

ZCC



Carbide Rolls



Zhuzhou Cemented Carbide Group Corp. Ltd.
www.zccamerica.com

Introduction of ZCC

Zhuzhou Cemented Carbide Group Corp. Ltd. (ZCC) has been a leading manufacturer of carbide products in China since it was built in 1954. It produces about 5,000 tons of Cemented Carbides, more than 10,000 tons of APT, Tungsten Powder, Tungsten Carbide Powder, Ready to Press Powder, and 800 tons of Cobalt Powder annually. Meanwhile, ZCC also owns separate plants to produce Molybdenum, Tantalum and Niobium Products.

ZCC has different business sectors which are for Hard Material, Cutting Inserts and Tools, Tungsten & Molybdenum, Cobalt, Tantalum & Niobium Products.

The Hard Material Sector is the biggest one in ZCC. Its annual production capability is around 600 tons of Carbide Rolls and Anvils, 1,000 tons of Carbide Rods, 600 tons of Mining and Road Milling Buttons, 500 tons of Carbide Molds & Dies, a few hundred tons for Special Products and Wear Parts.

Carbide Rolls are the key products since the mid of 1980s, now about annual 30,000 pieces of Carbide Rolls are supplied to the steel industry including Carbide Rolls for high speed rolling mills, Titanium Carbide Guide Rollers, Tungsten Carbide Composite Rolls, Mechanical Combined or Solid Carbide Rolls for seamless tube.

The “Diamond Brand” trademark has been named as “China’s Renowned Trademark” since 1999, and “Diamond Brand” cemented carbide has been awarded as “China’s Famous Brand” since 2004.

ZCC has established a global sales network since 2001. With branches in America, Europe, HongKong, and a liaison office in India, ZCC has been providing better local services for our customers around the world:

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R & D Center

ZCC



Testing Center

ZCC



Accepted by China National Accreditation Board for Laboratories. (Equivalent to ISO/IEC17025)





Main grades of carbide rolls

Grade	Chemical Composition %	Hardness (HRA)	Density (g/cm ³)	Transverse Rupture Strength (MPa)	Compressive Strength (MPa)
	Co				
YGH05	6	88.5	14.91	2620	3700
YGH10	8	87.8	14.71	2870	3500
YGH30	15	84.8	13.99	2870	3300
YGH45	20	83.6	13.55	2840	3100
YGH55	26	82.1	13.03	2700	3000
YGH60	30	80.8	12.72	2730	3000
	Co+Ni+Cr				
YGR30	15	84.2	13.98	2900	3200
YGR45	20	81.7	13.52	2720	3000
YGR55	26	79.5	13.01	2630	2800
YGR60	30	79.1	12.71	2630	2600
	Co+Ni+Cr				
PA10	10	86	14.52	2750	3800
PA20	15	84.4	13.95	2910	3700
PA30	20	82	13.47	2760	3300

Note: The above property data are typical.

Popular sizes of carbide rolls

O. D.	I. D.	Thickness
145 - 450	87 - 280	62 - 210

Operational suggestions for carbide rolls

Carbide roll is a kind of tool material which consists of tungsten carbide and binder with high hardness and excellent wear resistance. To take advantage of good wear resistance, longer lifetime and high efficiency of carbide roll during the high speed rolling, some tips are suggested as follows when purchasing and using carbide rolls.

A. Grade selection

An overall understanding of the properties of carbide grades is a basis for correctly selecting the grades for rolls used in the stands of rolling mills, and an optimal combination of grades is required for the various stands of rolling mills to get best rolling performance.

B. Roll installation

1. Rolls matching: Outside diameters of the pairs of rolls in one stand must be finished within $\pm 0.05\text{mm}$ of the same diameter.
2. Before mounting, rolls and conical sleeves should be kept in a 25-30°C isothermal case, at the same time, pour hot water on the shafts or free run about 20-30 minutes to pre-heat them.
3. Proper fitting is needed for the rolls, shafts for stands and conical sleeves, which can not be over tight or loose. When it is too tight, the rolls are in a tensile state and more fluctuation of rolling force will make the rolls break; when it is too loose, it causes the rolls, shafts and conical sleeves to slide relatively during rolling, which scratches conical sleeves and shafts resulting in cracks.
4. Before running the mill, make a check if the rolls meet the needs, and the rolls, the assembling faces of the conical sleeves and the shafts need to be cleaned. It is forbidden to knock at the rolls with a hammer or other hard materials when mounting and to impact each other during the transportation and installation to prevent rolls from damage.

C. Cooling requirement

Cooling is intended to reduce the influence on the thermal corrosion of rolls, fatigue and stress during rolling. It can prevent the rolls from cracking and slow down the diffusion of cracks, prolonging the life time of grooves. It plays an important role in optimizing the performances of rolls.

The reference data for cooling are as follows:

It is better that the temperature of cooling water does not exceed the ambient temperature by more than 6°C, usually less than 30-35°C, pressure of cooling water is 4-6 bar with a water volume of 350-400l/min (last two stands) and 250-350l/min (other stands). The water is jetted in a radial direction and the angle between the water jet and the rotating direction of rolls is 15-30 degrees. The width of the water column is about 2 times that of the groove and the water should be jetted directly into the grooves and the water should not be scattering or misty, the main nozzle should pour about 30% of water volume on the bar exit, the nozzle is about 20mm away from roll surface.

