HIGH-TECH TANDEM MILLS
Latest references in steel processing
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We offer our customers state-of-the-art plant equipment and engineering for low-cost manufacture of rolled products of high and premium quality. The term “high-tech rolling” embraces all those cold rolling technologies which feature an excellent balance of technical and economic benefits. The outstanding development level of our cold rolling facilities can be safeguarded only through a close cooperation with our customers on a partnership basis.

For the benefit of our customers, we are constantly working to develop pioneering concepts and future-oriented technologies based on proven solutions and techniques. Thanks to our comprehensive technological know-how, we are ready and prepared to confront the ever-growing requirements of the global market.

NEW CONTROL ELEMENTS for influencing the roll gap

The increasing demands imposed by the automotive industry on the quality of cold-rolled strip in the recent past called for rapid innovations and developments. As a result, more than half of all the steel grades employed for motorcar construction have been enhanced or modified. These innovative materials – such as dualphase, IF and TRIP steels – necessitate novel or optimized technologies to be adopted during the cold-rolling process. To cope with this development, it is a must for mills and equipment to enable a markedly wider adjusting range for influencing the roll gap, a demand that prompted us to develop such novel adjusting elements as CVC PLUS, EDC® and ESS.

Additional support comes from our T-roll® process model which allows such parameters, e.g. temperature, rolling force, lubricating behavior and surface roughness to be exactly precalculated for optimized roll gap lubrication (tribology).

WHAT YOU GET

Our product portfolio combines first-class equipment with state-of-the-art technologies. Our rolling mills operate cost-effectively thanks to low production and operating costs. Upon request, we also supply complete packages, i.e. plant equipment and engineering, process engineering and technology, automation, electrical equipment and engineering as well as technological competence including erection, commissioning and training from a single source.
Introduction

Baoshan Iron & Steel, China

Hyundai Hysco, South Korea

AK Steel, USA

Dongbu Steel, South Korea

Usiminas, Brazil

ThyssenKrupp Steel, Germany

Vega do Sul, Brazil

Handan Iron & Steel, China

Baotou Iron & Steel, China

Wuhan Iron & Steel, China

Shougang Group, China

SeverCorr, USA

Baoshan Iron & Steel, China

Tianjin Tiantie Metallurgical Group, China
PICKLING LINE/TANDEM MILL for 0.8 million t of tin strip, light-gage strip and Si strip

Responding to an order from Baoshan Iron & Steel Co. Ltd., China, we headed a consortium and supplied the cold rolling mill No. 2 in Shanghai incorporating a coupled pickling line/tandem mill. The mill features an annual capacity of approx. 800,000 t of cold strip, with tin strip accounting for nearly 60% of the production.

FIVE-STAND CVC TANDEM MILL for minimum 0.18 mm final thickness

The first three stands are provided in the form of 4-high units while stands four and five are of 6-high design. They are equipped with all the essential components of our high-tech rolling concept, including CVC technology as well as state-of-the-art gage and flatness control systems.

Designed to the latest findings and recognitions, the coolant system permits the entire product spectrum to be rolled with just one type of emulsion. A concentration control system takes care of exactly adapting the coolant to the specific requirements of the different grades or qualities.

The design of the emulsion system enables conversion from tin strip to light-gage strip within minimum time.
FIVE-STAND CVC TANDEM MILL COUPLED WITH A PICKLING LINE

Commissioning: 1997

Production data

- Rolled material: tin strip, C-steel/Si steel
- Strip width: 730 to 1,230 mm
- Strip thickness:
  - ingoing: 2.0 to 3.0 (4.0) mm
  - outgoing: 0.18 to 0.8 mm
- Coil weight: max. 26,500 kg

Technical data

- Mill stand design:
  - stands 1 to 3: CVC 4-high
  - stands 4 and 5: CVC 6-high
- Rolling speed: max. 1,600 m/min
- Rolling force: max. 18,000 kN
- Capacity: 780,000 t/year

