



PRECISION METALLURGY



**PRECISION METALLURGY
INDIA PVT. LTD.**



BRIEF INTRODUCTION TO TUNGSTEN CARBIDE ROLL RINGS

Tungsten carbide roll rings possess good thermal conduction property. Compared with other materials, it is much better in terms of heat-resistance, wear-resistance and strength. What's more it's hardness reduces a little under the condition of high temperature. So, tungsten carbide roll rings is invented with the appearance with high speed wire rod mill. With development and improvement, it is widely applied in the production of high speed wire, bar and deformed steel bar.

As far as the materials for our products, there are two series as Wc-Co and Wc-Co-Ni-Cr which possess the good comprehensive mechanical properties. The bending strength and impact toughness reach 2200 Mpa and $(4-6) \times 10^6 \text{J/m}^3$ respectively. Its hardness and wear resistance comes from tungsten carbide (Wc) while the toughness and strength depend on the binding agent (Co-Ni-Cr).

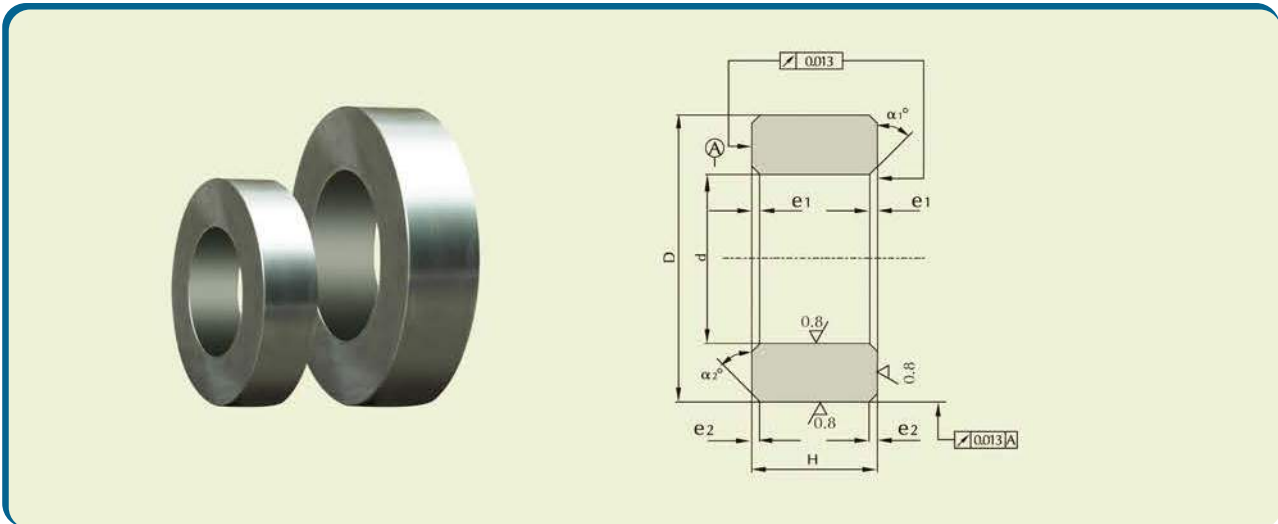
At present, the finishing mill may resist heavy duty and strong impact. Thus, the high hardness and good thermal fatigue resistance are the primary factors, which are prior to wear-resistance. While there is low load and impact for the rear stand, we shall pay more attention to the wear-resistance and thermal fatigue resistance of roll rings.

This manual describes the grades and properties of our cemented carbide roll rings in detail so that you can make the correct choice.





DIMENSIONS AND PRECISION OF FINISHED CARBIDE ROLL RINGS



DIMENSION RANGE OF FINISHED ROLL RINGS

(D) External Diameter (mm)	(d) Inner Diameter (mm)	(H) Height (mm)
100 -480	50 -380	20 -200

