HOT STRIP MILLS
Mechanical Equipment
SMS Siemag is the worldwide leading supplier of plant and equipment for the iron and steel industry. Our spectrum comprises both the supply of complete new plants and the modernization of existing facilities.

Many years of experience and close cooperation with our customers in all continents are the cornerstones of our success.

Working teams of experienced engineers from the fields of

- design
- process engineering
- R&D
- electrical and automation systems
- manufacture

continually enhance our products to increase their operational dependability and maintenance ease. In our workshops we manufacture, assemble and test all key components before they are shipped to the site.

In addition, we offer our customers erection and commissioning services including practice-oriented training of operating staff, qualified After Sales Service as well as know-how transfer.

Our customers value our integrated solutions and economical equipment as the basis for their success.
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A slab sizing press in the roughing mill area offers decisive advantages for more flexibility in hot strip production today and in the future. Width reductions of up to 350 mm in one pass enable the number of different casting sizes in the spectrum of the continuous caster to be reduced to just a few standard widths. Slabs whose widths considerably exceed the required finished-strip widths boost the throughput of the continuous casting facility. A special Short-Stroke operating mode at the slab head and tail results in less cropping losses and higher yield. Robust construction and operational reliability are the key characteristics of the continually enhanced design. Compactness and small moving masses during the sizing process ensure just minor wear even after many years of operation.

**MAIN DATA**

- Sizing force: 22,000 kN
- Width reduction: up to 350 mm
- Drive power: 4,400 kW
- Feed rate: up to 300 mm/s
- Slab thickness: up to 280 mm
- Slab width: 650 to 2,300 mm
- Slab length: 4 to 12 m
- Slab temperature: 1,250 °C

The essential technological advantage of the slab sizing press over a conventional edger – besides the large width reduction – is the distinctly better through-forming of the slab right to its center. The slab sizing press produces flatter “dogbones” leading to reduced respreading and greater sizing efficiency.

The slab sizing press is ideally suited for integration into existing facilities. Thanks to our many years of experience, the press equipment can be installed during short shutdowns and precommissioned while production is underway.

**FEATURES**

- Simple design and robust construction
- Closed frame to accommodate the forces in the sizing press
- Patented kinematics
- Tailor-made technology package
- “Stop-and-Go” mode
- Slab transport by means of position-controlled pinch rolls
- Hydraulic balancing
- No relative movements between slab and tool
- Long tool service lives
- Optimized tool contour
- Easy tool changes
- Proven press drive
- Efficient tool cooling

**ADVANTAGES**

- Large width reduction in one pass
- Fewer casting sizes
- Higher production of the continuous caster
- Reduced slab storage
- Correction of off-size slabs
- Easier direct rolling
- Greater production flexibility
- Better through-forming
- Extremely constant width over the slab length
- Improved width tolerance along the entire strip
- Higher specific coil weight
- Short-Stroke operating mode
- Variable slab width over its length, if demanded

**OPTIONS**

- "Flying" mode
- Tool changing device

**RECENT REFERENCES**

- 2005 Handan Iron & Steel, China
- 2005 Maanshan Iron & Steel, China
- 2005 Anshan Iron & Steel, China
- 2004 Shougang Iron & Steel, China
- 2000 Wuhan Iron & Steel (HSM No. 2), China
- 2000 Salzgitter Flachstahl, Germany
- 2000 Ilva (TNA2), Italy
- 1998 Ilva (TNA1), Italy
- 1994 Sollac Fos-sur-Mer (Arcelor), France
- 1989 ThyssenKrupp Steel (Beeckerwerth), Germany
Hydraulic **ADJUSTING SYSTEMS**
for horizontal and vertical stands

**VERTICAL STANDS**
The width of the strip from its head to its tail is controlled by means of hydraulic edger adjusting systems. The quick dynamic response of these systems enables the fast corrective movements at the material head and tail as required to minimize cropping losses and to control the width over the length of the rolled stock.

Latest-generation edgers are fully hydraulic facilities without any additional electro-mechanical adjusting systems – a feature that reduces the amount of maintenance work considerably.

