HEAVY-PLATE MILLS

References
X-ROLL® HEAVY-PLATE MILLS
from SMS Siemag

THE FASCINATING WORLD OF HEAVY PLATE

Sky-scrapers, and drilling rigs on the high seas, bridges with giant spans and slender wind turbines, pipelines stretching into infinity and gasholders for enormous pressures, excavators, mobile cranes, container ships, luxury liners – heavy plate is a growth market thanks to its versatile spectrum of applications. Heavy-plate mills from SMS Siemag allow steelmakers to cover the entire range of products and to supply plates with tailor-made material properties for every envisaged application.

THE MOST STRINGENT DEMANDS

The most important market trend is the demand for plates with increasingly higher strengths, a demand that will definitely continue to rise over the next few years, for example with a view to enhancing the transport capacity of oil and gas pipelines without need to enlarge the wall thicknesses. Further requirements are high toughness, hardness and good weldability. At the same time, ever closer tolerances are being demanded in respect of dimensional accuracy and flatness.
MODERN PRODUCTION PROCESSES

Today, thermomechanical rolling is the most important production process for the manufacture of high-strength plates. In this method, the temperatures are specified and set exactly for finish-rolling and for cooling in the plate-cooling systems. The carefully targeted control of these complex processes requires close interaction between the mechanical equipment and the automation systems.

X-Roll® characterizes the family of brands from our Hot Rolling Mills division. It symbolizes plants and technical equipment for the economical and flexible production of hot strip and heavy plate.
HEAVY-PLATE MILLS
from SMS Siemag

SOLUTIONS FROM A SINGLE SOURCE

As system suppliers, we offer our customers the complete plant technology from a single source. Our integrated solutions comprising mechanical engineering, electrical and automation systems and process know-how enable the plant potential to be utilized optimally in order to manufacture plates within narrow geometrical tolerances, with the desired mechanical and technological properties and with high productivity.

OUR SUCCESS FACTORS

- Tailor-made plant concepts that are adapted to the customer’s requirements and to the local conditions and also allow expansion
- Mechanical equipment is of high quality thanks to our own manufacture of core components and to pre-assembly in our workshop
- Integrated solutions for mechanical equipment, electrical and automation systems and process know-how
- Continuous further development of design and plant technology
- Pre-optimization and pre-commissioning of the automation systems by means of Plug&Work tests
- Professional project management including erection and commissioning of the plants, training of the operating personnel and comprehensive service.
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POSCO
5.5 m heavy-plate mill
Gwangyang, South Korea

Posco awarded us the honor of "Outstanding Supplier of the Year" even while the supply was still being made.
The Posco heavy-plate mill is so far the only one worldwide to be designed for plates with a width of up to 5,300 mm over the entire process line. With this two-stand facility, the South Korean steelmaker has expanded its capacity by 2.5 million tons per year. Posco’s CEO emphasized the significance of the rolling mill at the time of its inauguration: “Posco has become an undisputed world’s largest steel plate manufacturer with the completion of this thick steel plate plant in Gwangyang. This factory will relieve supply shortages in domestic industries such as shipbuilding, and contribute to increasing global competitiveness of clients by providing the world’s best quality thick steel plates efficiently when needed.”

At Posco, we have installed a two-part spray cooling system for the first time. It operates over the whole length with highly efficient spray nozzles and possesses two pressure ranges. This enables Posco to achieve very high cooling rates and to flexibly implement the various cooling strategies. To ensure good flatness also at high cooling rates, the plate is guided between wrapper rolls in the high-pressure range in the front part of the cooling system. A pre-leveler ensures that the result of the cooling action is not impaired by any unevenness in the rolling stock.

**SCOPE OF SUPPLY**
- High-pressure descaler
- Four-high reversing roughing stand with edger (entry end)
  - Hydraulic adjustment systems
  - Roll force 120 MN
- Four-high reversing finishing stand
  - Hydraulic adjustment systems
  - Work roll bending
  - Roll force 120 MN
- Spray cooling with pre-leveler
- Hot plate leveler
- Crop shear
- Double-side trimming shear
- Slitting shear
- Dividing shear
- 9/5 cold plate leveler

**TECHNICAL DATA**

<table>
<thead>
<tr>
<th>Commissioning</th>
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<tbody>
<tr>
<td>Annual production</td>
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</table>

**Steel grades**
Structural steel, shipbuilding steel, offshore steel, pipe grades up to X120, pressure vessel steel

**Slab**
- Thickness: 250 to 400 mm
- Width: 1,600 to 2,400 mm
- Weight: max. 28.0 t

**Finished plate**
- Thickness: 6 to 200 mm
- Width: 1,400 to 5,300 mm
- Length: 7 to 25 m
- Weight: max. 28.0 t

For plant layout, see page 46.
ANGANG STEEL
5.5/5.0 m heavy-plate mill
Yingkou, China

Diameter: 2,400 mm, length: 5,400 mm: the backup rolls of the roughing stand.

Inspection of the plates after cutting to finished dimensions.
CHINA’S FIRST 5.5 M MILLSTAND

The heavy plate mill at Angang Steel Company went into operation in August 2008. The two-stand mill line consists of a 5.5 m roughing stand and a 5.0 m finishing stand. The roughing stand was China’s first 5.5 m heavy-plate millstand and the widest to have gone into operation worldwide for over 30 years. The 5.0 m finishing stand is equipped with our CVC® plus technology.

The roughing stand has a rapid mechanical screwdown system in addition to the hydraulic roll-gap adjustment system, so as to enable the roll gap to be opened extremely quickly during the rolling of ingots. The maximum roll force is 105 MN. A vertical edger at the exit end of the roughing stand ensures the precise setting of the plate width.

The capacity of the mill is two million tons of heavy plate per year. The product range of Angang Steel comprises all of the grades required on the market today, including plates for shipbuilding, pressure vessels and containers, high-strength structural steels and pipe grades. Its proximity to the ocean-going port of Yingkou gives Angang Steel good access to the export markets.

