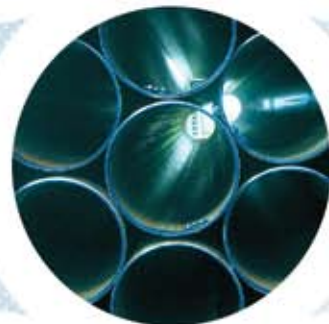




Baosteel seamless steel tubes & pipes  
for petrochemical refining

## 宝钢炼化用管

产品手册



[www.baosteel.com](http://www.baosteel.com)



宝山钢铁股份有限公司  
BAOSHAN IRON & STEEL CO., LTD.



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## 简介 Introduction

宝钢钢管以先进技术、设备、管理、良好的信誉以及强大的研发能力，保证提供高质量的产品和服务，令客户满意。我公司已贯彻了行之有效的质量控制和质量保证体系，长远规划、保持、控制并改进产品的质量。

衷心感谢您对宝钢炼化用管的关注和使用，竭诚欢迎您对本公司产品和服务提出宝贵意见。

如您所需产品的品种、规格、特殊要求在本产品样册中未覆盖，本公司将予以即时答复。



For the purpose of satisfying customers, we supply products and services at a high quality level based on our advanced equipment, technical knowledge, management, and high credit. We have implemented an efficient quality assurance system, permanently planned, maintained, controlled and continuous.

Its personal are sincerely grateful for your concern and use of our products, and you are welcome to put forward valuable suggestion on our products and services.

If the type, size and special requirements of products are not covered herein, please don't hesitate to contact us, and we will reply promptly.

## 质量保证 Quality assurance system

### 质量管理体系

宝钢采用国际先进的质量管理体系，主要产品均获得国际权威机构认可。公司获得了英国BSI公司颁发的质量、环保和安全综合管理体系证书IMS（ISO 9001、ISO/TS 16949、ISO 14001、ISO 18001）、华夏认证中心（CCCI）颁发的ISO14001环境管理体系证书以及国家质量监督检验检疫总局颁发的完善计量检测体系证书。锅炉管、炼化用管获得德国TÜV公司颁发的TÜV认证证书和PED认证证书。

