Abrasion resistant pipe

By Mr. Sum Xu

Abrasion resistant pipe applied in coal-fired power plant ash and slag discharge tube, powder, powder tube, desulfurization pipeline, in addition also widely used in the following industries:

Welcome to Sunny Steel Enterprise Ltd.

Sunny Steel provide a wide range of steel products as Steel pipes, Seamless tube and seamless pipes, Alloy pipes, Pipe fittings, Composite steel pipe used in the industry, construction etc.

You can get in touch by telephone, post, online or E-mail. Please check the help section first to see if your question may be answered there.

Tel.: +8621 3378 0199
E-mail: sales@sunnysteel.com
Http://www.sunnysteel.com
Abrasion resistant pipe

Abrasion resistant pipe applied in coal-fired power plant ash and slag discharge tube, powder, powder tube, desulfurization pipeline, in addition also widely used in the following industries:

- After analyses and research, it was thought that the main facts which affect drilling pipe abrasion resistant ring failure were abrasive property of formations, selection of high-abrasive material, and welding technique.
- Mining coal industry, coal, coal mines, washing filling, coal mine,
- Metal mine ore tailings transport, and wear-resistant elbow,
- Metallurgy furnace of steel, coal, iron pipe; such loss CAO, zinc Bei sand conveying pipeline steel, alloy, the secondary refining etc; the selection of wear-resisting elbow.

Ceramic-Lined Pipes & Elbows

Ceramic-lined pipe is the use of SHS – Manufacturing centrifugation, the melting point of alumina ceramic pipe in 2045 °C, alumina layer and the steel layer structure due to process special reasons, the stress field is also special.

The molten alumina produced from the reaction Fe2O3+2Al=2Fe+Al2O3 spreads on the inside wall of the steel pipe under the influence of a centrifugal force, then solidifies, so the ceramic layer has high density and smooth surface and bonds to the steel pipe. They are widely used to convey highly abrasive material such as fly ash and any other fine powder material in mine, thermo power generating, coal processing plant, metallurgy, construction, etc. The service life is 10 to 20 times longer than normal steel pipe.
Properties of the Ceramic-lined Steel Pipes

Ceramic (Corundum: a-Al2O3) lined abrasion resistant straight pipe and fittings are lined with highly abrasion resistant ceramic by SHS -------Self-propagating High-temperature Synthetic process.

Physical Properties

<table>
<thead>
<tr>
<th>Material</th>
<th>Thickness of the ceramic layer (mm)</th>
<th>Density of the ceramic layer (g/cm³)</th>
<th>Linear expansion coefficient (x10⁻⁶/°C)</th>
<th>Micro-hardness H1702 (Kg/mm²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ceramic-lined steel composite pipes</td>
<td>≧ 2</td>
<td>≧ 3.40</td>
<td>12-13</td>
<td>1200-1600</td>
</tr>
</tbody>
</table>

Mechanical Properties:

Hoop Strength: Hoop strength is the resistance against radial pressure. The strength of the ceramic -lined steel composite pipe is 300 to 500MPa.

Compression-Shear Strength: Compression-shear strength is the bonding strength at the interface between the ceramic layer and the steel pipe. The compression-shear strength of the ceramic-lined composite pipe is 15 to 20MPa.

Resistance to Mechanical Shock: The ceramic layer does not crack or flake off when the composite pipe receives a mechanical shock.

Resistance to Thermal Shock: The ceramic layer does not crack or flake off when heated to 800°C and then quenched.

Resistance to Abrasion: The ceramic-lined steel composite pipe has exceptional resistance to abrasion. Its service life in materials transportation with hard abrasives is more than 20 times longer than in common steel pipe.

Good Weld Ability:

The ceramic-lined steel composite pipe can be joined by welding the steel pipe layer.

Light Weight: The ceramic-lined steel composite pipes are lighter than alloy pipes, cast iron pipes, and cast stone pipes, which reduces the expense of transportation and makes the pipes easier to install.

