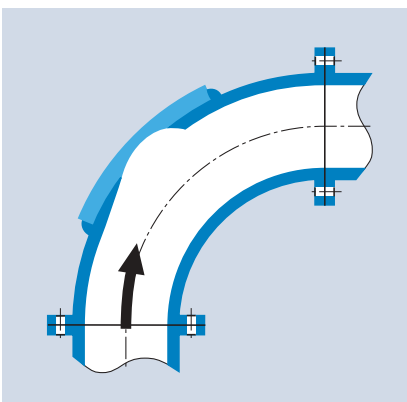
***Simple but not very efficient:
Welded patches on steel pipes.***



***Concrete filled wear boxes
are a short term solution.***



***Costs go up when the repair
location is difficult to reach.***



***The wear pattern gets more
severe as the patch is worn.***

***This method of repair increases
turbulence as it wears, leading
to more severe abrasion, loss
of efficiency and product
degradation.***

***Preventive abrasion protection in
this location is extremely valuable.***

Critical Zones

Hydraulic Conveying

With hydraulic conveying the effects of gravity on the bulk materials being transported cause wear in pipelines along the lower section of the pipe.



The entire length of a hydraulic pipeline needs to be protected against abrasion. Under typical conveying conditions and general operating procedures, ABRESIST has proven to be extremely effective.

Pneumatic Conveying

With pneumatic conveying abrasion normally occurs in the pipe bends and in the subsequent straight sections where the conveyed material is subject to a high degree of turbulence. Compared to later straight sections, service life will be shorter.



To reduce the severe abrasion of the bends in pneumatic systems, abrasion resistant piping components with internal linings – such as ABRESIST – should be used.

Because of continuing turbulence in the straight sections after bends, abrasion resistant pipes should be installed. Recommended length: 10 times the inside diameter or 1 - 2 meters on the smaller diameters.

Dense Phase Conveying

Dense phase conveying is limited to materials with specific characteristics. The basic principle is the pulsating forward movement of air and material plugs.

Even with a relatively low initial velocity, dense phase conveying can have a high rate of abrasion. This is dependent upon the size and particle hardness of the conveyed material.

Pipe Chain Conveyers

Pipe chain conveyers are mechanical flow conveyor systems that are completely enclosed with circulating conveying chains.

With pipe chain conveyers materials can be transported up to distances of 50 m and for capacities of approx. 65 m³/h.

The advantage of these systems is in the transportation of wet or sticky materials. Wear problems can develop depending upon conveyed materials and conveying conditions, all of which can be overcome with the appropriate lining material.

Operating Limitations

Design Solutions

It is possible to reduce wear problems with design solutions. Avoiding particular installation arrangements and avoiding tight bends is one way.

Quite often design solutions are limited by unavoidable obstacles and required process conditions.

For example, it is only possible to reduce the conveying velocity in a few cases. Many times this reduction would change the plant effectiveness or the reduced velocity could possibly result in line plugs and shut-downs, or lower the conveying system capacity to an unacceptable level.

It is usually more important to maintain or increase the productivity with higher velocities and to accept the resulting higher wear rates.

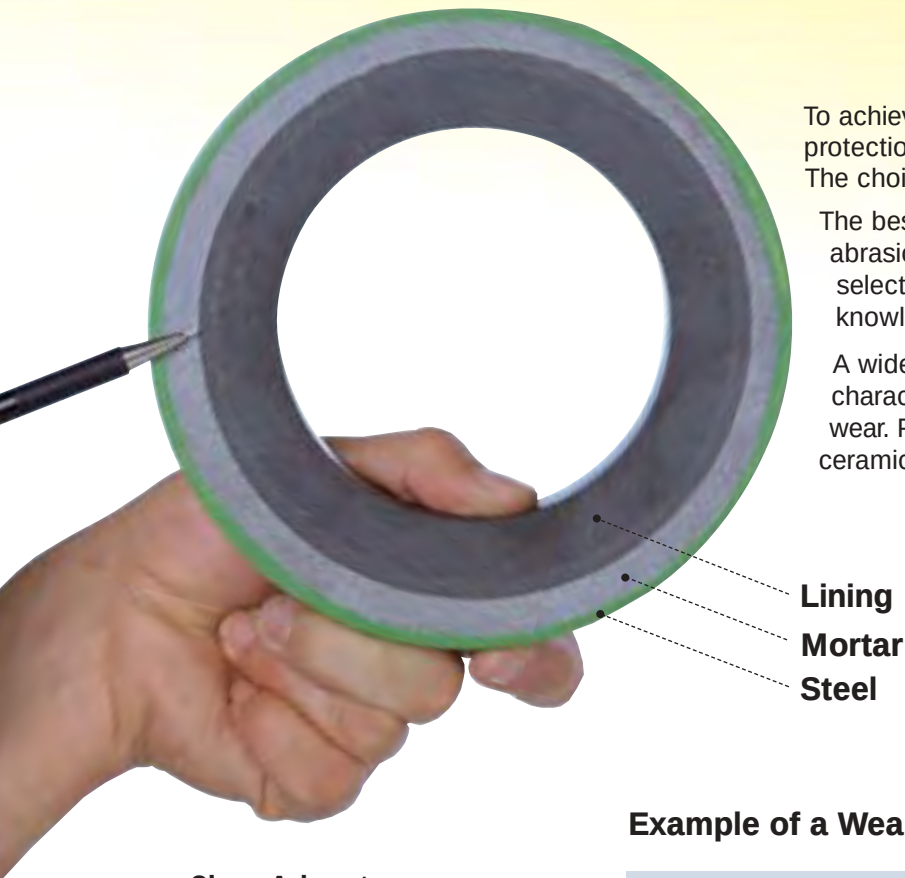


Quite often, design and process conditions oppose the optimal routing of pipelines for minimal wear.



The radius of a pipe bend strongly influences the rate of abrasive wear.

Materials to Reduce Repair Expense



To achieve both technical and economical wear protection, many factors have to be taken into account. The choice needs to be based on the application.

