



TSR | RUNFU



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Shanghai Tangshan Heavy Machinery International Co., Ltd
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Post Code:200131 Website: www.tsroll.com Email: service@tsroll.com

fACTORY: Jiangsu Runfu Machinery Roll Manufacturing Co., Ltd
Address: No.2 Rongwen Road, Huangjing Town, Taicang, Jiangsu, China

**Trust Stemming from
Reliability**

OUR COMPANY

TSR is an integral company capable of supplying all types of rolling mill rolls as well as technical assistance services to our customers in order to improve the operation of the rolling mills.

TSR has a team of experts composed of Doctors and Engineers with long experience in Metallurgy and Rolling. Our goal is to supply the best rolls at the best price, allowing our customers to improve their quality and TCO.

Guided by our desire to offer our customers the best rolling mill rolls, TSR has signed a cooperation agreement with RUNFU (Jiangsu Runfu Machinery Roll Manufacturing Co. Ltd), a private company manufacturer of high-quality forged steel rolling mill rolls.

TSR

Trust Stemming from Reliability



RUNFU

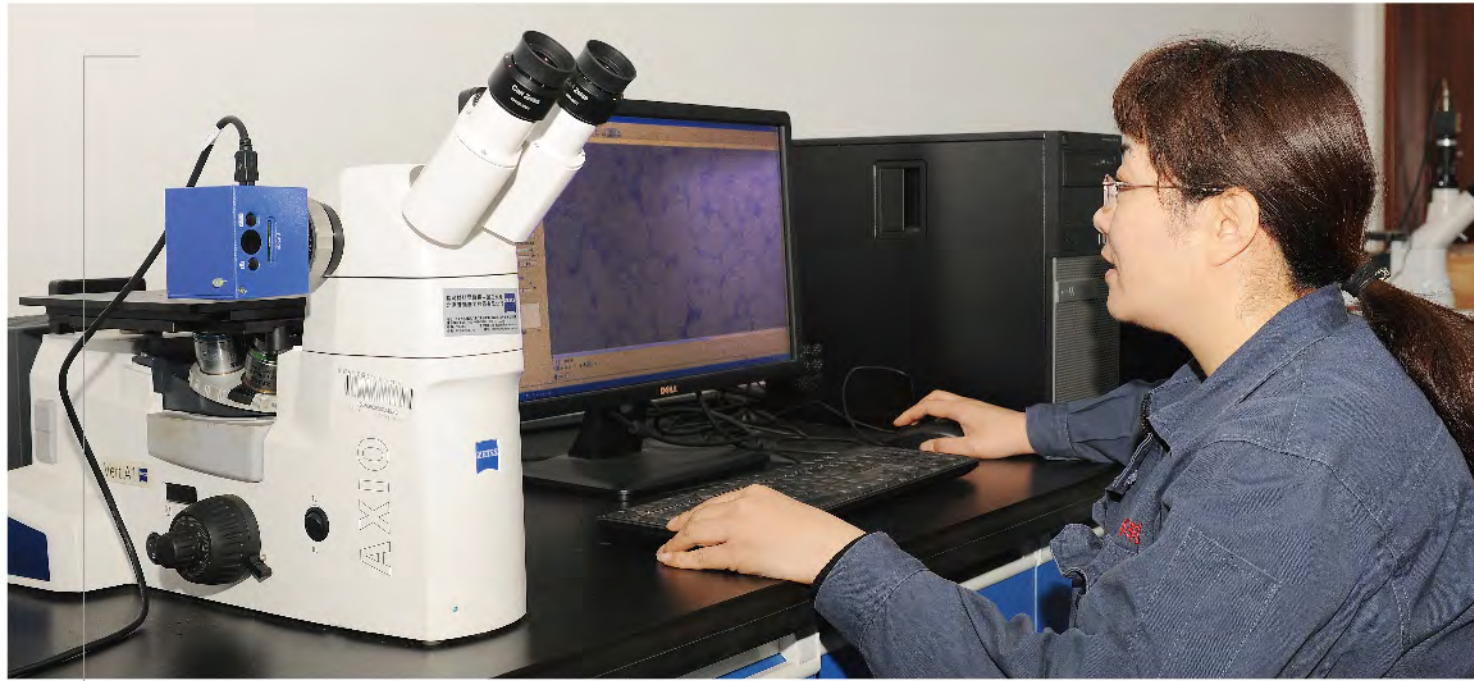
TSR | RUNFU

Jiangsu Runfu Machinery Roll Co., Ltd (TSR RUNFU) is situated in the prosperous Yangtze Delta of Southeast China, it is a specialized manufacturer for ferrous and non-ferrous cold mill rolls with a designed manufacturing capacity of 10000 tons. The company is located in Taicang City, Jiangsu Province, 40 miles from Shanghai and 30 miles from Suzhou City. The region has a convenient transportation network, it is known for the numerous high road networks and the Taicang Port, the sailing port of the celebrated Tang dynasty Zhenghe Voyage. At present, we are capable of producing 2%C, 3%Cr and 5%Cr cold mill rolls, and also the materials of cold work die steel, hot working die steel, Semi High Speed Steel, High Speed Steel mill rolls etc. Our excellent cold mill rolls have been sold to various steel companies both at home and abroad.



MODERN WORKSHOP





R & D

Only companies that actively invest in R&D in order to meet the needs of their customers can survive in an increasingly competitive market. TSR RUNFU is always listening to the needs of our customers, actively pioneering innovation with high quality products to satisfy our customers' demands.

Our company has passed ISO 9001:2008 quality system certification and ISO14001:2004 environmental system certification. Many of our products have won the national patents, and have been assessed as a high-tech enterprise in JIANGSU province and SUZHOU municipal engineering research and development center.

Achievements:

High-tech Enterprise

National Patent: Double frequency quenching technology

National Patent: Nitrogen quenching facilities and process flow

High precision aluminum foil cold mill rolls. Surface hardness uniformity controlled within 1.5 HSD

Extra-deep hardened rolls.