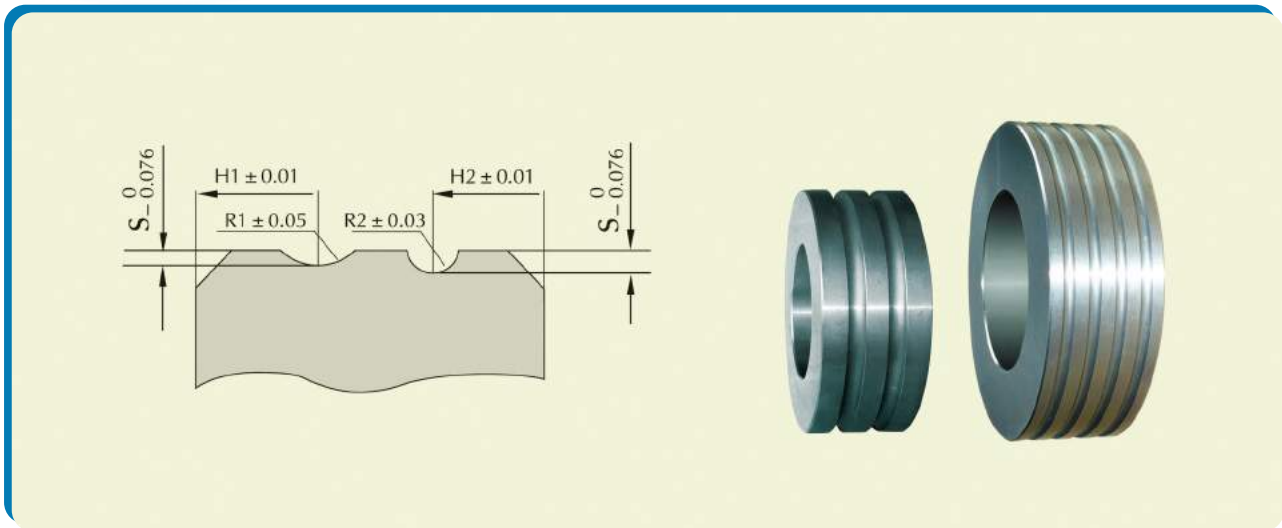
TOLERANCES ALLOWABLE FOR THE O.D., I AND HEIGHT OF ROLL RINGS

PRECISION CLASS	(D) ≤ 200mm		(D) ≥ 200mm		SPECIAL REQUIREMENTS
	BETTER	ORDINARY	BETTER	ORDINARY	
OUT DIAMETER (mm)	±0.02	±0.05	±0.03	±0.05	
INNER DIAMETER (mm)	+0.0200	+0.0350	+0.0250	+0.0500	
HEIGHT (mm)	±0.025	±0.10	±0.05	±0.10	

Note: We can supply rings according to the drawings provided by the customers.



TECHNICAL SPECIFICATIONS OF FINISHED CARBIDE ROLL RINGS

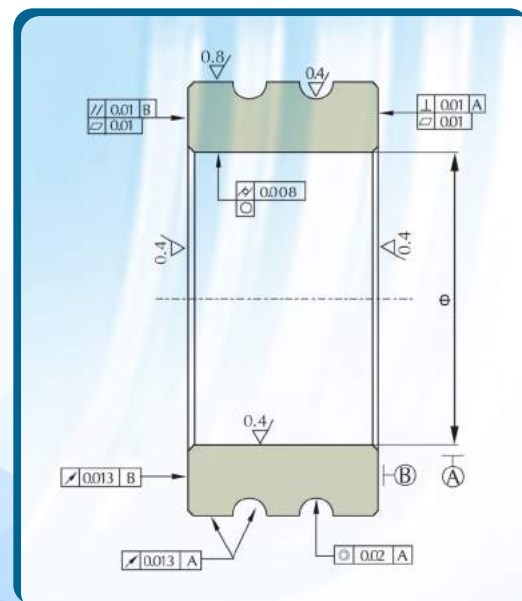


THE ALLOWABLE DEVIATION OF CARBIDE ROLL RINGS

- Radial runout of groove $\leq 0.013\text{mm}$
- Radial runout of periphery $\leq 0.013\text{mm}$
- End face runout $\leq 0.02\text{mm}$
- End face planeness $\leq 0.01\text{mm}$
- End face parallelism $\leq 0.01\text{mm}$
- Inner hole cylindricity $\leq 0.01\text{mm}$

ROUGHNESS OF CARBIDE ROLLS

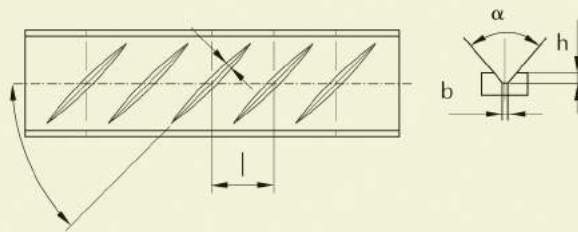
- Inner hole roughness 0.4 m
- Periphery roughness 0.8 m
- End face roughness 0.4 m



The allowable deviation in external diameter, internal diameter and height is to be determined based on customer needs.