### 采用标准 Standard

中国国家标准  
Chinese National Standards

GB 8163 GB 3087  
GB 5310 GB 9948

美国机械工程协会标准  
American society of mechanical engineers

ASME SA-106  
ASME SA-335M  
ASME SA-333M

美国材料试验协会标准  
American society of testing materials

ASTM A-106  
ASTM A 335M  
ASTM A 333M

美国管线钢管规范  
American Standard of pipeline steel  
API Specification 5L

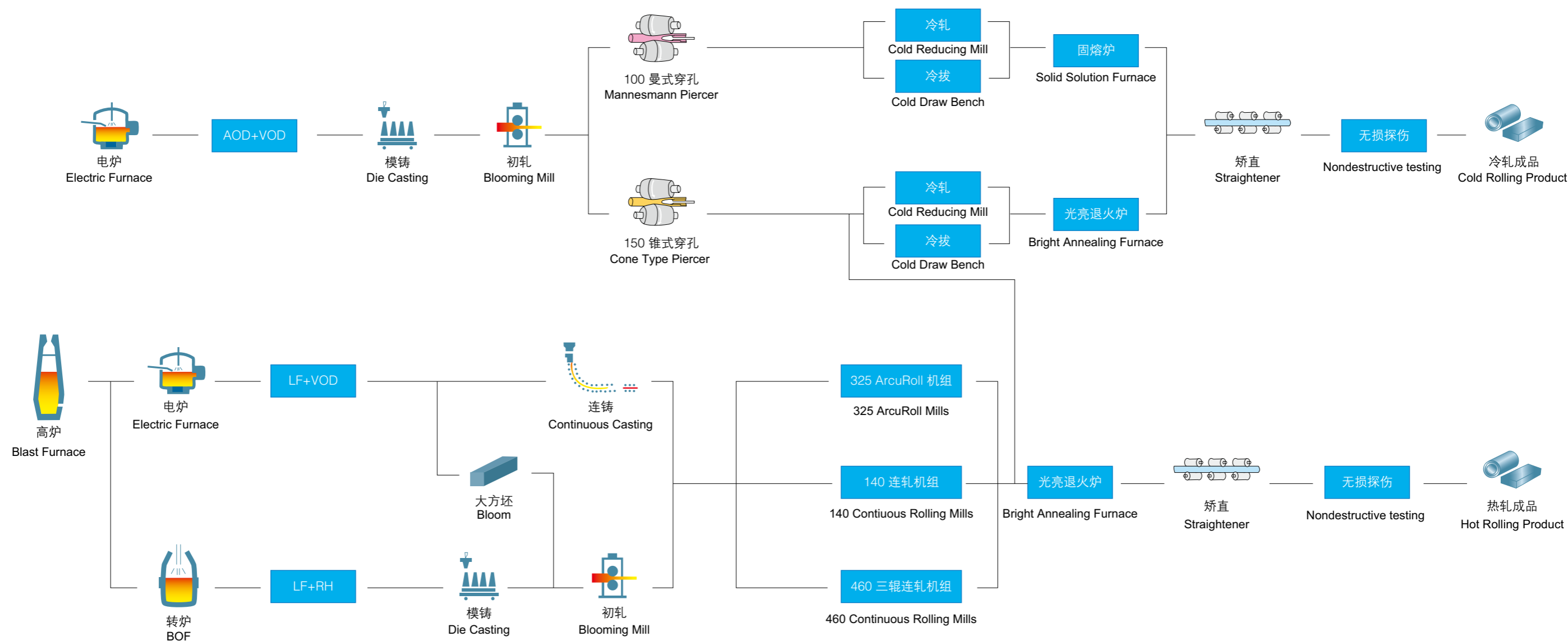
欧洲标准  
European standard  
EN 10216-2

### Quality management system

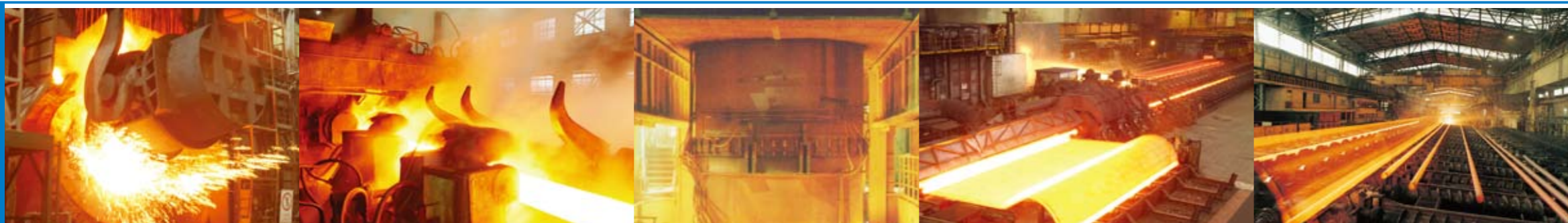
Based on the advanced quality management system, main products of Baosteel obtained the certification of the international authoritative institution. Our company have passed IMS (ISO 9001、ISO/TS 16949、ISO 14001、ISO 18001)、ISO14001. Boiler and petrochemical refining tube&pipe have passed the TÜV certification and PED certification.



# 生产工艺流程 Process flowchart



## □ 主要设备 Main equipment

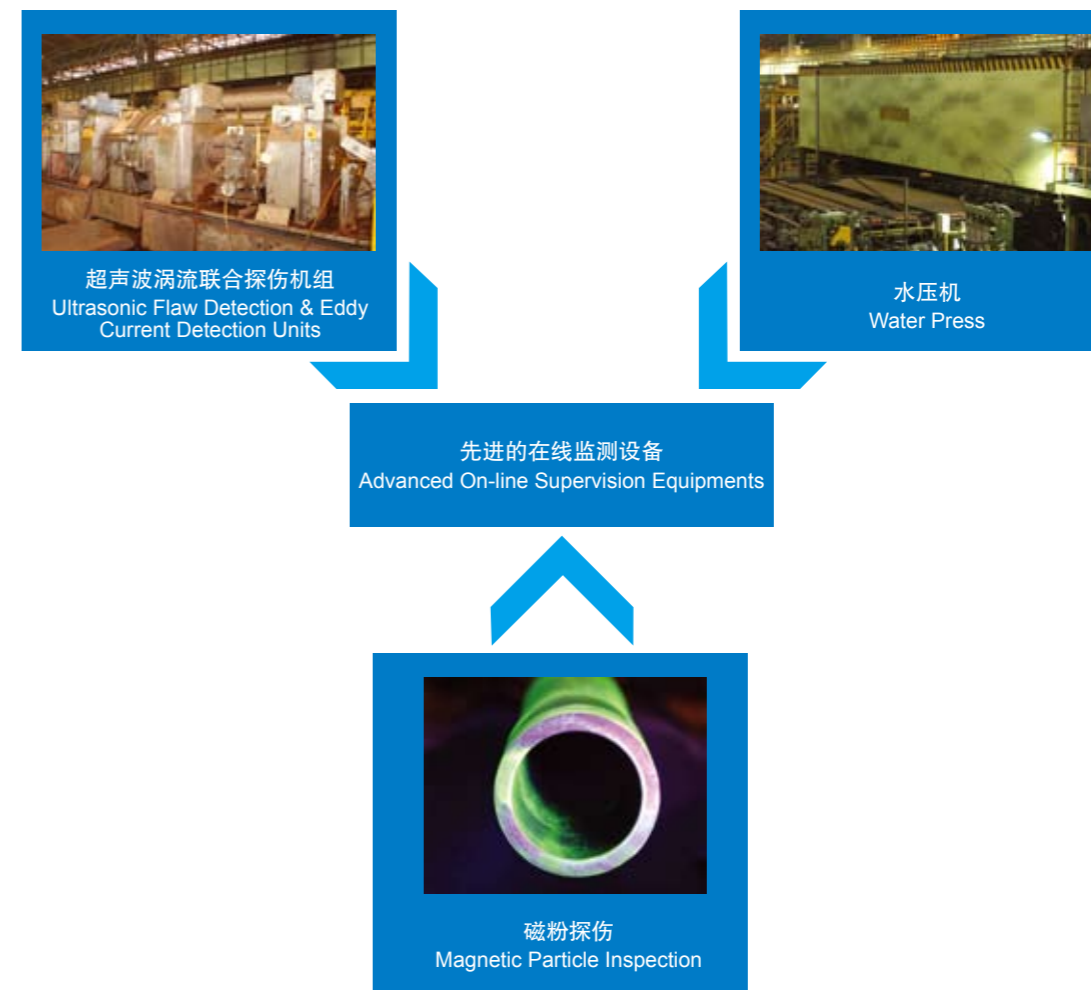


宝钢全部装备技术建立在当代钢铁冶炼、冷热加工、液压传感、电子控制、计算机和信息通讯等先进技术的基础上，具有大型化、连续化、自动化的特点。通过引进并对其不断进行技术改造，保持着世界最先进的技术水平。

宝钢炼化用管是在宝钢的统一质量保证和质量控制标准下进行，从原料到成品的每一环节均采用先进的超声波、涡流、漏磁、磁粉和其他无损检测设备和方法进行严格的控制，确保了质量水平的稳定。宝钢炼化管产品钢质纯净，成分均匀稳定，表面质量好，几何尺寸精度高，综合力学性能及工艺性能优良。

All the facilities are based on the advanced technologies of contemporary steel melting, cold and hot rolling processing, hydraulic sensing, real-time detection, electronic control, computer and information communications. They feature large-scale, continuity and automation and keep the most advanced technology in the world through constant technical modification and innovation.

To insure the steady quality level, tubes & pipes for petrochemical refining are all produced in the uniform quality assurance system of Baosteel. From the raw material to finished product, we inspect and control them by the advanced non-destructive testing methods, such as UT, ET, MT etc. Our products have the clean and steady chemical components, and good exterior quality, dimension precision and mechanical properties.