Technical features

- Cassette design with positive/negative work and intermediate roll bending
- Work roll shifting on stands 1 to 3
- Intermediate roll shifting on stands 4 and 5
- CVC technology
- Tension reel group with carousel reel and sleeve feeding system
- Emulsion system using just one type of base oil for the entire product spectrum (light-gage strip and tin strip)
- DS system (Dry Strip) for strip drying
PICKLING LINE/TANDEM MILL for sheet and low-alloyed steels

Since December 2005, Hyundai Hysco has been operating an SMS Demag-supplied coupled pickling line/tandem mill in the former works of Hanbo Steel in Asan Bay, South Korea. The mill was originally built ready for operation in 1997 by a European consortium under our leadership but was not put on stream at the time due to the economic crisis in Asia. Teaming up with Hyundai Hysco, we overhauled and finally commissioned the facility at the beginning of 2006.

Today, the mill is capable of producing 1.55 million t of strip per year in CQ, DQ, DDQ, EDDQ, HSS and HSLA steel grades. The minimum strip thickness is 0.25 mm, the maximum strip width 1,890 mm.

The rolling mill comprises four CVC 4-high stands and one CVC 6-high stand. All of the stands feature state-of-the-art width and gage control systems. Another specialty of the mill is its inline strip inspection system enabling direct quality control of the rolled stock.

The pickling line is equipped, among others, with our proven turbulence technology ensuring optimal control of hydrochloric-acid concentration and bath temperature during strip processing.
FIVE-STAND CVC TANDEM MILL COUPLED WITH A PICKLING LINE

Commissioning: (1997) 2006

Production data
Rolled material CQ, DQ, DDQ, EDDQ, HSS and HSLA grades
Strip width max. 900 to 1,890 mm
Strip thickness
  ingoing 1.2 to 6.0 mm
  outgoing min. 0.25 to 3.2 mm
Coil weight max. 44,000 kg

Technical data
Mill stand design
  stands 1 to 4 CVC PLUS 4-high
  stand 5 CVC PLUS 6-high
Rolling speed max. 1,200 m/min
Rolling force max. 28,000 kN
Capacity 1,550,000 t/year

Technical features
- CVC 4-high technology as well as positive and negative work roll bending on stands 1 to 4
- CVC 6-high technology as well as positive and negative work and intermediate roll bending on stand 5
- CVC PLUS technology with state-of-the-art gage and width control
- DS system (Dry Strip) for strip drying
- Tension reel group with dividing shear and two direct-driven tension reels
- Special inline strip inspection line
AK STEEL, USA

CONTINUOUS TANDEM MILL
for light-gage strip from carbon steel as well as stainless steel grades

In the first construction stage, the tandem mill attains a production of 1.6 million US-t of light-gage strip from C-steel as well as of 580,000 US-t from stainless steel grades. The second construction stage will bring the mill’s capacity up to 4 million US-t of carbon steel. The as-rolled width ranges up to 2,057 mm, with stainless steel products featuring a width of up to 1,676 mm. At present, the minimum finished thickness amounts to 0.3 mm, but it is optionally planned to reduce this value to 0.2 mm in the future.

This mill is the first of its type worldwide to roll strip from both carbon steels and stainless steel grades. What makes this mill so remarkable is the high quality standard of the strip produced in variable rolling programs. This is achieved by means of mill stands equipped with the most up-to-date strip thickness and flatness control systems. The mill features low production costs along with great flexibility so that fluctuations in the demand for certain materials can be compensated.

A special highlight is the Speed-Efficiency software from SMS Demag for optimal process control in continuous operation.