ROLL RINGS FOR HIGH SPEED ROLLING OF RIBBED STEEL BARS



COMPOSITE TUNGSTEN CARBIDE ROLL RINGS

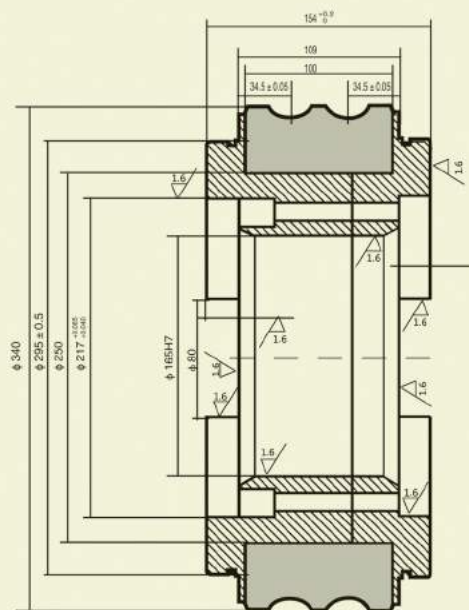




TABLE OF GRADES AND PROPERTIES OF CARBIDE ROLL RINGS AND RELATED DATA

Grade	Wc(%)	Co(%)	Ni(%)	Cr(%)	G/cm ³	≥HRA	≥N/mm ²
LS08A	92		8		14.7±0.15	88	2800
LS10A	90		10		14.5±0.15	87.5	2750
LS12A	88		12		14.2±0.15	86	2700
LS15A	85		15		14.1±0.15	85	2650
LS18A	82		18		13.7±0.15	83.5	2600
LS20A	80		20		13.5±0.15	82.5	2550
LS25A	75		25		13.1±0.15	80.5	2450
LS30A	70		30		12.7±0.15	79	2350
LS06C	94	6	±0.15		14.8±0.15	89	2850
LS08C	92	8	±0.15		14.7±0.15	88.5	2750
LS10C	90	10	±0.15		14.5±0.15	88	2700
LS15C	85	15	±0.15		14.1±0.15	85	2650
LS20C	80	20	±0.15		13.5±0.15	83	2600
LS25C	75	25	±0.15		13.1±0.15	81.5	2550
LS30C	70	30	±0.15		12.7±0.15	80	2450
LS32C	68	32	±0.15		12.5±0.15	78.5	2300
LSA20	90		10		14.4±0.15	87.5	2700
LSA25	88		12		14.3±0.15	86.5	2650
LSA30	85		15		14.2±0.15	85	2600
LSA40	82		18		13.7±0.15	83.5	2550
LSA45	80		20		13.5±0.15	82.5	2500
LSA55	75		25		13.1±0.15	80	2400
LSA60	70		30		12.8±0.15	78	2300
LSC40T	85		15		14.1±0.15	84.5	2700
LSC45T	80		20		13.5±0.15	84	2580



MANUFACTURING PROCESS OF TUNGSTEN CARBIDE ROLL RINGS

TURNINGS

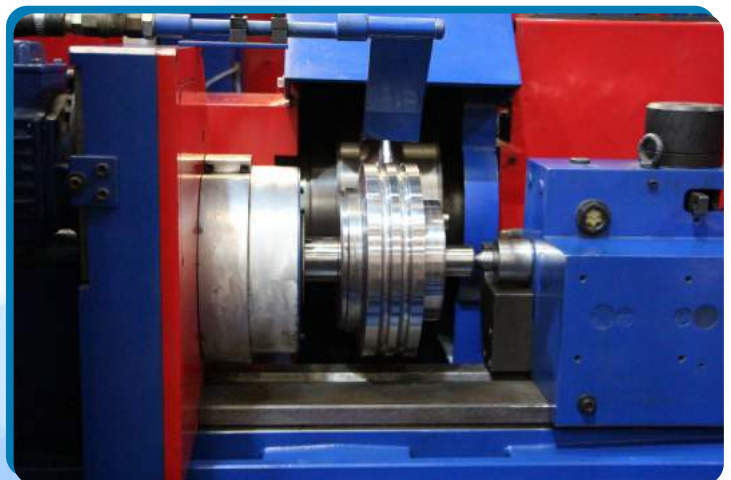
A machine designed for hard turning of tungsten carbide is a necessary pre condition. This kind of processing permits, subsequent to sintering, a low-cost and fast premachining of flat sides, inner diameters and also the net shaping of the grooves.