SCOPE OF SUPPLY

- 5.5 m four-high reversing roughing stand with edger (exit end)
  - Hydraulic adjustment systems
  - Work roll bending
  - Roll force 105 MN
- 5.0 m four-high reversing finishing stand
  - Hydraulic adjustment systems
  - Work roll bending
  - CVC® plus
  - Roll force 100 MN
- Combined spray and laminar cooling
- Hot plate leveler
- Crop shear
- Double-side trimming shear
- Slitting shear
- Dividing shear
- 9/5 cold plate leveler
- X-Pact® automation system for
  - Finishing stand
    (Profile and Flatness Control)
  - Spray and laminar cooling
  - Hot plate leveler
  - 9/5 cold plate leveler

TECHNICAL DATA

Commissioning August 2008

Annual production 2.0 million t

Steel grades
Structural steel, shipbuilding steel, pipe grades, pressure vessel steel, container steel, bridge-building steel and other structural steels

Slab
- Thickness 135 to 350 mm
- Width 1,300 to 2,300 mm
- Weight max. 30.3 t

Ingots
- Thickness max. 1,000 mm
- Weight max. 60.0 t

Finished plate
- Thickness 5 to 400 mm
- Width 1,200 to 4,800 mm
- Length 3 to 25 m
- Weight max. 60.0 t

For plant layout, see page 46.
BAOSHAN IRON & STEEL
5.0 m heavy-plate mill
Shanghai, China

Realized for the first time: Combined spray and laminar cooling.

The finishing stand was the first one in China to have CVC® plus technology.
COMBINED SPRAY AND LAMINAR COOLING FOR HIGH-STRENGTH PLATES

The 5 m heavy-plate mill from Baoshan Iron & Steel (Baosteel for short) has become the standard for a series of further new plants, thanks to the large number of innovative solutions. The finishing stand was the first heavy-plate stand in China to be equipped with the CVC® plus system. An innovation was the combined spray and laminar cooling. It makes possible a wide range of cooling strategies and the production of high-strength plates with economical alloying concepts.

In this cooling system, spray cooling is installed upstream of the laminar section. The spray cooling system attains very high cooling rates thanks to a powerful high-pressure water station in combination with special nozzles. To achieve good plate flatness in the spray cooling also at the highest cooling rates, pinch rolls are installed between the cooling headers to regulate the water flow onto the plate and thus improve the temperature distribution and the cooling efficiency. A retrofitted pre-leveler additionally evens out the cooling action.

Our X-Pact® process model controls the cooling curve. It is based on a mathematical-physical process model, which links the most important characteristic data of the plate with metallurgical parameters that are stored in the system for all materials. The ideal cooling process is thus calculated for each plate.

SCOPE OF SUPPLY

1st construction stage
- High-pressure descaler
- Four-high reversing finishing stand with edger (exit end)
  - Hydraulic adjustment systems
  - Work roll bending
  - CVC® plus
  - Roll force 108 MN
- Combined spray and laminar cooling
- Hot plate leveler
- 2 walking-beam cooling beds
- Crop shear
- Double-side trimming shear
- Sitting shear
- Dividing shear
- 9/5 cold plate leveler
- X-Pact® automation for
  - Finishing stand
    (Profile and Flatness Control)
  - Spray and laminar cooling
  - Hot plate leveler
  - 9/5 cold plate leveler

2nd construction stage (commissioning: 2008)
- Four-high reversing roughing stand
  - Hydraulic adjustment systems
  - Roll force 108 MN

3rd construction stage (commissioning: 2012)
- Pre-leveler
- 9/5 cold plate leveler
- X-Pact® automation for pre-leveler and cold plate leveler

TECHNICAL DATA

Commissioning March 2005
Annual production
1st construction stage 1.4 million t
2nd construction stage 1.8 million t

Steel grades
Carbon and high-strength steels such as shipbuilding steels, pipe grades, structural steel, pressure vessel steel, boiler plate, and others

Slab
- Thickness 220, 250, 300 mm
- Width 1,300 to 2,300 mm
- Weight 25.8 t

Ingots
- Thickness max. 1,000 mm
- Weight max. 60.0 t

Finished plate
- Thickness 5 to 400 mm
- Width 1,200 to 4,800 mm
- Length 3 to 25 m
- Weight 45.0 t

For plant layout, see page 46.
MMK
5.0 m heavy-plate mill
Magnitogorsk, Russia

The pre-leveler improves the plate flatness prior to entry into the spray and laminar cooling system.

Electrical and automation systems from SMS Siemag.
A PLANT ALL FROM THE SAME SOURCE

The 5.0 m heavy-plate mill from MMK is pure SMS Siemag technology. We supplied the mill with everything, from the millstand to the plate finishing line: the complete mechanical system, the automation systems, and the electrics with the complete drive technology. With an output of 12 MW each, the main drives are the strongest that we have installed so far. The reheating furnaces, the heat-treatment line and the roll shop also belonged to our supply scope. The secondary metallurgy equipment and the continuous caster which supplies the heavy-plate mill with slabs are likewise our products.

MMK uses its heavy-plate mill above all for the manufacture of plates for large-diameter pipes for pipelines. MMK commenced the production of these grades as early as four weeks after commissioning of the mill and increased their proportion to 100% within six months. MMK produces these grades exclusively with the thermomechanical rolling method. The optimized interplay of the pass-schedule model, the profile and flatness control and the mill pacing model allows MMK to perform multiple plate rolling with groups of up to six plates and thus achieve high productivity.

The multi-part backup rolls developed by us were installed for the first time in the MMK finishing stand. The smaller part weights meant that the long delivery times were able to be shortened and the MMK mill thus went into operation by the desired deadline.

SCOPE OF SUPPLY

- 2 reheating furnaces
- High-pressure descaler
- Four-high reversing finishing stand in multi-part construction with edger (exit end)
  - Hydraulic adjustment systems
  - Work roll bending
  - CVC® plus
  - Multi-part backup rolls
  - Roll force 120 MN
- Combined spray and laminar cooling with pre-leveler
- Hot plate leveler
- Walking-beam cooling bed
- Crop shear
- Double-side trimming shear
- Slitting shear
- Dividing shear
- 9/5 cold plate leveler
- Heat treatment furnace
- Roller quenching station
- Roll shop
- Complete X-Pact® electrical, drive technology and automation package

TECHNICAL DATA

Commissioning July 2009

Annual production
1st construction stage 1.5 million t

Steel grades
Pipe grades (up to X120), pressure vessel steel, bridge-building steel, shipbuilding steel

Slab
- Thickness 190, 250, 300 mm
- Width 1,400 to 2,700 mm
- Weight max. 30,0 t

Finished plate
- Thickness 8 to 160 mm
- Width 1,500 to 4,800 mm
- Length 6 to 24 m
- Weight max. 25.7 t

For plant layout, see page 48.
MINMETALS YINGKOU
5.0 m heavy-plate mill
Yingkou, China

The dividing shear is equipped with a movable stop for measuring the plate length.