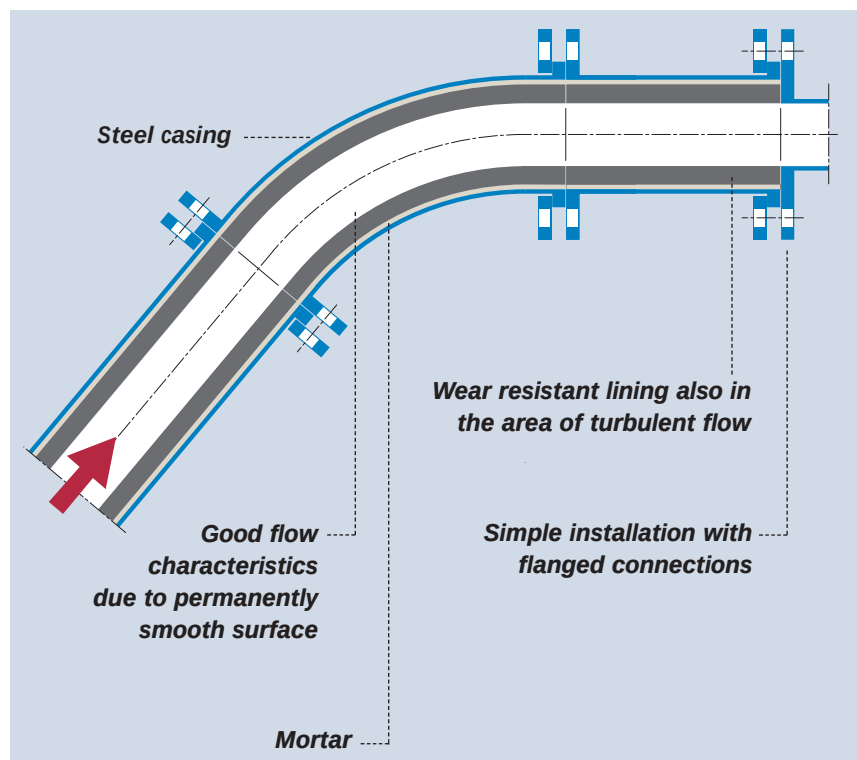
The best solution for long life and economical abrasion protection depends upon the proper selection of the lining material as well as a knowledge of expected cost.

A wide range of different materials with different characteristics can be chosen to protect against wear. Pipe linings made of mineral, metallic or ceramic materials have proven to work well.

Clear Advantages

- long lifetime
- maintenance free operation
- no operation interruption
- no production losses
- no contamination of the conveyed materials due to abrasion, mixture or oxidation
- physiologically harmless, suitable for food products
- smooth surface to achieve good flowability and to avoid plugs
- reduced pressure losses and lower energy cost
- no spilled material to clean up

Example of a Wear Protected Pipe Bend



Application Examples

We Solve Wear Problems in Plant Components and Pipes



Depending on the lining material, pipes with an ID of up to 525 mm will be lined with cylinders.



The different manufacture and installation methods of the various linings allow protective coverage in many special situations such as pipe branches, intersections, square-to-round and conical transitions.



Pipe with larger internal diameters are protected with custom made tiles. Thin ceramic tiles can be used to reduce the weight. The material choice is based on the severity of the working conditions.

Examples in Hydraulic Conveying

Industry	Material
Cement (wet process)	Raw kiln feed
Chemical industry	Slurries with solids
Coal fired power stations	Bottom ash, fly ash, pyrites, scrubber sludge, limestone
Coal mining & preparation	Raw coal slurries, magnetite, tailings
Iron & steel	Blast furnace slag, furnace scrubber slurry, mill scale
Phosphate	Phosphate ore, tailings
Potassium & salt industry	Potassium salts, kieserite, salts
Refuse incineration	Slag, non-combustible residue
Sand & gravel plants	Sand, gravel
Sewage treatment	Sludge, storm water, grit, sludge ash

Examples in Pneumatic Conveying

Industry	Material
Abrasive products	Grinding wheel granules, shingle granules
Aluminium plants	Calcined Alumina, bauxite, electrode carbon, crushed bath
Breweries, grain processing, feed mills, malting plants	Corn, barley, soybeans, malt, cocoa beans, sunflower seeds, rice hulls
Cement	Clinker dust, limestone, cement, fly ash, coal, blast furnace slag, petro coke
Chemical plants	Caustic lime, fertilizers, lime dust, chrome ore, paint pigments, plastic pellets with glass fibers
Coal fired power stations	Coal, fly ash, pyrites, slag, ash, limestone
Coal mines	Coal dust, mine waste for backfilling
Foundries	Molding sand, dust collection
Glass plants	Batch, cullet, quartz, kaoline, feldspar, nepheline
Iron & steel	Sinter dust, limestone, lime injection, iron carbide, alloy additives, carbon injection, iron oxide
Mineral mining plants	Kiln feed, ore concentrate, coal, tailings, dust
Mineral wool & insulation products	Perlite, stone dust, refractory fibers, production wastes, dust from sawing operations
Refuse incineration, vacuum refuse collection systems	Domestic and industrial refuse
Sewage treatment	Limestone, organic fertilizer, bio solids
Technical carbon products	Technical carbon, dust, graphite for electrodes

ABRESIST Linings

Wear Resistant Fused Cast Basalt for Friction Induced Abrasion

ABRESIST fused cast basalt has been used successfully for years as a universal material for abrasion protection. Depending on the application and geometry, it can be used with temperatures up to 350 °C / 662 °F. Installed as original equipment, ABRESIST is an excellent solution to wear problems before they start.

During the manufacture of ABRESIST, selected basalt is melted and cast into molds, then moved into an annealing furnace. Due to the casting process, precise cylinders from 40 mm to 525 mm internal diameter can be produced for pipes and bends. Special tile shapes are engineered for larger pipe diameters and other equipment.

ABRESIST has an extremely hard and smooth surface. The material is corrosion resistant to most acids and alkalis. This makes ABRESIST very effective for pipelines where abrasion and corrosion occur together.

The idea to melt stone is age-old. However, the melting of basalt started with lab tests only at the beginning of the last century. Further development overcame crystallisation problems and made commercial success possible.

By the mid-twenties our company successfully produced an abrasion resistant material based on basalt. Today, under the trade name ABRESIST, fused cast basalt has become a proven product.

ABRESIST

Fused cast basalt is a mineral based wear protection material for plant components when the conveying material produces friction induced abrasion.

Installation: cylinders or shaped components in cement mortar. In special cases epoxies or synthetic mortars may be used due to strong mechanical stresses and/or vibration. Where higher temperatures are concerned, potassium silicate mortar may be used for installation.

Application temperature: up to 350 °C / 662 °F depending on application and geometry.

Advantages: highly abrasion resistant, smooth surface that lasts, no corrosion.





Hydraulic ash conveying at an Indian coal fired power station (four units 250 MW each).



Hydraulic ash conveying pipe being manufactured at the Abresist Corporation plant in Indiana, U.S.A.



With lifetimes of more than 30 years, ABRESIST pipelines have been used for the hydraulic conveying of ash on all continents. This plant in the U.S. has over 10,000 meters of 294 mm ID pipe in service.