Convenient Installation

The ceramic-lined steel composite pipes can be easily connected by welding, or with flanges and soft easy connectors.
Use of Ceramic-Lined Steel Composite Pipe (CLSP)

The liquid pipe transport has been widely used in the industries of electric power, metallurgy, coal, petroleum, chemical engineering, building materials, mechanism and so on. And it has developed rapidly. When transporting the materials with the harder abrasion (such as ash dregs, slag, coal powder, mining dregs, the rest mines, cement, etc), it will exit the problem that the abrasion of pipes is too rapid. Especially, the abrasion of bent pipes is greatly more rapid. When transporting the special abrasion materials or erosive materials, it will exit the problem that the damage of pipes is too rapid.

Wear-resisting comparative table of ceramic lined pipe

<table>
<thead>
<tr>
<th>Material</th>
<th>Volume diminution (cm³)</th>
<th>Material</th>
<th>Volume diminution (cm³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ceramic lined Steel pipe</td>
<td>0.0022</td>
<td>ceramic lined Steel pipe</td>
<td>3</td>
</tr>
<tr>
<td>Ceramic pipe Al₂O₃ 97%</td>
<td>0.0025</td>
<td>S45C</td>
<td>25</td>
</tr>
</tbody>
</table>

When transporting the materials with comparatively high temperature, it will exit the problem that the anti-hot steel pipes are very expensive. Since the ceramic steel pipe has gone into the market, the above problems have been settled down easily.

The ceramic steel pipes are widely used for the transporting of mining fillings, mining power, and the rest mines with hard abrasion; for the pipe lines of hardening slag, blast furnace dregs, steel-making red-clay, agglomerated whitewash, dust cleaning of steel & iron companies; for the pipe lines to transport powder, to clean dregs, to clean sulfides, to clean dust for the thermal power plants; for the transport pipe lines of green stock, clinker, cements, coal powder and collective dust in the industry of cement. The ceramic steel unbent pipes are also the ideal pipelines for transporting the materials with erosive matter.

The ceramic steel unbent pipes, the ceramic steel bent pipes, reducers, three-path pipes, four-path pipes, multi-path pipes and others manufactured in our factory have been used in over 200 thermal power plants, more than 50 mines and the industries of coal, building materials, mechanism, petroleum and so on. For example, in the condition of hard abrasion, the ceramic steel unbent pipes have been used for several years. But, at present, there is no any ceramic steel unbent pipe has been worn through. Even the ceramic steel unbent pipes with hardest abrasion, their use life is 10 times longer than the cast stone bent pipes and wearable alloy steel bent pipes, 15 times longer than the toughened plastic bent pipes and toughened latex bent pipes.

The ceramic steel pipe has captured the market rapidly. Besides the high quality and the wonderful capability, it's also because its capability price ratio is higher than other wearable, anti-abrasion & anti-hotness pipes.

For the pipes with the same sizes, types and length, the weight of ceramic pipe is about 1/2 of the wearable cast alloy steel pipes, while the cost has reduced 10%~20% per meter; the weight of ceramic pipe is about 1/3 of the cast stone bent pipe's, 1/2 of the cast stone unbent pipe's.

The cost per meter is equal to the unbent pipe's, 5%~15% less than the bent pipe's.
Self-propagating High-temperature Synthetic process

Self-propagating high-temperature synthesis (SHS) and processes based on SHS are currently being developed the world over for the production of powders and near-net shape components of advanced materials.

The ceramic layer is formed by molten alumina at a temperature above 2500 degree Celsius. The molten alumina produced from the reaction Fe₂O₃+2Al=2Fe+Al₂O₃ spreads on the inside wall of the steel pipe under the influence of a centrifugal force, then solidifies, so the ceramic layer has high density and smooth surface and bonds to the steel pipe.

Specifications & size range of ceramic lined pipe

Hoop strength is the resistance against radial pressure. The strength of the ceramic-lined steel composite pipe is 300 to 500MPa.