Backup roll change with changing stool.
HEAVY-PLATE MILL OF LENGTH 1,600 M

Minmetals Yingkou belongs to one of China’s leading trading companies for steel and NF metals and, with the 5.0 m mill, has also become established as a manufacturer of high-quality heavy plate. We supplied both the mechanical equipment and the complete automation systems for the mill, at Yingkou in the northeast of China.

With a length of around 1,600 m from the slab furnaces to the plate dispatch area, the Minmetals Yingkou works is very generously designed and offers possibilities for further expansion. Such future expansion possibilities are: a heavy-plate area, a heat-treatment line, a second shearing line and additional reheating furnaces for slabs and ingots.

The mother plates produced on the two-stand mill line are trimmed to the final dimensions in the shearing line following the cooling and hot leveling. The four shears process plates of thickness up to 50 mm and strengths up to 1,200 N/mm². All shears operate with the rolling-cut method, which guarantees particularly precise cuts and clean plate edges. Crop shears and dividing shears are of the enclosed design type. This reduces the deformation of the housing during cutting, which in turn additionally improves the cutting accuracy and edge quality.

SCOPE OF SUPPLY

- High-pressure descaler
- Four-high reversing roughing stand in multi-part construction with edger (exit end)
  - Hydraulic adjustment systems
  - Roll force 120 MN
- Four-high reversing finishing stand in multi-part construction.
  - Hydraulic adjustment systems
  - Work roll bending
  - CVC® plus
  - Roll force 120 MN
- Laminar cooling system
- Hot plate leveler
- 3 walking-beam cooling beds
- Crop shear
- Double-side trimming shear
- Slitting shear
- Dividing shear
- 9/5 cold plate leveler
- Complete X-Pact® automation system

TECHNICAL DATA

Commissioning
September 2009

Annual production
1st construction stage 2.0 million t
2nd construction stage 2.3 million t

Steel grades
HSLA steel, shipbuilding steel, tube grades, pressure vessel steel, structural steel

Slab
Thickness 150, 200, 250, 320 mm
Width 1,300 to 2,600 mm
Weight max. 31.15 t

Ingots
Thickness max. 1,100 mm
Weight max. 80.0 t

Finished plate
Thickness 5 to 125 mm / 400 mm
Width 1,300 to 4,800 mm
Length 3 to 25 m
Weight max. 60.0 t

For plant layout, see page 50.
HYUNDAI STEEL
5.0 m heavy-plate mill
Dangjin, South Korea

Plug & Work tests.

Slipper-type spindles transmit the high rolling torques.
FAST COMMISSIONING THANKS TO PLUG&WORK

Hyundai Steel’s 5.0 m heavy-plate mill went into operation in December 2009. It is part of the company’s new integrated iron and steel plant on the west coast of Korea. The mill has an annual capacity of 1.5 million tons and this will be expanded to 2 million tpy by an additional roughing stand in 2013. With this rolling mill, Hyundai Steel is concentrating predominantly on the manufacture of ship plates.

We supplied the mechanical equipment and the complete automation for the mill. Prior to delivery, the automation systems were put through the Plug&Work tests. Here, they were tested against the real-time simulation of the rolling process.

The preliminary optimization shortened the commissioning time and enabled a rapid run-up of the mill. Already after nine months, the rolling mill attained 85% of its nominal capacity. A further benefit: The operating personnel were able to familiarize themselves with the mill beforehand by means of training sessions involving realistic operating situations. The maintenance personnel could also run through the relevant scenarios.

The control pulpit in the mill line is characterized by its special ergonomic design. The HMI systems are set up in such a way as to allow the operator good visibility and represent the process in a production-oriented manner, with all relevant information.

SCOPE OF SUPPLY

1st construction stage
- High-pressure descaler
- Four-high reversing finishing stand
- Hydraulic adjustment systems
- Work roll bending
- CVC® plus
- Roll force 108 MN
- Laminar cooling system
- Hot plate leveler
- 2 walking-beam cooling beds
- Crop shear
- Double-side trimming shear
- Slitting shear
- Dividing shear
- 9/5 cold plate leveler
- Complete X-Pact® automation system

2nd construction stage (commissioning: 2013)
- Four-high reversing roughing stand with edger (exit end)
- Hydraulic adjustment systems
- Spray cooling with pre-leveler
- Walking-beam cooling bed
- Dividing shear
- Complete X-Pact® automation system

TECHNICAL DATA

Commissioning: December 2009

Annual production
1st construction stage: 1.5 million t
2nd construction stage: 2.0 million t

Steel grades
Shipbuilding steel, structural steel and others

Slab
- Thickness: 220, 250, 300, 400 mm
- Width: 1,600 to 2,200 mm
- Weight: max. 22.5 t

Finished plate
- Thickness: 6 to 200 mm
- Width: 1,000 to 4,800 mm
- Length: 3 to 25 m
- Weight: max. 22.5 t

For plant layout, see page 48.
VYKSA STEEL
5.0 m heavy-plate mill
Vyksa, Russia

Cold plate leveler with a leveling force of 54 MN.
PLATE MILL FOR PIPE GRADES

Vyksa Steel is one of the leading Russian manufacturers of line pipes. With the new 5.0 m heavy-plate mill the company, which is part of the OMK Group, can manufacture high-strength heavy plates at its Vyksa location and process these directly into large-diameter pipes on plants from SMS Meer.

The production of tube steel grades up to strength class X120 places extremely heavy demands on all plant sections, from the mill line to the adjustment line. The cold plate leveler can therefore level plates up to a strength of 1,200 N/mm² in a single pass. The machine is constructed in 9/5 design and, in addition to the main hydraulic adjustment system, it has hydraulic roll-gap adjustment systems for each individual leveler roll. All leveler rolls are driven separately, which means that the ideal curvature progression can be set for each plate, through interaction with our leveling model. Furthermore, the machine can be operated with nine and five leveler rolls, thus providing an expanded leveling range. The change-over from the 9-roll to the 5-roll mode and vice-versa can be made from one plate to the next.

For the Vyksa Steel rolling mill we also supplied the complete electrical and automation system including the power supply, the drive engineering, the Level 1 and Level 2 systems and the production planning at Level 3.

Under consideration of the technological and logistical boundary conditions, the production planning system automatically generates the production orders from the order backlog and defines all process steps as far as the finished plate.