**MAIN DATA**
- Slab thickness: 125 to 280 mm
- Strip width: 650 to 2,200 mm
- Strip thickness: 1 to 25 mm

**Vertical adjusting systems**
- Adjusting speed: up to 60 mm/s per side
- Adjusting force: up to 8,000 kN

**Horizontal adjusting systems**
- Adjusting speed: up to 12 mm/s
- Adjusting force: approx. 50,000 kN

**FEATURES**
- Robust design
- Reliable and proven cylinder sealing
- Digital position measurement
- Redundant position and force measurement (in case of horizontal adjustments)
**HORIZONTAL STANDS**

Strip thickness and strip travel control is accomplished through hydraulic adjusting cylinders provided in the roughing and finishing stands. In cooperation with hydraulic sideguides and the associated automation system, horizontal adjusting systems in the roughing stand minimize camber and wedge, and thus ensure the rolling of a straight transfer bar.

The forward stands of a finishing mill are equipped with hydraulic adjusting systems to safeguard stable strip travel, while the close thickness tolerances of the finished strip are achieved mainly by means of the hydraulic adjusting cylinders of the rear finishing stands and suitable gage control.

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**RECENT REFERENCES**

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<td>Taiyuan Iron &amp; Steel, China</td>
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<td>ThyssenKrupp Steel (Bruckhausen), Germany</td>
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<td>Wuhan Iron &amp; Steel (HSM No. 2), China</td>
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<td>Shanghai Meishan Corp., China</td>
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<td>1999</td>
<td>SSAB (Borlänge), Sweden</td>
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<td>1998</td>
<td>Benxi Iron &amp; Steel, China</td>
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<td>PT Krakatau Steel, Indonesia</td>
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<td>1996</td>
<td>China Steel Corporation, Taiwan</td>
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<td>1996</td>
<td>EKO Stahl (Arcelor Group), Germany</td>
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E = edger, R = roughing mill, F = finishing mill
MANDREL-LESS COILBOX

The coilbox arranged between the roughing stand and the finishing mill of a hot rolling mill forms coils of transfer bars, thus serving as both material and heat accumulator. During uncoiling, the former transfer bar tail runs into the finishing mill as transfer bar head.

The coilbox is employed in new facilities and modernized plants. Based on the experience gained from more than half of all the coilboxes built worldwide – and in fact the very first mandrel-less coilboxes – SMS Siemag has developed strategies allowing a coilbox to be installed into an existing facility within a minimum period of standstill.

MAIN DATA

- Transfer bar width 650 to 2,200 mm
- Transfer bar thickness 20 to 40 mm
- Transfer bar temperature 900 to 1,100 °C
- Coil weight 4.5 to 40 t
- Specific coil weight up to 25 kg/mm
- Entry speed up to 4.0 m/s
- Coiling speed up to 5.5 m/s
- Uncoiling speed up to 2.5 m/s

FEATURES

- Mandrel-less coil transfer
- Maximum coiling speeds
- Position-controlled bending rolls
- Position- and pressure-controlled pinch roll leveler

OPTIONS

- Adjustable heat insulating hood
- Coil furnace

Economic and qualitative

ADVANTAGES

- Higher specific coil weights
- Smaller finished strip thicknesses
- Better profile and thickness tolerances
- Freely selectable distance between roughing mill and finishing mill
- Reduced temperature loss due to shorter dwell times of the material on the roller table
- Temperature equalization over the transfer bar length
- Lower rolling forces and less energy consumption due to higher temperature level
- Less cropping losses due to longer transfer bars
- Coil storage in case of disturbances in the finishing mill
- Possibility to use reheated coils
- Extension of the product range
The patented mandrel-less transfer of the coil from the coiling to the uncoiling station prevents the inner windings from cooling down, and our latest-generation coilbox minimizes the temperature losses of the transfer bar even further. Adjustable heat insulating hoods for which a patent application has been filed reduce the heat radiation and hence the temperature loss of the wound coil.

The optimized coilbox geometry enables higher coiling speeds, thereby shortening the dwell times of the transfer bar on the roller table.

Coilboxes with transfer mandrel can be revamped so as to incorporate all the benefits of a mandrel-less coilbox.