Special-design emulsion system for rolling carbon steels and stainless steel grades.
FIVE-STAND CVC CONTINUOUS TANDEM MILL

Commissioning: 1998

Production data
Rolled material
- low-carbon steels, stainless steels

Strip width
- C-steel: 609 to 2,057 mm
- stainless steel: 609 to 1,676 mm

Ingoing strip thickness
- C-steel: 1.77 to 6.35 mm
- stainless steel: 0.63 to 4.57 mm

Outgoing strip thickness
- C-steel: 0.30 to 4.04 mm
- stainless steel: 0.30 to 2.29 mm

Coil weight max. 54,400 kg

Technical data
Mill stand design
- stands 1 to 3: CVC 4-high
- stands 4 and 5: CVC 6-high

Rolling speed max. 1,800 m/min
Rolling force max. 30,000 kN

Capacity
- light-gage strip: 1,600,000 US-t/year
- stainless steel: 580,000 US-t/year
(max. capacity 4,000,000 US-t/year attainable only for C-steels in case of a corresponding product mix)

Technical features
- Positive and negative work and intermediate roll bending
- Work roll shifting (stands 1 to 3)
- Intermediate roll shifting (stands 4 to 5)
- DS system (Dry Strip) for strip drying
- Laser welder
- Special inline strip inspection system for strip from C-steel and stainless steel
FIVE-STAND 6-HIGH TANDEM MILL with ESS system for minimum 0.15 mm final thickness

Representing the state of the art, the essential production facilities that SMS Demag supplied for the Dongbu works, Asan Bay, comprised: a continuous pickling line/tandem mill with five mill stands in 6-high design, a continuous hot-dip galvanizing line as well as a two-stand DCR cold rolling facility (Double Cold Reduction).

The coupled pickling line/tandem mill is the perfect example of an innovative high-tech facility. Designed for endless rolling, it features an annual capacity of 1.34 million t and is capable of producing cold strip down to a minimum thickness of 0.15 mm.

SPECIAL FEATURES

- Problem-free production of small finished-strip dimensions with excellent strip thickness, profile and flatness by means of a five-stand 6-high rolling mill at rolling speeds of up to 1,900 m/min
- Increased yield thanks to direct coupling of pickling line and tandem mill
- Easy finished-strip transfer through carousel reel; coil weight increased to 45 t by using a butt welder

Producing strip down to 0.15 mm minimum thickness at rolling speeds of up to 1,900 m/min, this mill represents a high-capacity facility.
FIVE-STAND CVC TANDEM MILL COUPLED WITH A PICKLING LINE

Commissioning: 1999

Production data
Rolled material: low-carbon steel, higher-strength steels
Strip width: 700 to 1,600 mm
Strip thickness:
  ingoing: 1.6 to 5.0 mm
  outgoing: 0.15 to 2.3 mm
Coil weight: max. 45,000 kg
Coil diameter: max. 508/2,500 mm

Technical data
Mill stand design:
  stands 1 to 5: 6-high with ESS
Rolling speed: max. 1,900 m/min
Rolling force: max. 22,000 kN
Capacity: 1,335,000 t/year

Technical features
- Positive and negative work and intermediate roll bending
- Intermediate roll shifting
- ESS technology (Enhanced Shifting Strategy)
- Tension reel group with carousel reel and sleeve feeding system
USIMINAS, Brazil

THE MOST MODERN FACILITY of its type on the South American market

The cold rolling mill of Usinas Siderúrgicas de Minas Gerais S.A. (Usiminas) in Ipatinga, Brazil, comprises a coupled, continuous pickling line/tandem cold rolling mill featuring state-of-the-art process control systems. Boosting the annual cold strip production of Usiminas up by approx. 1 million t, this mill at the same time achieves a quality that is setting new standards for the South American market.

The plant was built under our technical leadership. Usiminas was responsible for the foundations and for erection.

Stands 1 to 3 of the five-stand tandem mill are provided with CVC 4-high technology while stands 4 and 5 feature CVC 6-high design. The cold strip produced by this mill is mostly intended for the South American automotive industry.

The inline strip inspection facility serves to inspect the strip topside and underside. Strip head or tail samples can be taken while production is underway.