SCOPE OF SUPPLY

- Walking beam furnaces
- High-pressure descaler
- Four-high reversing finishing stand in multi-part construction.
  - Hydraulic adjustment systems
  - Work roll bending
  - CVC® plus
  - Roll force 120 MN
- Spray cooling with pre-leveler
- Hot plate leveler
- Disk-type cooling bed
- Double-side trimming shear
- Slitting shear
- Dividing shear
- 9/5 cold plate leveler
- Complete X-Pact® electrical and automation package including Level 3

TECHNICAL DATA

Commissioning November 2011

Annual production
1st construction stage 1.2 million t

Steel grades
Pipe grades to X120, mechanical-engineering steel, shipbuilding steel, bridge-building and other structural steels.

Slab
Thickness 250 to 400 mm
Width 1,300 to 2,600 mm
Weight max. 40.0 t

Finished plate
Thickness 7 to 150 mm
Width 1,400 to 4,800 mm
Length 6 to 25 m
Weight max. 40.0 t

For plant layout, see page 50.
TANGSHAN IRON & STEEL
5.0 m heavy-plate mill
Tangshan, China

The backup rolls are supported in MORGOIL® bearings.

The high-pressure descaler operates at pressures up to 210 bar.
The Chinese steelmaker Tangshan Iron & Steel has decided to commence the production of heavy plate and is therefore investing in a new 5.0 m mill with an annual capacity of 1.8 million tons. The mill is designed for plates in thicknesses between 5 and 200 mm and widths from 1,300 to 4,800 mm. The high-quality product range focuses on shipbuilding plates, pipe grades, high-strength structural plates as well as plates for the construction of pressure vessels and boilers. By increasing the starting-material weights, the annual production can be increased later to 2.0 million tons.

The mill line consists of a roughing stand with edger and a finishing stand. The finishing stand is equipped with CVC® plus technology for good plate flatness and high productivity.

The two millstands each have a maximum roll force of 120 MN. To absorb these high roll forces, the backup rolls are mounted in Morgoil® roll neck bearings of the KLX® series. In Morgoil® bearings, an oil film supports the roll neck and keeps it separate from the bearing bush, thus preventing any friction between the metal parts. The KLX® series is the most recent further development of the Morgoil® bearings. This series can be loaded to an extremely high degree and ensures optimum running accuracy of the rolls with high operational reliability.

**SCOPE OF SUPPLY**

- High-pressure descaler
- Four-high reversing roughing stand with edger (exit end)
  - Hydraulic adjustment systems
  - Roll force 120 MN
- Four-high reversing finishing stand
  - Hydraulic adjustment systems
  - Work roll bending
  - CVC® plus
  - Roll force 120 MN
- Laminar cooling system
- Hot plate leveler
- Crop shear
- Double-side trimming shear
- Slitting shear
- Dividing shear
- 9/5 cold plate leveler
- X-Pact® automation system for
  - Finishing stand
    (Profile and Flatness Control)
  - Laminar cooling system
  - Hot plate leveler
  - Cold plate leveler

**TECHNICAL DATA**

<table>
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<td>Width</td>
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<td>Length</td>
<td>3 to 25 m</td>
</tr>
<tr>
<td>Weight</td>
<td>max. 37.4 t</td>
</tr>
</tbody>
</table>

For plant layout, see page 50.
Nanjing, China
TENTH HEAVY-PLATE MILL FROM SMS SIEMAG IN CHINA

The Chinese steel group Nanjing Iron & Steel (Nisco) awarded an order to us in August 2011 to build a new 4.7 m heavy-plate mill. The order comprises the delivery of a finishing stand with CVC® plus technology, a pre-leveler, a hot plate leveler and a shearing line. We are supplying these components inclusive of the technological X-Pact® automation systems.

The Nisco plant is the tenth heavy plate mill to be erected by us in China in less than ten years. It is being built in Nanjing and will commence operation in 2013. With this heavy-plate mill, Nisco aims at attaining an annual production of 1.6 million tons. The product range covers all steel grades currently demanded by the market such as tube and pipe steel grades, ship plates and other high-strength steel grades.

The finishing stand has a roll force of 120 MN and is equipped with hydraulic adjustment systems, work-roll bending and the CVC® plus system (Continuously Variable Crown). In cooperation with SMS Siemag’s profile and flatness control (PFC), CVC® enables the production of plates with close geometrical tolerances and a high throughput.

SCOPE OF SUPPLY

- Four-high reversing finishing stand
  - Hydraulic adjustment systems
  - Work roll bending
  - CVC® plus
  - Roll force 120 MN
- Pre-leveler
- Hot plate leveler
- Crop shear
- Double-side trimming shear
- Slitting shear
- Dividing shear
- X-Pact® automation system for
  - Finishing stand
    (Profile and Flatness Control)
  - Pre-leveler
  - Hot plate leveler

TECHNICAL DATA

Commissioning 2013

Annual production
1st construction stage 1.6 million t

Steel grades
Shipbuilding steel, pipe grades, pressure vessel steel, structural steel, HSLA steels

Slab
Thickness 150, 180, 220, 260, 320 mm
Width 1,600 to 2,800 mm
Weight max. 30.0 t

Ingots
Thickness max. 600 mm
Weight max. 45.0 t

Finished plate
Thickness 8 to 250 mm
Width 1,800 to 4,850 mm
Length 6 to 25 m
Weight max. 45.0 t

For plant layout, see page 52.
QINHUA NGDAO SHOUQIN METAL MATERIALS 4.3 m heavy-plate mill Qinhuangdao, China
MULTI-PART MILL HOUSING

In the 4.3 m heavy-plate mill at Qinhuangdao Shouqin we have for the first time installed mill housings in split and bolted design. In this type of construction, it is only on the jobsite that the finish-machined mill housing yokes and posts are firmly connected with each other by tension rods. This approach simplifies casting of the mill housing, cuts delivery times and makes shipment easier. At the same time, a lower degree of necking under load is obtained through the controlled pre-stressing of the tension rods. This results in improvement of the plate running and thus also of the plate geometry.

Four years after the start of production, the second construction stage went into operation in 2010 with a roughing stand and the second shearing line with double-side trimming shear, slitting and dividing shears and a cold plate leveler. The annual capacity of the 4.3 m mill is thus around 1.8 million tons.

Qinhuangdao Shouqin Metal Materials is a part of the Chinese Shougang Group to which, since the year 2000 alone, we have supplied a continuous slab caster, two hot strip mills, two pickling line/tandem cold mills and several strip finishing lines.