□ 主要设备  
Main equipment

■ 先进的试验设备 *Advanced Testing Equipments*



压溃试验机  
Collapse Testing Machine



冲击试验机  
Impact Testing Machine



上卸扣试验机  
Make-and-break Test Machine



实体拉伸试验机  
Object Tensile Testing Machine



金相实验设备  
Metallographic Experiment Equipments



拉伸试验机  
Tensile Testing Machine



单头持久蠕变试验机  
Single-sample Long-time Creep Test Machine



多头持久蠕变试验机  
Multi-samples Long-time Creep Test Machine

□ 主要产品及用途  
Main products and applications

钢种 Steel Grade	标准 Standard			应用 Applications
	GB (CHINA)	ASME ASTM API 5L (U.S.A)	EN 10216-2 (European)	
碳钢 Carbon steel	10、20 20G	SA-106B A 106B SA-106C A 106C SA-333-1 A333-1 SA-333-6 A333-6 B,X42,X52	P195GH P235GH P265GH	输送管道 Transfer pipe
合金钢 Alloy steel	12CrMo 15CrMo 1Cr5Mo 12Cr1MoVG 15CrMoG	SA-333-3 A333-3 P11 P12 P22 T/P5 T/P9 P91	16Mo3 10CrMo5-5 13CrMo4-5 10CrMo9-10 X10CrMoVNb9-1 15NiCuMoNb5-6-4	炉管、 热交换器管 Furnace pipe Heat rechanger pipe



# 尺寸公差 Tolerances on dimensions

## ■ 外径公差 Tolerances on out diameter单位(unit) mm

标准 Standard	热轧管 Hot finished seamless tube		冷拔(轧)管 Cold finished seamless tube		
	外径 outside diameter	允许偏差 tolerance	外径 outside diameter	允许偏差 tolerance	
GB 8163	All	±1%(min. ±0.5)	All	±1%(min. ±0.3)	
GB 3087	All	±1%(min. ±0.5)	All	±1%(min. ±0.4)	
GB 5310	≤54	±0.40	≤25.4	±0.15	
	>54~325	S≤35	±0.75%	>25.4~40	±0.20
		S>35	±1.0%	>40~50	±0.25
	>325	±1.0%	>50~60	±0.30	
	-	-	>60	±0.5%	
GB 9948	≤50	±0.50	14~30	±0.20	
	>50	±1.0%	>30~50	±0.30	
	-	-	>50	±0.75%	
ASME SA-106M ASTM A 106M	≤48.3	±0.40	≤48.3	±0.40	
	>48.3~114.3	±0.79	>48.3~114.3	±0.79	
	>114.3~219.1	+1.59, -0.79	>114.3~219.1	+1.59, -0.79	
	>219.1~457.2	+2.38, -0.79	>219.1~323.9	+2.38, -0.79	
ASME SA-335M ASTM A 335M ASME SA-333M ASTM A 333M	≤48.3	±0.40	≤48.3	±0.40	
	>48.3~114.3	±0.79	>48.3~114.3	±0.79	
	>114.3~219.1	+1.59, -0.79	>114.3~219.1	+1.59, -0.79	
	>219.1~323.9	+2.38, -0.79	>219.1~323.9	+2.38, -0.79	
API 5L	<60.3	+0.8,-0.4	<60.3	+0.8, -0.4	
	≥60.3~168.3	±0.75%	≥60.3~168.3	±0.75%	
	>168.3~610	±0.75%(max. ±3.20)	>168.3~610	±0.75%(max. ±3.20)	
EN10216-2	≤219.1	±1%(min. ±0.50)	All	±0.5% ( min. ±0.30 )	
	>219.1				

## ■ 壁厚公差 Tolerances on wall thickness单位(unit) mm

标准 Standard	热轧管 Hot finished seamless tube			冷拔(轧)管 Cold finished seamless tube		
	外径 outside diameter OD (mm)	壁厚 wall thickness S (mm)	壁厚允许偏差 tolerance	外径 outside diameter OD (mm)	壁厚 wall thickness S (mm)	壁厚允许偏差 tolerance
GB 8163 GB 3087	≤102	-	±12.5%(min ±0.40)	-	≤3	+15% -10%(min±0.15)
	>102	S/D≤0.05	±15%(min ±0.40)	-	>3	+12.5%, -10%
		S/D>0.05~0.10	±12.5%(min ±0.40)			
GB 5310	-	≤4	±0.45	-	≤3	±0.30
		>4~20	+12.5%, -10%			
	最小壁厚 Min thickness	>20	D<219 ±10% D≥219 +12.5%, -10%	-	>3	±10%
GB 9948	-	Smin≤4.0	-0/+0.9	-	Smin≤3.0	-0/+0.6
		Smin>4.0	-0/25%Smin	-	Smin>3.0	-0/20%Smin
	-	≤20	+15%, -10%	-	≤3	+12.5%, -10%
	>20	+12.5%, -10%	-	>3	±10%	
ASME SA-106M ASTM A 106M ASME SA-335M ASTM A 335M ASME SA-333M ASTM A 333M	-	All	±12.5%	-	All	±10%
API 5L	-	≤4.0	+0.60, -0.50	-	≤4.0	+0.60, -0.50
	-	>4.0~25	+15%, -12.5%	-	>4.0~25	+15%, -12.5%
	-	≥25	±10%(min +3.7, -3.0)	-	≥25	±10%(min +3.7, -3.0)
EN10216-2	≤219.1	All	±12.5%(min±0.40)	-	All	±10% (min. ±0.20)
	>219.1	S/D≤0.025	±20%			
		S/D>0.025~0.05	±15%			
		S/D>0.05~0.10	±12.5%			
		S/D>0.10	±10%			
	≤219.1	All	-0/+28%, (min-0/+0.80)			
	>219.1	S/D≤0.02	-0/+50%			
S/D>0.02~0.04		-0/+35%				
S/D>0.04~0.09		-0/+28%				
	S/D>0.09	-0/+22%				