Optimized strategies for flying gage change to minimize off-gages.
FIVE-STAND CVC TANDEM MILL COUPLED WITH A PICKLING LINE

Commissioning: 1999

Production data
- Rolled material: C-steel
- Strip width: 700 to 1,865 mm
- Strip thickness:
  - ingoing: 1.8 to 6.0 mm
  - outgoing: 0.4 to 2.3 mm
- Coil weight: max. 50,000 kg
- Coil diameter: max. 610/2,500 mm

Technical data
- Mill stand design:
  - stands 1 to 3: CVC 4-high
  - stands 4 and 5: CVC 6-high
- Rolling speed: max. 800 m/min
- Rolling force: max. 28,000 kN
- Capacity: 1,000,000 t/year (expandable to 1,400,000 t/year)

Technical features
- Axial work roll shifting (stands 1 to 3)
- Axial intermediate roll shifting on stands 4 and 5
- Positive and negative work and intermediate roll bending
- CVC technology
- DS system (Dry Strip) for strip drying
- Inline strip inspection
ThyssenKrupp Steel, Germany

PREMIUM-QUALITY COLD STRIP

ThyssenKrupp Steel in Duisburg has installed one of the most modern and powerful tandem mills in the world, thereby completing an investment program that is setting standards. Built under our leadership, this five-stand high-tech tandem mill is unique in terms of both rolling capacity and tolerances:

- Possibility of rolling high-strength and ultrahigh-strength grades into strip with large widths and small thicknesses
- Implementation of closest thickness tolerances over the strip length
- Distinct improvement of flatness
- Less surface defects
- Reduction of edge drop effect
- Increased yield

All of the five stands are provided in CVC 6-high design with the following special features:

- Axial shifting of intermediate rolls
- Edge Drop Control (EDC): use of special EDC rolls as work rolls on all of the five stands, with closed control loop for EDC
- All-In-One design (AIO): pipework, side walls and stand platform in modular design

Simultaneous changing of work rolls on all stands in less than 8 minutes.
Deflector roll in the coupling section to the pickling line.

FIVE-STAND CVC 6-HIGH TANDEM MILL COUPLED WITH A PICKLING LINE

Commissioning: 2000

Production data

- Rolled material: low-carbon steels, high-strength steels
- Strip width: 1,000 to 2,040 mm
- Strip thickness:
  - ingoing: 1.5 to 6.5 mm
  - outgoing: 0.3 to 4.0 mm
- Coil weight: max. 50,000 kg

Technical data

- Mill stand design: stands 1 to 5 CVC 6-high
- Rolling speed: max. 1,400 m/min
- Rolling force: max. 33,000 kN
- Capacity: 2,100,000 t/year

Technical features

- EDC-type work rolls (Edge Drop Control)
- Axially shiftable work rolls
  (for EDC control in a closed loop)
- Axially shiftable intermediate rolls
  (for CVC control)
- Positive and negative work and intermediate roll bending
- Special inline strip inspection system
- DS system (Dry Strip) for strip drying
- AIO (All-In-One) modular design
- 90°-deflector roll in the coupling area between pickling line and tandem mill
VEGA DO SUL, Brazil

A NEW PLAYER IN COLD-STRIP PRODUCTION

For VEGA do Sul S.A., led by the Arcelor Group, we built a new turnkey cold rolling mill in São Francisco do Sul in the southern part of Brazil. Located near the Atlantic port of São Francisco, the VEGA complex went on stream in October 2003.

In its present construction stage, the VEGA facility features a production capacity of 880,000 t of cold strip. A reel provided in the exit section of the pickling line allows pickled hot strip to be taken out of the production flow. Potential further expansion will boost the annual capacity of pickled cold strip to 1.4 million t.