- **Size of Ceramic-Lined Steel Composite Pipe (CLSP)**
- **Use of Ceramic-Lined Steel Composite Pipe**
- **Size of 22.5 degree elbows**
- **Size of 45 degree elbows**
- **Size of 90 Degree elbows**
- **Size and Type of Composite Tee**
Recommended Ceramic-lined Steel Pipes as below:

Ceramic-lined carbon steel pipe

Ceramic-lined carbon steel pipe with conventional steel, wear-resistant alloy steel pipe, cast stone and plastic pipe, steel pipe and other rubber has the essential difference.

The ceramic-lined steel composite pipe

The composite pipe is composed of three layers: ceramic, intermediate, and steel layers.

Ceramic Lined Elbows and Bends

Ceramic Lined Elbows and Bends could be also applied in the parts of concrete pump owing to their advantages especially the low weight which helps to avoid the jam during the transport of concrete.
Ceramic Lined reducer pipe

Ceramic Lined Reducer Pipe is integrally fired ceramic tube, with special molded ceramic filler pouring inside the pipe reducer assembled.

Backpack ceramic lined pipe elbow

Backpack wear-resistant ceramic lined elbow manufactured using superior grade raw materials.

Ceramic Lined Reducer Pipe with flange

Ceramic materials are neutral, chemically stable, has excellent corrosion resistance and acid resistance, resistant to various inorganic acids, organic acids, organic solvents, and its degree of corrosion of stainless steel is more than ten times.
Ceramic lined steel pipe structure

Ceramic lined pipes and fittings like ceramic bend, reducer and tee are manufactured by Sunny Steel.

$$2Al + Fe_2O_3 = Al_2O_3 + 2Fe + 836kJ$$
$$3Fe_3O_4 + 8Al = 4Al_2O_3 + 9Fe + 3265kJ$$

These ceramic lined system can provide excellent structural support and wear resistance, they are widely used in the heavy industries' most difficult wear situation.

<table>
<thead>
<tr>
<th><strong>Size</strong></th>
<th>76mm-1020mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wall Thickness</td>
<td>9mm-27mm</td>
</tr>
<tr>
<td>Outside Housing Material</td>
<td>Carbon Steel Seamless Pipe</td>
</tr>
<tr>
<td>Inner Material</td>
<td>Alumina Ceramic</td>
</tr>
<tr>
<td>Ceramic Lining Thickness (Including Transition Layer)</td>
<td>3mm to 6mm</td>
</tr>
<tr>
<td>Normal Operation Temperature</td>
<td>-50 deg. C ---- 800 deg. C</td>
</tr>
<tr>
<td>Normal Operation Velocity</td>
<td>20-35m/s</td>
</tr>
<tr>
<td>Length</td>
<td></td>
</tr>
</tbody>
</table>

1. 1M, 2M, 3 M
2. Customized Maximum Length Can be Achieved by Welding.

Features & Benefits

1. The lining of the product is manufactured from alumina Ceramics for engineering. Alumina ceramic material have a high hardness, and have a strong wear resistance.

2. As the amphoteric compound, the engineering ceramics will not chemically react with acid and alkali.

3. Since the density of the ceramic is just half that of the steel, the weight of the custom ceramic pipes and fittings is light, which contributes to easy installation.

4. 10 to 1 life performance, reducing the maintenance cost, down time and clean up.
Ceramic Tile Lined Pipe

Ceramic Tile Lined Pipe has very uniform coating of specially formulated ceramic material that is affixed to the inner of the pipe and gives a very smooth surface.

Ceramics with very low friction factor at low impingement angles decreases the abrasion of materials maximally. Its low density makes it easy to carry and install.

Our ceramic linings are the highest quality materials available to ensure that we provide the most cost-effective solutions for our clients.

The Ceramic Tiles could protect Industrial Components against abrasion, impact wear and high temperature of above 1000°C. Standard Flat Tiles of Square & Rectangular Shape having thickness of 6 to 50 mm, with or without central hole are available.