ISO9001:2015



ISO:14001:2015

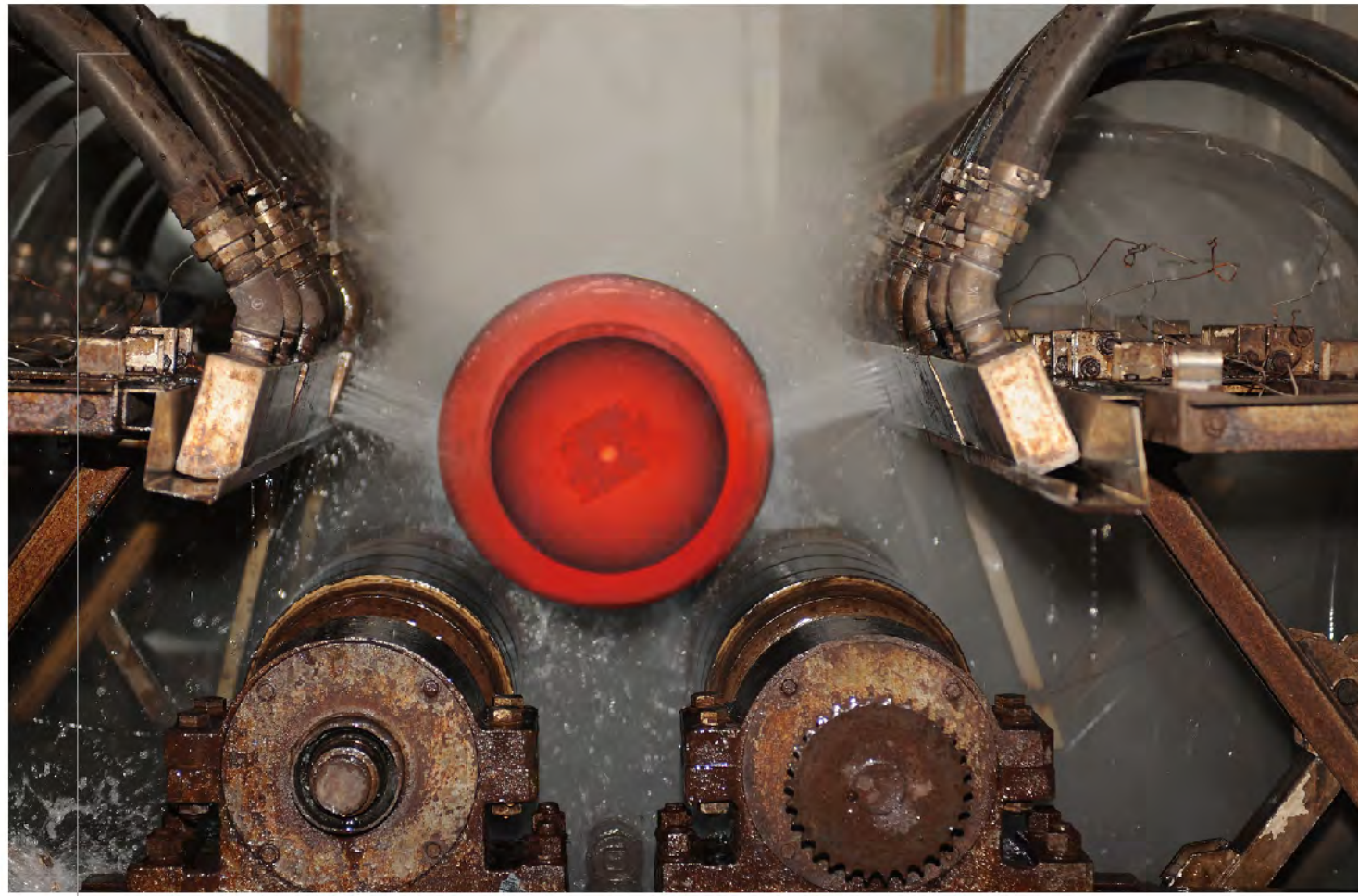
R & D facilities

Microscope

Universal tensile testing machine

Infrared carbon sulfur analyzer

Direct reading spectrometer.



HEAT TREATMENT

During the roll manufacturing, many materials require to go through one or more Heat Treatment cycles to reach the most appropriate mechanical conditions and the best microstructure. The resistance furnace used by TSR RUNFU can realize a multi-point accurate temperature control and ensure the stability of temperature in the furnace. The conditions of heating and cooling environment in different furnaces are all controlled