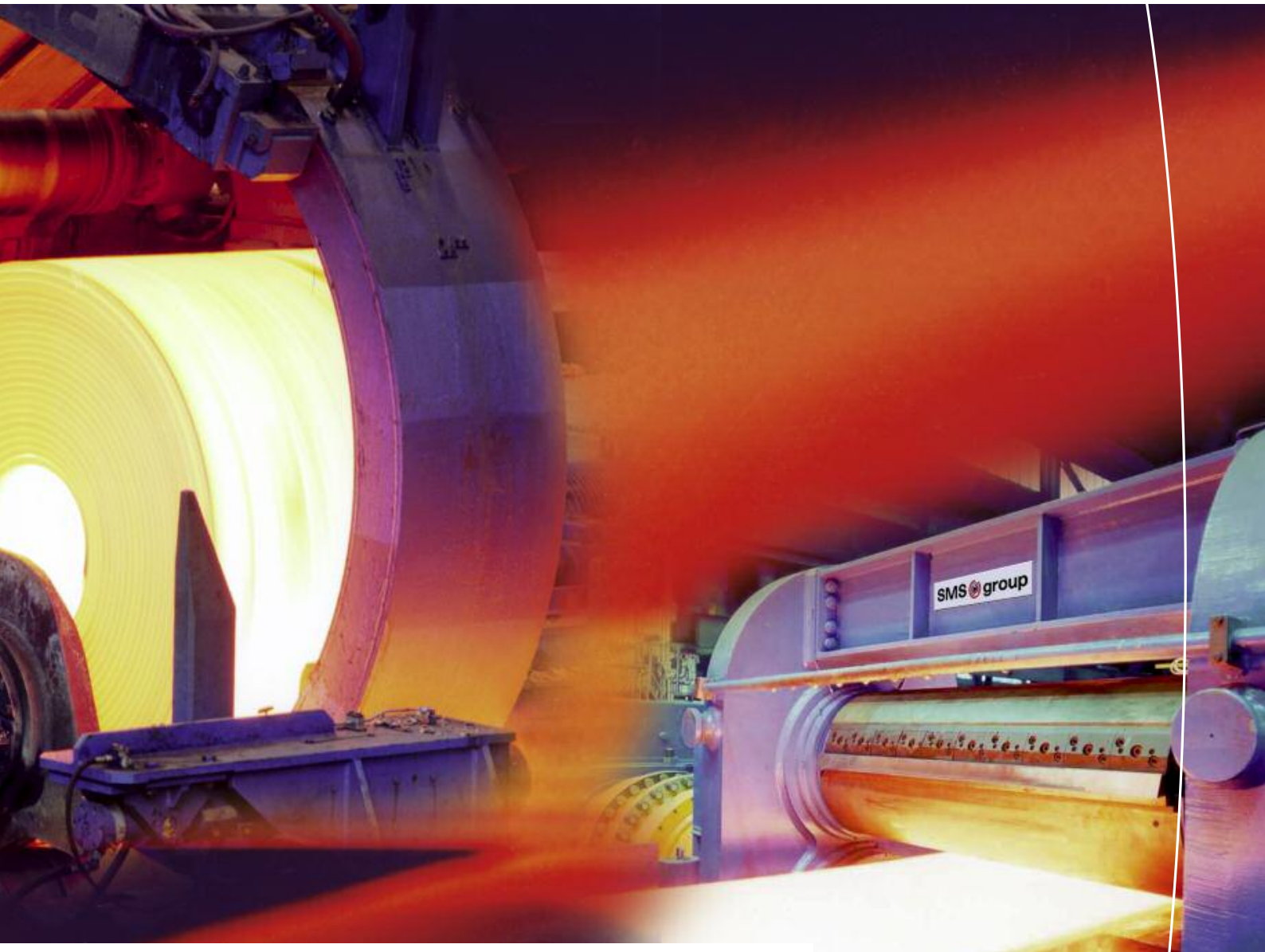
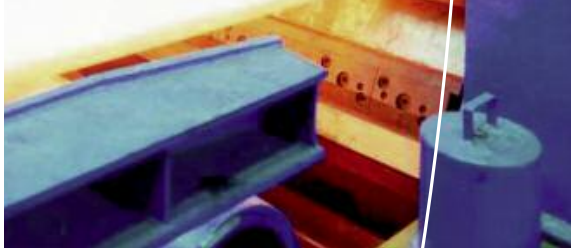
SMS group

X-Roll®

Hot strip mills
Mechanical equipment





Integrated, cost-effective solutions

SMS group is the world's leading supplier of plant and equipment for the iron and steel industry. That includes both the supply of complete new plants and the modernization of existing facilities.