Water quality:

For YGH series: Medium or weak alkali water of $\text{PH} \geq 7.2$

For YGR and PA series: $\text{PH} \geq 7.2$ or weak acid water of $\text{PH} \leq 7.2$

The content of solid particles in the water < 15 milligram/liter

The solid particles in water work as abrasive grains when rolling and this would decrease rolls life time. After stopping rolling, the pass surface temperature should not exceed the ambient temperature by more than 20°C.

D. Reasonable rolled tonnage per pass

During rolling microcracks in grooves can not be avoided, and they need to be reground when they are at a certain depth (about 0.2-0.4mm based on experience). Excess rolling causes the depth of microcracks to extend rapidly and dangers of crushed rolls increase, which should be prevented.

The rolled tonnage normally after each regrinding is suggested as follows for wire rods in high speed rolling mills which may vary depending on different rolling conditions.

- Stands of pre-finishing mill: 3,500-4,000 tons
- 1-2 stands of finishing mill: 3,000-4,000 tons
- 3-4 stands of finishing mill: 3,000-4,000 tons
- 5-6 stands of finishing mill: 2,000-3,000 tons
- 7-8 stands of finishing mill: 2,000-3,000 tons
- 9-10 stands of finishing mill: 1,000-1,800 tons
- Stands for reducing and sizing mill: 600-1,200 tons

E. Regrinding of grooves

Normally microcracks will occur after the rolling of the groove for some time and when the microcracks extend to about 0.2-0.4mm the roll has to be reground. Microcracks must be reground thoroughly when regrinding, otherwise the unground microcracks will extend more rapidly during next rolling and probably make the roll crack. Rolls of all grades would be ground by diamond wheel but the YGR55 and YGR60 rolls may be turned.

The recommended amount of regrinding after normal rolling is as follows:

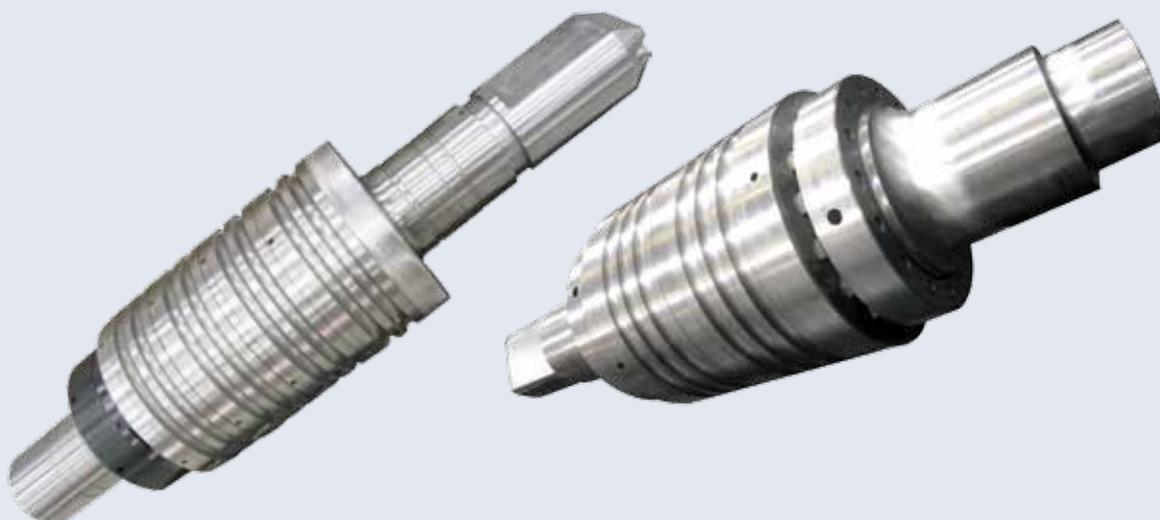
- Rolls for stands 9-10 of finishing mill (0.4-0.6)mm
- Rolls for stands 1-8 of finishing mill (0.7-1.2)mm
- Rolls for stands of pre-finishing mill (1.2-2.0)mm

Composite rolls for hot rolling

For rolling rebars and bars (round, flat and angle bars), composite rolls can substantially reduce the times of pass changes and roll changes, reduce labor intensity, increase productivity, improve surface quality and yield of rolled steel.

With hydraulic nut locking system and in-feed of oil with a huge pressure, the hydraulic nut creates an axial pre-tightening force and fasten the carbide rolls to the shafts. The system is practical and reliable and ensures higher performances of composite carbide rolls under the protection of a proper preload stress.

Mechanical assembly system is also available as per customer's need.



Carbide rolls for hot rolling of seamless tubes

The lifetime of carbide roll is 50-80 times that of conventional cast iron roll when they are used at tension tube reducing machines for hot rolling of seamless tubes, and the surface quality and dimensional precision is substantially improved.

Based on the conditions of tension tube reducing machines (rolling force, speed, tube diameter), either integrated or composite rolls can be workable.

Suggested carbide grades are YGR55 and YGR60.



Titanium carbide guide roller



Grade	Chemical Composition	Mechanical Properties		
		Hardness HRA	Transverse Rupture Strength MPa	Density g/cm ³
GT35	Fe+TiC	86.5	1450	6.43

Carbide rolls for cold rolling

Rolling steel strip or non-ferrous metals e.g. Al, Cu with improved surface finish and longer life time.

The grade of carbide roll would be subject to specific rolling application.



Carbide rolls for cold rolling rebars



Grade	Chemical Composition		Mechanical Properties		
	WC %	Co+Ni+Cr %	Density g/cm ³	Hardness HRA	Transverse Rupture Strength MPa
YGH30	85	15	14.02	84.9	2700

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