Besides the tungsten carbide grain size needs to be taken into account. Too large grains can cause a 'chattering' of the cutting edges. Too small grains induce an increase of the hardness.



GRINDING

Grinding compared to hard turning results in substantially improved surface quality. This may be of importance in relation to inner diameter fitting or in work areas with high requirements to the surface quality. But in general terms all non-turnable tungsten carbide require grinding in order to attain the geometrical accuracy.





CAUTION OF APPLICATION OF TUNGSTEN CARBIDE ROLL RINGS

Cemented carbide roll rings, composed of tungsten carbide and binding metal, is one kind of tool material with high hardness and good wear-resistance. In order to make full use of the above advantages of cemented carbide roll rings, the manufacturer of high-speed wire rod shall pay more attention to the following items during the course of purchasing and using it.

1 MAKE CORRECT CHOICE FOR THE TUNGSTEN CARBIDE USED BY THE FINISHING MILL.

Before determining the grade of cemented carbide for every stand, we shall have a thorough understanding about their properties so as to make correct choice.

2 INSTALLATION OF TUNGSTEN CARBIDE ROLL RINGS

The sleeve insertion and assembly of cemented carbide roll rings shall be carried out in accordance with the requirements of precision. There shall be appropriate space between the roll rings and axle between the roll rings and sleeve. The fit is neither tight nor loose. You should check whether the roll rings conforms to the technological requirement and clean the mounting surface of roll rings, sleeve and axle before the installation. It is prohibited to beat the roll rings with hammer or other hard things while assembling.

3 REQUIREMENT FOR THE COOLING OF ROLL RINGS AND COOLING WATER DURING THE COURSE OF ROLLING

Because of the negative effect of heat corrosion, thermal fatigue and thermal stress, the net-shaped thermal fatigue crack usually appears while the collar working. With the increase of cracks, small parts may come off and even the roll rings is broken. We adopt the cooling method to reduce the bad effect, prevent the cracks from stretching and prolong the durability of rolling groove, which plays a positive role on the cemented carbide roll rings. The parameters of cooling water are as follows: temperature no more than 35 degree Celsius, pressure of 0.4-0.6Mpa, volume of 24-30m³ per stand per hour, radical direction for spraying water, the angle of 15-30 degree between the spraying direction and rotating direction of roll rings. The water is twice as wide as the rolling groove and directly sprayed into the groove without scattering.

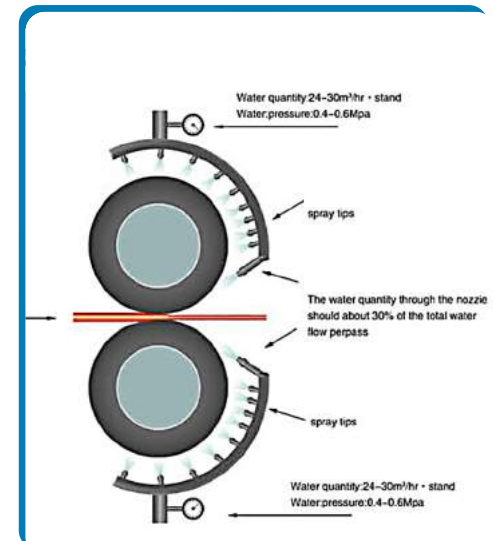


WATER QUALITY REQUIREMENT:

For LSC series medium or weak alkali water of PH>7.2

For LSC series or PH<7.2 weak acid water of PH>7.2

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



4 DETERMINE THE REASONAL YIELD

It is inevitable to find the the microcrack on the rolling groove. The microcrack will gradually extend, stretch and deepen. The groove shall be repaired immediately while the depth of crack reaching 0.2-0.4 mm. Otherwise, the crack will deepen quickly, which leads to risk of broken roller.