Supplied by SMS Demag as general contractor, the cold strip mill produces sophisticated products of high quality to provide the nearby automotive and electrical industries with pickled hot strip, rolled sheets as well as galvanized cold strip. The production facilities were built by a consortium under our leadership jointly with the Brazilian SMS Demag Ltda.
**FOUR-STAND CVC 4-HIGH TANDEM MILL COUPLED WITH A PICKLING LINE**

Commissioning: 2003

**Production data**

- Rolled material: low-carbon steels, high-strength steels
- Strip width: 750 to 1,875 mm
- Strip thickness:
  - ingoing: 1.2 to 4.8 mm
  - outgoing: 0.4 to 2.0 mm
- Coil weight: max. 40,000 kg

**Technical data**

- Mill stand design: stands 1 to 4 CVC 4-high
- Rolling speed: max. 850 m/min
- Rolling force: max. 30,000 kN
- Capacity: 880,000 t/year (expandable to 1,400,000 t/year)

**Technical features**

- Work roll bending, work rolls with CVC shifting
- Multizone cooling (stand 4)
- Work roll cooling
- Wedge adjustment
- DS system (Dry Strip) for strip drying, exit end
- Provisions made for future expansion:
  - second tension reel
  - continuous exit section with pinch roll units and drum-type shears
  - increase of rolling speed
In September 2005, Handan Iron & Steel Co. Ltd., Hebei Province, China, put its first cold rolling mill into production. The order for the coupled pickling line/tandem mill and a skin-passing mill had been placed with us as consortium leader in October 2002.

The rolling mill is designed for an annual capacity of 1.4 million t of cold strip from a large variety of different steel grades. In addition to low-carbon steels (CQ, DQ and DDQ), high-strength steels (HSLA) as well as Si steels can be processed into finished products.

The plant comprises a latest-generation turbulence pickling line and a five-stand tandem mill with CVC Plus technology. Also included in the supply package were the single-stand high-capacity 4-high skin-pass facility incorporating a double-expanding-head payoff reel group for minimum coil cycle times, a wet skin-passing facility as well as hydraulic systems and coil handling equipment. The hot strip for the new cold rolling mill comes from a two-strand CSP® plant.

Numerous adjusting or control elements of the five-stand tandem mill such as axially shiftable intermediate rolls for CVC Plus control as well as positive and negative work and intermediate roll bending offer the user great flexibility and enable the production of top-quality products. Handan will thus be able to cope with the ever increasing requirements of the market for premium-quality cold strip. This coupled PL-TCM ranks among the most modern plants we have recently completed in the PR China.

The coupled pickling line/tandem mill and the skin-pass stand for cold strip were officially accepted just 6 months after rolling of the first strip.
FIVE-STAND CVC 6-HIGH TANDEM MILL COUPLED WITH A PICKLING LINE

Commissioning: 2005

Production data

- Rolled material: low-carbon steel, Si grades, high-strength steels
- Strip width: 900 to 1,665 mm
- Strip thickness:
  - ingoing: 1.5 to 5.0 mm
  - outgoing: 0.25 to 2.0 mm
- Coil weight: max. 33,000 kg

Technical data

- Mill stand design: stands 1 to 5 CVC® 6-high
- Rolling speed: max. 1,250 m/min
- Rolling force: max. 25,000 kN
- Capacity: 1,400,000 t/year

Technical features

- Axially shiftable intermediate rolls (for CVC control)
- Positive and negative work and intermediate roll bending
- DS system (Dry Strip) for strip drying
- AIO (All-In-One) modular design
- Offline strip inspection line
- Carousel reel
- Edge Drop Control (in preparation)
BAOTOU IRON & STEEL, China

COUPLED PICKLING LINE/TANDEM MILL accepted after less than 26 months

August 25, 2005, saw the first cold rolling mill go into production at Baotou Iron & Steel Co. Ltd., Inner Mongolia, China. The plant comprises a latest-generation turbulence pickling line which is coupled with a five-stand tandem mill in CVC® technology. Engineered for an annual capacity of 1.432 million t of high-quality steel strip, the cold rolling mill is capable of producing strip with thicknesses of minimum 0.25 to 3.0 mm and widths up to 1,540 mm. The hot strip for the new cold rolling mill comes from a CSP® plant which was likewise supplied by us and went on stream in August 2001.