Pneumatic piping components used in a separator at a cement plant.



ABRESIST Linings

ABRESIST develops an extremely smooth surface after a short period of operation. Plugs in pneumatic conveying pipelines are avoided, even with moist materials. Likewise, plugging problems are avoided after shut-downs due to the corrosion resistant properties.

***Dust collection system in a mineral wool plant.
Lifetime: several years for the
handling of abrasive mineral
wool fibers.***



Internal protection of pipelines against abrasion and corrosion.

Almost 3,500 ft of pipe and more than 390 fittings crisscross this coal preparation plant in Canada. Pipe installed initially in 1986 is still working and conveying coal.



Fly ash pipelines in a coal fired power station.



Hydraulic conveying pipeline for ore in Far East.



Cement industry example: conveying pipelines to the cement silos are protected by ABRESIST in the bends and subsequent straight sections.



KALCOR Linings

Zirconium Corundum Wear Protection with High Temperature and Abrasion Resistance

With the growing knowledge of preventive wear protection the demand for durable materials with extended service life has increased.

■ KALCOR, a fused cast corundum, was developed for extreme abrasion protection and high temperatures of up to 1000 °C / 1832 °F. Alumina and zirconia are melted in an electric arc furnace and cast into tiles, shaped components and cylinders.

■ KALCOR-S is cold cast and sintered. This material withstands temperatures up to 1250 °C / 2282 °F. Further advantage: good thermal shock resistance. The fabrication process allows tiles and cylinders to be made with relatively thin walls. Asymmetric cross sections for pipe bends are possible.

KALCOR

Zirconium corundum based on alumina and zirconia for plant components, where extreme wear and/or high temperatures occur.

Installation: cylinders or shaped components in cement mortar or special mastics. Mechanical fixing is also possible.

Application temperature: up to 1250 °C / 2282 °F depending on application and geometry.

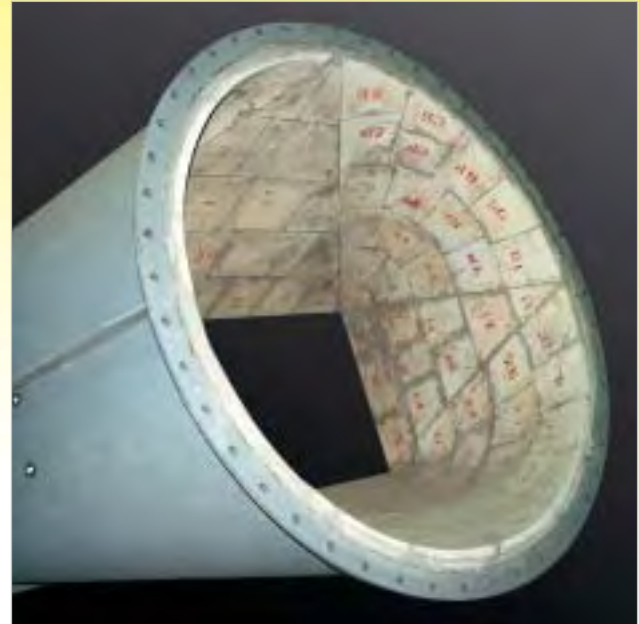
Advantages: highly abrasion resistant, temperature resistant, corrosion resistant.

**KALCOR
lined pipe.**



**Asymmetric
cross section
of a pipe lined
with KALCOR-S.**

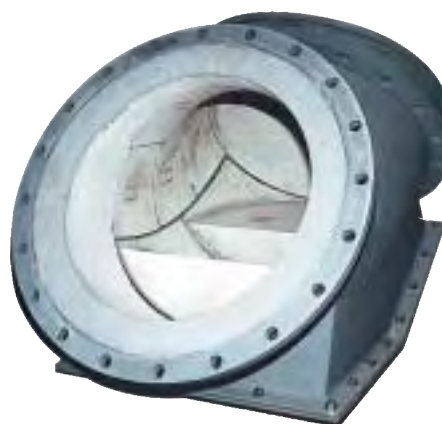




KALCOR protection easily applied in high wear areas: special cast shapes or cut components (diamond tipped tools only).



*Proven for PF-bends:
KALCOR lined elbows and pipe last many years.*



KALCOR bend with special deflectors to distribute the conveying stream of coal.



ALRESIST Linings

Abrasion and Temperature Resistant High Alumina Ceramics

ALRESIST is a member of the oxide family of ceramics, with the main component aluminium oxide. Extremely high abrasion resistance is achieved by careful selection of the particle size and distribution.

Most tiles or cylinders are formed by pressing a dry powder of the ceramic. Machining of ceramic prior to kiln firing allows the manufacture of components with geometrically difficult shapes.

ALRESIST can be manufactured in very thin tiles. This is an advantage when existing plant components have to be lined and space or weight are of critical importance.

ALRESIST Advantages

Highly wear resistant, smooth surface that lasts, no corrosion, available in various thicknesses.



Installation of thin ALRESIST tiles in epoxy mortar. Attachment using KALBOND or silicone RTV is also possible.

ALRESIST

Special high alumina ceramics for plant components with extreme wear and / or temperature conditions, for thin linings or for smooth surfaces.

Installation: pipes, shaped components, or thin tiles laid in epoxy mortar, RTV or attachment using KALBOND.

ALRESIST tiles can be vulcanized into rubber mats for installation by gluing. Mechanical fixing by welding is also common.

Application temperature: up to 1000 °C / 1832 °F depending on application and geometry.

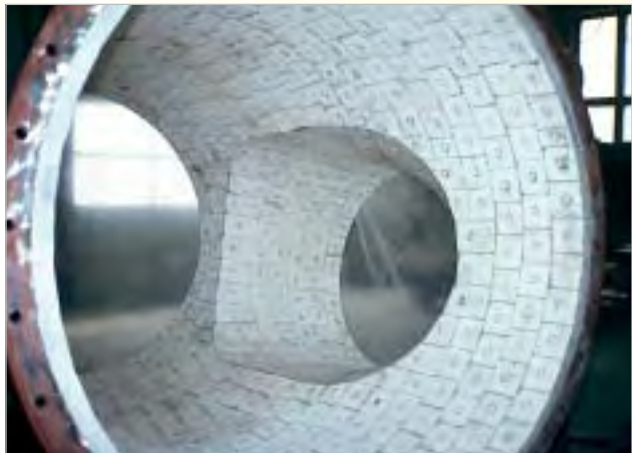




Highly wear resistant ALRESIST pipe used for ore slurry conveying at a nickel mine in the Far East.