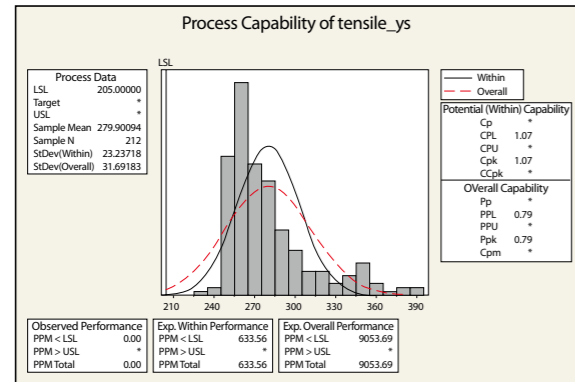
GRADE		C	Si	Mn	S	P	Cr	B	W	Mo	V	Ti	Ni	Al	Nb	N	其他 Others
标准 Standard	钢种 Steel grade				max.												
GB 8163 GB 3087	10	0.07~0.13	0.17~0.37	0.35~0.65	0.030	0.030	≤0.15										
	20	0.07~0.23	0.17~0.37	0.35~0.65	0.030	0.030	≤0.25										
GB 5310	20G	0.17~0.23	0.17~0.37	0.35~0.65	0.015	0.025											
	12Cr1MoVG	0.08~0.15	0.17~0.37	0.40~0.70	0.015	0.025	0.90~1.20			0.25~0.35	0.15~0.35						
	15CrMoG	0.12~0.18	0.17~0.37	0.40~0.70	0.015	0.025	0.80~1.10			0.40~0.55							
GB 9948	10	0.22~0.30	0.17~0.37	0.70~1.00	0.030	0.030											
	20	0.12~0.20	0.17~0.37	0.40~0.80	0.030	0.030				0.25~0.35							
	15CrMo	0.12~0.18	0.17~0.37	0.40~0.80	0.030	0.030	0.80~1.10			0.40~0.55							
	12CrMo	0.08~0.15	≤0.50	0.40~0.70	0.030	0.030	2.00~2.50			0.90~1.20							
	1Cr5Mo	≤0.15	≤0.50	≤0.60	0.030	0.030	4.00~6.00			0.45~0.60							
ASME SA-106M ASTM A 106M	SA-106B/A 106	≤0.30	≥0.10	0.29~1.06	0.030	0.030											
	SA-106C/A 106	≤0.35	≥0.10	0.29~1.06	0.030	0.030											
ASME SA-335M ASTM A 335M	P11	0.05~0.15	0.50~1.00	0.30~0.60	0.025	0.025	1.00~1.50			0.44~0.65							
	P12	≤0.15	≤0.50	0.30~0.61	0.025	0.025	0.80~1.25			0.44~0.65							
	P22	≤0.15	≤0.50	0.30~0.60	0.025	0.025	1.90~2.60			0.87~1.13							
	P5	≤0.15	≤0.50	0.30~0.60	0.025	0.025	4.00~6.00			0.45~0.60							
	P9	≤0.15	0.25~1.00	0.30~0.60	0.025	0.025	8.00~10.00			0.90~1.10							
	P91	0.08~0.12	0.20~0.50	0.30~0.60	0.010	0.020	8.00~9.50			0.85~1.05	0.18~0.25		≤0.40	≤0.040	0.06~0.10	0.030~0.070	Nb+Ta≥8°C%-1.00
ASME SA-333M ASTM A 333M	A 333-1	≤0.30		0.40~1.06	0.025	0.025											
	A 333-3	≤0.19	0.18~0.37	0.31~0.64	0.025	0.025							3.18~3.82				
	A 333-6	≤0.30	≥0.10	0.29~1.06	0.025	0.025											
API 5L	B	≤0.28		≤1.20	0.03	0.03					≤0.08						Ti≤0.04
	X42	≤0.28		≤1.30	0.03	0.03					≤0.08						Ti≤0.04
	X52	≤0.28		≤1.40	0.03	0.03					≤0.08		≤0.04				Ti≤0.04
EN10216-2	P195GH	≤0.13	≤0.35	≤0.70	0.020	0.025	≤0.30			≤0.08	≤0.02	≤0.040	≤0.30	≤0.020	≤0.010		Cr+Cu+Mo+Ni≤0.70
	P235GH	≤0.16	≤0.35	≤1.20	0.020	0.025	≤0.30			≤0.08	≤0.02	≤0.040	≤0.30	≤0.020	≤0.010		Cr+Cu+Mo+Ni≤0.70
	P265GH	≤0.20	≤0.40	≤1.40	0.020	0.025	≤0.30			≤0.08	≤0.02	≤0.040	≤0.30	≤0.020	≤0.010		Cr+Cu+Mo+Ni≤0.70
	16Mo3	0.12~0.20	≤0.35	0.40~0.90	0.020	0.025	≤0.30			0.25~0.35			≤0.30	≤0.040			Cu≤0.30
	10CrMo5-5	≤0.15	0.50~1.00	0.30~0.60	0.020	0.025	1.00~1.50			0.45~0.65			≤0.30	≤0.040			Cu≤0.30
	13CrMo4-5	0.10~0.17	≤0.35	0.40~0.70	0.020	0.025	0.70~1.15			0.40~0.60			≤0.30	≤0.040			Cu≤0.30
	10CrMo9-10	0.08~0.14	≤0.50	0.30~0.70	0.020	0.025	2.00~2.50			0.90~1.10			≤0.30	≤0.040			Cu≤0.30
	X10CrMoVNb9-1	0.08~0.12	0.20~0.50	0.30~0.60	0.010	0.020	8.00~9.50			0.85~1.05	0.18~0.25		≤0.40	≤0.040	0.06~0.10	0.030~0.070	Cu≤0.30
15NiCuMoNb5-6-4	≤0.17	0.20~0.50	0.80~1.20	0.020	0.025	≤0.30			0.25~0.50			1.00~1.30	≤0.05	0.05~0.045		Cu 0.50~0.85	