RECENT REFERENCES

2005   Stelco Inc., Canada (revamp)
2005   Bhushan Steel & Strips, India
2005   Shougang Iron & Steel, China
2004   Shanghai Meishan Corp., China
2004   Taiyuan Iron & Steel, China
1999   CST (Arcelor Group), Brazil
1998   Rautaruukki Oj, Finland
1997   Saldanha (Mittal Steel), South Africa
1997   Nucor (Trico), USA
1996   EKO Stahl (Arcelor Group), Germany
The drum-type shear installed between the roughing and finishing mills of a hot strip mill crops the transfer bar at its head and tail. In special applications, the drum-type shear also serves to divide transfer bars and finished plates. Based on the experience gained from more than 60 drum-type shears built so far, SMS Siemag has set standards, and we offer our customers a choice of various options to meet their specific requirements. An intelligent automation system featuring crop-length optimization reduces expensive cropping losses.

In modernized facilities, the compact design of the SMS Siemag drum-type shear permits the cutting capacity to be increased many times over while maintaining the given mounting space. Our long-standing experience and customized installation strategies enable conversion jobs to be implemented with but minor foundation modifications, short shutdowns and substantial precommissioning, also while production continues.

**MAIN DATA**
- Transfer bar width: 650 to 2,200 mm
- Transfer bar thickness: up to 60 (80) mm
- Transfer bar temperature: 800 to 1,100 °C
- Shear force: 6,000 to 35,000 kN
- Motor power: 500 to 3,000 kW
- Speed: 0.4 to 3.5 m/s

**FEATURES**
- Compact, robust construction with closed frame, ideally suited also for modernizations
- Low motor power required due to optimized design and rating
- Patented, high-speed knife change in the mill
- Patented knife gap adjustment
- Patented shear coupling

**OPTIONS**
- Patented knife clamping device with hydraulic unclamping
- Different cutting contours possible for transfer bar head and tail cuts by using two knife pairs, arranged at angles of 90° or 180°
- Motor-operated knife-gap adjusting system
- Swingable entry and exit rollers
- Practice-tried tools and auxiliaries for knife changing
- Electric drive, automation system and crop length optimization
- Customized scrap removal system
- Quick-changing shear
- Cassette design for changing the drum set

Design and components of the drum-type shear.
Robust construction and operational dependability are the key characteristics of the continually enhanced design. The use of two pairs of knives allows the cutting contours for the transfer bar head and tail to be freely selected, thereby reducing the biting forces and the number of rolling troubles in the finishing mill. The knife shape has been optimized so as to ensure a perfect cut and long service lives.

Our patented hydraulic knife clamping system allows inline knife changes and knife gap readjustments within minimum time. There is no time-consuming slackening of nuts and screws, and the shear need not be dismounted.

Both the change shear and the cassette-design shear for changing the drum set come with optional equipment outfits allowing the shear or the drum set to be changed within minimum time.
CRANK-TYPE SHEAR

The crank-type shear arranged between the roughing mill and the finishing mill serves to crop the transfer bar at its head and tail. Higher material strengths and larger transfer bar dimensions require ever-higher cutting capacities. The SMS Siemag crank-type shear is specifically designed for this field of application.

Great dependability in service, a robust design and easy maintenance permit cost-efficient operation. On account of the favorable cutting geometry, the crank-type shear particularly features great cutting reliability and long knife service lives.

Optimally rated drive motors with connectable flywheel masses guarantee a reliable cutting performance also when handling ultra-thick transfer bars at low speeds.

MAIN DATA

- Transfer bar width: 650 to 2,200 mm
- Transfer bar thickness: up to 80 mm
- Transfer bar temperature: 800 to 1,100 °C
- Shear force: 6,000 to 15,000 kN
- Motor power: 500 to 3,000 kW
- Speed: 0.4 to 2.5 m/s

FEATURES

- Compact, robust construction with closed frame
- Low motor power required due to optimized design and rating
- Great cutting reliability
- No shearing chips
- Long knife service lives
- Quick knife change in the mill
- Closed housing, low foundation loads
- Shear and drive gear from one source
- Patented knife clamping

OPTIONS

- Knife clamping device with hydraulic unclamping
- Knife changing device for short changing times
- Motor-operated knife-gap adjusting system
- Swingable entry and exit roller tables
- Electric drive, automation system and crop length optimization
- Customized scrap removal system
- Change shear
- Different cutting contours possible for the transfer bar head and tail by using two knife pairs

Entry of transfer bar head  Head-end crop cut  Exit of transfer bar tail  Tail-end crop cut
In the cutting area, the knives of the crank-type shear move parallel to each other, thereby creating a large overlap and ensuring very reliable cutting. Roof-shaped top knives reduce the required shearing forces markedly. When equipped with two different knife pairs, different cutting contours can be selected for the transfer bar head and tail. The resultant benefits include a reduction of the biting forces in the finishing mill as well as fewer strip tail-end crashes.