SCOPE OF SUPPLY

1st construction stage
- High-pressure descaler
- Four-high reversing finishing stand in multi-part construction
  - Hydraulic adjustment systems
  - Work roll bending
  - CVC® plus
  - Roll force 92 MN
- Laminar cooling system
- Hot plate leveler
- Walking-beam cooling bed
- 2 disk-type cooling beds
- Double-side trimming shear
- Dividing shear
- X-Pact® automation system for
  - Laminar cooling system
  - Hot plate leveler

2nd construction stage
(commissioning: 2010)
- Four-high reversing roughing stand
  - Hydraulic adjustment systems
  - Roll force 90 MN
- Double-side trimming shear
- Slitting shear
- Dividing shear
- 9/5 cold plate leveler
- X-Pact® automation for cold plate leveler

TECHNICAL DATA

<table>
<thead>
<tr>
<th>Commissioning</th>
<th>October 2006</th>
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<tbody>
<tr>
<td>Annual production</td>
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<tr>
<td>1st construction stage</td>
<td>1.2 million t</td>
</tr>
<tr>
<td>2nd construction stage</td>
<td>1.8 million t</td>
</tr>
<tr>
<td>Steel grades</td>
<td></td>
</tr>
<tr>
<td>Shipbuilding steel, pipe grades, bridge-building steel, pressure vessel steel, mechanical-engineering steel</td>
<td></td>
</tr>
<tr>
<td>Slab</td>
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</tr>
<tr>
<td>Thickness</td>
<td>150 to 400 mm</td>
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<tr>
<td>Width</td>
<td>1,200 to 2,400 mm</td>
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<td>Weight</td>
<td>max. 24.5 t</td>
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<tr>
<td>Finished plate</td>
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<tr>
<td>Thickness</td>
<td>5 to 200 mm</td>
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<tr>
<td>Width</td>
<td>1,400 to 4,100 mm</td>
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<tr>
<td>Length</td>
<td>3 to 28 m</td>
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<tr>
<td>Weight</td>
<td>max. 31.0 t</td>
</tr>
</tbody>
</table>

For plant layout, see page 52.
DONGKUK STEEL
4.3 m heavy-plate mill
Pohang, South Korea

SMS Siemag renewed the automation for the roughing and finishing stands.
STAND MODERNIZATION WITH CVC® PLUS

The growing demand for high-quality ship plates prompted Dongkuk Steel to entrust us with the modernization of the Heavy-Plate Mill No.2 in 2008. The mill had been in operation since 1997 and had originally been supplied to a Mexican customer in 1982. At that time, we supplied the major part of the equipment.

The aims of the revamp were to increase the production from 1.7 to 2.0 million tpy, to improve the plate quality and to lower the minimum plate thickness from 8 to 5 mm.

For this revamp, we equipped a millstand supplied by another manufacturer with our CVC® plus technology for the first time. This enables Dongkuk Steel to perform higher reductions especially during the last few rolling passes and ensures the adherence to narrow profile and flatness tolerances. We also installed new hydraulic adjustment systems to increase the roll force to 90 MN.

Dongkuk Steel equipped the finishing stand with our newly developed slipper-type spindles with length compensation for transmitting higher rolling torques. These spindles enable the work rolls to be shifted and, thanks to their robust construction as compared to other spindle types, have a considerably higher torque capacity and greater operational reliability.

In the field of automation, we supplied new process models for pass schedule calculation, for profile and flatness control (PFC), for mill pacing and for material tracking, as well as new technological control systems (TCS) in both millstands.

SCOPE OF SUPPLY

1st construction stage
- High-pressure descaler
- Hot plate leveler
- 2 walking-beam cooling beds
- 3 dividing shears
- Slitting shear
- 2 double-side trimming shears
- Plate finishing line

Revamp 2008
- Finishing stand:
  - CVC® plus, slipper-type spindles,
  - hydraulic adjustment systems
- Roughing and finishing stands:
  - Technological control systems (Level 1),
  - process models (Level 2) for pass schedule calculation, profile and flatness control (PFC), pacing system and material tracking

Revamp 2011
- Roughing stand: slipper-type spindles

TECHNICAL DATA

Commissioning: 1997
Revamps: 2008/2011
Annual production: 2.0 million t

Steel grades
Shipbuilding steel, pipe grades,
bridge-building steel, pressure vessel steel,
structural steel

Slab
- Thickness: 250 mm
- Width: 1,100 to 2,200 mm
- Weight: max. 14.0 t

Finished plate
- Thickness: 6 to 120 mm
- Width: 1,524 to 4,100 mm
- Length: max. 25 m
- Weight: max. 14.0 t

For plant layout, see page 52.
BAOSHAN IRON & STEEL
4.3 m heavy-plate mill
Shanghai (Luojing), China
BAOSTEEL MILL FOR STAINLESS STEELS AND SPECIAL GRADES

In March 2008 Baoshan Iron & Steel commissioned its second heavy-plate mill from SMS Siemag, the 4.3 m mill. The mill supplements the product range of the 5.0 m rolling mill and is designed for the production of stainless steels and special grades.

The 4.3 m mill also has a two-stand mill line with CVC® plus in the finishing stand, a combined spray and laminar cooling system with pre-leveler, a hot plate leveler, a shearing line and a cold plate leveler.

The hot plate leveler is designed for plates between 8 and 100 mm with low-temperature strengths up to 1,000 N/mm². Its leveling force is 34 MN. The adjustment of the upper pressure frame takes place in a purely hydraulic manner and, in addition, the entry and runout rolls of the lower leveler roll set can be adjusted separately. The elastic deformations in the machine are compensated via short-stroke cylinders during leveling.

Our X-Pact® leveling model is based on the mathematical-physical mapping of the processes in the plate and in the machine. It calculates the adjustment of the leveler rolls and the drive torque as a function of the material properties such as yield point, tensile strength, modulus of elasticity and plate size.

SCOPE OF SUPPLY

1st construction stage
- High-pressure descaler
- Four-high reversing roughing stand with edger (exit end)
  - Hydraulic adjustment systems
  - Roll force 90 MN
- Four-high reversing finishing stand
  - Hydraulic adjustment systems
  - Work roll bending
  - CVC® plus
  - Roll force 90 MN
- Combined spray and laminar cooling
- Hot plate leveler
- Walking-beam cooling beds
- Crop shear
- Dividing shear
- 9/5 cold plate leveler
- X-Pact® automation system for
  - Finishing stand (Profile and Flatness Control)
  - Spray and laminar cooling
  - Hot plate leveler
  - Cold plate leveler

2nd construction stage (commissioning: 2012)
- Pre-leveler in the entry section of the spray cooling system
- X-Pact® automation system for pre-leveler

TECHNICAL DATA

Commissioning March 2008
Annual production
1st construction stage 1.6 million t
Steel grades Special grades, stainless steels, structural steel, pressure vessel steel, shipbuilding steel
Slab
- Thickness 200, 230, 250, 300, 350, 400 mm
- Width 1,500 to 2,300 mm
- Weight max. 28.0 t

Finished plate
- Thickness 5 to 200 mm
- Width 1,200 to 4,100 mm
- Length 3 to 25 m
- Weight max. 28.0 t

For plant layout, see page 54.
ROURKELA STEEL PLANT
4.3 m heavy-plate mill
Rourkela, India

Dividing shear.
NEW HEAVY-PLATE MILL FOR ROURKELA

We are supplying the Steel Authority of India (SAIL) with the process equipment for a new 4.3 m heavy-plate mill, from the cooling bed to the plate finishing line. The mill is being built at the Rourkela location in the province of Orissa and is designed for an overall capacity of 920,000 t each year. The later expansion of the mill, with an increase of production, has already been included in the layout planning.

