

Pursuing high quality, leading-edge technology and tomorrow

Kobe Wire Rod & Bar Plant

The plant has been progressing along with the city of Kobe, surrounded by mountains and the sea Aiming to be the world's number one special wire rod & bar plant—Kobe Wire Rod & Bar Plant

The plant is a byword for wire rods among customers so far.

We aim to be a Kobe Wire Rod & Bar Plant that creates products in anticipation of customers' future needs.

At the same time, it is our wish to grow together with the local community.

Outline of Kobe Wire Rod & Bar Plant

Site area: 570,000 m²

(total area is 1,070,000 m², including Kobe Power Plant, etc.)

Employees: About 1,800 employees (including those of affiliates)

Production of steel products: Approx. 130,000 tons/month

Production items: Steel wire rods and bars

History of Kobe Wire Rod & Bar Plant

- Jan. 1959: No. 1 blast furnace blown in (until 1983)
- Aug. 1959: No. 3 bar mill completed (until 1984)
- Sep. 1960: No. 4 wire rod mill completed (until 1981)
- May 1961: No. 5 wire rod mill completed (until 1982)
- Sep. 1961: No. 2 blast furnace blown in (until 1983)
- Jun. 1965: No. 6 wire rod mill completed (until 1986)
- Oct. 1966: No. 3 blast furnace blown in (until 2017)
- No. 1 continuous casting line completed (until 1980)
- No. 2 continuous casting line completed (until 1985)
- Nov. 1969: No. 7 wire rod mill completed
- Jan. 1981: No. 3 continuous bloom casting line completed (until 2017)
- Apr. 1984: Bar mill completed
- Mar. 1987: No. 4 continuous billet casting line completed (until 2006)
- Jan. 1999: A new finishing rolling line completed at No. 7 wire rod mill
- Apr. 2002: No. 1 unit of Kobe Power Plant started up
- Apr. 2004: No. 2 unit of Kobe Power Plant started up
- Oct. 2017: Stopped upstream operations (including No. 3 blast furnace)
Operations consolidated at the Kakogawa Works
- Nov. 2017: Started a new production system with a rolling mill for special steel
- Started a new production system with a special steel works.
- Sep. 2019: Finishing rolling mill for bar mill updated
- Apr. 2020: Changed the name of the office from Kobe Steel Works to Kobe Wire Rod & Bar Plant

Kobe Power Plant
No. 3 and No. 4 units are
under construction

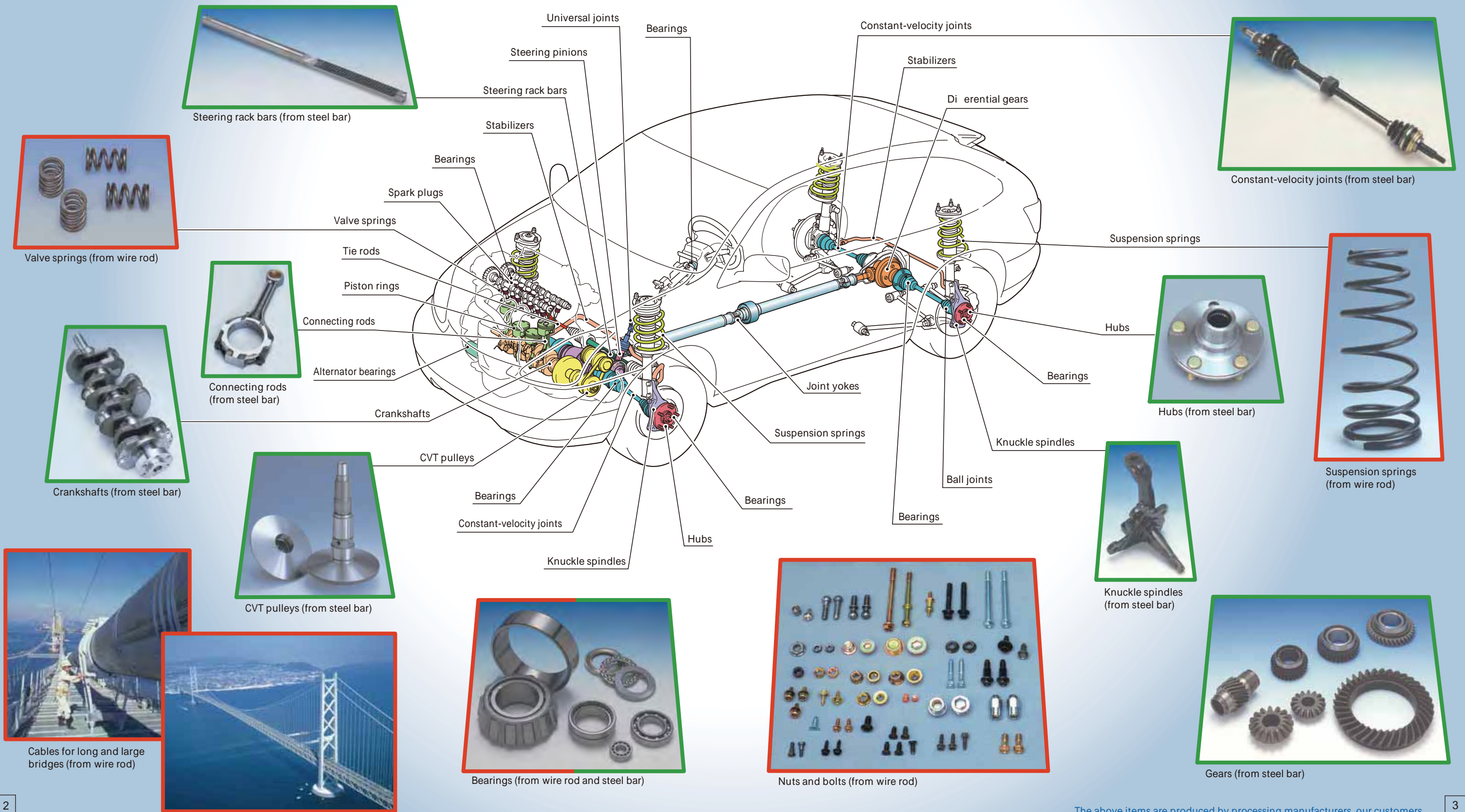
Night view of Kobe from the boiler building of the Kobe Power Plant