The range of normal yield is regulated as follows:

Stands of pre-finishing rolling mill: (5000-7000)tons

1-2 Stands of finishing rolling mill: (2000-3000)tons

3-4 Stands of finishing rolling mill: (2000-3000)tons

5-6 Stands of finishing rolling mill: (1500-2500)tons

7-8 Stands of finishing rolling mill: (1500-2500)tons

9-10 Stands of finishing rolling mill: (1200-2000)tons

Stands for reducing diameters: (1000-1500)tons

5 REPAIR OF GROOVE

It is normal to find micro cracks on the rolling groove. The groove shall be repaired immediately while the depth of crack reaching 0.2 mm. It is necessary to prevent the roller from being broken. While repairing, we must ensure to remove the crack thoroughly. Otherwise, it will bring a potential risk to next rolling. It is difficult and inconvenient to check if the surface is polishing. To ensure complete removal of microcrack, we can increase the grinding quantity. Under the normal condition, the repair is controlled in range of:

Roll rings for stands 9-10 of finishing rolling mill(0.4-0.6)mm

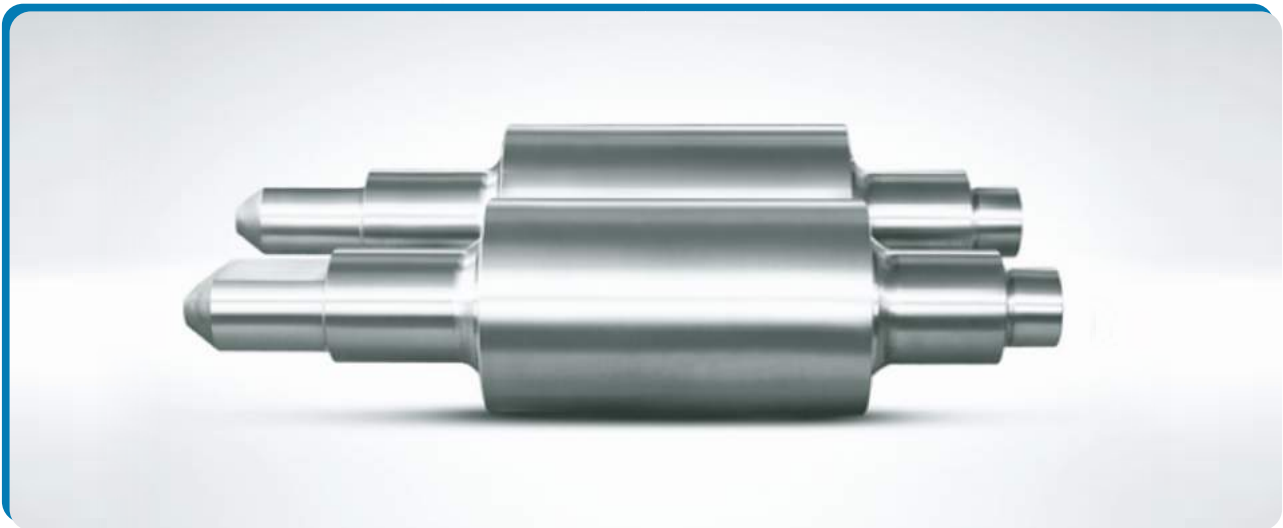
Roll rings for stands 1-8 of finishing rolling mill(0.7-1.2)mm

Roll rings for stands of pre-finishing rolling mill(1.2-2.0)mm



HIGH SPEED STEEL ROLLS (HSS)

Steel rolling technology has progressed in recent years, improving product quality, enhancing productivity, and reducing production costs. This trend has increased the demand for rolling mill rolls of higher performance, longer life, and higher reliability. High Speed Steel (HSS) rolls are composed of high alloy and high carbon HSS outer shell with either a forged steel or nodular iron core. This type of molten metal for HSS is poured along the core material continuously or spun cast. HSS provides excellent hardness, wear resistance, and high temperature properties. The high-carbon, high-alloy outer shell has high hardness at high temperatures, providing excellent wear resistance. The outer shell has a fine microstructure without gravity segregation due to its special casting method. The boundary between the outer shell and core is combined by metallic diffusion.