During the production tests run at the beginning of August 2005, the tandem mill already achieved all values guaranteed for thickness tolerance, flatness and off-size lengths and even exceeded the guaranteed production capacity by up to 15%.

Thanks to this investment, Baotou can expand its product spectrum. The continuous process chain from the CSP® plant right up to the strip-surface finishing facilities incorporating innovative technologies from SMS Demag will help Baotou maintain its edge also in case of more stringent future product requirements.
### FIVE-STAND CVC 6-HIGH TANDEM MILL COUPLED WITH A PICKLING LINE

Commissioning: 2005

### Production data

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
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</thead>
<tbody>
<tr>
<td>Rolled material</td>
<td>CQ, DQ, DDQ, HSS and HSLA</td>
</tr>
<tr>
<td>Strip width</td>
<td>960 to 1,540 mm</td>
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<tr>
<td>Strip thickness</td>
<td></td>
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<tr>
<td>ingoing</td>
<td>1.8 to 5.0 mm</td>
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<tr>
<td>outgoing</td>
<td>0.25 to 3.0 mm</td>
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<tr>
<td>Coil weight</td>
<td>max. 28,000 kg</td>
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### Technical data

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
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<tr>
<td>Mill stand design</td>
<td>CVC® 6-high</td>
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<tr>
<td>stands</td>
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<td>Rolling speed</td>
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<td>Rolling force</td>
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<tr>
<td>Capacity</td>
<td>1,432,000 t/year</td>
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</table>

### Technical features

- Axially shiftable intermediate rolls (for CVC control)
- Positive and negative work and intermediate roll bending
- DS system (Dry Strip) for strip drying
- AIO (All-In-One) modular design
- Offline strip inspection line
- Carousel reel
- Edge Drop Control (in preparation)
Expansion of the new COLD ROLLING MILL COMPLEX

With the goal to expand its cold strip production, Wuhan Iron & Steel Group Corporation (Wisco) in Wuhan, Hubei Province, China, in September 2003 awarded us a contract for the supply of a coupled pickling line/tandem cold rolling mill.

The facilities belong to a new cold rolling mill complex that was arranged downstream of the hot wide strip mill No. 2 also built by us. The first strip was produced on December 15, 2005. The new complex is designed for the production of cold-rolled and surface-finished strip of top quality for the automotive industry, applications in the field of electro-technology and the construction industry.

Designed for an annual capacity of 2.3 million t, this PL-TCM ranks among the most powerful plants of this type worldwide. It produces strip between 800 mm and 2,080 mm wide with supreme surface quality and flatness from low-alloyed steels of all grades as well as HSS steels (High-Strength Steel), DP and TRIP steels.

The first tandem cold rolling mill in China to produce automotive sheets up to 2,080 mm wide.
FIVE-STAND CVC 6-HIGH TANDEM MILL COUPLED WITH A PICKLING LINE

Commissioning: 2005

Production data
Rolled material  low-alloyed steels of grades CQ, DQ, DDQ, EDDQ, SEDDQ and HSS steels
Strip width 800 to 2,080 mm
Strip thickness
  ingoing 1.5 to 6.0 mm
  outgoing 0.3 to 2.5 mm
Coil weight max. 38,000 kg

Technical data
Mill stand design
  stands 1 to 5 CVC® 6-high
Rolling speed max. 1,400 m/min
Rolling force max. 33,000 kN
Capacity 2,300,000 t/year

Technical features
- Carousel reel
- CVC® 6-high technology
- EDC technique (Edge Drop Control)
- ESS system (Enhanced Shifting Strategy)
**SHOUGANG GROUP, China**

**COUPLED PICKLING LINE/TANDEM MILL** for 1.8 million t of cold strip

In June 2005, Shougang Group located on the western outskirts of Beijing, China, commissioned us as the leader of a consortium to supply a coupled high-performance pickling line/tandem mill. Designed for an annual capacity of some 1.8 million t, the mill will produce cold strip of top quality and strength from DP, BH and TRIP steels which will be processed, for instance, into high-quality carbody external parts. The pickling line/tandem mill is due to go on stream at the end of October 2007.