Fundamental to our success are our many years of experience and close cooperation with our customers on all continents.

Our teams of experienced engineers in the fields of

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

continually enhance our products so you benefit from top operational reliability and easy maintenance. We manufacture, assemble, and test all key components in our workshops before shipping them to the construction site.

What's more, we offer you erection and commissioning services – including hands-on training of your operating personnel, qualified after-sales service, and know-how transfer.

Our customers value our integrated solutions and cost-effective equipment as the basis for their success.

Contents

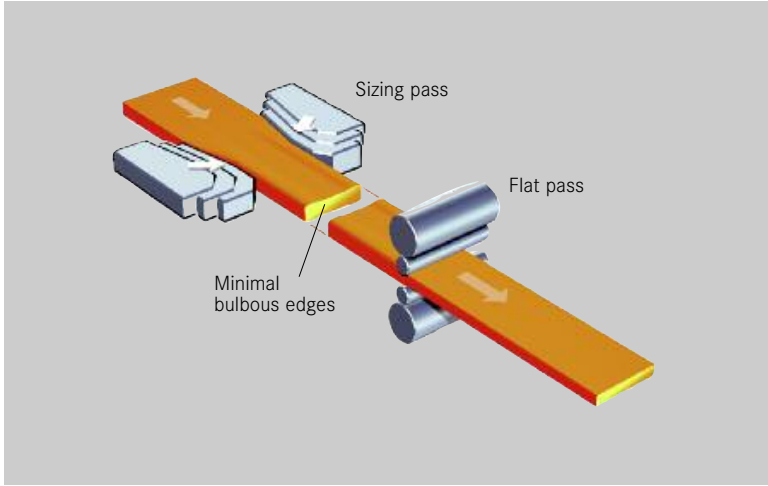
Slab sizing press

A slab sizing press in the roughing mill area gives you more flexibility in hot strip production. You can benefit from this today and in the future. This press achieves width reductions of up to 350 mm in one pass. As a result, you can reduce the number of casting sizes in the spectrum of your continuous caster to just a few standard widths. Slabs in widths considerably larger than the required finished-strip widths boost the throughput of the continuous caster. Available here is a special short-stroke operating mode at the slab head and tail. It results in lower 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 only minor wear, even after many years of operation.

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.

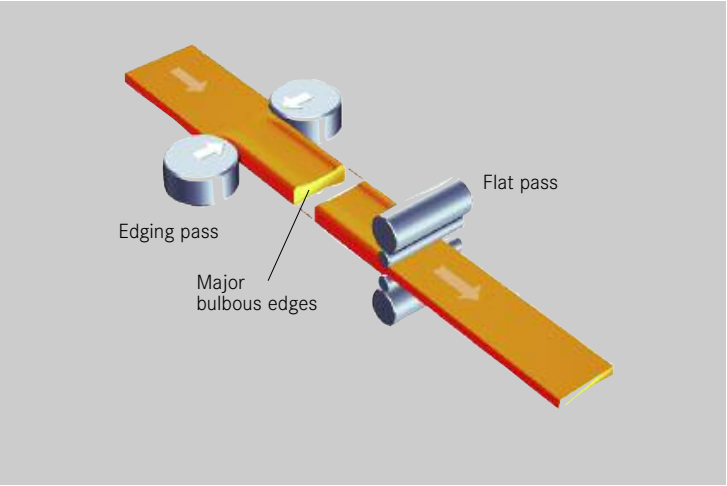
Slab sizing presses are ideal for integration into existing facilities. Due to our many years of experience, we can install your press equipment during short downtimes and precommission it during ongoing production.

SMS group has installed and commissioned a total of 21 slab sizing presses in hot strip mills.



Top: Slab sizing press (view of the exit side).

Bottom: Comparison of sizing and edging processes.



Technical 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

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 with position-controlled pinch rolls
- Hydraulic balancing
- No relative movements between slab and tool
- Long tool service lives
- Optimized tool contour
- Easy tool changing
- Proven press drive
- Efficient tool cooling

Benefits

- 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 the length, if required

Options

- “Flying” mode
- Tool-changing device

Hydraulic adjusting systems
for horizontal and vertical stands

Vertical stands

To control the width of the strip from head to tail, we use hydraulic edger adjusting systems. Characteristic of these systems is a rapid dynamic response. That enables fast corrective movements at the material head and tail which minimize cropping losses and control the width over the length of the rolled stock.