Pursuing high performance, achieving high quality

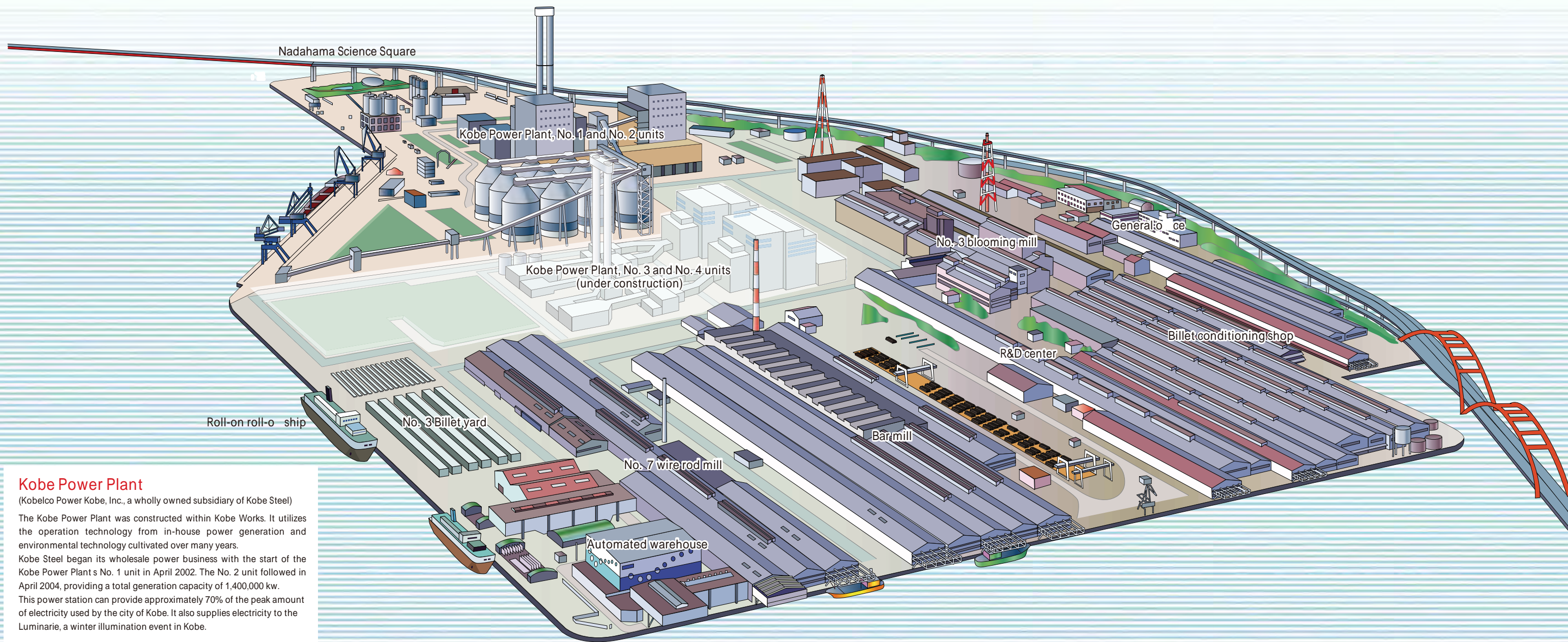
High value-added wire rods and steel bars are produced at the Kobe Wire Rod & Bar Plant. Our wire rods for automobile valve springs, in particular, have more than 50% of the world market share.

Products made from wire rods and steel bars



How special steel is produced

at Kobe Wire Rod & Bar Plant



Kobe Power Plant

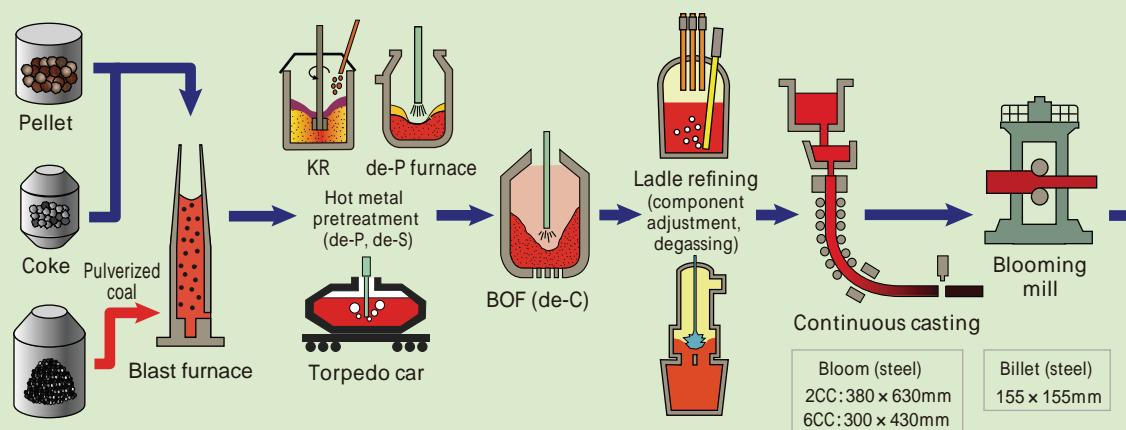
(Kobelco Power Kobe, Inc., a wholly owned subsidiary of Kobe Steel)

The Kobe Power Plant was constructed within Kobe Works. It utilizes the operation technology from in-house power generation and environmental technology cultivated over many years.

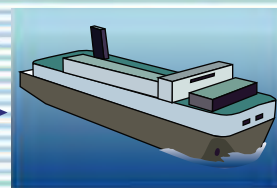
Kobe Steel began its wholesale power business with the start of the Kobe Power Plant's No. 1 unit in April 2002. The No. 2 unit followed in April 2004, providing a total generation capacity of 1,400,000 kw.

This power station can provide approximately 70% of the peak amount of electricity used by the city of Kobe. It also supplies electricity to the Luminarie, a winter illumination event in Kobe.