The choice of the right attachment system is dependent upon temperature, vibration, chemical attack, etc.



The thickness of the ALRESIST lining depends on the severity of the abrasion and pipe diameter.

Pipes smaller than 200 mm diameter will be protected with ALRESIST cylinders up to 25 mm thick.

Pipes larger than 200 mm diameter normally are lined with beveled tiles from 6 mm to 25 mm thickness.



ALRESIST beveled tiles are pre-engineered and cut to shape during manufacture to fit together in the required configuration.



KALSICA Linings

Silicon Carbide Ceramics with Extremely High Temperature Abrasion Resistance

Outstanding resistance against wear and thermal shock is achieved with KALSICA. KALSICA is part of the silicon carbide ceramics group and is available in different qualities:

- silicon infiltrated (KALSICA-S)
- silicon nitride bonded (KALSICA-A, -N, -P)

High precision can be achieved in manufacturing KALSICA shapes, formed by pressing or casting, then sintered in a reactor kiln.

Wall thickness from 2 mm for the shaped components is another advantage of using KALSICA wear protection linings.

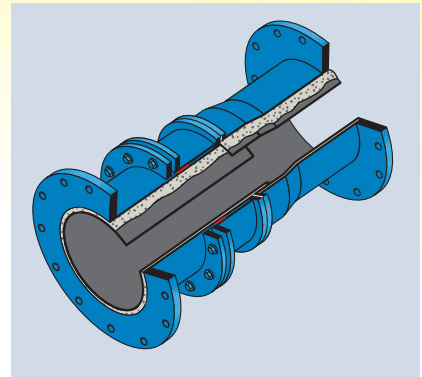
KALSICA

Silicon carbide ceramics for plant components for extreme wear, high temperature and / or thermal shock.

Installation: individual shapes and components laid in mortar, epoxy, or temperature and acid resistant based mastics. Mechanical fixing is also possible.

Application temperature: up to 1000 °C / 1832 °F depending on application and geometry.

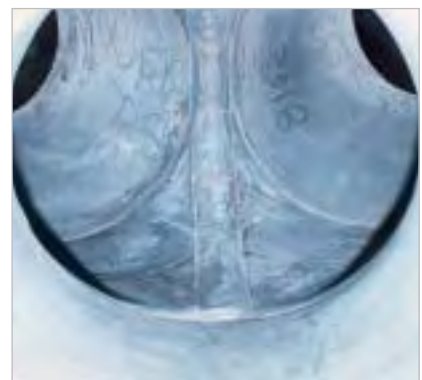
Advantages: highly abrasion resistant, resistant to thermal shocks and manufactured with small tolerances.



Expansion joint with 30 mm inside diameter. The thin lining allows an aerodynamically optimal pipe transition.



For extreme wear in pneumatic conveying.



KALSICA lined pipe transition.



KALCRET Linings

Hard Compound can be Trowelled, Cast or Sprayed for Jointless Lining

KALCRET is a mineral based cement bonded hard compound. KALCRET can be trowelled, cast or sprayed, by the customer, in the workshop or on-site.

The lining is densely packed, using hard minerals that are fixed in a matrix. With a defined particle distribution and additional micro silica, KALCRET has a very high wear resistance and strength.

KALCRET reaches 75% of its strength in 8 hours, the minimum needed for repair work.

KALCRET is clearly superior to highgrade concretes. The application temperature is up to 1200 °C / 2192 °F, depending on the situation.

KALCRET is especially useful in protecting components with a difficult geometry.

Pipes and Pipe Bends Lined with KALCRET

Pipes and pipe bends lined with KALCRET are produced with an inside diameter of more than 40 mm. Inside diameters up to 600 mm are lined with castable KALCRET where as the use of trowelled KALCRET is more economical for inside diameters beyond 600 mm:

- pipe lengths up to 5000 mm
- radii of more than 500 mm
- normally, the lining has a thickness of 20 mm, other thicknesses optional



KALCRET can be trowelled, ...



...cast ...



...or sprayed.

KALCRET

Cement bonded hard compound for a jointless lining of plant components where high wear and temperature occur.

Installation: by trowelling, casting in molds or spraying.

Application temperature: up to 1200 °C / 2192 °F depending on application and geometry.

Advantages: highly wear resistant, strong and jointless lining, highly temperature resistant.



One benefit of the KALCRET wear protection lining is that the lining can be made thicker in the outer radius of the bend (extrados) which is subject to the greatest wear (asymmetric cross section).

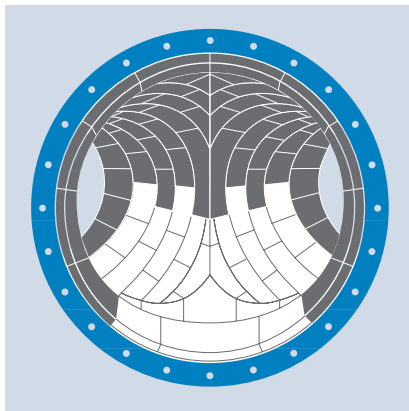
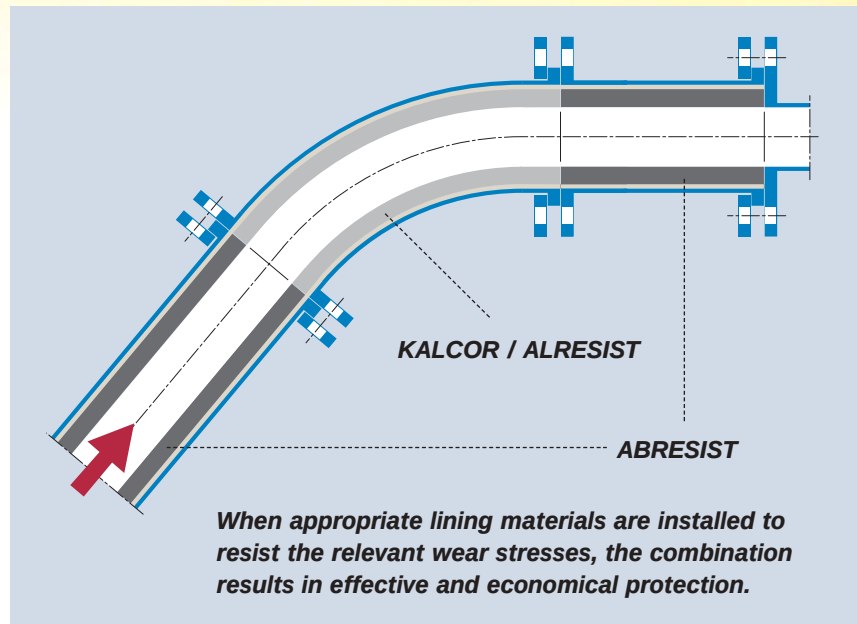
Combined Linings

More Economical due to Similar Lifetimes for all Plant Components

High conveying speeds and abrasive materials quite often cause early wear in the deflection points of pipelines. This wear is usually limited to the outer radius of the bends.