Materials: seamless mild steel pipe plus 95% alumina ceramics for liner
Designed pressure: >= 0.35Mpa
Normal operation velocity: 20-35m/s
Normal operation temperature: -50-800
Running medium: mixture of air and powder
Size of the pipe: the inner diameter is between 1 to 120 or even lager

Sunny Steel supply ceramic lined abrasion resistant steel pipes to your custom dimensions and budget.

Suggested Usage of the Ceramic Tile Elbow:

<table>
<thead>
<tr>
<th>Ash Pipe &amp; Elbows</th>
<th>Add-Mix Transport Lines</th>
<th>Coal Piping Clinker Chutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chutes</td>
<td>Coal Conduit Lining</td>
<td>Coal Handing Chute Lining</td>
</tr>
<tr>
<td>Fan Lining</td>
<td>Pulverize Housing Liner</td>
<td>Coal Mill Pulverize Cone Lining</td>
</tr>
<tr>
<td>Bumer Feed Pipes</td>
<td>Classifier Cone Lining</td>
<td>Cullet Chutes &amp; Hoppers</td>
</tr>
<tr>
<td>Cyclone Lining</td>
<td>Down comer Pipe Lining</td>
<td>Coal Mill Exhauster Lining</td>
</tr>
<tr>
<td>Fan Housings</td>
<td>Drag Convey or Lining</td>
<td>Coal Mill Pulverize Lining</td>
</tr>
</tbody>
</table>
Recommended Ceramic tile lined Steel Pipes as below:

**Ceramic Tile lined elbow**
Ceramic Tile Lined Elbow has very uniform coating of specially formulated ceramic material that is affixed to the inner of the pipe and gives a very smooth surface.

**Ceramic Tile lined pipe reducer**

Ceramics are among the hardest materials available and provide ultimate wear resistance in piping.

**Ceramic tile lined bending**

Ceramic Tile Lined bending have very uniform coating of specially formulated ceramic material that is affixed to the inner of the pipe and gives a very smooth surface.
Bimetal Clad Pipe

Bimetal Clad Pipe is cast with mold vanishing vacuum suction casting cladding process.

Outer of straight pipe is common steel pipe, cladding realized by forming high chromium lining via centrifugal forming technique.

1. Manufacturing Process of Bi Metal Clad pipe:
Bi Metal Clad flanged pipe are cast with mold vanishing vacuum suction casting cladding process. Outer of straight pipe is common steel pipe, cladding realized by forming high chromium lining via centrifugal forming technique. Outer of bend uses hot-bending bend and lining is cast with high-chromium cast iron. Bends and other profile sections can be cladded in whole and this process has changed the traditional practice to fabricate bend and other profile sections by drawing polyline without changing flow pattern of material inside piping, greatly reducing conveyance resistance of material.

2. Advantages Compared with Traditional Wear Resistant Alloy Cast Iron, Alloy Cast Steel, General Clad Steel Pipe and Cast Stone Pipe:

1. Good wear-resistance, giving full play to wear-resistance of high chromium cast iron.
2. Withstanding high pressure:
Bimetal cladding pipe and bend can be used for any pressure rating. Close bonding of outer and lining by adopting special process make cladding interlayer molten-joint to ensure reliable operation.
3. Good mechanical impact and thermal impact resistance property.
4. Convenient in connection for installation:

Bimetal cladding pipe and bend can be cut and welded as you like.

Physical Properties of Bi Metal Clad flanged pipe:

<table>
<thead>
<tr>
<th>Flexure Strength</th>
<th>Tensile Strength</th>
<th>Elongation</th>
<th>Cross Section Stretch Ratio</th>
<th>Impact Toughness</th>
<th>Hardness of Wearable Layer</th>
<th>Hydrostatic Testing Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>MN/m²</td>
<td>MN/m²</td>
<td>%</td>
<td>%</td>
<td>J/c m²</td>
<td>HRC</td>
<td>Mpa</td>
</tr>
<tr>
<td>&gt;610</td>
<td>&gt;700</td>
<td>5</td>
<td>5.1</td>
<td>&gt;15</td>
<td>&gt;38</td>
<td>5.6-12.9</td>
</tr>
</tbody>
</table>
Recommended Bi metal clad pipes as below:

**Bi Metal Clad flanged pipe**

Bi Metal Clad flanged pipe is cast with mold vanishing vacuum suction casting cladding process.