Kakogawa Works

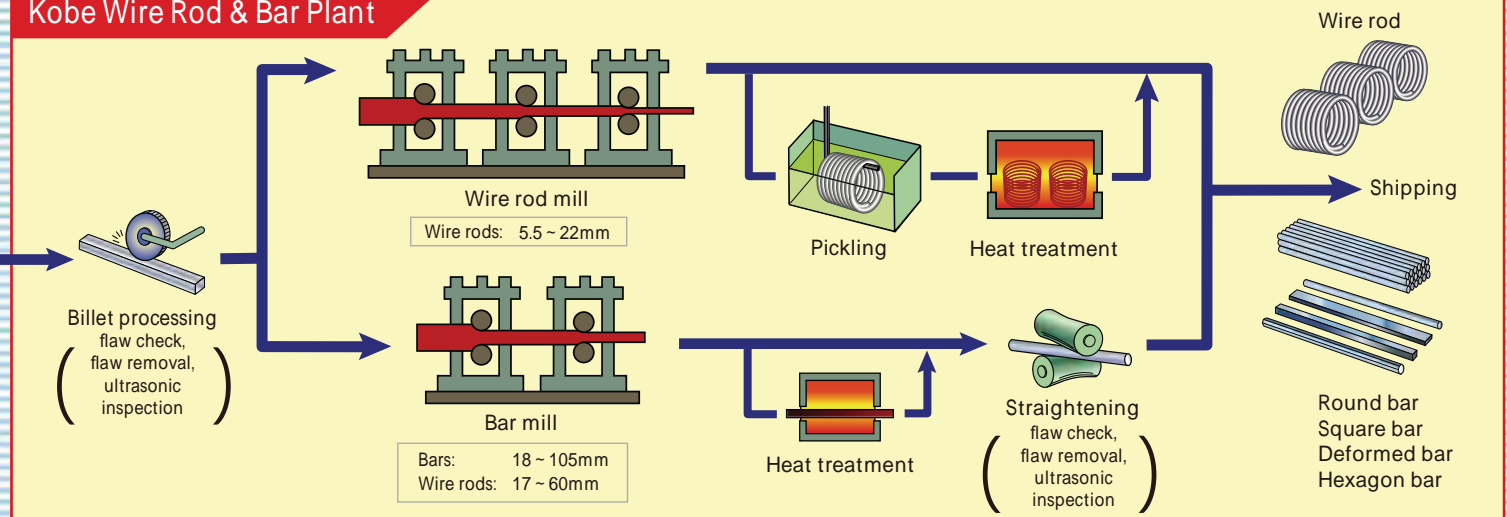


Transportation by ship



Steel materials are transported to Kobe Works by roll-on roll-off ships

Kobe Wire Rod & Bar Plant



Kakogawa Works carries out the ironmaking, steelmaking (refining), and blooming processes.

Blast furnace Iron ore and coke, a baked coal, are charged alternately into a blast furnace, and hot air (1,200 °C) is blown into the furnace to induce a chemical reaction to reduce and melt the ore, creating molten iron.



No. 3 Blast furnace

BOF Components are adjusted according to the intended application to produce high-quality steel.



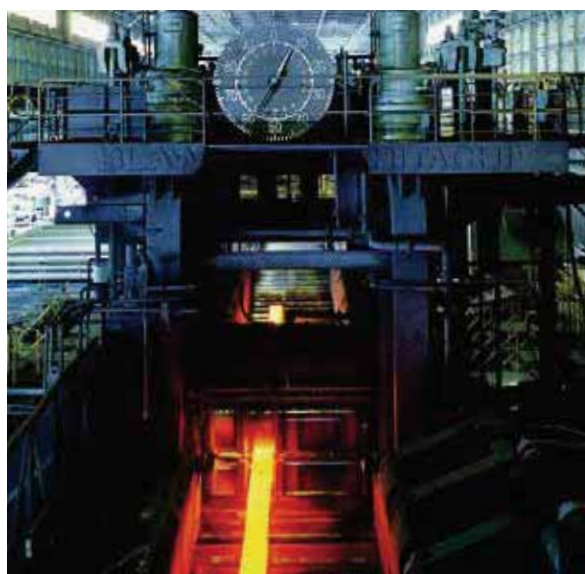
BOF

Continuous casting Through continuous casting, semi-finished steel (slabs or blooms) can be produced directly from molten steel refined in the BOF, without the ingot-making or blooming processes.



No. 6 continuous caster

Blooming Cast steel is passed through the blooming mill to create billets. Blooms are rolled into the proper shapes for the subsequent processes.



Blooming mill

[Kakogawa Works]

Specifications of the blast furnace facilities

Name	Internal volume	Nominal production capacity
No. 1	4,550 m ³	10,000 tons/day
No. 2	5,400 m ³	11,200 tons/day
No. 3	4,844 m ³	11,000 tons/day

Specifications of the BOF

Name	Number of units	Volume
LD-OTB	3	250 tons/charge

Specifications of the continuous casting facilities

Name	Nominal production capacity	
No. 2 (Bloom)	140,000 tons/month	
No. 3 (Slab)	250,000 tons/month	
No. 4 (Slab)	1 strand	115,000 tons/month
	2 strands	125,000 tons/month
No. 5 (Bloom)	140,000 tons/month	

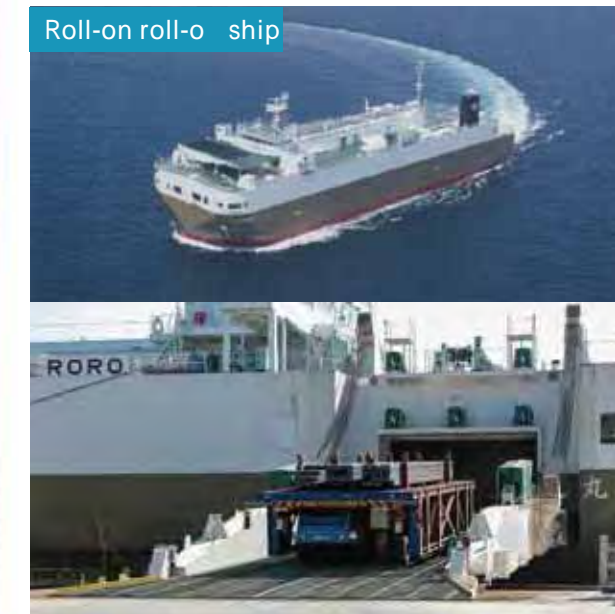
Specifications of the blooming mills

Name	Number of stands	Nominal production capacity
No. 1 blooming mill	1	300,000 tons/month
No. 2 blooming mill	1	
Continuous billet mill	6	