In cases involving larger diameters, a combination of linings, KALCOR or ALRESIST in the outer radius of the wear area and ABRESIST on the inner surface can lead to substantial benefits.

This way, all parts can achieve approximately the same lifetime without premature failure on one hand or over-protection on the other.



Junction points and transitions are critical wear areas due to the turbulence in these sections. KALCOR and ABRESIST lining components installed in these areas result in comparable surface conditions and lifetimes matching the balance of the lining.



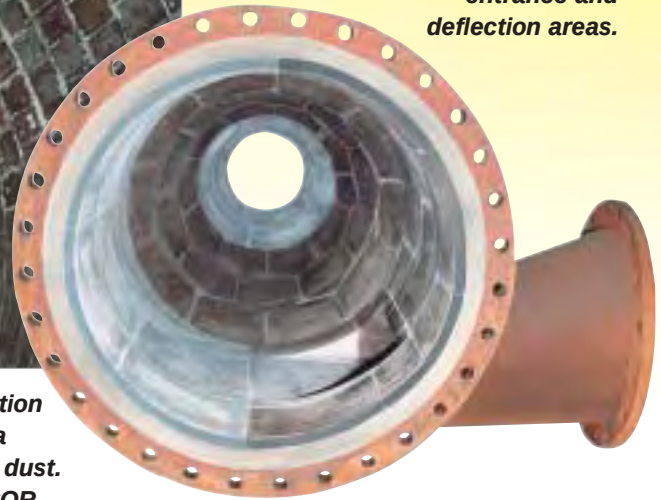
Combined lining with ABRESIST and ALRESIST.

Combined lining of ABRESIST and KALCOR. The bend is provided with a KALCOR deflector and an inspection device.





ABRESIST lined cyclone body in a German chemical plant: the fine but extremely abrasive silicon powder requires special KALSICA wear protection at the entrance and deflection areas.



ABRESIST and KALCOR combination within a dust collection system in a steel plant. The raw gasses in the duct have a temperature of 250 °C / 482 °F and are loaded with sinter dust. The impact area opposite the gas inlet is lined with KALCOR.



Deviation pot with replaceable ceramic wear protection. This system is used in pneumatic conveying systems where there is little space for large bend radii. It is lined with ALRESIST and ABRESIST.



PF-pipes in power plants are subject to significant wear. Despite this fact these areas must not be allowed to fail. In this case the PF-distributors are lined with ALRESIST for high wear and KALCOR for the impact stress.

KALFLEX Bends

Both Flexible and Wear Resistant

KALFLEX flexible bends are easily installed with normal flanging. The core elements of the system are abrasion resistant segments that fit into each other. The segments are capable of moving in relation to each other, providing the desired flexibility.

The segments are enclosed in a rubber jacket containing a fabric insert, producing the needed stability and tightness.

KALFLEX

- **nominal diameters**
20-150 mm
- **max. temperature**
180 °C / 356 °F
- **pressure up to 10 bars**
- **flexible radius and angle positions**



*2-way diverter valve with
150 mm Ø KALFLEX pipe,
1,851 mm long.*

KALMETALL-C, Wear Resistant Hard Cast

The wear resistant KALMETALL-C segments are hard castings. KALMETALL-C offers resistance against wear caused by impact and sliding abrasion. Diameters range from 50 – 150 mm.

ALRESIST, when Wear is Extreme

The segments can also be made of ALRESIST high alumina ceramics, useful in cases of extreme sliding abrasion. Diameters are available from 50 – 100 mm. When ALRESIST linings are used, the collars are made of KALMETALL-C and the flanges are made of steel to provide the strength needed.



KALDETECT Wear Detection

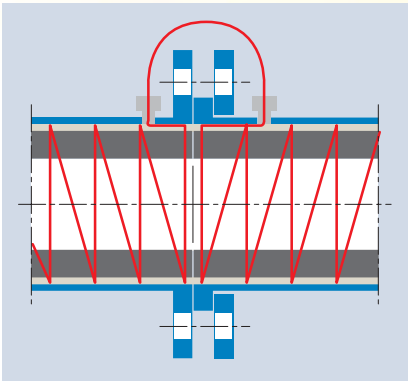
Electrical, Pneumatic or Mechanical Systems to Monitor Wear

Even superior wear resistant linings do not have unlimited lifetimes, especially in cases of extremely abrasive materials and harsh operating conditions. This can become critical, e.g. when for environmental protection reasons, certain harmful materials cannot be allowed to pollute the environment.

For example: pneumatic conveying lines within waste incineration plants that are designed for the

incineration of hazardous waste. The leakage in a conveying line as a result of unexpected abrasion would cause dangerous or environmentally harmful substances to be released.

For these and other cases systems for lined pipes are offered that monitor possible wear in the lining before material leaks into the atmosphere or soil.



Electrical Wear Detection

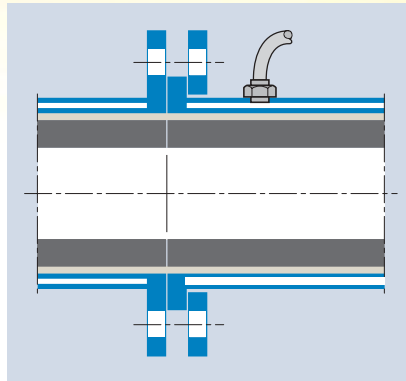
The wear resistant lining is fitted on the cylinder OD with a low voltage electrical circuit.

If the wear resistant lining wears through due to abrasion in the pipeline, the electrical circuit will be interrupted.

Options in the electrical circuit design will allow the system to initiate an alarm with an indication of the relevant pipe section or shut down the plant automatically.

Straight pipe sections as well as pipe bends or other lined plant equipment, such as conical cyclone components, can be fitted with these systems.

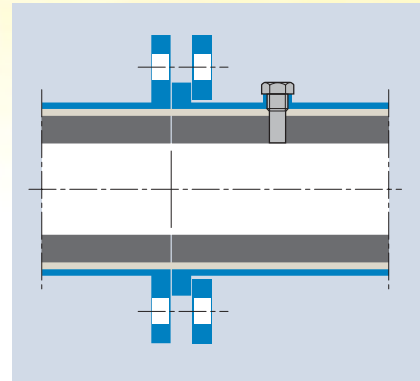
The electrical wear detection is available for all of the wear resistant materials and also for combined linings of any plant components.