by computers, to make sure that the rolls processed by different furnaces have the same structure and properties.

Heat treatment facilities

Large-sized double frequency quenching equipment

Nitrogen quenching tanks

Spray quenching machines

Large-sized car type heat treatment furnaces

Program-control differential hardening furnace





MACHINING

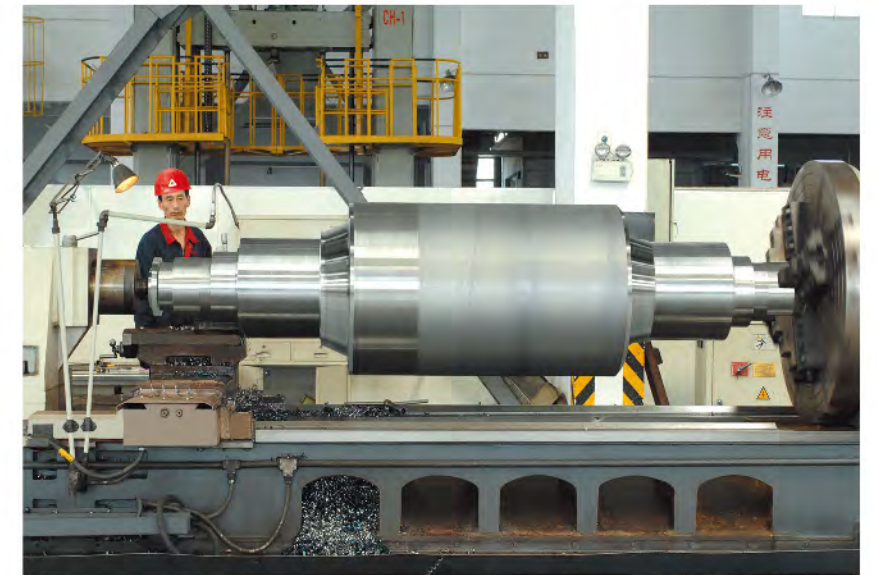
CNC Lathes, CNC Grinders and a series of automatic processing equipment are operated and inspected by skilled staff who engaged in roll manufacturing for years, which means they can calmly deal with the strict accuracy and tolerance requirements.