The five-stand tandem rolling mill will comprise 6-high roll stands and state-of-the-art technology, for example CVC technology and an EDC edge drop control system. Strip winding is accomplished by means of a carousel reel. High-capacity exhaust and filter systems ensure eco-friendly operation.

The latest-generation turbulence pickling line will incorporate, among others, our proven tension levellers as well as an ASC side trimmer. By means of this investment, Shougang intends to broaden its product spectrum and create more value, to thereby safeguard its market position before the background of increasingly stringent requirements made on the various products.

### Production data

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<tr>
<th>Rolled material</th>
<th>DP, BH and TRIP steels</th>
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<tbody>
<tr>
<td>Strip width max.</td>
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<tr>
<td>Strip thickness ingoing</td>
<td>1.6 to 6.0 mm</td>
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<tr>
<td>Strip thickness outgoing</td>
<td>min. 0.2 to 2.5 mm</td>
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<td>Coil weight max.</td>
<td>38,000 kg</td>
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### Technical data

<table>
<thead>
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<th>Mill stand design stands 1 to 5</th>
<th>CVC 6-high</th>
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<td>Rolling speed max.</td>
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<td>Rolling force max.</td>
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<tr>
<td>Capacity</td>
<td>1,800,000 t/year</td>
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</table>

### Technical features

- AIO (All-In-One) design
- Edge Drop Control System (EDC) for strip edge control
- Carousel reel
SEVERCORR, USA

COLD ROLLING MILL with pickling line/five-stand tandem mill

SeverCorr LCC, USA, awarded us a supersize contract for the supply of all the production facilities of an integrated works – from steelmaking through hot and cold rolling right up to strip refining. The cold rolling mill comprises a coupled pickling line/five-stand tandem mill as well as a skin-pass mill and a hot-dip galvanizing line.

In its first construction stage, the plant will be designed for an annual capacity of some 1.4 million US-t of hot strip of which approx. 0.9 million US-t will be further processed in the cold rolling mill.

In the second stage, capacity can be boosted to some 2.8 million US-t of hot strip and 1.82 million US-t of cold strip. The strip has a width of max. 1,880 mm and a thickness of min. 0.28 mm.

The pickling line/tandem mill will be equipped with our proven turbulence pickling technology and five 4-high stands. In addition, the mill will come with inline inspection facilities for immediate inspection of the end product. The cold rolling mill is due to go on stream in spring 2007.

FIVE-STAND CVC 4-HIGH TANDEM MILL COUPLED WITH A PICKLING LINE

Commissioning: spring 2007

Production data

Rolled material carbon steel, LC IF, HSS, HSLA

Strip width 914 to 1,880 mm

Strip thickness

ingoing 1.4 to 5.0 mm
outgoing 0.28 to 1.4 mm

Coil weight max. 40,000 kg

Technical data

Mill stand design stands 1 to 5 CVC® 4-high

Rolling speed max. 900 m/min (stage 2)

Rolling force max. 30,000 kN

Capacity

1,252,000 US-t/year (stage 1)
1,820,000 US-t/year (stage 2)

Technical features

- Work roll bending, CVC work roll shifting
- Multizone cooling (stand 5)
- Work roll cooling
- Wedge adjustment
- DS system (Dry Strip) on stand 5
- Provisions for further expansion
- Inline inspection line
BAOSHAN IRON & STEEL, China

COUPLED PICKLING LINE/TANDEM MILL for cold rolling mill complex No. 5

Baoshan Iron & Steel Co. Ltd. (Baosteel), Province of Shanghai, China, will expand its cold strip production and, in October 2005, commissioned us to supply a coupled pickling line/tandem mill.