Latest-generation edgers are fully hydraulic facilities without any additional electromechanical adjusting systems. This drastically cuts maintenance work.

Horizontal stands

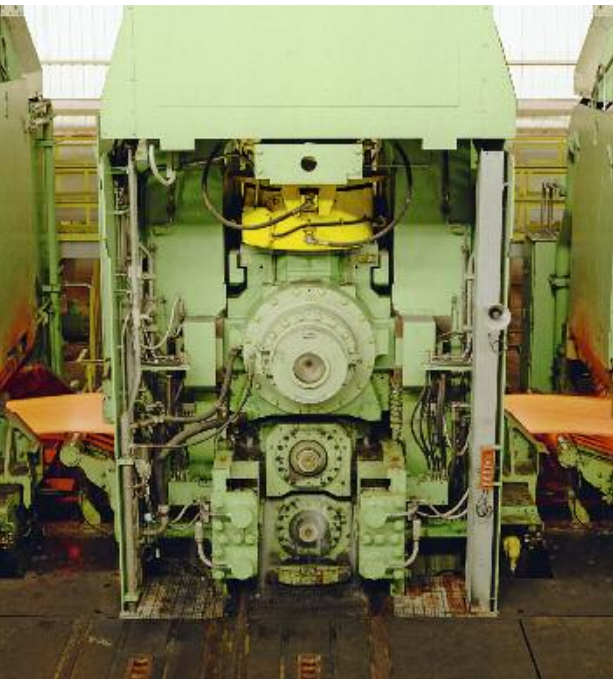
Here, the hydraulic adjusting cylinders in the roughing and finishing stands are responsible for strip thickness and travel control. Acting together with hydraulic sideguides and their automation system, hydraulic horizontal adjusting systems in the roughing stand minimize camber and wedge. That ensures straight transfer bars.

All the finishing mill stands feature hydraulic adjusting systems. Combined with our advanced gauge control and well proven strip flow control a stable strip flow as well as close thickness tolerances of the finished strip can be reached.

Since 2000, SMS group has equipped more than 40 rolling mills with hydraulic adjusting systems.

Top: Four-high reversing rougher with edger.

Right: Finishing stand.



Technical data

• Slab thickness	125 to 280 mm
• Strip width	650 to 2,200 mm
• Strip thickness	1 to 25.4 mm

Vertical adjusting systems

• Adjusting speed per side	up to 60 mm/s
• 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, proven cylinder sealing
- Digital position measurement
- Redundant position and force measurement (with horizontal adjustments)

Mandrel-less coilbox

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

Equipped with coordinated coiling and payoff stations, the line achieves a rapid strip-to-strip sequence and higher production rate. The coilbox is ideal for new facilities and modernized plants. Drawing on the experience gained from more than half of all the coilboxes built worldwide – including the very first mandrel-less coilboxes – SMS group has developed highly efficient strategies. They enable us to install a coilbox into an existing facility within very short downtimes.

The patented mandrel-less transfer of the coil from the coiling to the uncoiling station prevents the inner windings from cooling down. Our latest-generation coilbox minimizes the temperature losses of the transfer bars even more. Also new are our adjustable heat-insulating panels, for which we have filed a patent application. They reduce the heat radiation and therefore the temperature loss of the wound coil.

The optimized coilbox geometry allows higher coiling speeds, so the transfer bars leave the roller table faster.

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

Since 2000, SMS group has integrated coilboxes into nine hot strip mills.

Top: Mandrel-less coilbox in operation.

Bottom left: Design of the mandrel-less coilbox.

Bottom right: Transfer bars coiled in mandrel-less coilbox.

Technical 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
• Spec. 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
- Top coiling speeds
- Position-controlled bending rolls
- Position and pressure-controlled pinch roll leveler

Options

- Adjustable heat-insulating panel
- Coil furnace

Benefits

- 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
- Option of using reheated coils
- Extension of the product range
- Achievement of very thin gauges
- Stabilized rolling process

Drum-type shear

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. There are some special applications where the shear also divides transfer bars and finished plates or shreds transfer bars. Applying the experience from more than 70 drum-type shears built so far, SMS group has set industry standards. We offer a wide range of options to meet customer-specific requirements. An intelligent automation system featuring crop-length optimization reduces expensive cropping losses.

