



SHS ceramic lined pipe

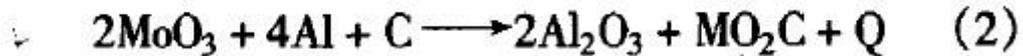
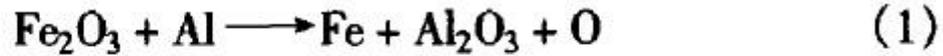
Ceramic lined pipe is made through self-propagating high-temperature synthesis (SHS) technique.

Main Properties of Ceramic lined pipe

Sand injection test		30% Transfer test of sludge with SiO ₂	
Material	Volume diminution (cm ³)	Material	Volume diminution (cm ³)
Ceramic lining Steel pipe	0.0022	Ceramic lining Steel pipe	3
Ceramic pipe	0.0025	S45C	25



Self-propagating high-temperature synthesis (SHS) is a method for producing inorganic compounds by exothermic reactions, usually involving salts.



The ceramic layer is formed by molten alumina at a temperature above 2500 degree Celsius. The molten alumina produced from the reaction $\text{Fe}_2\text{O}_3 + 2\text{Al} = 2\text{Fe} + \text{Al}_2\text{O}_3$ 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.

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



Self-propagating High-temperature Synthetic process

Self-propagating high temperature synthesis (SHS) is used to describe a process in which the initial reagents (usually powders), when ignited, spontaneously transform into products due to the exothermic heat of reaction.



The combination of high rigidity of ceramic and high elasticity of steel gives the pipe unmatched features as an abrasion resistant, heat resistant and corrosion resistant material for use in the fields of power generation, metallurgy, mining, and chemical industry etc. It has many advantages over steel pipes, cast stone pipes, and steel-plastic compound pipes.

This reaction generates temperatures above the melting point of alumina and is used in the thermit welding process for joining railway lines.

Several other terminologies - such as combustion synthesis, glasses combustion or



Properties of the Ceramic-lined Steel Composite Pipes

self-propagating exothermic reaction - are used to describe the process.

Features and Advantages:

1). High Abrasion Resistant:

Vickers hardness of the corundum lining is HV1100 to 1500, as high as that of tungsten-cobalt hard alloys, and the abrasion resistance is 20 times as carbon steel pipes. The composite ceramic lined steel elbow was used in a mining plant for about fifty thousand hours. The general service life of common steel elbow is about 700 hours.

2). Corrosion Resistant:

Corundum is a neutral material, and is acid-proof and fouling-free.

3). Heat Resistant:

Ceramic lined composite steel pipe can work under circumstances of -50 to 800 Celsius degree.

4). Lower Weight and Convenient Installation:

The ceramic lined steel pipes are lighter than alloy pipes, cast iron pipes, and cast stone pipes and can be welded or connected through flanges, which reduces the expense of transportation and makes the pipes easier to install. 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 pipe's, while the cost has reduced 10%~20% per meter. The weight of ceramic lined steel pipe is about 1/3 of the cast stone bent pipe's, 1/2 of the cast stone straight pipes.

5). Lower Cost:

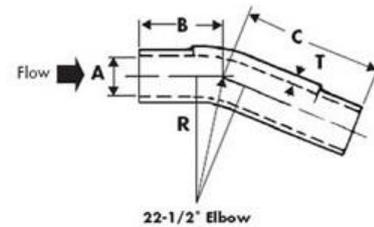
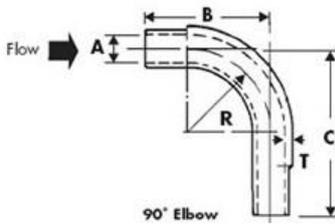
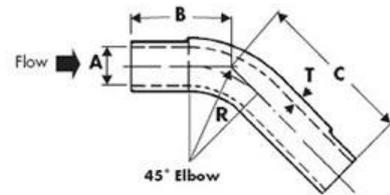
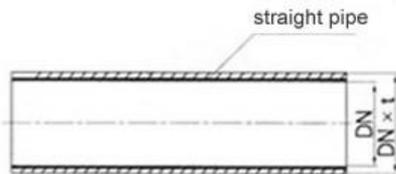
Ceramic lined pipes can take place of expensive stainless steel, titanium, nickel, cast stone or alloy pipes. Extended service life can also reduce maintenance cost.

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



Abrasion resistant pipe specification, Standard and identification

One-hundred-twenty-nine-million tons of coal ash—a byproduct of the coal burning process—is produced every year. Most power plants transport the coal ash in liquid form to large surface impoundments or in



Micro structure of ceramic layer



Section of the composite pipe



Resistance to thermal shock



A composite elbow was used in a mining plant for about fifty thousand hours.



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 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.

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.

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.



Good weld ability



The relative weight of the composite pipe is about 40-50% lighter than that of the cast-stone pipe

Convenient Installation

The ceramic-lined steel composite pipes can be easily connected by welding, or with flanges and soft easy



connectors.



Convenient installation



The composite pipes have good corrosion-resistant. There is no evidence of corrosion filling the composite pipes with bitter for one year (left), but the common steel pipe under the same condition is corroded seriously (right).



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.

Wear-resisting comparative table of ceramic lining pipe

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.



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 pipe's, 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.





Remarks:

1. Under the direction of the arrow diagram for the export direction.
2. Bend radius is usually 1.5-5 times the diameter of steel pipe (1.5-5D).
3. Other specifications of the composite pipe can be manufactured accord to the user requirements.



Well packing:





Gallery of production:









Packing in container



Ceramic lined pipe bend



Ceramic lined Sleeve Type Expansion Joints



Large diameter ceramic lined pipe



SHS machine



Out diameter 1020mm ceramic lined pipe





List of Core values

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