Machining facilities

CNC Roll lathes

CNC grinders

Large sized boring-milling machine



QUALITY ASSURANCE

Our Company keeps every step of the roll manufacturing under strict supervision, from heat treatment to machining. We are pleased to say that we realize the continuous quality control of the whole process. The data of all kinds of inspection instruments is collected directly by computer, which provides a modern means and a more efficient way for the quality controlling process.

INSPECTION	BLANK	ROUGH MACHINING	QUENCHING	HEAT TREATMENT	FINISH MACHINING
Hardness			○	○	○
Dimensional	○	○			○
Chemical	○				
Temperature			○	○	
Micro				○	
Weight	○				○
Ultrasonic	○	○		○	○
Surface UT					○
Tensile				○	
Time			○	○	



More than 20 inspection procedures

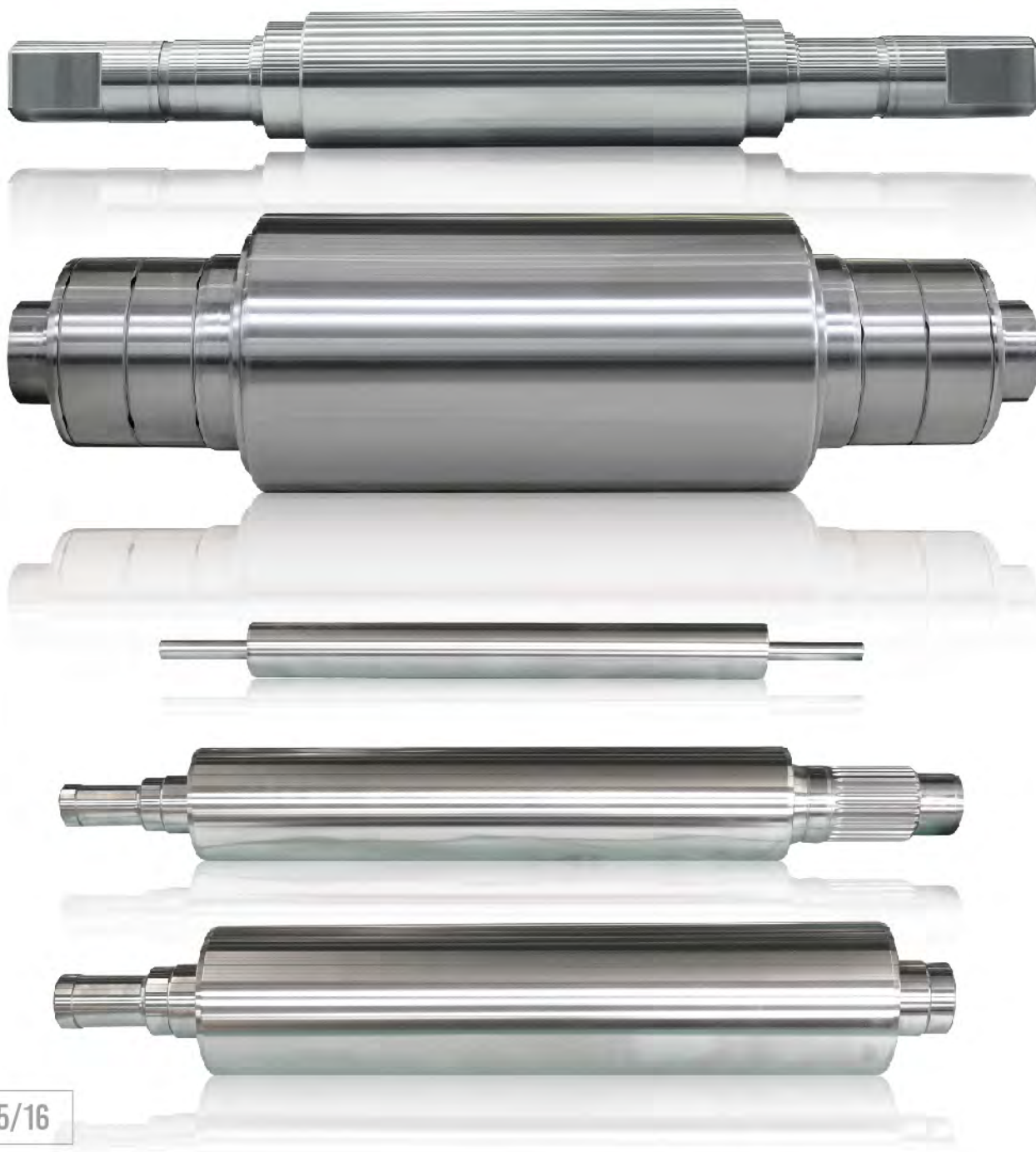
Recheck the finished product before transport