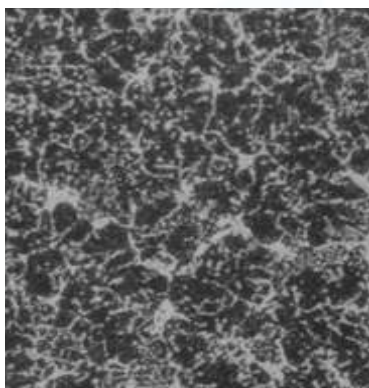


TECHNICAL SPECIFICATIONS

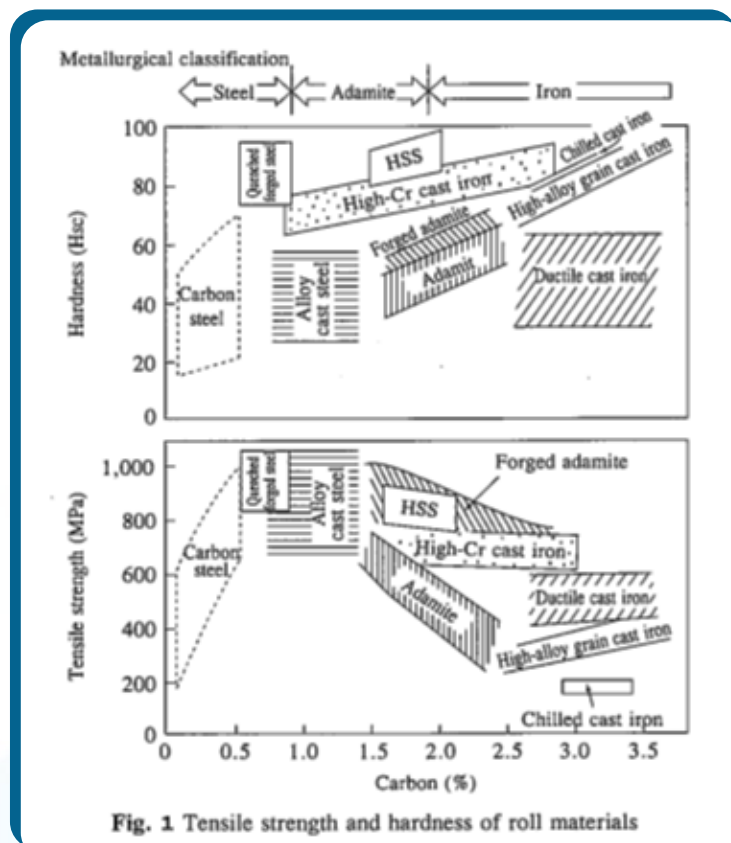
Hardness: The alloy content is higher than that of conventional roll material, with two or more types of carbides being dispersed. The hss rolls are harder than roll materials of equivalent carbon content as shown in fig and are expected to provide higher resistance to wear and surface roughening.

CHEMICAL PROPERTIES

With the addition of certain chemicals like of Vanadium, chromium, tungsten, molybdenum, niobium etc. HSS rolls outer shell gets good thermal stability, high hardness under high temperature and excellent wear and tear resistance against hot material.



HSS Shell Photomicrograph



C	Si	Mn	P	S	Ni	Cr	Mo	W	V
1.50/2.20	0.31/1.00	0.40/1.20	0.030	0.025	0.00/1.50	3.00/8.00	200/8.00	0.50/8.00	2.00/9.00



QUALITY CONTROL

Our quality control department is equipped with the latest testing equipments to analyse various physical and chemical properties to ensure the highest quality.



CARBON AND SULFUR ANALYZER



TENSILE TESTING MACHINE



HARDNESS TESTER



DIRECT READING SPECTROMETER



PHYSICAL LAB



ADVANTAGES

Lower Roll Cost per Tonne: It is estimated that the useful life of HSS rolls is almost 5-6 times more than that of conventional rolls. Meaning that over all cost of rolls consumed per tonne of finished steel produced is much less.

Increase in Production: Because of the longer product life of the HSS Rolls, the time required for repetitive changing of roll pass is considerably reduced. This regular change of roll pass consumes a lot of time and results in production loss. In addition to production loss, this also accounts for huge energy loss.

Zero wastage of raw material: Since the grooves/ passes of the HSS rolls have a greater resistance to wear and tear, the shapes of the grooves are stably maintained. Because of the high swelling factor of the HSS rolls with time the barrel swells in turn reducing the size of the worn out grooves.

SERVICE COMMITMENTS

We strive to provide our customers with the highest quality of high speed steel rolls and tungsten carbide rings in the country. From the procurement of raw materials till the dispatch stage, every step is guided by well structured systems to provide value to our customers. We aspire to become the global leaders in the industry in the coming years by strictly adhering to our motto “quality first, integrity first”.





