Mill Rolls

Centrifugal and Static Casting Spheroidal Graphite (SG) Acicular Structure with Non Continuous Carbide Cast Iron Roll and Ring

Properties

Improve in wear-resistance and thermal fatigue resistance. High fracture toughness reduces the degree of fire cracking and helps to extend the campaign time. The high strength spheroidal graphite core overcomes the high loads.

Applications

For roughing rod/bar mills.

Mechanical Properties	Centrifugal	Static
Hardness of shell	HSD45-60	HSD45-60
Hardness of neck	HSD38-50	HSD40-55
Tensile Strength of Core	≥500Mpa	≥500Mpa

Chemical Analysis

C	Si	Mn	Ni	Cr	Mo
3.0/3.4	1.5/2.5	0.8/1.0	2.5/4.5	≤0.20	0.7/1.0

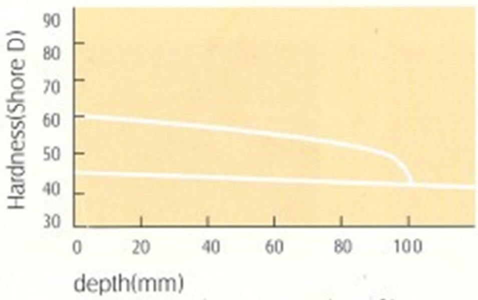

Figure 1. Hardness in Depth Profile (Centrifugal)

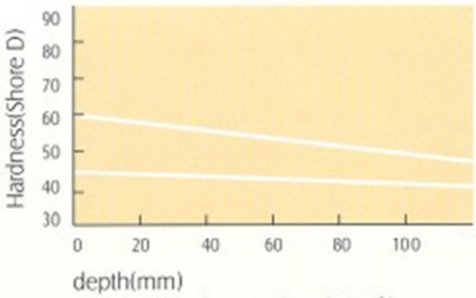

Figure 2. Hardness in Depth Profile Microstrncture(Static)

Figure 3.Mag.x100

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Mill Rolls

Centrifugal and Static Casting Steel Base Adamite Iron Roll and Ring

Properties

The microstructure consists of matrix and carbide with carbon content of 1.3-2.3%, depending on content of alloy and heat treatment process. The matrix consists of Pearlite or Bainite. With the addition of Cr, Mo and Ni for higher stability of carbide, enhanced high temperature resistance and strengthened matrix. The centrifugal roll has virtually no fall off in the hardness throughout the shell as well as highly wear and high temperature resistance and high load resistance etc.

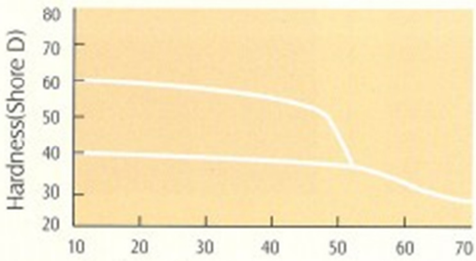
Applications

The front finishing stands of section mill and hot strip mill, the roughing and intermediate stands of bar and wire mill.

Mechanical Properties	Centrifugal	Static
Hardness of shell	HSD40-60	HSD40-60
Hardness of neck	HSD35-50	HSD40-55
Tensile Strength of Core	≥450Mpa	≥420Mpa

Chemical Analysis

C	Si	Mn	Ni	Cr	Mo
1.3/2.3	0.3/0.6	0.6/1.2	≥0.2	0.8/1.6	0.2/0.6



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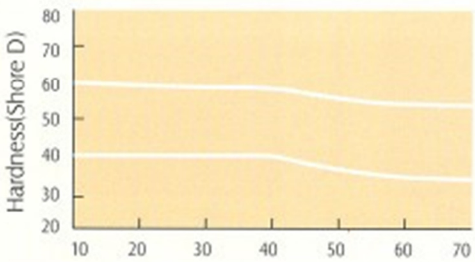

Figure 2. Hardness in Depth Profile Microstructure(Static)

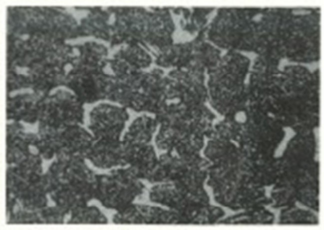

Figure 3.Mag.x100

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Mill Rolls

Centrifugal Casting Alloy Indefinite Chill Cast Iron Roll and Ring

Properties

The shell has a remarkable mechanical performance. With virtually no fall off in hardness due to the quantity of the quality if graphite remains basically unchanged throughout the working layer. The hardness of roll depends mainly on the type of matrix, namely sorbite, bainite or martensite.