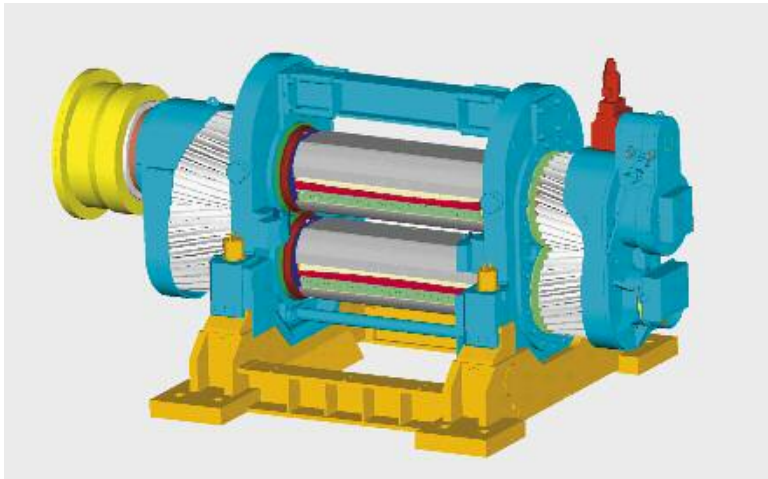
In modernized facilities, the compact design of the SMS drum-type shear drastically increases cutting capacity within the same mounting space. Our longstanding experience and tailored installation strategies enable conversion jobs to be implemented with just minor foundation modifications, short shutdowns and substantial precommissioning. Much of this work can happen while production continues.

Central to the continually enhanced design are robust construction and operational reliability. Because the shear uses two pairs of knives, you can freely select the cutting contours of the transfer bar head and tail. This reduces the biting forces and any rolling problems in the finishing mill. The knife shape is optimized for a perfect cut and long service life.

Our patented hydraulic knife clamping system provides for super-fast inline knife changing. There is no need to waste time loosening nuts and screws or dismounting the shear.

The automatic knife-gap readjustment ensures precise cuts and a long service life.

Both the change shear and the cassette-type shear for changing the drum set are available with optional equipment outfits for rapid changing.



Top: Drum-type shear with hydraulic knife clamping device in a hot strip mill.

Left: Design and components of the drum-type shear (hoods partly open visualized).

Since 2000, we have installed a total of 12 drum-type shears in hot strip mills.

Technical data

• Transfer bar width	up 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	0.3 to 2.5 m/s

Features

- Compact, robust design with closed frame, also ideal for modernizations
- Low motor power required due to optimized design
- Patented, high-speed knife changing in the mill
- Patented knife-gap adjustment
- Patented shear coupling

Options

- Patented knife clamping device with hydraulic unclamping
- Different contours possible for transfer bar head and tail cuts using two or three knife pairs, arranged at angles of under 90° or 60° up to 180°
- Motor-operated knife-gap adjustment
- Swingable entry and exit rollers
- Tried-and-tested tools and auxiliaries for knife changing
- Electric drive, automation system and crop-length optimization
- Customized scrap removal systems
- Quick-change shear
- Cassette design for changing the drum set

Crank-type shear

Arranged between the roughing mill and the finishing mill, crank-type shears crop the transfer bars at the head and tail. Today's higher material strengths and larger transfer bar dimensions require ever-higher cutting capacities. The SMS group crank-type shear is specifically designed for this field of application.

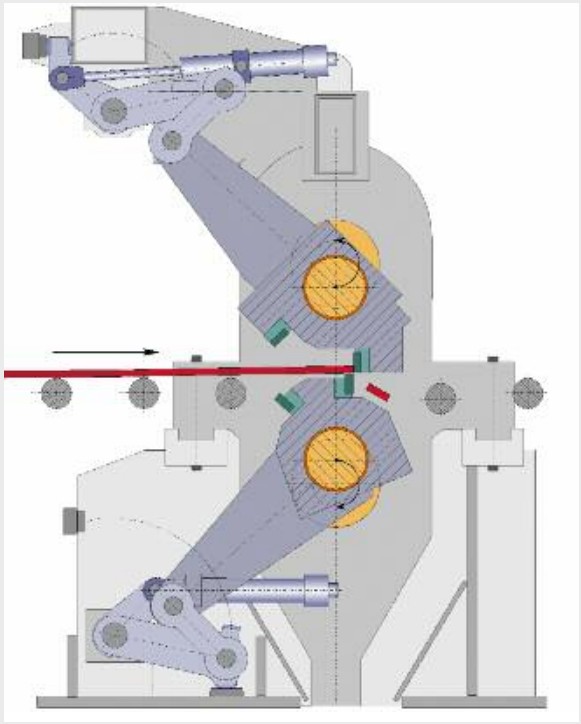
Great reliability, a sturdy design and easy maintenance add up to cost-effective operation. The favorable cutting geometry means the crank-type shear stands out for high cutting reliability and knife durability.