The knives are changed inline, optionally by using a knife changing device which will be placed on top of the scrap pit. Knife clamping can be implemented by means of spring clamping elements; there is no time-consuming slackening of screws and nuts. Thanks to the crop length optimization system, costly cropping losses are minimized. Small total fly-wheel masses enable the speeds of transfer bar and shear to be adequately synchronized which in turn helps to keep the length of crop pieces down to a minimum.

RECENT REFERENCES

2005  Handan Iron & Steel, China
2005  Maanshan Iron & Steel, China
2004  Shougang Iron & Steel, China
2004  Taiyuan Iron & Steel, China
2003  ThyssenKrupp Steel (Bruckhausen), Germany
2000  Wuhan Iron & Steel (HSM No. 2), China
1998  China Steel Corporation, Taiwan
1990  ThyssenKrupp Steel (Bochum), Germany
1990  Sidmar (Arcelor Group), Belgium
DESCALERS

Descalers are a must in hot strip mills for attaining good surface quality. We have optimized our descalers so as to ensure maximal scale removal and hence perfect cleaning at minimum material cooling.

SMS Siemag offers practice-tried solutions for any kind of application. Extra optional facilities allow the descaler as well as the powerful high-pressure water station to be tailored to the specific requirements of our customers.

Quick-changing devices and few moving components mean reduced maintenance times and costs.

MAIN DATA

- Material width: 650 to 2,200 mm
- Material thickness: 15 to 280 mm
- Speed: 0.15 to 2.0 m/s
- Water pressure: up to 400 bar
- Water consumption: 200 to 700 m³/h

FEATURES

- State-of-the-art nozzle technology
- Highly effective application of HP water
- Closed design to prevent water from escaping
- Optimized water flow inside the descaler for service water, side water and scale
- Spraying headers of simple, maintenance-friendly design

OPTIONS

- Several pairs of spraying headers
- Connectable and disconnectable spraying headers
- Several spraying widths
- Spraying headers of quick-changing type
- Automatic level adjustment of spraying headers and water collecting troughs
- Pinch roll unit also usable for strip retraction
- Removable or hydraulically opening hood

Principle design of the descaler upstream of the finishing mill.

Descaler upstream of the roughing mill.
Level adjustment of the top spraying headers and water collecting troughs enables optimal adaptation to the thickness of the material just being handled. Due to the special nozzle arrangement, different degrees of cooling on the material upper side and underside are minimized.

Undesired cooling of the material is reduced through adequate design solutions. The time the water is left on the material on completion of the cleaning process is minimized by the use of water collecting troughs and squeegee rolls. Amply dimensioned water ducts to the scale flume prevent water and scale turbulences. A more powerful entry pinch roll unit can also be employed to pull the strip back from the finishing mill.

A water connecting coupler of quick-changing type enables the spraying headers to be replaced in minimum time without having to slacken any screwed connections.

In modernized plants, state-of-the-art scalers allow to achieve a markedly better cleaning effect and higher material temperatures. Advantages worth mentioning are the compact design and short conversion times.

**RECENT REFERENCES**

2005  Handan Iron & Steel, China  
2005  Bhushan Steel & Strips, India  
2005  Maanshan Iron & Steel, China  
2005  Shougang Iron & Steel, China  
2004  Taiyuan Iron & Steel, China  
2004  PT Krakatau Steel, Indonesia  
2003  Baoshan Iron & Steel, China  
2001  Shanghai Meishan Corp., China  
2000  Wuhan Iron & Steel (HSM No. 2), China  
1999  CST (Arcelor Group), Brazil  
1999  SSAB (Borlänge), Sweden  
1999  ThyssenKrupp Steel (Beeckerwerth), Germany  
1999  Ilva (TNA 1), Italy  
1998  Benxi Iron & Steel, China
Low-maintenance CONCEPTS for MEDIA DISTRIBUTION

We developed our novel, modular-design media piping systems to ensure easier installation, greater maintenance ease and maximal protection against damage during rolling.