[Kobe Wire Rod & Bar Plant]

Name	Number of stands	Nominal production capacity
No.3 blooming mill	2	2,480 tons/month (daytime operation)

Billets are transported to Kobe Wire Rod & Bar Plant by roll-on roll-off ships

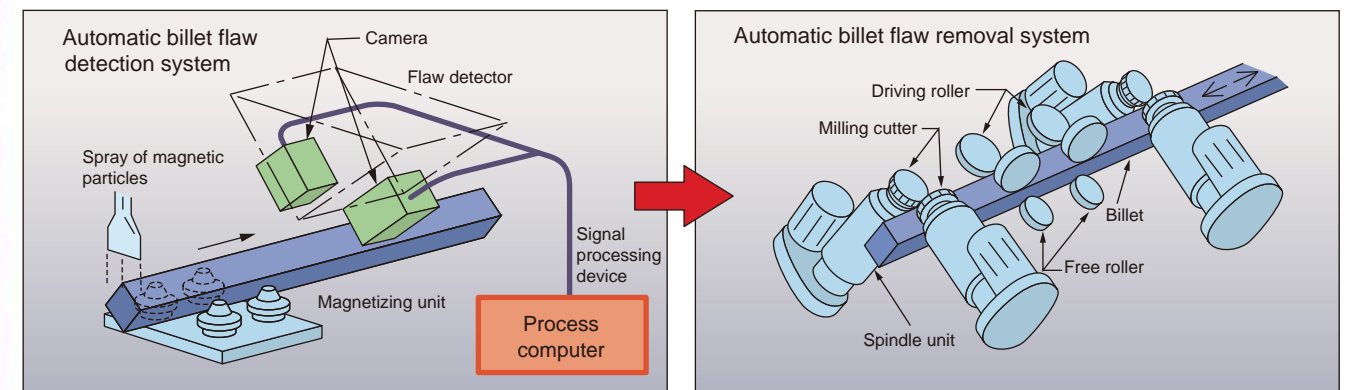


Facility specifications

No. 3 billet yard	Capacity	90,000 tons
	Length (north to south)	71 m
	Length (east to west)	304 m
	Total length	102.0 m
Roll-on roll-off ship	Width	27.0 m
	Depth	17.0 m
	Total tonnage	6,249 tons
	Deadweight tonnage	8,300 tons
	Speed at sea	10 knots
Carrier	Maximum number of pallets	28 pallets
	Total length	13.7 m
	Total width	5.2 m
	Height	1.6 m
	Weight	29 tons

Billet conditioning

As extremely high quality is required for wire rods and bars, the automatic flaw detection/removal system, developed by Kobe Steel, is used to inspect and remove surface flaws. Ultrasonic inspection machines are used to check internal quality.



Facility specification

No. 1 billet processing mill	
Shot blaster	1 unit
Automatic flaw detector	1 unit
Automatic flaw remover	3 units
Automatic ultrasonic tester	1 unit
Billet grinder	2 units

No. 3 billet processing mill	
Shot blaster	1 unit
Magnetic particle surface tester	1 unit
Automatic ultrasonic tester	1 unit
Billet grinder	2 unit

Achieving High Quality

Wire rod rolling

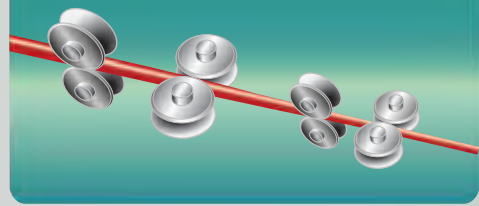
Billets are rolled into wire rods

The No. 7 wire rod mill can roll special steel wire rods in diameters ranging from \varnothing 5.5 mm to \varnothing 22.0 mm through controlled rolling and cooling technologies. Heat treatment and pickling are also available according to customers' requests and applications.

Wire rod rolling

To produce special steel wire rods with superior workability dedicated to the highest performance for processing by our customers, it is indispensable to control their mechanical properties and dimensions precisely. For this purpose, controlled rolling and cooling technologies are strategically applied utilizing state-of-the-art rolling and cooling equipment.

Principle of rolling



How rolling proceeds:

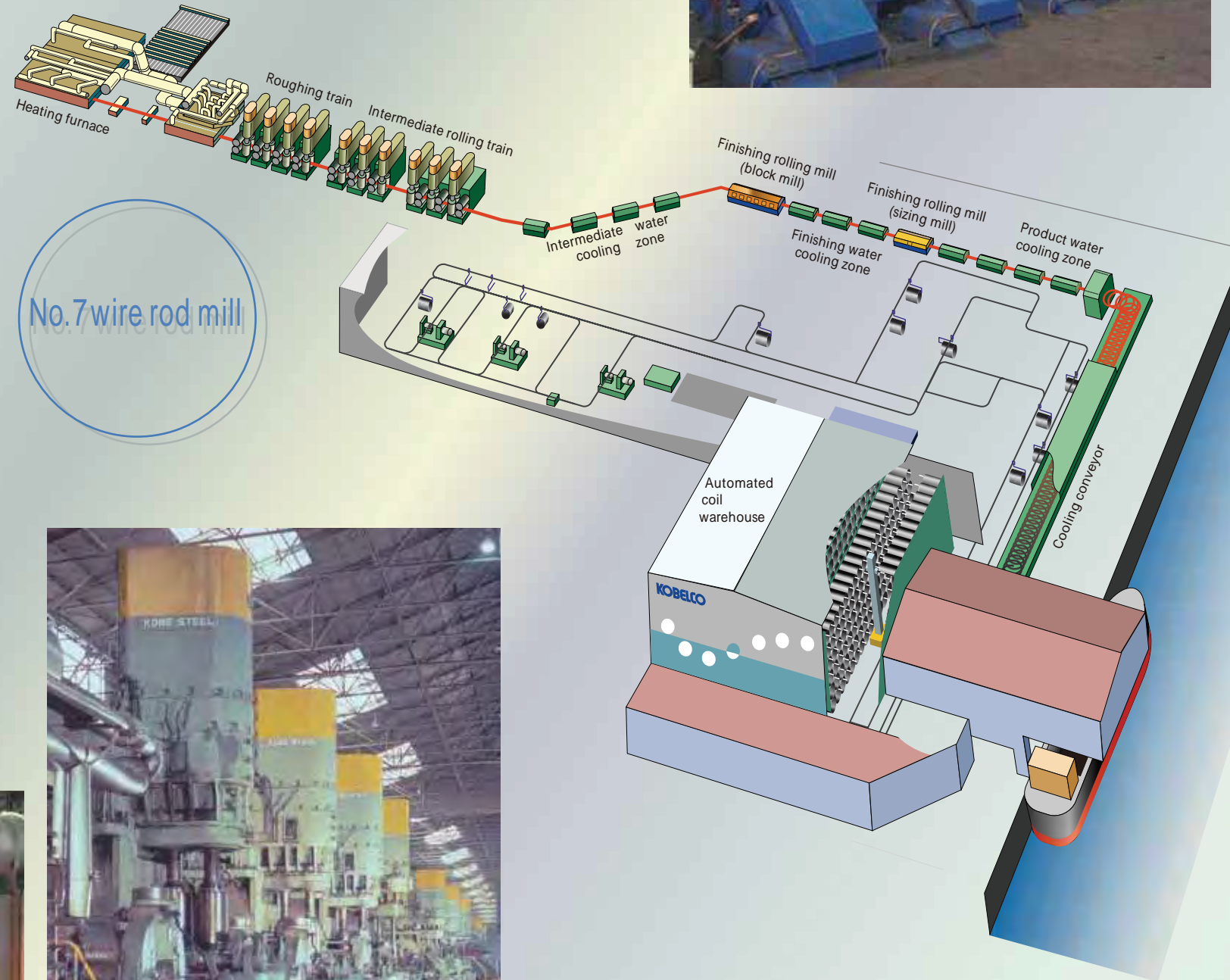
The heated steel (billet) passes through several set of rolls that have grooves. The material is deformed by the grooves and its cross section is reduced gradually.