Our supply scope comprises a disk-type cooling bed and an inspection bed, the shearing line with double-side trimming shear and dividing shear and, for the plate finishing line, the cold plate leveler in 9/5 design with the leveling model.

In combination with the technological control system (TCS), our X-Pact® leveling model sets the adjustments of the leveler rolls and calculates the drive torques. When doing this, it considers the properties of the material at the current plate temperature and the plate dimensions. The ideal curvature progression is thus found for each plate.

For the plate finishing line we shall also be supplying the complete transport and conveying facilities, the pre-piler, an inspection bed and a rail-bound car for the transport of heavy plates.

The new heavy-plate mill is part of the extension of the Rourkela works. We had helped to erect this works already in the 1960’s. At that time, one of the facilities supplied by SMS Siemag was the 2.5 m heavy-plate mill.

SCOPE OF SUPPLY

- Disk-type cooling bed
- Inspection bed
- Double-side trimming shear
- Dividing shear
- 9/5 cold plate leveler
- Plate finishing line
- X-Pact® automation system for cold plate leveler

TECHNICAL DATA

- Commissioning: 2012
- Annual production: 920,000 t

Steel grades
Structural steels, pressure vessel steel, shipbuilding steel, pipe grades, HSLA grades

Finished plate
- Thickness: 6 to 100 mm
- Width: 1,500 to 4,100 mm
- Length: 6.3 to 15 m
- Weight: max. 23.2 t

For plant layout, see page 54.
HYUNDAI STEEL
4.3 m heavy-plate mill
Dangjin, South Korea
A SECOND HEAVY-PLATE MILL FOR HYUNDAI STEEL

In May 2011 Hyundai Steel asked us to supply a 4.3 m heavy-plate mill. The new mill is being built directly adjacent to the 5.0 m mill, likewise supplied by SMS Siemag, in the integrated iron and steel plant of Hyundai Steel in Dangjin.

The millstand has a roll force of 90 MN and is equipped with hydraulic adjustment systems, work-roll bending and the CVC® plus system. The rolling process is controlled by our X-Pact® automation system. Before the first pass, the pass-schedule model (PSC) calculates the optimum pass schedule with the smallest number of rolling cycles. After each pass, the remaining rolling steps are recalculated within milliseconds and adapted to the actual conditions. Thanks to the high precision of the first calculation, only small adaptations of the set values are needed. The profile and flatness control (PFC) is part of the PSC and it adapts the work roll bending and the position of the CVC shifting from pass to pass.

The plate cooling system is designed as a purely spray-cooling system with a high-pressure station in the front section and a low-pressure cooling system in the rear section. It makes possible very high cooling rates with good plate flatness and the ability to implement a large variety of cooling patterns.

SCOPE OF SUPPLY

- High-pressure descaler
- Four-high reversing finishing stand with edger (exit end)
- Hydraulic adjustment systems
- Work roll bending
- CVC® plus
- Roll force 90 MN
- Spray cooling
- Hot plate leveler
- 2 walking-beam cooling beds
- Crop shear
- Double-side trimming shear
- 2 dividing shears
- 9/5 cold plate leveler
- X-Pact® automation system for
  - Finishing stand (Level 1 and Level 2)
  - Spray cooling
  - Pre-leveler
  - Hot plate leveler
  - Cold plate leveler

TECHNICAL DATA

Commissioning 2013

Annual production
1st construction stage: 1.5 million t

Steel grades
Shipbuilding steel and other high-grade steels

Slab
- Thickness: 225, 250, 300 mm
- Width: 1,600 to 2,200 mm
- Weight: max. 21.2 t

Finished plate
- Thickness: 6 to 200 mm
- Width: 1,500 to 4,100 mm
- Length: 3 to 25 m
- Weight: max. 21.2 t

For plant layout, see page 48.
BAOTOU IRON & STEEL
3.8 m heavy-plate mill
Baotou, China
HEAVY-PLATE PRODUCTION IN THE HIGHLANDS OF MONGOLIA

Baotou Iron & Steel Group is the largest steelmaker in Inner Mongolia and has been concentrating since the year 2000 on expanding its flat-steel production. Thus, in October 2007, following the CSP® plant and a combined pickling line/tandem cold mill, already the third facility from SMS Siemag within six years went into operation: the 3.8 m heavy-plate mill.

The main components of the mill are a roughing stand and a finishing stand, the plate cooling system, the hot plate leveler, the shearing line and the cold plate leveler. The plate cooling is designed as a laminar cooling system. This makes possible accelerated cooling and direct quenching and thus the manufacture of a wide range of high-strength plates. Further advantages are the simple design, the low energy consumption and the low costs of care and maintenance. Laminar cooling is the type of cooling that is the most widely distributed throughout the world.

Following the supply and commissioning of the heavy-plate mill, we are cooperating with Baotou Iron & Steel also in the field of materials technology and have developed a concept for the manufacture of high-strength tube steels that is specially attuned to the Baotou process chain.