Pneumatic Wear Detection

The steel pipe is twin-walled. With changes of the pressure level in the space between the two pipes caused by a leak, an indicator or alarm will be activated or the plant will be shut down.

This system can be used for single pipes or complete pipelines.



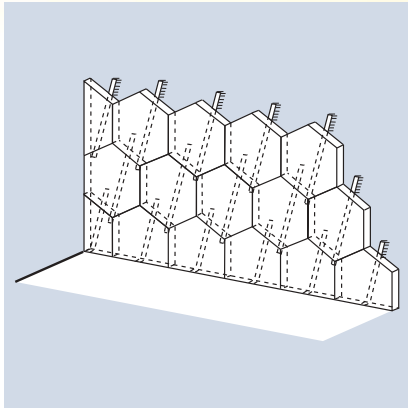
Mechanical Wear Detection

The steel casing and wear resistant linings are fitted with a bore hole.

The length of the indicator pin monitors the thickness or condition of the protective lining when removed and inspected.

Design Details

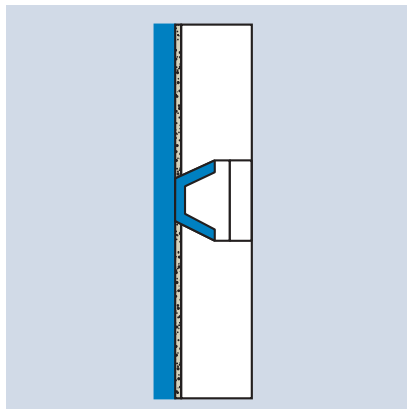
Individual Fixing Alternatives Depending on Conditions and Processes



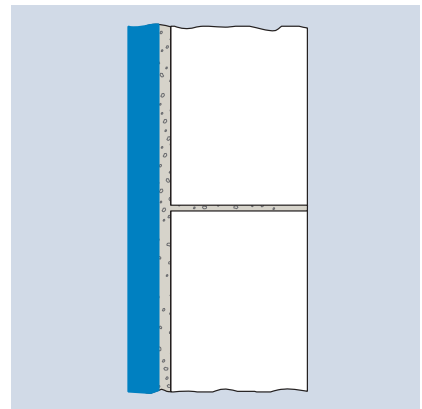
Installation and Erection

A precondition for effective wear protection is proper installation. Installation and erection of the lining is dependent upon the material and the application, e.g. pipe diameter, temperature, corrosive and acid exposure.

ABRESIST, ALRESIST, KALCOR, and KALSICA normally are laid in cement mortar or special mastics. Different mechanical fixings are also possible.



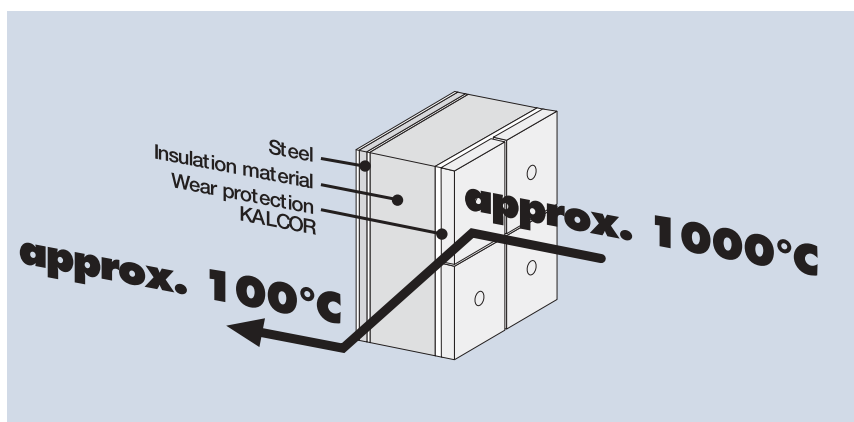
One method proven to resist strong mechanical stresses is the use of welded steel inserts.



Gluing with epoxy.

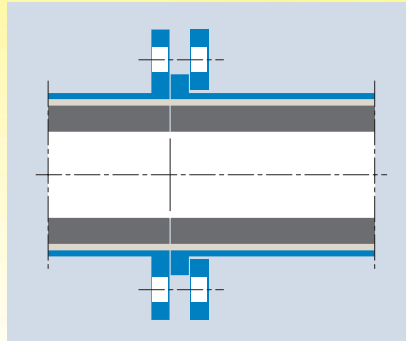
High Temperature Applications

KALCOR, ALRESIST and KALSICA are wear protective materials capable of withstanding high temperatures. A wide range of mechanical fixing methods and design details permit finding cost effective wear protection for any application. Moreover, KALCRET hard compound can be installed by trowelling, casting or spraying.

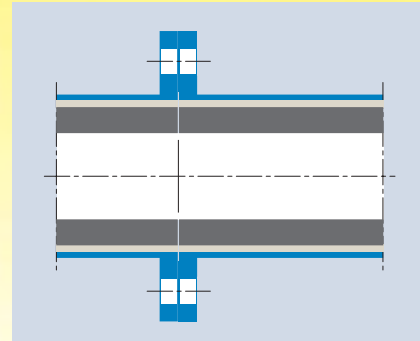


Flange Joints

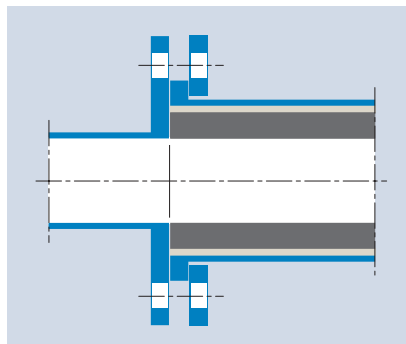
The connection of wear resistant pipes to each other or to regular steel pipes can be done with fixed and / or loose flanges.



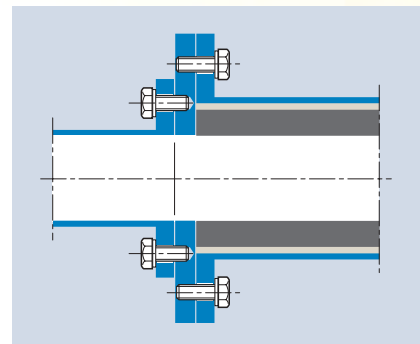
Lined pipes can be connected to each other easily with a fixed collar and a loose turnable flange on one end.