In 2017, our company has passed ISO9001-2008 quality system certification.

It is TSR's consistent commitment to quality management, that wins our products a recognition by dozens of customers worldwide.

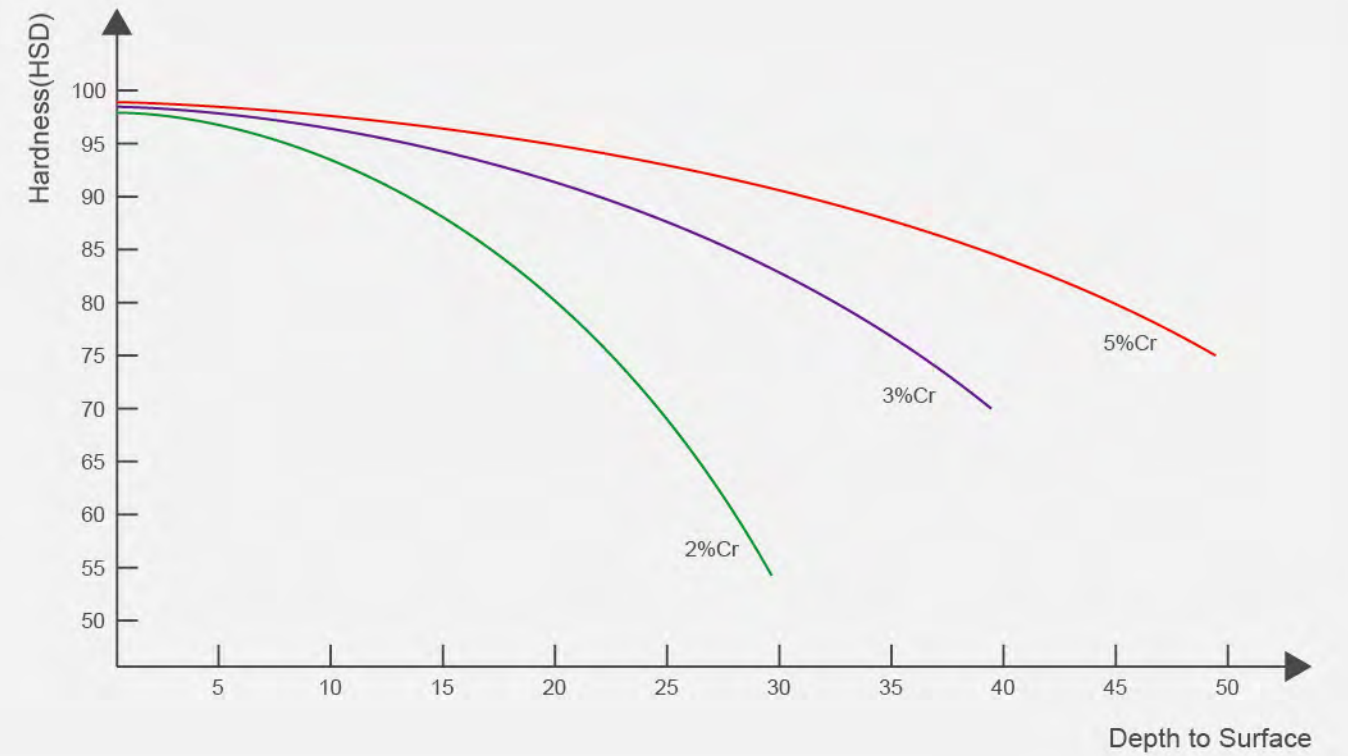
PRODUCTS

- 1. 6-High HC Mill Work Rolls
- 2. 6-High HC Mill Intermediate Rolls
- 3. Tandem Cold Mill Rolls
- 4. Non-Ferrous Cold Mill Work Rolls
- 5. Roll Shafts
- 6. Backup rolls
- 7. Aluminum Foil Mill Backup rolls
- 8. Wide Aluminum Plate mill work rolls
- 9. High-precision Aluminum Foil Mill Work Rolls
- 10. Sendzimir Rolls



HARDENING LAYER DEPTH FOR DIFFERENT MATERIALS OF MILL ROLLS

Roll Disassemble Experiment



ROLL MATERIALS AND APPLICATION RANGE

Application Range

Material	Hardness (HSD)	Cold Mill		Non-ferrous Strip & Foil Mill Work Rolls	Back-up Rolls	Multi-Roll Mill		Hot Mill Work Rolls	Roll shafts	Table Roller	Rolls for Battery Pole Flake
		Work Roll	Intermediate Roll			Work Roll	Intermediate Roll				
2%Cr	95-105			○							