Optimally rated drive motors with connectable flywheel masses deliver perfect cutting performance even for ultra-thick transfer bars at low speeds.

In the cutting area, the knives of the crank-type shear move parallel to each other, creating a large overlap for very reliable cutting. Roof-shaped top knives significantly reduce the shearing forces required. When the shear is equipped with two different knife pairs, you can select different cutting contours for the transfer bar head and tail. The benefits include reduced biting forces in the finishing mill as well as fewer strip tail-end crashes.

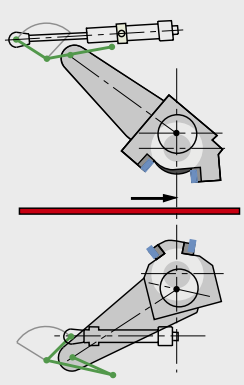
The knives are changed inline, optionally using a knife changing device positioned above the scrap pit. Spring clamping elements hold the knives in place, so there is no need to waste time loosening nuts and screws.

Due to the crop-length optimization system, costly cropping losses are minimized.

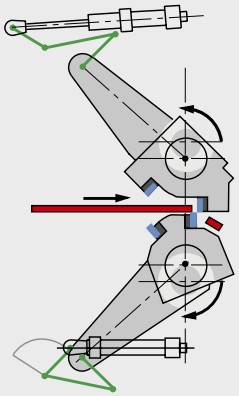


Left: Cutting principle of the crank-type shear with two knife pairs.

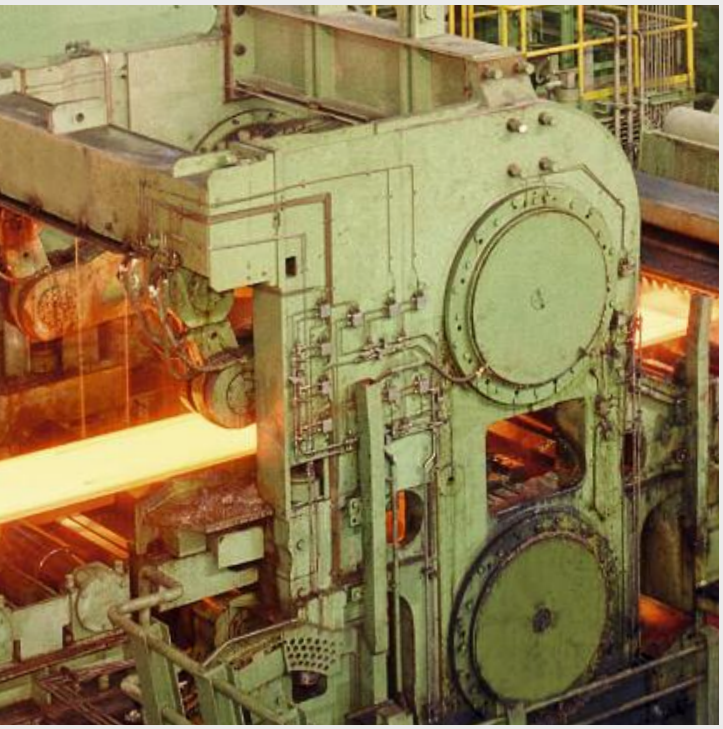
Right: Crank-type shear in a hot strip mill.



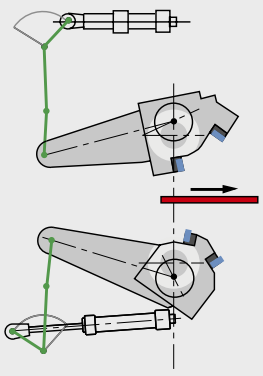
Entry of transfer bar head



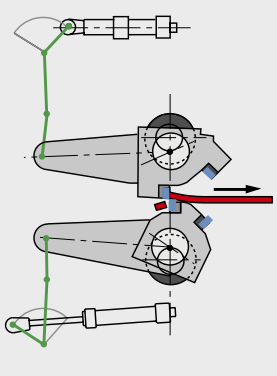
Head-end crop cut



Since 2000, we have installed and commissioned a total of 15 crank-type shears in hot strip mills.



Exit of transfer bar tail



Tail-end crop cut

Technical data

• Transfer bar width	up 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	0.3 to 2.0 m/s

Features

- Compact, robust design
- Low motor power required due to optimized design
- Great cutting reliability
- No shearing chips
- Long knife service life
- Quick knife changing in the mill
- Low foundation loads
- Patented, prestressed knife clamping device

Options

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

Descalers

Descalers are crucial in hot strip mills for attaining good surface quality. Our descalers are optimized to achieve perfect cleaning at minimum material cooling.