**Bi Metal Clad elbow**

Bi-metal Clad Pipe and Bend are cast with mold vanishing vacuum suction casting cladding process.

**Bimetal Clad Pipe Bend**

Bi-metal Clad Pipe and Bend are cast with mold vanishing vacuum suction casting cladding process.
Rare Earth Alloy Wear-resisting Casting Pipe

We are manufacturer of Rare Earth Alloy Wear-resisting Casting Pipe and supply high quality Rare Earth Alloy Wear-resisting Casting Pipe in both large and small quantities worldwide and offer you the best prices in the market.

Features of Rare Earth Alloy Wear-resisting Casting Pipe:
The late eighty’s, American technology of rare earth wear resistant steel was introduced into our country. The relevant experts researched and made many experiments. The rare-earth wear-resistant steel had occupied the main position. Rare-earth wear-resistant steel is based on 40 steel. Cr, Ni, Si, Mo, Mn, Re elements are mixed in 40 steel forming low alloy steel which carbon content is 0.35~ 0.45%.

Performance indicators:
Grade: ZG40CrNiMoMnSiRe
Hardness: HRC \geq 40
Impact toughness: \geq 141/cm^2
Tensile strength: \geq 700MPa

Uses:
Rare high-strength low-alloy heat-resistant, wear-resistant steel parts for the power plant boiler systems in coal, powder, ash slagging pipeline.

Packing:
Packed in wooden crates, wrapped in plastic, and suitably protected for sea-worthy delivery or as requested. Both ends of each crate will indicate the order no., heat no., dimensions, weight and bundles. We have a team of experienced professionals with years of experience in manufacturing.

Hydrostatic Test
The inside diameter of the bend shall be 1 inch [25 mm].
Each length of pipe shall be Hydro tested, at option of manufacture nondestructive electric testing can be used.
Recommended Rare Earth Alloy Wear-resisting Casting Pipe as below:

**Rare earth alloy wear-resistant pipe bending**

![Image of wear-resistant pipe bending](image1)

We are manufacturer of Rare earth alloy wear-resistant pipe bending and supply high quality Rare earth alloy wear-resistant pipe bending in both large and small quantities worldwide and offer you the best prices in the market.

**Rare Earth Wear Resistant alloy Elbow**

![Image of wear-resistant elbow](image2)

The rare-earth wear-resistant steel had occupied the main position.

**Rare Earth Alloy Wear-resisting Casting Flanged Pipe**

![Image of wear-resistant flanged pipe](image3)

My company and major universities jointly developed a new type of high-strength wear-resistant alloy of rare earth products, it is crucial to overcome the technical material of cold, heat, cracking, brittleness, deformation, etc.,
How better packaging the abrasion resistant pipe

There are probably hundreds of different methods for packing a abrasion resistant pipe and Elbows, and most of them have merit, but there are two principles that are vital for any method to work prevent rusting and Sea transportation security.

Ceramic Lined Elbows and Bends

sales@sunnysteel.com
Ceramic Lined Elbows and Bends could be also applied in the parts of concrete pump owing to their advantages especially the low weight which helps to avoid the jam during the transport of concrete.

**Ceramic Tile Lined Steel Pipes**

Ceramic Tile Lined Pipe has very uniform coating of specially formulated ceramic material that is affixed to the inner of the pipe and gives a very smooth surface.

Our ceramic linings are the highest quality materials available to ensure that we provide the most cost-effective solutions for our clients.
Ceramic Tile Lined Bend

Ceramic tile lined pipe bending, Ceramic tile lined bending have very uniform coating of specially formulated ceramic material that is affixed to the inner of the pipe and gives a very smooth surface.

Rare Earth Wear Resistant alloy Elbow

The late eighty’s, American technology of rare earth wear resistant steel was introduced into our country.

Our packing can meet any needs of the customers.