Another standard connection is to use fixed flanges on both ends.



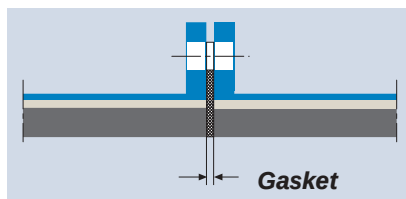
A weld-on counter flange with larger bolt circle diameter on the unlined pipe is a proven solution to connect pipe.



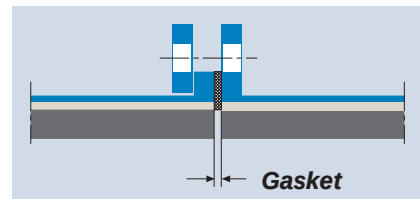
Unlined pipes, pumps or fittings can be connected with a lined pipe using an adaptor flange.

Gaskets

Gaskets are required to provide a tight seal between flanges in pipe sections.



For hydraulic pipe systems, we recommend a minimum 1/8" thick, rubber gasket. For example, gaskets made from SBR compound rubber.

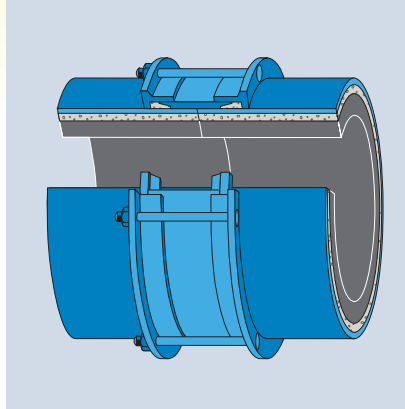


For pneumatic pipe systems, we recommend a minimum 1/8" thick rubber gasket for ambient temperatures, heat resistant material for temperatures above 80 °C / 176 °F.

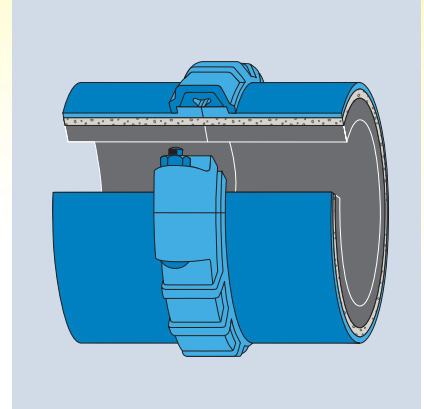
Design Details

Alternatives to Flanged Joints are Available for Lined Pipe using Different Coupling Systems

Couplings



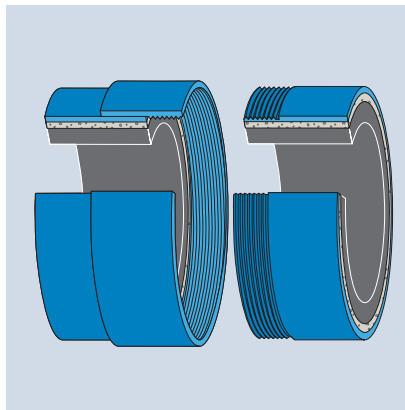
Couplings with radial restraint.



Couplings with axial and radial restraint.

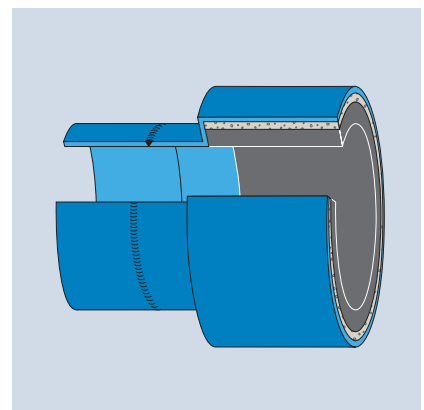
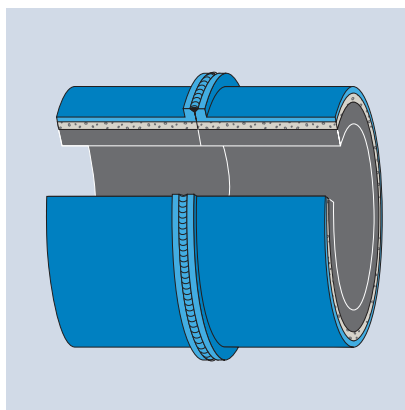
Threaded Joints

When a pipeline is stressed by tension, e.g. when vertically suspended, threaded joints can be used.



Welded Connections

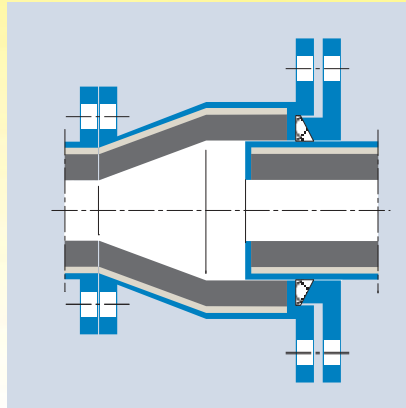
When flanged connections and couplings are not the answer, it is possible to connect wear resistant pipes by a welded connection.



Special Solutions

Expansion Joint Sections

For longer pipelines wear resistant lined expansion joints of various designs are available to compensate for changes in length.



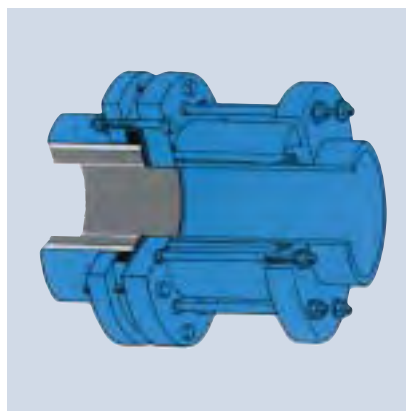
Expansion joints in a hydraulic bottom ash pipeline.



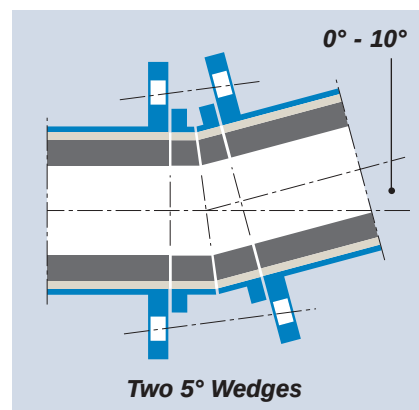
Expansion joints in a pneumatic fly ash pipeline.