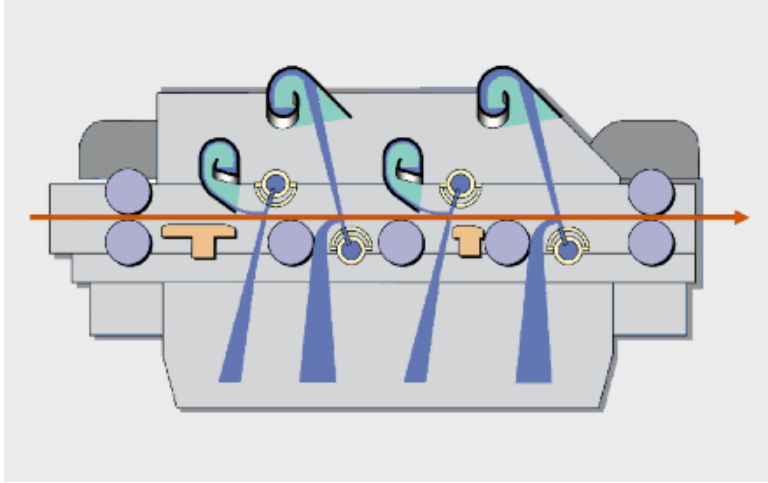
Whatever the specific application, we provide tried-and-tested solutions. Optional extras are available to tailor each descaler – including its powerful high-pressure water station – to your requirements. Quick-changing devices and few moving components translate into reduced maintenance times and costs.

The top spraying headers and water collecting troughs are height-adjustable for optimal adaptation to the material thickness. There is a special nozzle arrangement that minimizes cooling differences on the material upper and undersides.

This is just one of the design features that reduces unwanted cooling. Water collecting troughs and squeegee rolls remove the water after cleaning as quickly as possible. Amply dimensioned water ducts to the scale flume prevent water and scale turbulences. Also included is a powerful entry pinch roll unit that can pull the strip back from the finishing mill.

A quick-change water connecting coupler allows rapid replacement of the spraying headers without the need to unscrew connections.

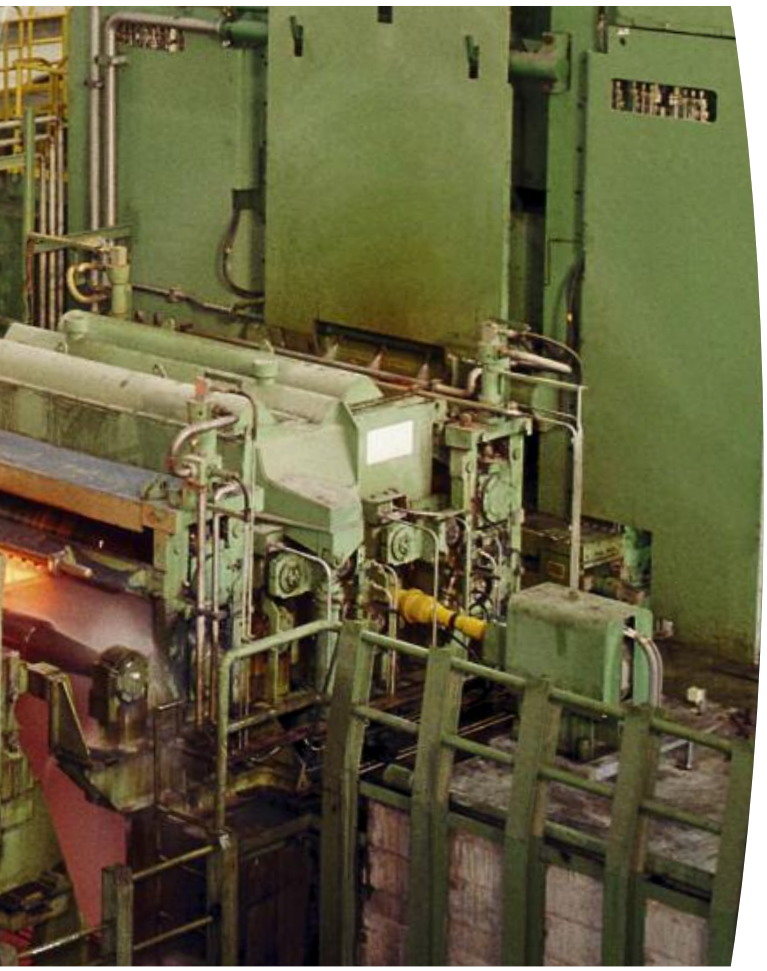
Installed in existing plants, state-of-the-art descalers produce a dramatically better cleaning effect and higher material temperatures. Other advantages are the compact design and short conversion times.