标准 Standard	牌号 grade	抗拉强度 Tensile Strength MPa	屈服强度 Yield Point MPa ≥			伸长率 Elongation % ≥		冲击功 Impact J ≥		硬度 Hardness ≤
			≤16	>16~30	>30	纵	横	纵	横	
GB 8163 GB 3087	10	335~475	205	195	195	24	—	—	—	—
	20	410~550	245	235	235	20	—	—	—	—
GB 5310	20G	410~550		245		24	22	40	27	—
	12Cr1MoVG	470~640		255		21	19	40	27	—
	15CrMoG	440~640		295		21	19	40	27	—
GB 9948	10	335~475	205	195	185	25		35	—	—
	20	410~550	245	235	235	21		35	—	—
	12CrMo	410~560	205	195	185	21		35	—	156HB
	15CrMo	440~640	235	225	215	21		35	—	170HB
	1Cr5Mo	390~590	195	185	175	22		35	—	187HB
ASME SA-106M ASTM A 106M	SA-106B A 106B	≥415		240		22	12		—	—
	SA-106C A 106C	≥485		275		20	12		—	—
ASME SA-335M ASTME A 335M	P11	≥415		205		22	14		—	—
	P12	≥415		220		22	14		—	—
	P22	≥415		205		22	14		—	—
	P5	≥415		205		22	14		—	—
	P9	≥415		205		22	14		—	—
	P91	≥585		415		20	13		—	25HRC(250HB)
ASME SA-333M ASTMA 333M	A 333-1	≥380		205		28	20	18	—	—
	A 333-3	≥450		240		22	14	18	—	—
	A 333-6	≥415		240		22	12	18	—	—
API 5L	B	≥415		245		—	—	—	—	—
	X42	≥415		290		—	—	—	—	—
	X52	≥460		360		—	—	—	—	—
EN 10216-2	P195GH	320-440	195			27	25			—
	P235GH	360-500	235	225	215	25	23			—
	P265GH	410-570	265	255	245	23	21			—
	16Mo3	450-600	280	270	260	22	20			—
	10CrMo5-5	410-560	275	275	265	22	20			—
	13CrMo4-5	440-590	290	290	280	22	20			—
	10CrMo9-10	480-630	280	280	270	22	20			—
	X10CrMoVNb9-1	630-830	450	450	450	19	17			—
15NiCuMoNb5-6-4	610~780	440	440	440	19	17			—	

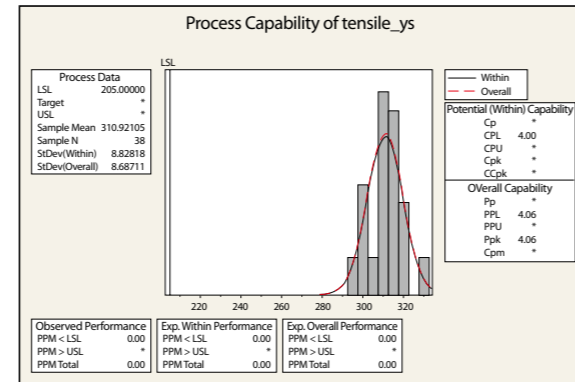


# 宝钢P9与国外对比 P9 comparison Baosteel with Importer

屈服强度控制水平: *Yield-strength controlling level*  
宝钢略低于国外 ys is a little worse than importer