Facility specification

No. 7 wire rod mill	
Heating furnace	1 unit
Roughing train	8 stands
Intermediate train	12 stands
Intermediate water cooling zone	4 zones
Finishing block mill	8 stands
Finishing water cooling zone	3 zones
Sizing mill	4 stands
Product water cooling zone	4 zones
Cooling conveyor	90 meters
Automated warehouse	9,300 tons



Heating furnace Billets are heated to about 1,000 °C



No. 7 wire rod mill



Roughing and intermediate trains Hot steel is passed through the grooved rolls to reduce its cross-sectional area.

Finishing block mill
High-rigidity rolling mill capable of low-temperature rolling. (controlled rolling)



Sizing mill
High-rigidity rolling mill capable of low-temperature rolling. This mill is capable of high dimensional accuracy rolling. (controlled rolling, dimensional control)



Product water cooling zone
Rolling temperature is controlled (controlled rolling)



Cooling conveyor
Cooling rate is controlled (controlled cooling).



Automated warehouse
After rolling, wire rods are unloaded from hook conveyor and directly stored in the automated warehouse.

Achieving High Quality

Bar rolling and Bar conditioning

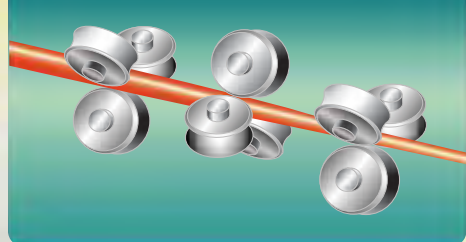
Billets are rolled into steel bars

The bar mill can roll special steel bars in a wide range of product sizes from $\varnothing 18$ mm to $\varnothing 108$ mm. The bar conditioning shop provides heat treatment, removal of surface flaws and other processes according to customers requests and applications. *The bar mill can also manufacture wire rods in sizes ranging from $\varnothing 17$ mm to $\varnothing 55$ mm.

Steel bar rolling

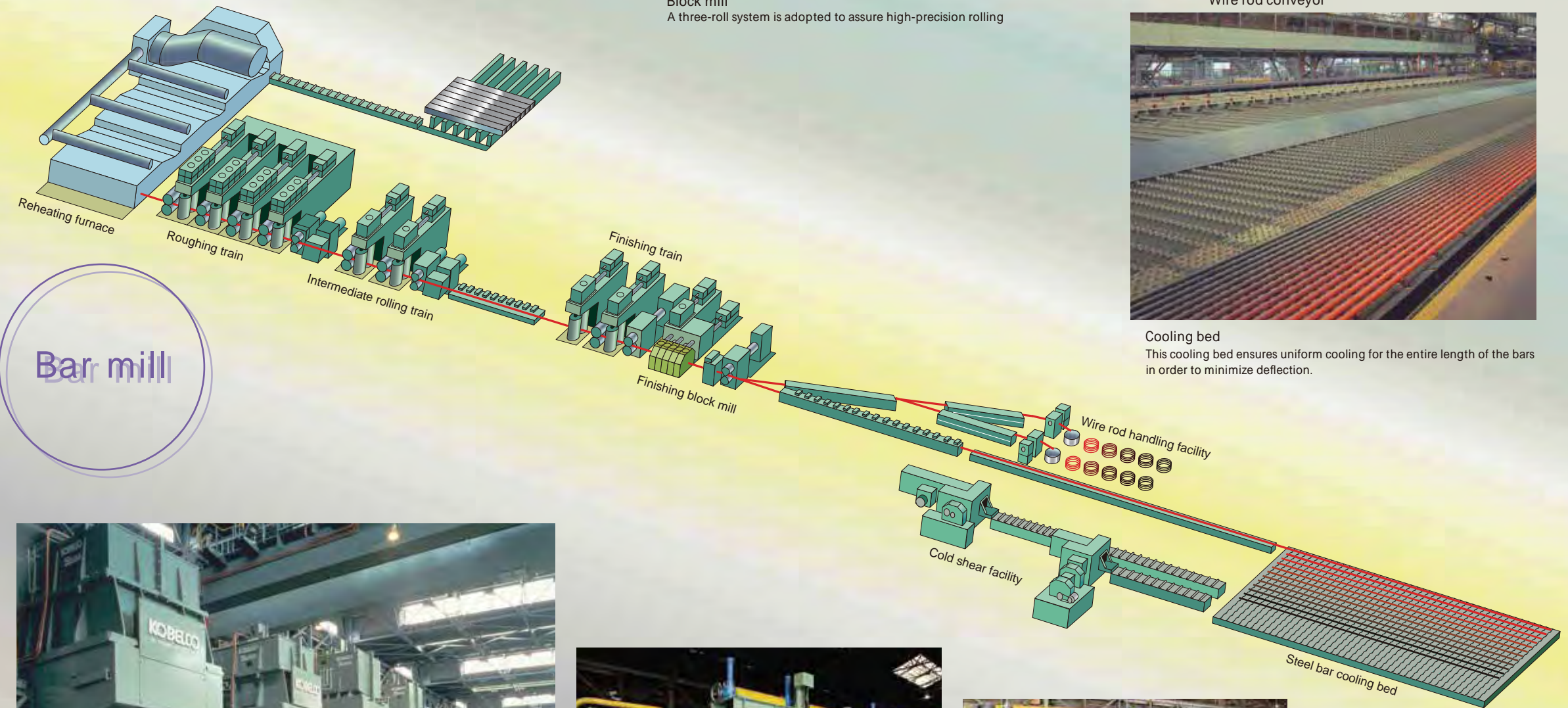
The highlight of the mill is that it uses a three-roll finishing block mill for precision rolling and high roundness of the bars.