Applications

For the finishing stands of continuous rolling mill of strip and bar, the pre-finishing stands of high speed wire, the intermediate and the front of finishing stands if small section, also utilized in thin plate and straightening roll.

	Mechanical Properties
Hardness of shell	HSD60-85
Hardness of neck	HSD35-48
Tensile Strength of Core	≥450Mpa

Chemical Analysis

Grade	Hardness(HSD)	C	Si	Mn	Ni	Cr	Mo
Indefinite I	60-70	3.0/3.5	0.5/1.0	0.5/1.0	0.5/1.0	0.5/1.0	0.2/0.6
Indefinite II	62-72	3.0/3.5	0.5/1.0	0.5/1.0	1.0/2.0	0.5/1.2	0.2/0.6
Indefinite III	65-75	3.0/3.5	0.5/1.0	0.5/1.0	2.0/3.0	0.7/1.2	0.2/0.6
Indefinite IV	70-85	3.0/3.5	0.5/1.0	0.5/1.0	3.0/5.0	1.0/2.0	0.2/0.6

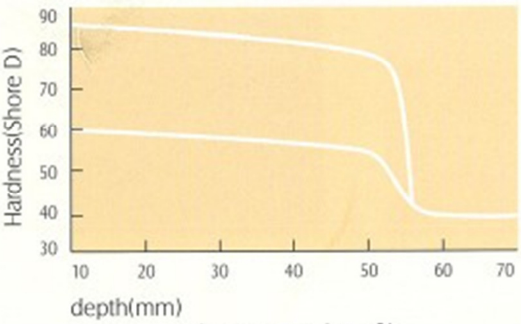

Figure 1. Hardness in Depth Profile


Figure 2.Mag.x100

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Mill Rolls

Centrifugal and Static Casting Spheroidal Graphite Cast Iron Roll and Ring

Properties

Thanks to its higher content of Ni and Mo alloys, pearlite, bainite and martensite matrix with excellent performance are produced. The roll has the higher conductivity of thermal and high tensile strength due to the graphite is in spheroidal form. A dense net primary cementite with high wear-resistance is produced through changing the heat treatment technology and the composition of the structure with bainite, martensite and acicular nodular.

Applications

Roughing and intermediate stands of various type continuous rolling mill, finishing stands of bar mill, section mill, finishing stands and back up rolls of strip mills, also suitable for stainless-steel strip hot mills.

Mechanical Properties	Centrifugal	Static
Hardness of shell	HSD50-80	HSD45-70
Hardness of neck	HSD35-48	HSD35-55
Tensile Strength of Core	≥450Mpa	≥300Mpa

Chemical Analysis

Grade	Hardness(HSD)	C	Si	Mn	Ni	Cr	Mo	Mg
SGP I	50-65	2.9/3.4	1.2/1.8	0.4/1.0	0.5/1.0	0.2/0.6	0.2/0.6	≥0.04
SGP II	50-70	2.9/3.4	1.2/1.8	0.4/1.0	1.0/3.0	0.2/1.2	0.2/0.6	≥0.04
SGA III	60-80	3.0/3.5	1.2/1.8	0.4/1.0	3.0/4.5	0.2/1.2	0.6/1.0	≥0.04

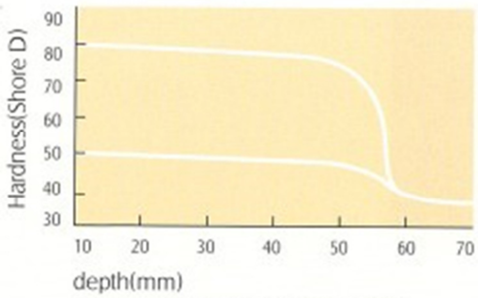

Figure 1. Hardness in Depth Profile (Centrifugal)