The facility will be part of the new cold mill complex No. 5 whose product spectrum comprises cold-rolled and surface-finished strip of premium quality for the automotive industry, applications in the field of electro-technology and the construction industry.

Designed for an annual production of 1.73 million t of cold strip, the new mill is to roll the first strip in May 2008.

The coupled pickling line/tandem mill features a latest-generation turbulence pickling line and a five-stand tandem mill with CVC® technology in 6-high design.

FIVE-STAND CVC 6-HIGH TANDEM MILL COUPLED WITH A PICKLING LINE

Commissioning: 2008

Production data
Rolled material: low-alloyed steels of CQ, DQ, DDQ, EDDQ, SEDDQ and HSS grades
Strip width: 700 to 1,630 mm
Strip thickness:
  ingoing: 1.8 to 6.0 mm
  outgoing: 0.25 to 2.3 mm
Coil weight: max. 34,500 kg

Technical data
Mill stand design:
  stands 1 to 5: CVC® 6-high
Rolling speed: max. 1,400 m/min
Rolling force: max. 25,000 kN
Capacity: 1,737,500 t/year

Technical features
- Carousel reel
- Axially shiftable intermediate rolls
- CVC® 6-high technology
- Positive and negative work and intermediate roll bending
- DS system (Dry Strip) for strip drying
- A/O modular design (All-In-One)
- Offline strip inspection line
Tianjin Tiantie Metallurgical Group Co. Ltd., Tiantie for short, a steel-making plant which, in 1995, emerged from Tianjin Steel Factory founded in 1969, commissioned us in March 2006 to supply a coupled pickling line/tandem mill for a new cold rolling mill in the Province of Hebei, China.

The mill comprises a latest-generation turbulence pickling line which is coupled with a five-stand tandem mill featuring 6-high stands in CVC™ design and the renowned SMS Demag technologies.

The annual production will amount to 1.6 million t of strip from low-carbon steels, IF and high-strength steels. Strip widths will range from 700 to 1,600 mm and final thicknesses from 0.25 to 2.0 mm.

To cope with future market requirements, an Edge Drop Control system can be added at a later date, if so required.

The mill is to start production at the end of 2007.

To cope with future market requirements, an Edge Drop Control system can be added at a later date, if so required.

Further to the main contract, Tiantie in April 2006 ordered an offline skin-pass mill from us.

**FIVE-STAND CVC 6-HIGH TANDEM MILL COUPLED WITH A PICKLING LINE**

Commissioning: 2007

**Production data**

<table>
<thead>
<tr>
<th>Rolled material</th>
<th>low-carbon steels, IF-steel, high strength steels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strip width</td>
<td>700 bis 1,600 mm</td>
</tr>
<tr>
<td>Strip thickness ingoing</td>
<td>1.8 bis 6.0 mm</td>
</tr>
<tr>
<td>Strip thickness outgoing</td>
<td>0.25 bis 2.0 mm</td>
</tr>
<tr>
<td>Coil weight</td>
<td>max. 30,400 kg</td>
</tr>
</tbody>
</table>

**Technical data**

<table>
<thead>
<tr>
<th>Mill stand design stands 1 to 5</th>
<th>CVC™ 6-high</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rolling speed</td>
<td>max. 1,200 m/min</td>
</tr>
<tr>
<td>Rolling force</td>
<td>max. 25,000 kN</td>
</tr>
<tr>
<td>Capacity</td>
<td>1,600,000 t/year</td>
</tr>
</tbody>
</table>

**Technical features**

- Axially shiftable intermediate rolls (for CVC control)
- Positive and negative work and intermediate roll bending
- DS system (Dry Strip) for strip drying
- AIO modular design (All-In-One)
- Offline strip inspection line
- Carousel reel
- Edge Drop Control (preparatory work)