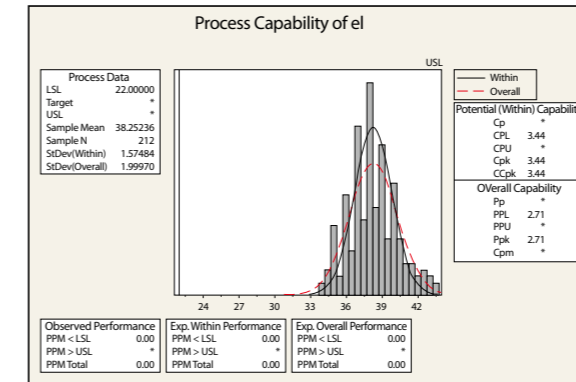


宝钢屈服强度平均控制为279.9MPa  
Average of Baosteel is 279MPa

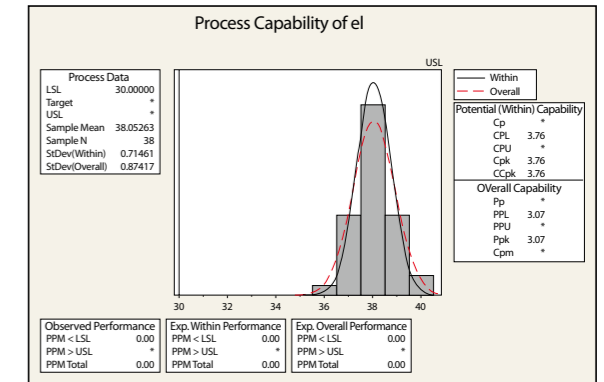


国外屈服强度平均控制为310.9MPa  
Average of Importer is 310.9MPa

延伸率控制水平: *Elongation controlling level*  
宝钢与国外相当 el is equivalent

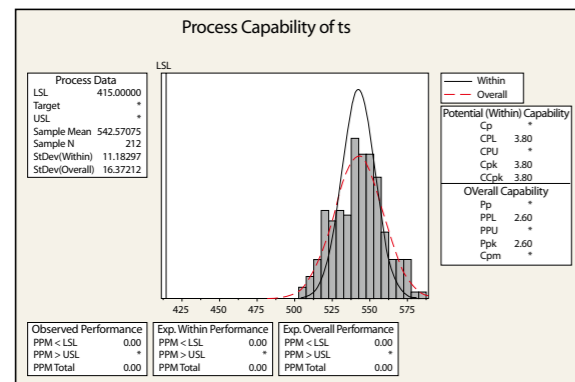


宝钢延伸率平均控制为38.25%  
Average of Baosteel is 38.25%

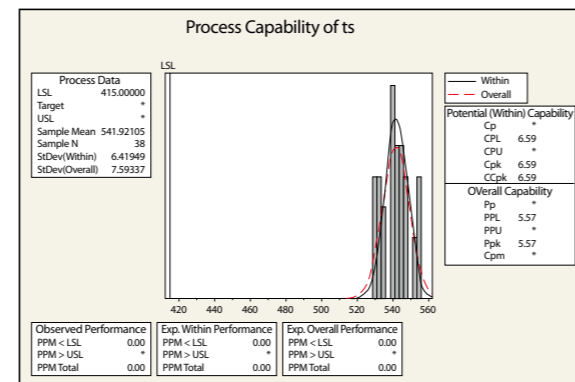


国外延伸率平均控制为38.05%  
Average of Importer is 38.05%

抗拉强度控制水平: *Tensile-strength controlling level*  
宝钢与国外相当 ts is equivalent

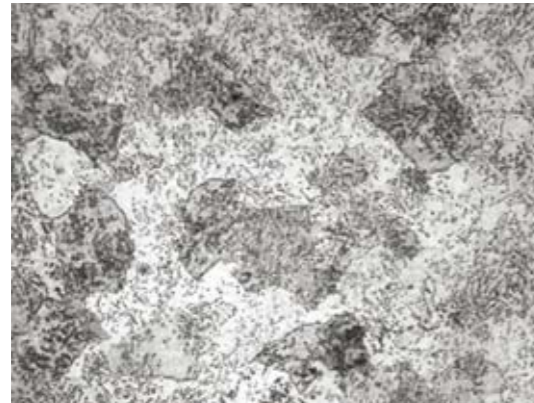


宝钢抗拉强度平均控制为542.6MPa  
Average of Baosteel is 542.6MPa

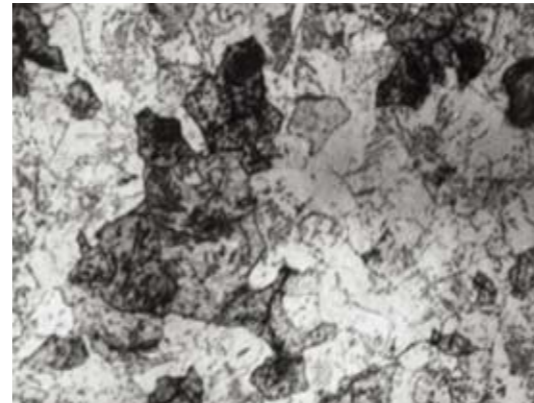


国外抗拉强度平均控制为541.9MPa  
Average of Importer is 541.9MPa

# 宝钢P9与国外对比 P9 comparison Baosteel with Importer



宝钢Cr9Mo的金相组织 ×400  
Cr9Mo Metallographic structure of Baosteel ×400

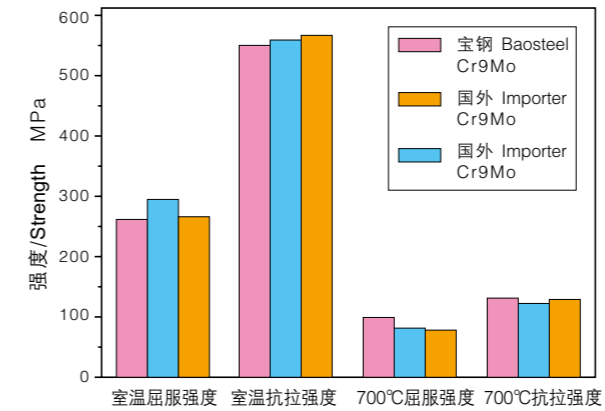


国外Cr9Mo金相组织 ×400  
Cr9Mo Metallographic structure of Importer ×400

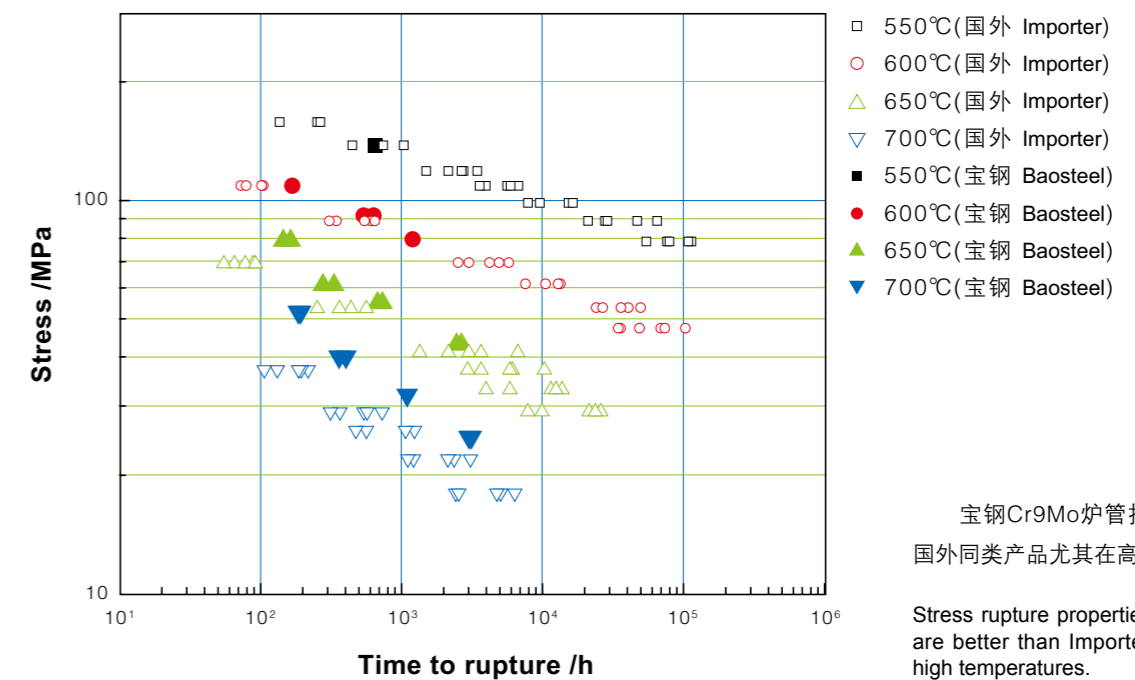
白色部分为铁素体，很多颗粒状的黑色部分是球状珠光体。通过对比以上两图，可以发现：国内、外Cr9Mo材料在金相组织上没有明显差异。

Cr9Mo microstructure has no obvious difference between Baosteel and Importer.