SCOPE OF SUPPLY

1st construction stage
- High-pressure descaler
- Four-high reversing roughing stand
  - Hydraulic adjustment systems
  - Roll force 81 MN
- Four-high reversing finishing stand
  - Hydraulic adjustment systems
  - Work roll bending
  - CVC® plus
  - Roll force 80 MN
- Laminar cooling system
- Hot plate leveler
- Crop shear
- Double-side trimming shear
- Dividing shear
- X-Pact® automation system for
  - Finishing stand (Profile and Flatness Control)
  - Laminar cooling system
  - Hot plate leveler

2nd construction stage (commissioning: 2010)
- Dividing shear
- 9/5 cold plate leveler
- X-Pact® automation system for cold plate leveler

TECHNICAL DATA

Commissioning October 2007
Annual production
1st construction stage 1.4 million t

Steel grades
High-strength structural steel, shipbuilding steel, pipe grades, pressure vessel steel, mechanical-engineering steel

Slab
- Thickness 200, 250, 300 mm
- Width 1,200 to 2,300 mm
- Weight max. 39.8 t

Finished plate
- Thickness 5 to 100 mm
- Width 1,150 to 3,650 mm
- Length 3 to 18 m
- Weight max. 36.6 t

For plant layout, see page 54.
XIANGTAN IRON & STEEL
3.8 m heavy-plate mill
Xiangtan, China

Complete automation from SMS Siemag.
COMPLETE AUTOMATION FROM SMS SIEMAG

With the two millstands, the plate cooling, the hot and cold plate levelers and three shears, we have supplied the most important mechanical equipment and all pertaining process models and technological control systems for the 3.8 m heavy-plate mill at Xiangtan Iron & Steel.

The following are the essential elements of our X-Pact® automation:
- Material tracking from the reheating furnace to the plate piler
- The mill pacing for optimum throughput
- The pass schedule calculation (PSC) for the roughing and finishing stands
- Technological control systems such as width and thickness control for the millstands
- Set-up model, coolant volume control and edge masking for the plate cooling
- Set-up model and hydraulic leveler-roll adjustment for the hot and cold plate levelers (drive control).

The new rolling mill has enabled Xiangtan Iron & Steel to become established as a producer of high-quality heavy plates, following the previous good reputation of the company, from the province of Hunan, as a manufacturer of long products. A special feature of the mill is its production of plates up to 74 meters in length, which only afterwards are cut to length in the shearing line.

SCOPE OF SUPPLY

1st construction stage
- Four-high reversing roughing stand with edger (entry end)
  - Hydraulic adjustment systems
  - Roll force 50 MN
- Four-high reversing finishing stand
  - Hydraulic adjustment systems
  - Work roll bending
  - Roll force 75 MN
- Laminar cooling system
- Hot plate leveler
- Double-side trimming shear
- Dividing shear
- Complete X-Pact® automation system

2nd construction stage (commissioning: 2008)
- Dividing shear (as sample shear)
- 9/5 cold plate leveler
- X-Pact® automation system for cold plate leveler

TECHNICAL DATA

Commissioning: October 2005

Annual production
1st construction stage: 1.4 million t

Steel grades
High-strength structural steel, shipbuilding steel, pipe grades, pressure vessel steel, mechanical-engineering steel

Slab
- Thickness: 180, 220, 260, 300 mm
- Width: 1,200 to 2,300 mm
- Weight: max. 35.0 t

Finished plate
- Thickness: 6 to 100 mm
- Width: 1,500 to 3,650 mm
- Length: 6 to 18 m
  (rolled length: 74 m)
- Weight: max. 35.0 t

For plant layout, see page 56.
XINYU IRON & STEEL
3.8 m heavy-plate mill
Xinyu, China
TWO YEARS FROM THE ORDER TO THE FIRST PLATE

A mere 24 months from the order to the first plate made the construction of the 3.8 m heavy-plate mill for Xinyu Iron & Steel become a special challenge. To implement the project in this short time was only possible thanks to our great experience on the Chinese market.

In the first construction stage, the mill possesses an annual capacity of 800,000 t and it can enhance its production to 1.2 million t by an additional roughing stand. The product mix comprises a wide range of steel grades, from simple carbon steels to shipbuilding steels, pipe grades and steel grades for manufacturing pressure vessels.

A hydraulic edger is flanged on at the exit end of the finishing stand in order to improve the width accuracy. This edger operates with a roll force of 4,500 kN. A special control system for the edging pass ("short stroke") ensures good rectangularity at the plate head and tail ends and thus improves the yield of the mill.

SCOPE OF SUPPLY

- Four-high reversing finishing stand with edger (exit end)
- Hydraulic adjustment systems
- Work roll bending
- Roll force 75 MN
- Hot plate leveler
- Double-side trimming shear
- X-Pact® automation system for hot plate leveler

TECHNICAL DATA

Commissioning: April 2005

Annual production
1st construction stage: 0.8 million t
2nd construction stage: 1.2 million t

Steel grades
Carbon steel, shipbuilding steel, pipe grades, pressure vessel steel, mechanical-engineering steel

Slab
Thickness: 210 to 300 mm
Width: 1,350 to 2,300 mm
Weight: max. 33.6 t

Finished plate
Thickness: 6 to 100 mm
Width: 1,500 to 3,610 mm
Length: 6 to 18 m
Weight: max. 33.6 t

For plant layout, see page 56.
SSAB
3.7 m heavy-plate mill
Oxelösund, Sweden
FOR THE FIRST TIME, CVC® PLUS FOR HEAVY-PLATE STAND

The Swedish steelmaker SSAB Oxelösund specializes in abrasion-resistant and high-strength steel plates, which are in demand above all in heavy mechanical engineering and in the building industry. With a view to increasing the capacity and improving the plate quality, SSAB placed an order with us in 1995 to build a new 3.7 m four-high millstand and a hot plate leveler. The new heavy-plate stand was the first millstand worldwide to be equipped with CVC® plus technology.

CVC® plus is an integrated system and is based on the combination of work roll bending, axial shifting of the work rolls provided with the special CVC grinding pattern, and the technological process model PFC (profile and flatness control). The PFC calculates the shifting position and the bending force for each pass under consideration of the roll force, thus enabling the profile and flatness to be set exactly, even for thin and wide plates. Furthermore, CVC® plus enhances the productivity because it allows high thickness reductions, above all for the final rolling passes.

In addition, we supplied SSAB with a drum shear for cutting the plates after roughing, a pre-leveler, the automation for the Mulpic cooling system, and a cold plate leveler. This is installed in the heat-treatment line and it also levels extremely wear-resistant plates, which are marketed by SSAB under the trade name of Hardox.

**SCOPE OF SUPPLY**

- Four-high reversing finishing stand
- Hydraulic adjustment systems
- Work roll bending
- CVC® plus
- Roll force 100 MN
- Profile and Flatness Control (PFC)
- Drum shear
- Pre-leveler
- Cooling model for Mulpic
- Cold plate leveler

**TECHNICAL DATA**

**Commissioning**

November 1997

**Annual production**

650,000 t

**Steel grades**

Abrasion and wear-resistant plates, structural steel grades, tool steel

**Slab**

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<td>Width</td>
<td>1,600 - 1,700 mm</td>
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**Finished plate**

<table>
<thead>
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<th>Thickness</th>
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<tbody>
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<tr>
<td>Length</td>
<td>max. 30 mm</td>
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<tr>
<td>Weight</td>
<td>max 13.5 t</td>
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</table>
SSAB NORTH AMERICA
Steckel/Plate rolling mill
Montpelier (Iowa), USA
STECKEL/PLATE ROLLING MILL FOR HEAVY PLATE AND HOT STRIP

At SSAB North America (formerly Ipsco) we implemented a plant concept for the first time in 1997 which makes it possible to manufacture heavy plate and hot wide strip on one millstand. Using the Steckel/Plate rolling mill, SSAB North America can adapt its production to the market quickly and flexibly.