	90-98	○				○					○
3%Cr	85-95	○				○					
	75-85		○			○					
5%Cr	50-80				○						
	50-60							○			
Cold Working Die Steel	75-95	○				○					
	75-85					○					
Hot Working Die Steel	75-85					○					
	60-75							○			
HSS	85-95	○				○					
	75-85							○			
Semi-HSS	85-95	○				○					
	75-85		○			○		○			
Alloy Structure Steel	40-55								○	○	

Chemical composition of the cold mill WR,IMR and BUR

Roll Type	Grade	Material	Chemical Composition							
			C	Si	Mn	Cr	Ni	Mo	V	P
WR & IMR	2%Cr Series	9Cr2Mo	0.80-0.95	0.25-0.45	0.2-0.4	1.7-2.1	<0.25	0.2-0.4	/	≤0.02
		86CrMoV7	0.80-0.95	0.25-0.45	0.2-0.4	1.7-2.1	<0.25	0.2-0.4	0.1	≤0.02
	3%Cr Series	9Cr3Mo	0.75-0.95	0.25-0.45	0.2-0.55	2.5-3.5	/	0.2-0.3	/	≤0.02
		MC3	0.75-0.95	0.2-0.9	0.2-0.6	2.5-3.2	0.2-0.8	0.2-0.6	<0.25	≤0.02
BUR		YB-50	0.4-0.65	0.2-0.6	0.4-0.85	2.0-3.0	0.2-0.8	0.3-0.7	0.05-0.15	≤0.02
WR&IMR	5%Cr Series	MC5	0.7-0.95	0.2-0.9	0.2-0.6	4.5-5.4	0.1-0.8	0.1-0.6	<0.25	≤0.02
BUR		YB-70	0.4-0.85	0.3-0.7	0.4-0.80	4.5-5.5	0.2-0.8	0.3-0.8	0.05-0.2	≤0.02