Principle of rolling (three-roll finishing block mill)



Facility specifications

Bar mill	
Heating furnace	1 unit
Roughing train	8 stands
Intermediate train	4 stands
Finishing train	4 stands
Finishing block mill	5 stands



Block mill
A three-roll system is adopted to assure high-precision rolling



Wire rod conveyor



Cooling bed
This cooling bed ensures uniform cooling for the entire length of the bars in order to minimize deflection.

Bar conditioning

This process removes surface flaws and inspects the internal quality.

Facility specifications

Flaw detection (surface, internal)	
Magnetic leakage flux testing (surface)	3 units
Automatic ultrasonic inspection (internal)	3 units
Straighteners	
Two-roll straighteners	3 units
Multi-roll straighteners	1 units



Heating furnace Billets are heated to about 1,000° C.



Roughing train Hot steel is passed through the grooved rolls to reduce its cross-sectional area.



Magnetic leakage flux testing



Automatic ultrasonic inspection tester

Achieving High Quality

Wire rod secondary processing

Rolled wire rod is processed in response to customers needs

Wire rod processing including heat treatment, acid pickling and wire drawing are performed to meet customers requests and applications.

Heat treatment facility

Owing to centralized control, a wide variety of qualities that are required can be accommodated.

Main equipment

Batch annealing furnace	7 units
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Heat treating furnace (Batch annealing furnace)

Acid pickling and surface treating facility

This facility meets the various quality requirements for bearing steel, cold rolled steel and steel for valve springs.

Main equipment

Automatic pickling and surface treatment equipment	1 unit
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Automatic pickling and surface treatment equipment

Main equipment

Large-diameter wire drawing machine
Number of boilers: single boiler
Method: Skip-feed type method
Wire drawing speed: inverter variable method, 70 m/min
Size range of wire rods: 7.0 ~ 14.0mm
Weight of material: 2 tons
Unit weight of wire rods: 1 ton and 2 tons

Main equipment

Intermediate-diameter wire drawing machine
Number of boilers: single boiler
Method: Skip-feed type method
Wire drawing speed: clutch with 3 speed modes 65 m/min
Size range of wire rods: 5.5 ~ 9.0mm
Weight of material: 2 tons
Unit weight of wire rods: 1 ton and 2 tons



Bearing wire drawing machine

Achieving High Quality

Steel bar secondary processing

Rolled steel bar is processed in response to customers needs

Steel bar processing including heat treatment and straightening are performed to meet customers requests and applications.

Heat treatment facility

The roller hearth continuous charging furnace improves quality and productivity.

Main equipment

Annealing furnace	1 unit
Quenching furnace	1 unit



Roller hearth continuous annealing furnace



Roller hearth quenching furnace

Straighteners

A wide range of straightening of bars with thick and thin diameters is possible.

Main equipment

Two-roll straightener	1 unit
Multi-roll straightener	1 unit



Two-roll straightener



Multi-roll straightener

Every member is responsible for quality assurance.

Aiming to provide products of high quality and reliability, Kobe Works was accredited for ISO 9001 in 1997.

In 2017, we shifted to the year 2015 version and promoted a quality management system, setting quality targets to ensure customer satisfaction.

Every member is responsible for quality assurance and is conducting improvement activities.

Field quality enhancement meeting
All participants are working to achieve their targets.



QC liaison conference
Kobe Works shares quality control problems on a company-wide basis and promotes activities to reduce quality risks.



QC presentation conference
The session allows all members to share the fruits of the quality improvement activities.



Quality audits
Auditors check the production process and shipment quality control to improve guaranteed accuracy.

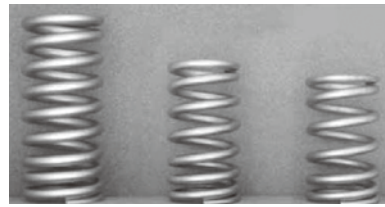
Pursuing High Quality Research and development

We are working to create new products and new technologies that reflect the future needs of our customers.

Our mission is to provide steel that not only features high quality but also excellent workability for parts to further enhance customer satisfaction.

Material design technologies

We are developing material design technologies that control fine metal structure, in order to improve the performance of a wide range of products, including valve springs for automobile engines and the main ropes for bridges.

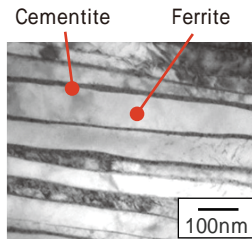


9254V KHV10N KHV12N

Small springs made from ultra-high strength valve spring steel (KHV12N)



Akashi Kaikyo Bridge and ultra-high strength main rope



TEM image of the pearlite structure of wire

Performance evaluation of steel parts

The fatigue properties of valve springs used in engines, suspension springs for the underbody, and gears used in automobile transmissions are examined under a variety of real-world conditions to evaluate the durability of new materials.



Suspension spring fatigue tester



Valve spring fatigue tester



Gear fatigue tester and a pair of gears

Evaluation of manufacturing properties

The machining properties of steel bars used in automobiles and parts used for manufacturing bolts are examined to develop steel materials with good machining properties.