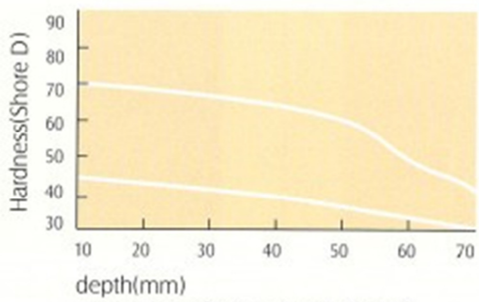

Figure 2. Hardness in Depth Profile Microstrncture(Static)

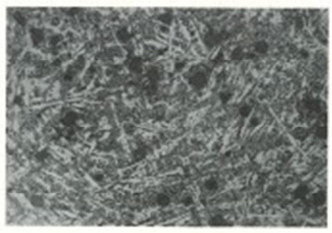

Figure 3.Mag.x100

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Mill Rolls

Centrifugal Casting High Speed Steel Roll and Ring

Properties

The shell is a high carbon alloy steel containing Cr, Mo, W, V and Nb. The microstructure consists of complex carbides embedded in a tempered martensitic matrix. Control of the carbon and a complex heat treatment allows the optimization of wear-resistance, thermal fatigue resistance and oxide film formation, whilst maintaining low residual stress values.

Applications

Widely used as the F5 and F6 work roll for hot strip mills, the pre-finishing stands of high-speed wire mills and the finishing stands of bar mills.

Mechanical Properties	Centrifugal
Hardness of shell	HSD75-85
Hardness of neck	HSD35-48
Tensile Strength of Core	≥450Mpa

Chemical Analysis

C	Si	Mn	Cr	Mo	W	V	Nb
1.6/2.3	0.3/0.9	0.2/0.8	3.0/6.0	3.0/6.0	1.0/4.0	2.0/6.0	1.0/3.0

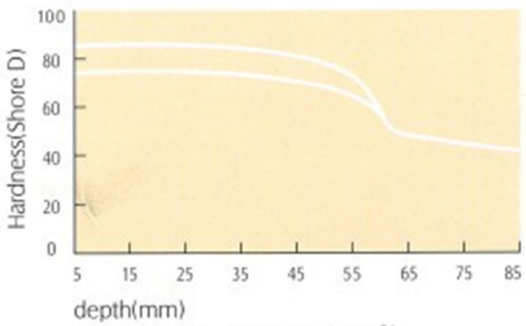

Figure 1. Hardness in Depth Profile


Figure 2.Mag.x200

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TiC Guide Rollers

Titanium carbide for wire rod mill has proved to be a cost-effective material for the manufacture of guide rollers for wire rod mills, having low density, excellent oxidation and wear resistance, coupled with relatively good resistance to thermal shock.

Sintered titanium carbide has been used extensively since the early 1980s for demanding wear-resistant applications; and in particular, in environments characterised by high temperature and oxidation. Thanks to its physical characteristics, especially its low density, titanium carbide (TiC) has been successfully applied in the manufacture of cassette guide rollers for hot steel rolling.

Titanium Alloys in Guide Roller Applications

Thanks to its low density, high wear, oxidation and temperature resistance, several different titanium based alloys are available for guide roller applications, but they can all be classified in two categories:

- Iron or steel matrix carbides, such as Ferrotic and Ferrodur-type alloys

These alloys are based on steel powder metallurgy with the titanium carbides dispersed in an iron-based matrix and sintered. These materials are magnetic and, in general, can be heat treated to reach hardness levels of around 60-65HRc. In the annealed state, hardness can be 45-50HRc for easy machining by lathe.