Top: Descaler upstream of the finishing mill.

Bottom left: General design of the descaler upstream of the finishing mill.

Bottom right: Descaler upstream of the roughing mill.



Technical 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 m^3/h

Features

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

Options

- Several pairs of spraying headers
- Connectable and disconnectable spraying headers
- Several spraying widths
- Quick-change spraying headers
- Automatic level adjustment of spraying headers and water collecting troughs
- Pinch roll unit also for strip retraction
- Removable or hydraulically opening hood
- Low-wear valves
- Energy-efficient high-pressure water supply

Since 2000, SMS group has installed and commissioned a total of 44 descalers.

Low-maintenance concepts
for media distribution at finishing mill stands

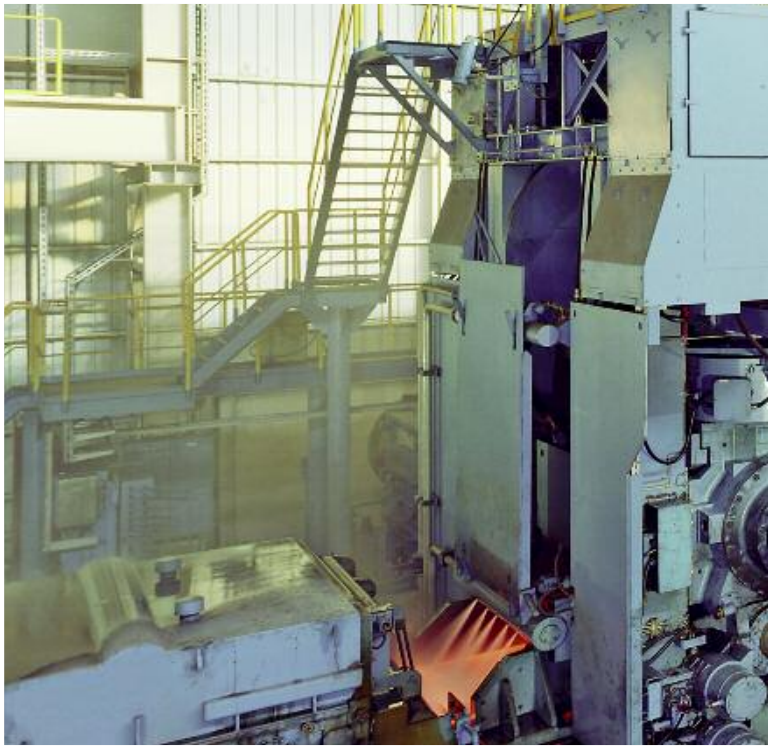
We developed our novel, modular-design media piping systems to ensure easier installation, simpler maintenance and maximal damage protection during rolling.

Unlike previous technology which used two hydraulic systems (280 bar for servo systems and 180 bar for auxiliary functions), the new piping concept requires just one hydraulic system (280 bar). All controls (per stand) are accommodated in compact control columns in the media platform.

The hydraulic valve stands are also installed in the media platform. Their modular design enables retrofitting in existing plants. We designed the media platform in such a way to ensure effective and safe maintenance. Premounted pipe ducts for media supply can be quickly fixed to the stand. That ensures a perfect fit and tight sealing. The pump stations come as a compact unit and can be installed to suit your layout.

The photo on the right shows a view inside the media platform. You can see the control columns and the common terminal box. The compact design guarantees optimal maintenance of the hydraulic and mechanical equipment. Furthermore, we significantly reduced the number of pipe connections and therefore the risk of leaks.

High-pressure hoses connect the modules.



Top: Operator side of the finishing stands.

Bottom left: Looking into the maintenance platform.

Bottom right: Modular-design media piping on the finishing stands.

Features

- All hydraulic consumers are fed 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

Interstand equipment

Effective and easy to service

Practice has shown that the interstand facilities are vital for the production of hot strip with top surface quality.