Automatic lathe (CNC lathe)



Evaluation of machining properties using a CNC lathe



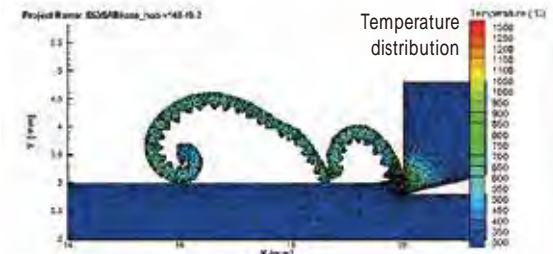
Multiple-stage former



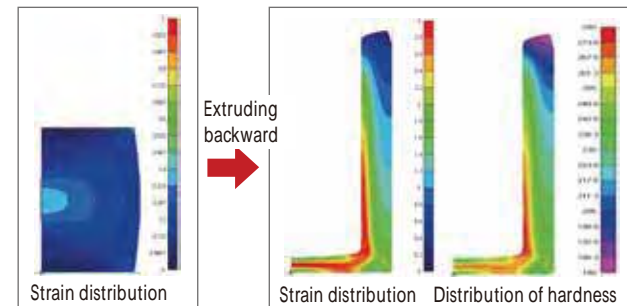
Example of products processed with a multiple-stage former

Simulation technologies

A variety of simulation technologies have been developed to estimate machining properties and the results of cold forging. They have been used to develop innovative materials.



Machining simulation



Cold forging simulation

Research and Development Laboratory
Wire Rod & Bar Products Development Department
Steelmaking Development Department

Technical Development Group
Materials Research Laboratory
Production Systems Research Laboratory

Research and Development System of Kobe Steel

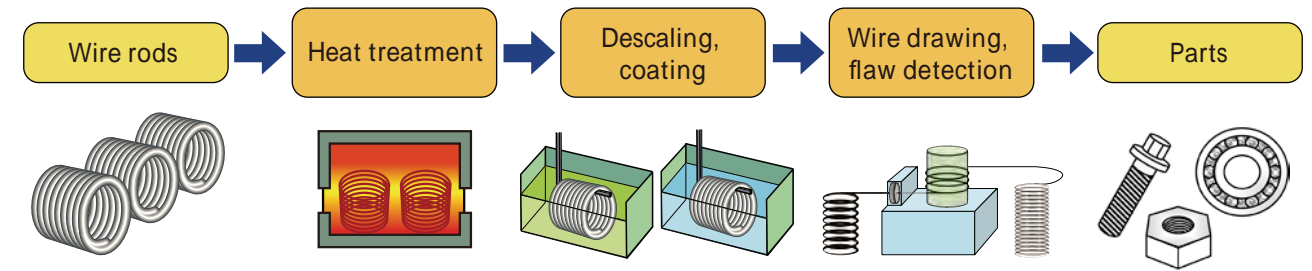
Kakogawa Works
Wire Rod & Bar Technology Department
Wire Rod Production Department

Kobe Wire Rod & Bar Plant
Wire Rod & Bar Rolling Department

We are committed to developing secondary processing technologies to achieve the compact production of high-quality, high-performance products in an energy-saving manner with a reduced environmental burden.

Secondary processing technologies

In secondary processing, hot-rolled wire rods go through the processes of heat treatment, descaling, coating and wire drawing to make wires that can be used for manufacturing parts such as bolts and springs.



Purpose

To improve machining properties by softening and controlling the structure of the material

To remove oxide films (scale) that are undesirable for processing, and to provide lubrication

To guarantee the machinability and dimensional accuracy of wire rods
To detect surface flaws

Development of technologies

Heat treatment pattern design
Fluidized bed patenting

Automatic acid pickling
Pickling with vibration
Mechanical descaling

Wire rod surface peeling (SV)
Lubrication of wire rods
Partial removal of flaws
Highly precise flaw detection

Testing and evaluation facility

Trial manufacturing can be performed at our testing and evaluation facility that can simulate manufacturing conditions at the customer's site. We are developing various secondary processing technologies applicable to mass production.



High speed wire drawing machine



Wet type wire drawing machine

Mass production facility (Wire Rod & Bar Products Manufacturing Section)

Development technologies are used for mass production at the secondary processing plant (Wire Rod & Bar Products Manufacturing Section) of Kobe Wire Rod & Bar Plant to produce high-quality and high-performance wire rods.



Automatic wire rod and coil pickling and coating facility



SV (SHAVELITE wire rod surface peeling) line

Kobe Wire Rod & Bar Plant that grows with the community.

Kobe Wire Rod & Bar Plant has been addressing environmental conservation, energy saving, resource recycling and other issues for much years in order to achieve and maintain clean steelworks. In addition, we value contact with local residents by using exchange facilities and participating in local activities.

ISO14001

Taking environmental conservation as an important subject in corporate activities, we are carrying at environmental activities under the following policies:

Environmental Policies

By observing laws, regulations and social norms, we aim at being a corporation that is trusted deeply by everybody through our technology, products and services. We, as a corporation founded in Kobe, consider environmental conservation in every aspect of our corporate activities based on our basic philosophy of collaboration with local communities and society. In doing so, we aim to leave a rich society that is comfortable to live in for the next generation.

- (1) To fully recognize the impact of corporate activities on the environment, strive to prevent pollution, and promote collaboration with society by communicating with local residents.
- (2) To respectfully observe environmental and related regulations, agreements on environmental conservation, and arrangements with community citizens.
- (3) To set environmental objectives and targets, promote continued improvements and conduct regular reviews.
- (4) To recognize the importance of environmental issues on a global scale, and therefore promote energy saving and material recycling for the effective use of resources.
- (5) To implement environmental education and training for all employees in order to enhance their environmental awareness and personal qualities.

We are committed to environmentally friendly operations in every aspect.

Air emissions and water quality

The environmental burden has been greatly reduced by consolidating upstream processes.

Resource recycling

All of the fly ash, a by product of our inhouse power plant, is recycled.