Dresser Conversion Flanges Wedges

Lined pipe segments can be fitted to accept manometer, flowmeter, temperature indicator and / or wear meter.



Dresser conversion flanges for connecting to plain end steel or cast iron pipe.



Wedges are used for small directional changes from 0° to 10°.

The Wear Protection People

Design, Manufacture, Delivery and Installation of Tailor-Made Wear Resistant Linings

Abresist Corporation and Kalenborn have been dedicated to plant protection since developing fused cast basalt for wear reduction and cost savings.



Starting with fused cast basalt more than 80 years ago, a wide range of wear resistant materials has been developed with each material offering special wear resistant characteristics.

The materials are valuable, but the knowledge from experience gathered all over the world in more than eighty branches of industry is just as important.

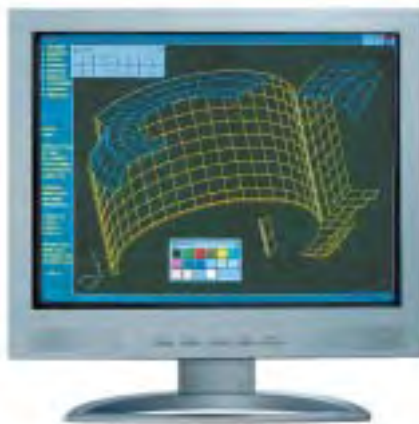


Design

Our engineers design customized, cost saving solutions for new or existing equipment.

We provide the total package in one source: starting with advice on application, measurements on-site, design services, manufacture of the lining through to proper installation.

This is the Abresist Corporation approach which offers long lasting protection.



Manufacturing

The foundation of the wear resistant systems offered by Abresist Corporation and Kalenborn consists of different materials with a wide range of individual characteristics:

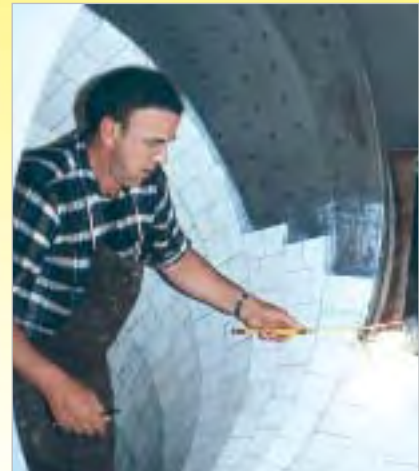
- ABRESIST
- ALRESIST
- KALCOR
- KALSICA
- KALCRET
- KALMETALL



Installation and Erection

Proper installation and erection require knowledge based on a wide range of experience.

Installation of the engineered wear resistant linings can be performed or supervised by Abresist Corporation and Kalenborn specialists in our workshops or on-site all over the world.



About Abresist Corporation

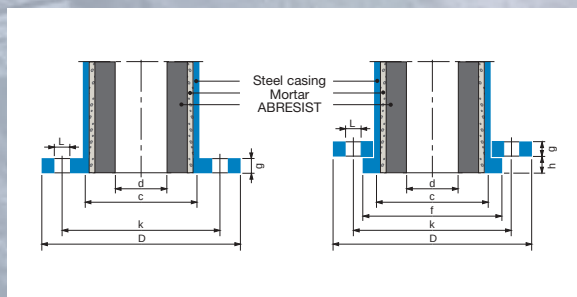
Abresist Corporation is the U.S. subsidiary of Kalenborn Kalprotect, the German company that has continued to develop abrasion resistance technology for more than 80 years. We are confident that, whatever your abrasion or impact wear problem is in Canada, Mexico or the U.S.A., you can get the help you need by contacting us.

We Solve Wear Problems in Plant Components and Pipes



Pipes and Bends

Standard for ABRESIST and KALCOR



Pipes / bends
with fixed flanges.

Pipes / bends with welded
collar and rotating flanges.

Pipes and Bends			
Inside diameter		Outside diameter steel casing	
nominal size	precise I.D.	pipes	bends
inches	mm inches	mm inches	mm inches
d	d	c	c
4"	100 3 15/16"	171 6 7/8"	171 6 7/8"
5"	125 4 15/16"	210 8 5/16"	210 8 5/16"
6"	150 5 15/16"	219 8 5/8"	232 9 1/8"
8"	200 7 7/8"	273 10 3/4"	286 11 1/4"
10"	250 9 27/32"	324 12 3/4"	336 13 1/4"
12"	294 11 5/8"	368 14 1/2"	387 15 1/4"
14"	350 13 25/32"	432 17"	432 17"

Flanges				
Outside diam. of flange	Bolt circle diam. of flange	Number of holes	Diameter of holes	Thick- ness
mm inches	mm inches		mm inches	mm inches
D	k		L	g
279 11"	229 9"	8	22 7/8"	16 5/8"
318 12 1/2"	267 10 1/2"	8	22 7/8"	16 5/8"
330 13"	280 11 1/16"	8	22 7/8"	16 5/8"
406 16"	353 13 7/8"	8	22 7/8"	19 3/4"
445 17 1/2"	395 15 9/16"	12	22 7/8"	19 3/4"
490 19 1/4"	445 17 1/2"	12	22 7/8"	19 3/4"
568 22 3/8"	518 20 3/8"	16	22 7/8"	25 1"

Rings	
Outside diam. of ring	Thick- ness
mm inches	mm inches
f	h
206 8 1/8"	16 5/8"
244 9 5/8"	16 5/8"
260 10 3/16"	16 5/8"
330 13"	19 3/4"
372 14 5/8"	19 3/4"
422 16 5/8"	19 3/4"
495 19 1/2"	25 1"

40	50	60	65	70	75	80	88	95	100	107	110
113	120	125	132	135	146	150	162	170	175	178	185
190	200	205	216	225	241	250	260	275	280	294	300
310	325	350	375	400	430	450	475	500	525		

Standard inside diameters in mm

made in cylinder form.

Any size above 525 mm made in tile shapes.

Radius	750 mm 2 - 5 1/2"	1000 mm 3 - 3 3/8"	1500 mm 4 - 11 1/16"	2000 mm 6 - 6 3/4"	2500 mm 8 - 2 7/16"	3000 mm 9 - 10 1/8"
90°	●	●				
60°	●	●	●			
45°	●	●	●	●	●	
30°	●	●	●	●	●	●
15°	●	●	●	●	●	●

Typical bend sizes

Bends are manufactured in any radii and angle, this table shows some standard sizes.

Ask Abresist Corp. for additional information

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abresist
The Wear Protection People