Other than the previous technology which employed two hydraulic systems (280 bar for servo systems and 180 bar for auxiliary functions), the novel piping concept features just one hydraulic system (280 bar). All controls (per stand) are accommodated in the form of compact control columns in the media platform.

FEATURES

- Feeding of all hydraulic consumers on the stand
- Service pressure: approx. 280 bar
- All media consumers are connected to one hydraulic system
- All controls are located in the media platform
- Easy access and maintenance

The figure on the right is a look into the media platform showing the control columns and the common terminal box. This compact design guarantees optimal maintenance of the hydraulic and mechanical equipment. Also, the number of pipe connections could be reduced significantly, thereby minimizing the risk of leaks.

The modules are interconnected by means of high-pressure hoses.
**RECENT REFERENCES**

- 2005 Handan Iron & Steel, China
- 2005 Bhushan Steel & Strips, India
- 2005 Maanshan Iron & Steel, China
- 2005 Shougang Iron & Steel, China
- 2004 Shanghai Meishan Corp., China
- 2004 Taiyuan Iron & Steel, China
- 2002 Outokumpu Stainless, Finland
- 2000 Wuhan Iron & Steel (HSM No. 2), China
- 1999 CST (Arcelor Group), Brazil

Operator side of the finishing stands.
INTERSTAND equipment

EFFECTIVE and EASY TO SERVICE

Practice has shown that the interstand facilities are vitally important for the production of hot-rolled strip with top surface quality.

Interstand equipment includes:
- Entry and exit guides
- Work roll cooling system
- Anti-peeling device
- Roll-gap lubrication system
- Interstand cooling / descaling systems

Close interplay of all these facilities is a must to achieve an optimal result. Sideguides featuring hydraulic width adjustment ensure exact positioning within minimum time. The strip guide areas are designed so that all wearing parts can be replaced quickly. The cooling efficiency was improved thanks to optimized selection and arrangement of the nozzles.

MAIN DATA

- Strip width 650 to 2,200 mm
- Strip thickness 1 to 25 mm
- Strip temperature 800 to 1,100 °C
- Cooling water consumption 300 to 1,000 m³/h
- Pressure 10 bar at the nozzle

FEATURES

- Optimal strip guiding
- Optimal roll cooling
- Lower rolling forces
- Optimized rolling-force distribution
- No vibrations
- Achievement of thinner finished strip gages
- Longer rolling campaigns

The combination of our patented roll gap cooling, roll gap lubrication and improved exit-side cooling systems reduces the roll temperature and the strip surface temperature. This results in a thinner oxide layer on the roll surface with less work roll peeling for consequence. Lubrication inside the roll gap minimizes friction, thereby enabling rolling force reductions of 20 to 30%. In this way it is possible to redistribute the rolling forces for optimizing the pass schedule and achieving thinner final strip gages. Added to this is that chattering or vibrations in the stand are prevented which leads to longer roll service lives.

The kind of roll gap lubrication adopted depends on the individual stands. Roll gap lubrication can be implemented in three different operating modes as depicted by the sketch above.
RECENT REFERENCES

2005  Handan Iron & Steel, China
2005  Bhushan Steel & Strips, India
2005  Maanshan Iron & Steel, China
2005  Shougang Iron & Steel, China
2004  Shanghai Meishan Corp., China
2004  Taiyuan Iron & Steel, China
2000  Wuhan Iron & Steel (HSM No. 2), China
1999  CST (Arcelor Group), Brazil
1999  Duferco La Louvière, Belgium
The loopers arranged between the finishing stands of a hot strip mill safeguard correct mass flow control and hence contribute to the stable rolling of finished strip down to a final thickness of <1 mm. The loopers are driven via hydraulic cylinders.

For the rolling of ultrathin strip, loopers featuring differential tension measurement (DTL) have been developed to detect strip tension differences between the drive and operator sides which can be eliminated by swiveling the top roll set. Minor tension differences contribute to reliable unthreading and help prevent tail-end crashes.