The property of the cold mill WR,IMR and BUR

Grade	Material	Mill	Roll Type	Specification
2%Cr	86CrMoV7	Single stand mill	WR	Depth 12 ~ 20mm
	86CrMoV7	Single stand mill	WR	Depth 12 ~ 20mm
	9Cr2Mo	Single stand mill	WR,IMR	Hardness Depth 10 ~ 15mm
3%Cr	MC3A	Single stand mill tandem mill	WR,IMR,	Ultra-deep Hardness Depth > 25mm
	MC3	skin pass mill	WR	Hardness Depth > 20 anti-roll mark
	YB-50	Single stand mill tandem mill	BUR	Hardness Depth 20 ~ 60mm
5%Cr	MC5	Single stand mill tandem mill	WR	Ultra-deep Hardness Depth ≥ 40mm
	MC5(A-H)	Single stand mill tandem mill	WR	high wear resistance. rollmark/uniformity
	YB-70	Single stand mill tandem mill	BUR	Hardness Depth 50-100mm

ROLL MATERIALS AND APPLICATION RANGE

Chemical composition of the Cluster Mill Rolls

Roll Type	material	Chemical Composition % Wt									
		C	Si	Mn	P	S	Cr	Mo	W	V	Co
WR	Cr12MoVCo	1.40-1.6	≤0.6	≤0.6	≤0.025	≤0.015	11.00-13	0.80-1.2	—	0.70-1	0.35-0.5
	Cr12Mo1V1 (D2/ SKD11)	1.45-1.65	≤0.4	≤0.6	≤0.025	≤0.015	11.00-13	0.70-1.1	—	0.7-1.1	—
	W6Mo5Cr4V2 (M2)	0.80-0.9	0.20-0.45	0.15-0.4	—	≤0.015	3.80-4.4	4.50-5.5	5.50-6.75	1.75-2.2	—
	8%Cr	1	0.7	0.5	≤0.025	—	8	2	—	1.2-1.5	—
IMR	4Cr5WMoSiV (H12/SKD62)	0.38-0.45	0.80-1.2	0.20-0.5	≤0.025	≤0.015	4.80-5.5	1.00-1.5	1.00-1.5	0.30-0.6	—
	X63CrMoV51	0.60-0.65	0.80-1.2	0.30-0.5	≤0.030	≤0.020	5.00-5.5	1.00-1.3	—	0.25-0.35	—
	5H12	0.48-0.55	0.80-1.2	0.20-0.5	≤0.025	≤0.015	4.80-5.5	1.00-1.5	1.00-1.5	0.30-0.6	—
	SHSS	0.72-0.8	0.80-1.05	0.25-0.45	≤0.02	≤0.015	4.80-5.2	1.00-1.2	—	0.40-0.6	—

The Properties of Cluster Mill Rolls

Roll Type	Grade	Material	Performance Characteristics	Barrel Hardness	Apply to	Hardness Depth
WR	12%Cr	Cr12Mo1V1Co	High wear resistance, resistance to accident	62-64	Stainless steel, silicon steel	Whole diameter hardening/surface quenching
		Cr12Mo1V1 (D2)	The better wear resistance	61-63	Stainless steel	
IMR	Hot mould steel series	H13	High basis resistance	58-60	Stainless steel	
		5H12	The better wear resistance	58-60	Stainless steel, silicon steel	



MARKET & SERVICE

TSR has its service specialists in many countries and regions. The company provides an comprehensive after-sales service and it is guaranteed that the service specialists will response in 24 hours, based on customers' problems. In the meantime, all kinds of roll products supplied by our company enjoy a wholelife-cycle quality assurance.

Distribution of Customers

- India
- Turkey
- Iran
- Taiwan
- Egypt
- Russia
- Sri Lanka
- Malaysia
- Saudi Arabia
- Spain
- Morocco
- Chile
- France
- Mexico

Service center

- Spain / Bilbao
- Argentina / Buenos Aires
- India / Calcutta
- Russia / Moscow
- Turkey / Istanbul
- Egypt / Cairo
- Pakistan / Islamabad
- Taiwan / Kaohsiung City
- Iran / Teheran
- Brazil / Timoteo
- Mexico / Monclova

Distribution of Customers & Service Center