- The Ni-Cr -W matrix carbides

In this case the product is a true hardmetal in which a hardness of approximately 86HRa (approx. 70HRc) is reached by sintering. They are non-magnetic, non-heat treatable and cannot be turned by lathe, but must be ground by diamond wheels. The characteristics that are common to both the above carbide types and which makes these materials particularly suitable for guide roller application are:

- Low density
- Relatively good resistance to thermal shock
- Excellent oxidation resistance
- Excellent wear resistance

The density of TiC of approximately 6.5g/cm^3, ie, lower than steel and less than half that of tungsten carbide, means very low inertia and lower loads for a longer bearing life. Even with the introduction of titanium nitrite in new TiC grades for improved toughness, some plant practices must be applied to reduce thermal shock during operations. The basic difference between the two types of cemented TiC is thermal stability. As the Fe-based alloys are heat treatable, this makes the material easily worked during manufacture, since it can be machined at low hardness before heat treatment. This can, however, affect the performance in high-temperature applications, where it can lose hardness and wear resistance. In the Fe-free Ni-based alloys hardness is a 'built- in' characteristic and not the result of heat treatment such as plating or nitriding, to produce a superficial hardness. This means a material with isotropic mechanical characteristics, metallurgically and dimensionally stable up to 900-1,000°C, and with excellent resistance to oxidation both at normal and elevated temperatures. This makes the material workable only by diamond grinding wheels, but it does achieve consistently high performance.

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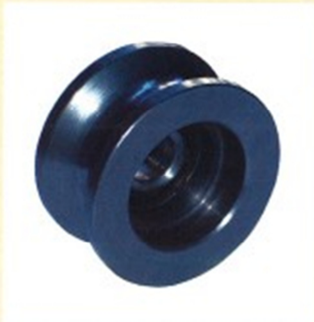
TiC Guide Rollers

Practices for Correct Application of TiC Guide Rollers

TiC guide rollers are relatively expensive, so maximum care must be used to avoid damage and maximise wear life. This includes care when handling to avoid dropping. The mill operating conditions must be such as to avoid local overheating and thermal shocks, hence special attention must be paid to cooling and bearings. The key point for effective roller cooling is rapid extraction of heat from the surface of the rollers that come in contact with the hot steel on each revolution. The aim is to keep the maximum surface skin temperature on each revolution just slightly higher than the inner roller body temperature, in order to minimise thermal fatigue and risk of damage. Therefore, in the pass area there must be a high volume of water at a relatively low pressure, which should be sufficient to break the vapour barrier but not so high that the water bounces back out of the pass without first extracting some of the heat from the hot surface. This water cooling must then remain on for three to four minutes, even after the mill has stopped. To prevent roller damage, bearing efficiency must also be checked and confirmed. The guide rollers must be pre-greased with high-performance grease on assembly into the guide. This does not affect the automatic on-line air/oil lubrication since the grease will melt away and the air/oil takes over. The air/oil lubrication must be fed through the centre of the guide roller pin or adjacent to the roller pin and the guide roller bearings must be pre-loaded. Polyamide cage bearings must be used which must be replaced after approximately 20 hours or 1,500–2,000t. This applies to all the block stands. In general, when bearings are replaced, the rollers are inspected and re-used if wear is not excessive. Redressing of our rollers must be carried out by grinding with diamond wheels. Both plunge and contour grinding can be used and typically a layer of 0.25mm is removed at each operation and rollers can be redressed approximately 8–10 times.

Cemented Based TiC Guide Roller

Grade	Main Components	Density g/cm^3	HRA Hardness (20˚C)	N/mm^2 Transverse Rupture Strength (20˚C)	KN/mm^2 Young's Modulus	Coefficient of Thermal Expansion $10^{-6}/^{\circ}C$	Applications
ZYT05	(Ti,W)C-Ni	6.40~6.70	≥84.5	≥1500	370	7.0	Guide roller
ZYT40	(Ti,W)CN-Ni	6.35~6.55	≥83.0	≥1600	360	7.3	Guide roller



Tungsten Carbide and Steel-bonded Carbide Guide Roller

Grade	Main Components	Density g/cm^3	HRA Hardness (20˚C)	N/mm^2 Transverse Rupture Strength (20˚C)	Applications
GT35	Fe+TiC	6.43	≥86.0	≥1450	Guide roller

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