The function of the tensiometer looper (TML) is to measure the distribution of tensile stresses across the width of the strip which represents an essential prerequisite for automatic online flatness control. A tensiometer looper is preferably arranged between the last two stands. We supply tensiometer and differential tension loopers complete with electronic evaluation unit for integration into the automation system.

**MAIN DATA and FEATURES**

- Strip width: 650 to 2,200 mm
- Strip thickness: 1 to 25 mm
- Strip temperature: 800 to 1,100 °C
- Speed: up to 20 m/s

- Minimum moment of inertia due to optimized design by means of FEM
- Patented design for differential tension measurement
- Patented design for strip flatness measurement under tension
- Improved flatness control
In Steckel mills, the so-called Steckel looper is located between the pinch roll unit and the coiling furnace to eliminate tension fluctuations produced by the furnace drum. This enables higher rolling speeds so that the production of hot strip can be boosted by up to 20%.

RECENT REFERENCES

2005  Handan Iron & Steel, China  
       (standard looper, DTL)

2005  Bhushan Steel & Strips, India  
       (standard looper)

2005  Maanshan Iron & Steel, China  
       (standard looper, DTL)

2004  Shougang Iron & Steel, China  
       (standard looper)

2004  Taiyuan Iron & Steel, China  
       (standard looper, DTL)

2002  Outokumpu Stainless, Finland  
       (standard looper, DTL)

2001  Shanghai Meishan Corporation, China  
       (standard looper)

2000  Outokumpu Avesta, Sweden  
       (Steckel looper)

2000  Wuhan Iron & Steel, (HSM No. 2), China  
       (standard looper, DTL)

2000  ThyssenKrupp Steel (Bochum), Germany  
       (standard looper, DTL)

1999  CST (Arcelor Group), Brazil  
       (standard looper, TML)

1996  EKO Stahl (Arcelor Group), Germany  
       (standard looper)

1996  SSAB (Borlänge), Sweden  
       (standard looper)

DTL = differential tension looper  
TML = tensiometer looper
During recent years, the production of hot strip has seen considerably increasing demands made on the profile, thickness, flatness and surface of the material. To meet this challenge, SMS Siemag has enhanced the CVC technology which has already proved its worth in more than 600 stands, the improvements relating to both the mechanical equipment and the process models. The new CVC PLUS technology comprises:

- Work-roll shifting systems
- CVC PLUS work-roll contour enabling a markedly wider setting range
- Work-roll bending systems, integrated in the shifting blocks
- CVC PLUS backup-roll contour to reduce roll loads (line loads)
- Process model for optimal utilization of the CVC PLUS technology
- Shape-optimized shifting strategies to prevent profile anomalies and extend the rolling campaigns

In new plants, all finishing stands come with our CVC PLUS shifting systems, and existing facilities can be retrofitted with CVC PLUS systems without any major modifications to their mechanical equipment.
MAIN DATA

- Strip width: 650 to 2,200 mm
- Strip thickness: 1 to 25 mm
- Speed: up to 20 m/s
- Bending force: 0 to 1,500 kN per side
- Shifting stroke: ±100...150 (200) mm

FEATURES

- Robust construction
- Small number of wearing parts due to fixed-block design (up to 150 mm stroke)
- Reliable sealing against scale
- Long service lives
- Low maintenance
- Constantly small clearance between WR chocks and stand housings

RECENT REFERENCES

- 2005 Handan Iron & Steel, China
- 2005 Bhushan Steel & Strips, India
- 2005 Maanshan Iron & Steel, China
- 2005 Shougang Iron & Steel, China
- 2004 Taiyuan Iron & Steel, China
- 2001 Shanghai Meishan Corporation, China
- 2000 Wuhan Iron & Steel (HSM No. 2), China
- 2000 SZFG (Salzgitter), Germany
- 1999 CST (Arcelor Group), Brazil

More than 600 finishing stands were successfully equipped with CVC technology.
Exit-end equipment
LAMINAR COOLING SYSTEM, EDGE MASKING

The exit area located between the finishing mill and the coiler of a hot strip mill is needed for material transport and material temperature setting, and hence for attaining the mechanical properties. Selection of the roller spacings as a function of the strip thickness range safeguards reliable transport especially of the strip head.