## 力学性能 Mechanical properties



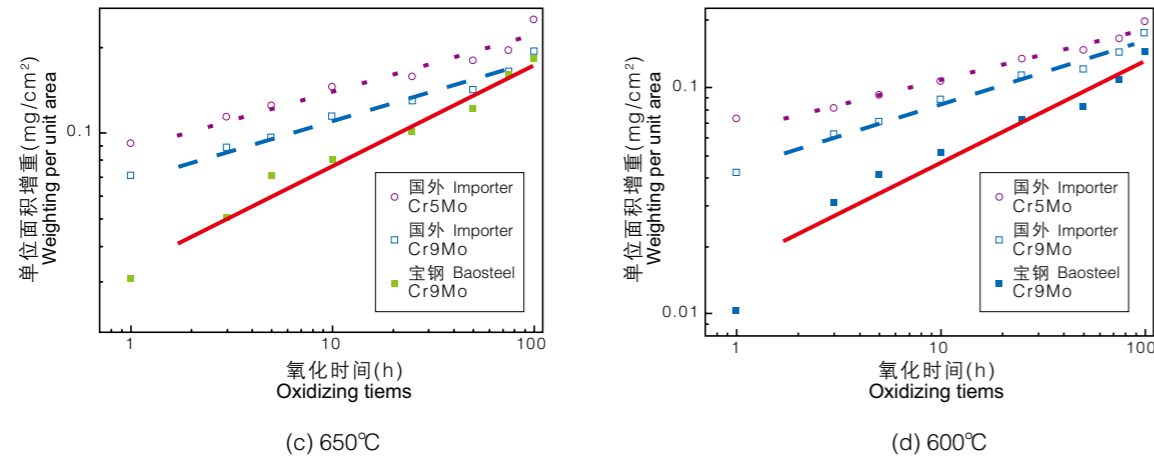
The mechanical properties at room temperature and 700°C of Cr9Mo has no obvious difference between Baosteel and Importer.



宝钢Cr9Mo炉管持久性能优于国外同类产品尤其在高温下

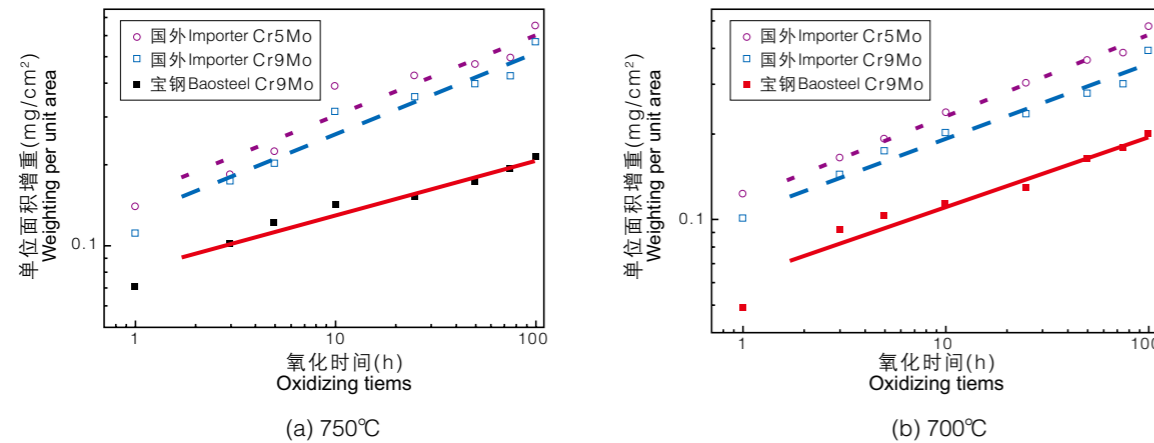
Stress rupture properties of Baosteel are better than Importer, specially in high temperatures.

# 宝钢P9与国外对比 P9 comparison Baosteel with Importer



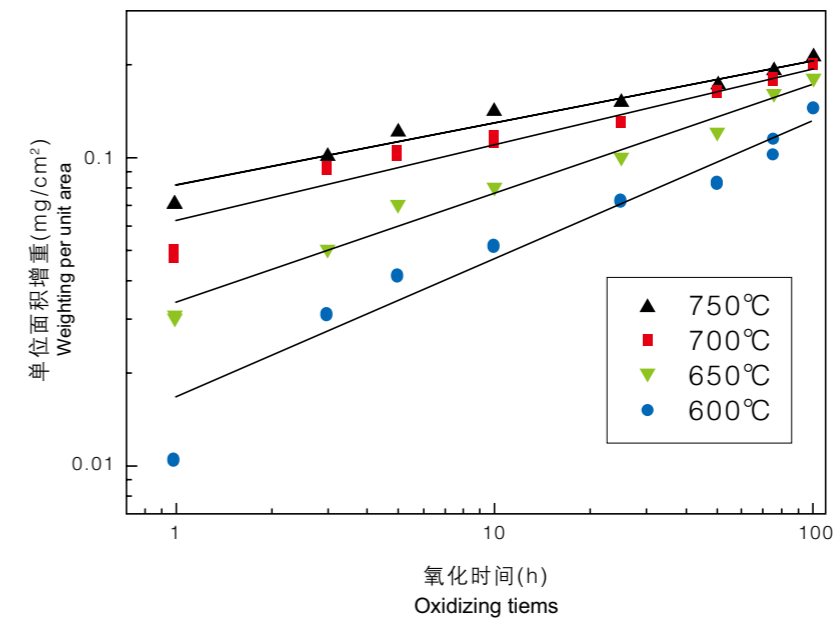
宝钢Cr9Mo、国外Cr9Mo的抗高温氧化性能明显优于国外Cr5Mo  
宝钢Cr9Mo与国外Cr9Mo的抗高温氧化性能相比，宝钢Cr9Mo较好

High temperature oxidation resistance of Cr9Mo is better than Cr5Mo, and Baosteel is better than Importer.



不同温度下三种材料的氧化动力学曲线(双对数坐标)

Oxidizing Kinetics curves of three materials in several temperatures ( log log coordinates).



Cr9Mo钢管在600°C~750°C下的氧化服从抛物线规律金属表面形成了牢固、致密的氧化膜

Oxidation of Cr9Mo tube obeys parabola law in 600~750°C, dense film stably generated on the surfaces.

宝钢生产的Cr9Mo钢管的化学成分及各项性能指标等均已达到甚至超出了国外同类产品的水平。

产品已经在中国石化股份有限公司茂名分公司等企业使用3年多，完全能够满足石油化工用材需要。

Chemical composition and Mechanical properties of Cr9Mo of Baosteel are equivalent with import, even better than Importer.

Cr9Mo pipes were applied to Sinopec Corp. more than 3 years ago, and the products quality completely meets the requirements for petrochemical refining.