Energy saving

Continuous innovation in our operations promotes energy saving (reducing consumption of electricity and steam)

Logistics

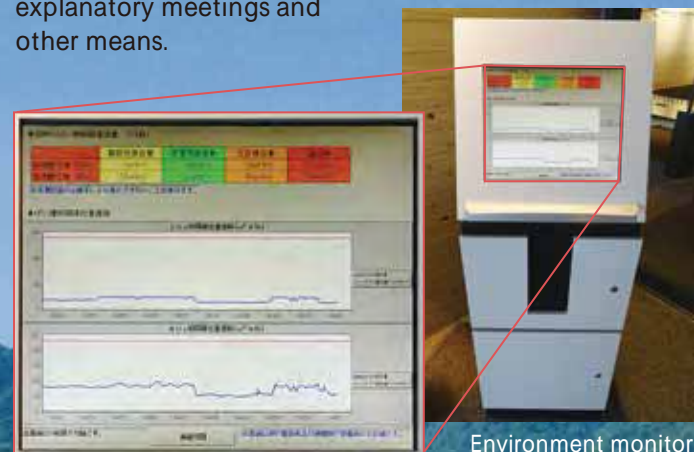
Transportation by ship and streamlining our logistics system help reduce CO emission.

Improving environmental awareness

We are working to improve environmental consciousness by regularly holding briefings for executives, educating employees, and conducting patrols.

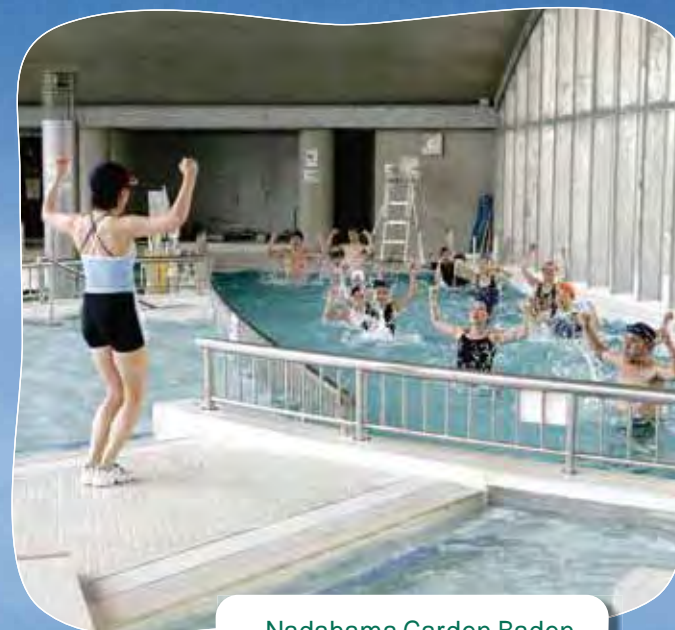
Disclosing environmental information

Environmental information is displayed on environment monitors (installed at two locations nearby). Communication is maintained with local residents through explanatory meetings and other means.



Environment monitor

Community exchange facilities



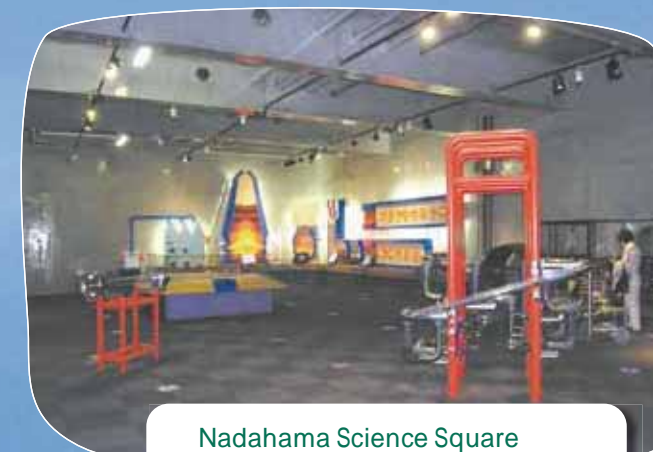
Nadahama Garden Baden

This hot bath facility utilizes waste heat from the Kobe Power Plant.



Nadahama Sports Zone

A clubhouse is also built in this sports facility, including tennis courts and an athletic ground.



Nadahama Science Square

Visitors enjoy and learn fascinating aspects of science and technology on the four themes of ironmaking, power generation, energy and the environment in this hands-on learning facility.

Participation in community activities



Aluminum can recycling activity

Festival

Clean-up activities

Kobe Steel has been growing along with the city of Kobe for over 100 years since its foundation in 1905. Here, we introduce the city that has fostered our company.





KOBE STEEL, LTD.

Steel & Aluminum Business

Kobe Wire Rod & Bar Plant

2 Nadahama Higashicho, Nada-ku, Kobe 657-0863, Japan
Tel.81-78-882-8030, Fax.81-78-882-8290

Head Offices

Kobe Head Office

2-4 Wakinohama Kaigandori 2-chome, Chuo-ku, Kobe 651-8585, Japan
Tel. 81-78-261-5111, Fax. 81-78-261-4123

Tokyo Head Office

9-12 Kitashinagawa 5-chome, Shinagawa-ku, Tokyo 141-8688, Japan
Tel. 81-3-5739-6000, Fax. 81-3-5739-6903

Overseas Offices and Contacts

Detroit Kobe Steel USA Inc.
19575 Victor Parkway, Suite 200, Livonia, MI 48152, U.S.A.
Tel: +1-734-462-7757 Fax: +1-734-462-7758

Shanghai Kobelco (China) Holding CO.,Ltd.
Room 3701, Hong Kong New World Tower, 300 Huai Hai
Zhong Road, Luwan District, Shanghai 200021, PEOPLE'S
REPUBLIC OF CHINA
Tel: +86-21-6415-4977 Fax: +86-21-6415-9409

Bangkok Kobelco South East Asia.Ltd.
17th Floor., Sathorn Thani Tower II, 92/49 North Sathorn
Road, Khwaeng Silom, Khet Bangrak, Bangkok 10500,
KINGDOM OF THAILAND
Tel: +66-2636-8971 Fax: +66-2636-8675

Düsseldorf Düsseldorf Office
Berliner Allee 55, 40212 Düsseldorf, Germany
Tel: +49-211-7792-0412 Fax: +49-211-7792-0450

Singapore Kobe Steel Asia Pte. Ltd.
72 Anson Road, #11-01A Anson House, Singapore 079911,
REPUBLIC OF SINGAPORE
Tel: +65-6221-6177 Fax: +65-6225-6631

URL: <https://www.kobelco.co.jp/>