The mill line comprises a Steckel millstand with an edging stand flanged on at the entry end. The initial passes are simple reversing passes. As from a thickness of 25 mm the rolling stock is coiled into the Steckel furnace and thus kept at the correct temperature during the last few passes. The millstand is equipped with CVC® plus, thus enabling the profile and flatness of plates and strips to stay within narrow tolerances.

On the millstand, SSAB North America can produce plates up to 600 m in length which, after rolling, can be cut by a dividing shear “on the fly” to the maximum cooling-bed length of 74 m.

Besides the rolling mill, we supplied the steelmaking equipment and the continuous caster for the works in Montpelier in the US federal state of Iowa. With a width of 3,048 mm, the caster is one of the world’s widest and produces slabs with a thickness of 152 mm. Directly after casting, the slabs run through the walking-beam furnace and are then fed into the mill line. Thanks to this close combination of casting and rolling, the plant is characterized by a low energy consumption.

SCOPE OF SUPPLY

- High-pressure descaler
- Four-high Steckel millstand with edger (entry end)
  - Hydraulic adjustment systems
  - Work roll bending
  - CVC® plus
  - Roll force 60 MN
- Flying cross-cut shear
- Laminar cooling system
- Downcoiler
- Hot plate leveler
- Disk-type cooling bed
- Crop shear
- Double-side trimming shear
- Dividing shear
- Cold plate leveler

TECHNICAL DATA

Commissioning: November 1997
Annual production
1st construction stage: 1.2 million t
Steel grades
- Structural steel, pipe grades
- Fine-grained engineering steel

Slab
- Thickness: 152.4 mm
- Width: 1,219 to 3,048 mm
- Length: 18.9 m
- Weight max.: 68.0 t

Finished plate
- Thickness: 4.78 to 50.8 mm
- Width: 1,219 to 3,048 mm
- Length max.: 24.38 m (rolled length: 600 m)
- Weight max.: 16.0 t

Finished strip
- Thickness: 2.29 to 19.0 mm
- Width: 1,219 to 2,438 mm
- Coil weight: 34.0 t

For plant layout, see page 56.
MAGHREB STEEL
2.8 m heavy-plate mill
Casablanca, Morocco
COMPACT WORKS COMPLEX

We have built a new works complex for the production of heavy plate and hot strip in Casablanca (Morocco) for Maghreb Steel. We supplied the complete plant engineering, including the electrical and automation package, for this works which comprises an electric steelmaking plant, continuous slab caster, 2.8 m heavy plate mill and twin-stand Steckel mill.

The heavy-plate mill and the Steckel mill receive their slabs from the same continuous caster and are arranged such that the heavy-plate stand can be used for plate production and as a roughing stand for the Steckel mill. This concept gives Maghreb Steel the required flexibility for adapting the production to the market demand.

The heavy-plate stand is equipped with our CVC® plus system. The finish-rolled plates are first cut to cooling-bed length by a hot dividing shear downstream of the millstand. They then pass through the hot plate leveler and, following the cooling bed, they are cut to final dimensions in the finishing line.

SCOPE OF SUPPLY

- High-pressure descaler
- Four-high finishing stand
- Hydraulic adjustment systems
- Work roll bending
- CVC® plus
- Roll force 36 MN
- Hot dividing shear
- Hot plate leveler
- Disk-type cooling bed
- Trimming shear
- Dividing shear
- Complete X-Pact® electrical and automation system

TECHNICAL DATA

- Commissioning: October 2011
- Annual production: 500,000 t
- Product range: Carbon steel grades

Slab
- Thickness: 100 to 250 mm
- Width: 1,200 to 2,150 mm
- Weight: max. 25.0 t

Finished plate
- Width: 1,500 to 2,650 mm
- Thickness: 4.75 to 50 mm
- Length: 6 to 12 m
- Weight: max. 25.0 t

For plant layout, see page 58.
POSCO
5.5 m heavy-plate mill
Gwangyang, South Korea

ANGANG STEEL
5.5/5.0 m heavy-plate mill
Yingkou, China

BAOSHAN IRON & STEEL
5.0 m heavy-plate mill
Shanghai, China
MMK
5.0 m heavy-plate mill
Magnitogorsk, Russia

HYUNDAI STEEL
Dangjin, South Korea
5.0 m heavy-plate mill
4.3 m heavy-plate mill
SMS SIEMAG Heavy-plate mills
MINMETALS YINGKOU
5.0 m heavy-plate mill
Yingkou, China

VYKSA STEEL
5.0 m heavy-plate mill
Vyksa, Russia

TANGSHAN IRON & STEEL
5.0 m heavy-plate mill
Tangshan, China
NANJING IRON & STEEL
4.7 m heavy-plate mill
Nanjing, China

QINHUANGDAO SHOUQIN METAL MATERIALS
4.3 m heavy-plate mill
Qinhuangdao, China

DONGKUK STEEL
4.3 m heavy-plate mill
Pohang, South Korea
Heavy-plate mills
BAOSHAN IRON & STEEL
4.3 m heavy-plate mill
Shanghai (Luojing), China

ROURKELA STEEL PLANT
4.3 m heavy-plate mill
Rourkela, India

BAOTOU IRON & STEEL
3.8 m heavy-plate mill
Baotou, China
XINYU IRON & STEEL
3.8 m heavy-plate mill
Xinyu, China

XUANGTAN IRON & STEEL
3.8 m heavy-plate mill
Xiangtan, China

SSAB NORTH AMERICA
Steckel/Plate rolling mill
Montpelier (Iowa), USA
MAGHREB STEEL
2.8 m heavy-plate mill
Casablanca, Morocco
"The information provided in this brochure contains a general description of the performance characteristics of the products concerned. The actual products may not always have these characteristics as described and, in particular, these may change as a result of further developments of the products. The provision of this information is not intended to have and will not have legal effect. An obligation to deliver products having particular characteristics shall only exist if expressly agreed in the terms of the contract."