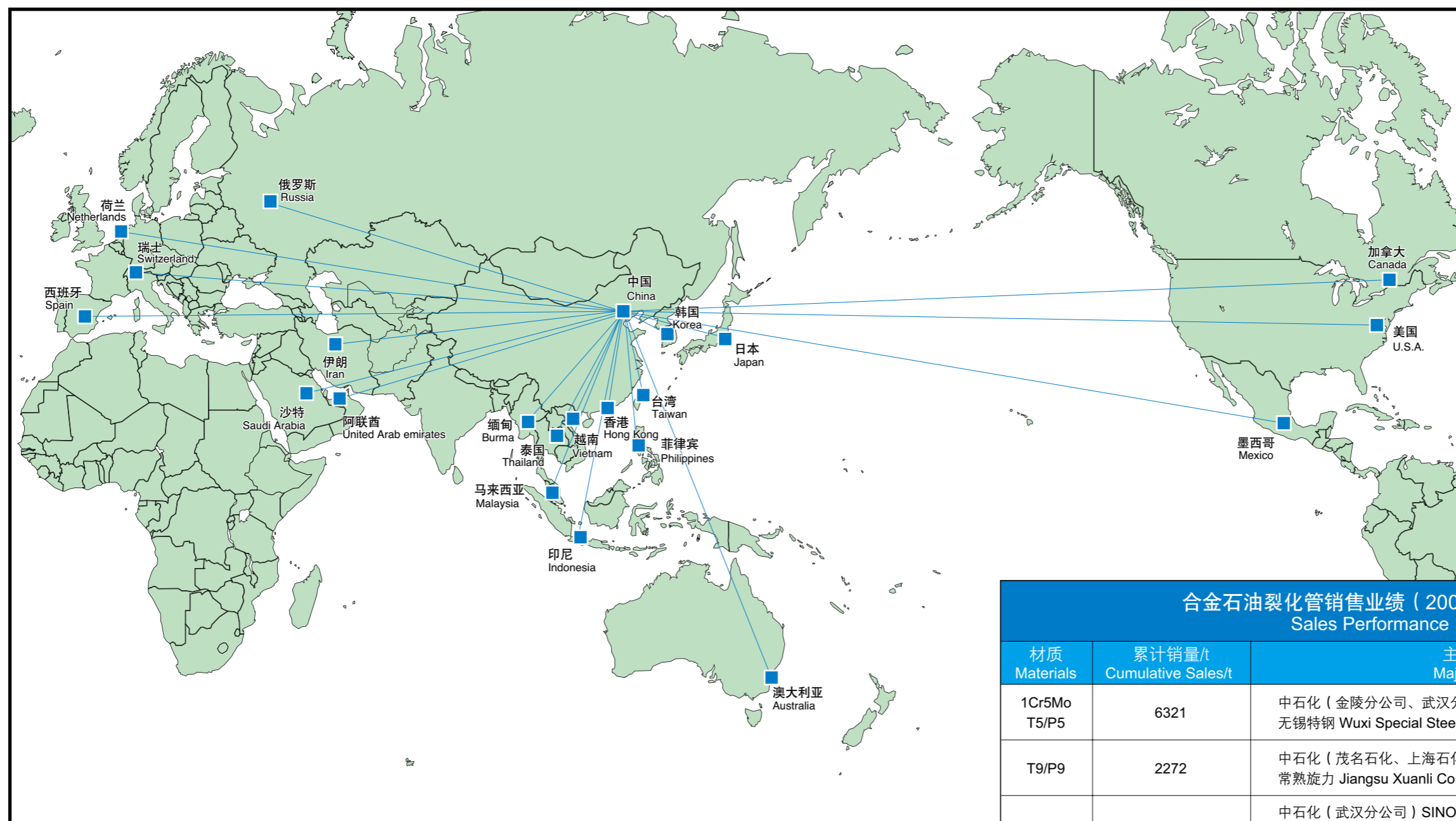
# 评估报告 Evaluation report



宝钢锅炉管、炼化用管通过中国国家权威机构的评估，得到中国所有大型锅炉制造厂和部分炼化企业的实际使用认可。

Baosteel seamless steel tubes & pipes for petrochemical refining has practically applicable to boilers and petrochemical equipments in China, and approved by authority institution and some well-known enterprises.

使用业绩  
Performance



合金石油裂化管销售业绩 (2003-2010年) Sales Performance		
材质 Materials	累计销量/t Cumulative Sales/t	主要用户 Major Client
1Cr5Mo T5/P5	6321	中石化 (金陵分公司、武汉分公司、华东公司、天津石化) SINOPEC 无锡特钢 Wuxi Special Steel Material Co., LTD.
T9/P9	2272	中石化 (茂名石化、上海石化、天津石化、华东公司) SINOPEC 常熟旋力 Jiangsu Xuanli Co., LTD
P11	2961	中石化 (武汉分公司) SINOPEC 神华宁煤集团 Shenhua Corporation Co., LTD 常熟旋力常熟旋力 Jiangsu Xuanli Co., LTD
P22	1060	中石化 (茂名石化、上海石化) SINOPEC 常熟旋力 Jiangsu Xuanli Co., LTD
合计 Sum	12614	



宝山钢铁股份有限公司  
http://www.baosteel.com

BAOSHAN IRON & STEEL CO., LTD.  
http://www.baosteel.com

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#### 国内贸易公司

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武汉宝钢华中贸易有限公司 电话: 027-84298800 传真: 027-84298224	上海宝钢商贸有限公司 电话: 021-60869800 传真: 021-60869804	上海宝钢浦东国际贸易有限公司 电话: 021-36014655 传真: 021-51266522 51266533	上海宝钢宝山钢材贸易有限公司 电话: 021-36014688 传真: 021-51266500
长春宝钢钢材贸易有限公司 电话: 0431-85889320 传真: 0431-85889317	沈阳宝钢钢材贸易有限公司 电话: 024-62220699 传真: 024-88210198		

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洛杉矶代表处 LOS ANGELES OFFICE TEL: 001-949-7526789 FAX: 001-949-7521234	宝钢巴西贸易有限公司 (宝美巴西代表处) BAOSTEEL DO BRAZIL PTE LTDA. TEL: 0055-21-25311363 FAX: 0055-21-25310298	