HIGH PERFORMANCE SPECTROFYIED ROLLS (HPS)

Our HPS is a new material developed for the finishing stand. The hardness is **HSD70-80**. The product has *good wear resistance, uniform wear, good impact resistance, no block dropping phenomenon, good heat resistance fatigue performance, and easy to process*. The negative tolerance of rolled material can be effectively controlled, the surface quality of rolled material is good, the requirement of cooling water is far lower than that of **CARBIDE ROLLS**. The average steel passing capacity of its single groove can reach 2-3 times of that of high Ni-Cr roll, and the total steel passing capacity can be guaranteed 2 times on average. The groove can be changed after 1-2 continuous shifts, which effectively improves the continuous operation time of the mill.





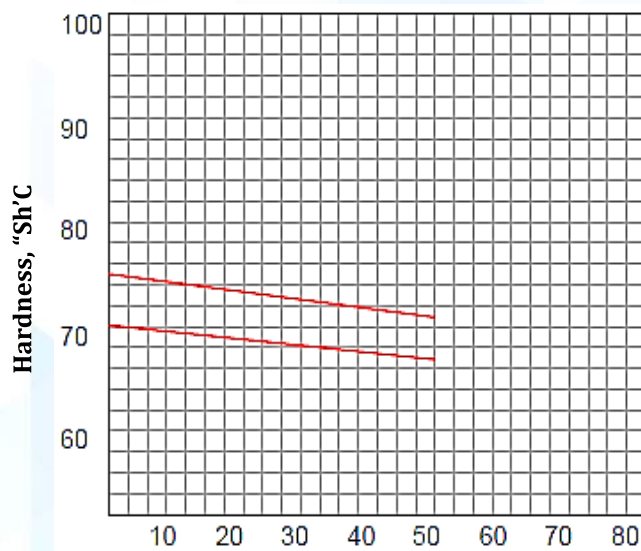
COMPARATIVE ANALYSIS OF COST ADVANTAGE:-

ITEM	HPS Rolls	DPIC Rolls	SGACC OR HIGH BORON ROLLS
Roll Model	Φ300*500*1150	φ300*500*1150	φ300*500*1150
Roll Weight (t/pc)	0.50	0.50	0.50
Rolled Specification (rebar)	φ10 four-slitting	φ10 four-slitting	φ10 four-slitting
Slot Number	14	14	14
Available Cycles	8	5	6
Steel Passing of single slot (t)	≥140-150	~70-80	~90-100
Total Steel Passing of 1 pair of Roll (t)	16800	5600	8400
Tensile Strength (mpa)	600-700	250-350	400-500

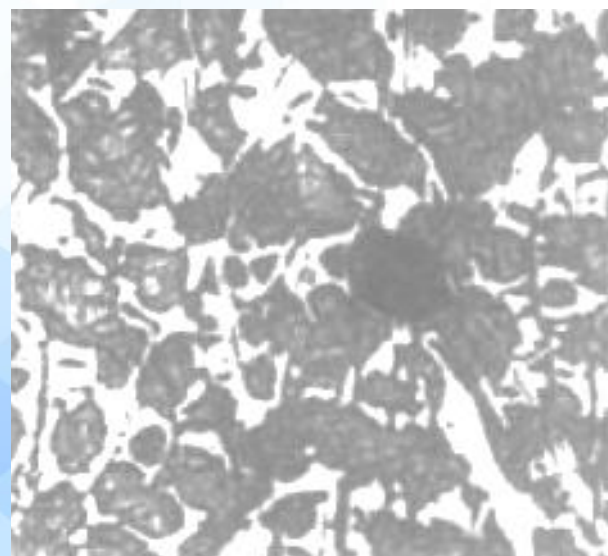
CHEMICAL COMPOSITION:-

Grade(HPS)	HSD	C	Si	Ni	Cr	Mo
V.SF 150	70-80	3.40-3.80	0.60-1.20	2.50-5.00	0.70-5.90	0.85-2.00
V.AC130	65-75	3.25-3.70	1.25-1.50	1.8-4.00	0.60-4.70	0.60-1.5
V.DC 110	62-72	3.00-3.50	1.30-1.60	1.3-3.00	0.50-3.00	0.40-1.00

HARDNESS DROP CURVE



Distance from Barrel Surface, mm



Photomicrograph
(Hs 70-75 °Shc)

X100



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