In coaction with a highly efficient cooling model, the laminar cooling system arranged in this area ensures the desired coiling temperature as well as cooling according to preselected cooling strategies to achieve the desired mechanical properties of the rolled stock.

The combination of laminar cooling system and edge masking system prevents excessive cooling of the strip edges, thereby minimizing stress differences across the strip width. As a result, cold strip flatness is improved.

MAIN DATA

- Strip width 650 to 2,200 mm
- Strip thickness 1 to 25 mm
- Coiling temperature 200 to 900 °C
- Speed up to 20 m/s
- Total water volume 4,000 to 14,000 m³/h
- Cooling rate up to 80 K/s
- Pressure 0.7 bar
The swingable arrangement (approx. 90°) of the top headers of the laminar cooling system ensures ready access to the roller table so that roller changing by means of crane during maintenance jobs poses no problem. Coming in the form of a complete quick-changing unit including motor, the rollers can be changed within minimum time.

**FEATURES**

- Compact design
- Easy maintenance thanks to swingable cooling headers
- Quick-changing device for roller changes
- Setting of the mechanical properties through computer-model-aided cooling strategies
- Production of dual-phase and multi-phase steels

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<td>Benxi Iron &amp; Steel</td>
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<td>Spain</td>
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COMPACT COOLING SYSTEMS

The demands made on the cooling lines of hot strip mills on the one hand are determined significantly by the dimensions of the rolled products and the coiling speed. On the other hand, the development of innovative materials nowadays included in the product spectrum of hot strip mills has created further demands.

In the case of high-strength, micro-alloyed steels, for instance, expensive alloying elements can be saved if the strip is cooled over a steep ramp right downstream of the finishing mill. Dual-phase and multi-phase steels featuring high strength along with excellent deformation behavior require the strip to be cooled in the cooling line, partly in several steps, from finish-rolling temperature (>850 °C) to less than 200 to 300 °C.

**MAIN DATA**
- Strip width: 650 to 2,200 mm
- Strip thickness: 1 to 25 mm
- Speed: up to 20 m/s

**Compact cooling system**
- Water volume: 5,000 to 12,000 m³/h
- Cooling rate: up to 400 K/s
- Pressure: 3.5 bar

**FEATURES**
- Compact design
- Maximal cooling rates
- Production of dual-phase and multi-phase steels
- Saving of alloying elements
- Easy maintenance due to swingable top side
To implement the high cooling rates, we have developed compact cooling systems which apply large amounts of water at higher pressure over a very short distance. Depending on the application in each case, these units are installed ahead of the conventional laminar cooling line or just before the coiler. If required, the top side of the compact cooling system can be swung open to afford ready access to the roller table.

**RECENT REFERENCES**

- **2005** Handan Iron & Steel, China
- **2001** Lianyuan Iron & Steel, China*
- **2001** Maanshan Iron & Steel, China*
- **1999** ThyssenKrupp Steel (Bruckhausen), Germany *

* CSP plants
HOT STRIP COILERS

A hydraulically adjustable entry guide provided at the terminal end of the runout roller table serves to center the strip before it enters the coiler station. The strip, running in at finish-rolling speed, is reliably seized by the pinch roll unit and directed onto the coiler mandrel. A holddown roll on the entry side of the pinch roll unit prevents the strip (especially heavy-gage strip) from bulging ahead of the pinch rolls.

With a view to the wide size range of hot-rolled strip (thicknesses from 1 to 25 mm; widths between 650 and 2,200 mm) as well as the conditions and costs for maintenance of the coiler station, the three-roll coiler offers the largest number of practical benefits. Upon our customers’ requests, we have also successfully implemented four-roll coilers.

Our product spectrum also includes special thick-strip coilers for coiling strip with large cross-section (e.g. 2,100 mm x 25.4 mm) of high-strength steel grades (X70; X80) at low coiling temperatures (~470 °C).

FEATURES of PINCH ROLL UNIT and SIDEGUIDE

- Hydraulically operated sideguide
- Exact adjustment of positions and forces as a function of the strip width
- Exact hydraulic adjustment of the pinch roll gap
- Automatic calibration of the pinch-roll-unit gap
- Takeover of the strip tension at the strip tail

FEATURES of COILER

- Hydraulically operated wrapper rolls
- Controlled spreading of the mandrel (hydraulic)
- Automatic calibration and exact hydraulic adjustment of the gap between mandrel and wrapper rolls
- Controlled limitation of the wrapper-roll forces as a function of strip dimensions and material
- Strip tension at the strip head built up after two to three windings

In addition to their robust design and operational dependability, our coilers particularly safeguard an impactfree coiling process and hence a good coiling result. Reliable entry of the strip head is guaranteed through exact setting of the sideguides, the pinch-roll-unit gap, the wrapper roll gaps and the associated drive speeds. By means of iAutomatic Step Control, the wrapper rolls are operated so that in the course of coiling the strip head does not produce any marks on the strip and the mechanical loads acting on the system, especially on the mandrel, are minimized. Full strip tension has built up already after two to three windings and is kept constant over the entire length of the strip. This ensures tightly wound and straight-edged coils.

At the strip tail, the pinch roll unit takes over the strip tension before the strip leaves the last finishing stand. Tension fluctuations are minimized in this phase to avoid any offset windings at the strip tail. Prior to coil removal, the outer windings are prevent-
ed from springing open by re-adjusting the wrapper rolls to the strip while the last one to two windings are being coiled.

COILER MANDRELS

Also representative of the high technical standard of this mill area are the coiler mandrels: capable of withstanding extremely high mechanical and thermal loads, dependable in service, easy to maintain, long service life. The position-controlled device for pre-expanding and further expanding of the mandrel contributes to rapid buildup of strip tension. Coiling completed, the finished coils are removed from the coiler by means of a coil car.

**RECENT REFERENCES**

- 2005 Handan Iron & Steel, China
- 2005 Bhushan Power & Steel, India
- 2005 Maanshan Iron & Steel, China
- 2005 Rautaruukki Steel, Finland
- 2005 NLMK Lipezk, Russia
- 2004 Shougang Iron & Steel, China
- 2004 Taiyuan Iron & Steel, China
- 2002 Outokumpu Stainless, Finland
- 2001 Shanghai Meishan Corporation, China
- 2000 Baoshan Iron & Steel, China
- 2000 Wuhan Iron & Steel (HSM No. 2), China
- 2000 Stelco Lake Erie, Canada
- 2000 Benxi Iron & Steel, China
- 1999 CST (Arcelor Group), Brazil
- 1999 Sollac (Arcelor Group), France
- 1999 Ilva TNA 1, Italy

Over the last 15 years, SMS Siemag has successfully commissioned more than 100 hydraulic hot-strip coilers.
POLISHING EQUIPMENT
for pinch rolls

To cope with the increasingly stringent demands made in recent years on the surface quality of hot strip, optical surface inspection systems have been installed in a number of hot-strip finishing mills. However, these systems can only detect defects, rather than eliminate or remove them. Our roll polisher is an efficient tool which helps prevent surface defects.

The production of stainless-steel hot strip in particular involves the major risk of microparticles coming loose from the strip edges due to contact with the entry guides and getting stuck to the surfaces of the pinch rolls. These pickups cause surface defects. Therefore, the pinch rolls are cleaned at regular intervals. So far, this is mostly done by hand and interrupts the production process.

The polishing device installed in the entry section of the pinch roll unit upstream of the coiler ensures permanent cleaning and hence prevents the formation of pickups. Thereby, the customers saves valuable time otherwise needed to clean the pinch rolls, and this time can be used for production.

In addition, the share of coils that have to be downgraded on account of surface defects is reduced. For special applications, the polishing device can be supplied inclusive of an exhaust system.

MAIN DATA
- Strip width 650 to 2,200 mm
- Temperature 200 to 900 °C
- Oscillation stroke variable

FEATURES
- Patented procedure for roll polishing
- Extended service life between two regrinding operations
- Less downtimes for manual cleaning of the pinch rolls (50 to 60 h/y)
RECENT REFERENCES

2005  Handan Iron & Steel, China
2005  Maanshan Iron & Steel, China
2005  Rautaruukki, Finland
2005  NLMK Lipezk, Russia
2004  Taiyuan Iron & Steel, China
2003  Tata Iron & Steel, India
2002  Outokumpu Stainless, Finland
1999  CST (Arcelor Group), Brazil
1998  Corus IJmuiden, Netherlands
1995  Ipsco, USA