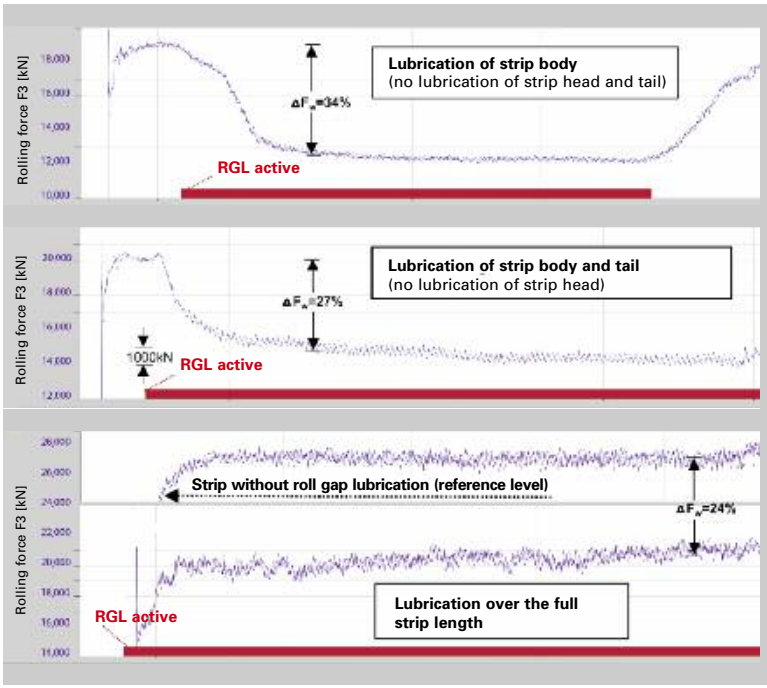
Included here are:

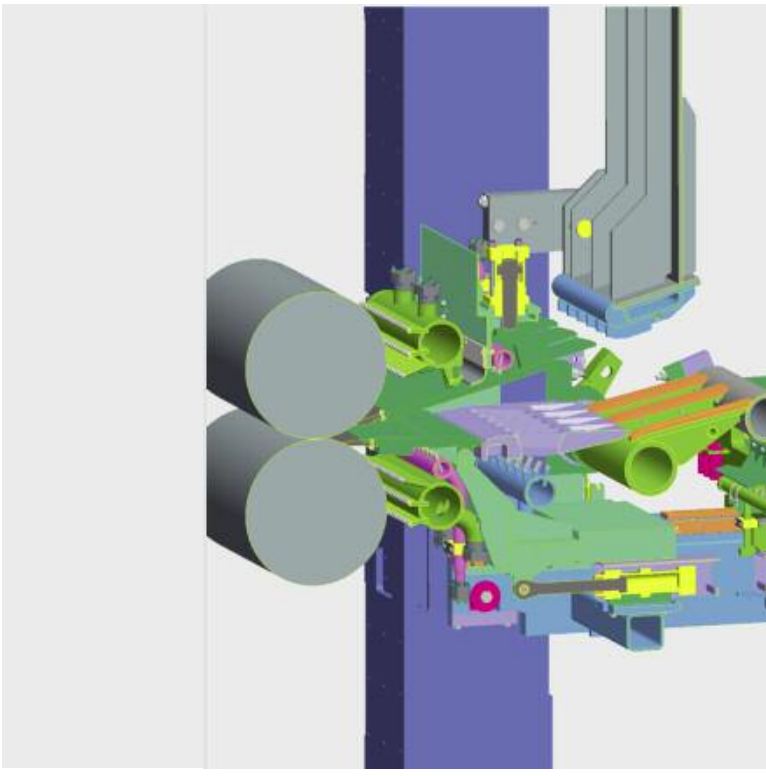
- Entry and exit guides
- Work roll cooling system
- Anti-peeling device
- Roll-gap lubrication system
- Interstand cooling / descaling systems
- Strip bottom side cooling

Only a close interplay of all these elements delivers an optimal result. Sideguides featuring hydraulic width adjustment provide fast, exact positioning. Equally effective here is that the strip guide areas are designed to ensure that all wear parts can be replaced quickly. Super-efficient cooling for all applications results from the special nozzle arrangement.

The combination of our patented roll-gap cooling, roll-gap lubrication and improved exit-side cooling systems reduces the roll and strip surface temperatures. This creates a thinner oxide layer on the roll surface, which requires less peeling. Lubrication inside the roll gap minimizes friction, enabling rolling force reductions of 20 to 30%. That makes it possible to redistribute the rolling forces for better pass schedules and thinner final strip gages. Another benefit is the prevention of chattering or vibrations in the stand, leading to longer roll service lives.

The type of roll-gap lubrication used depends on the individual stands. There is a choice of three operating modes.

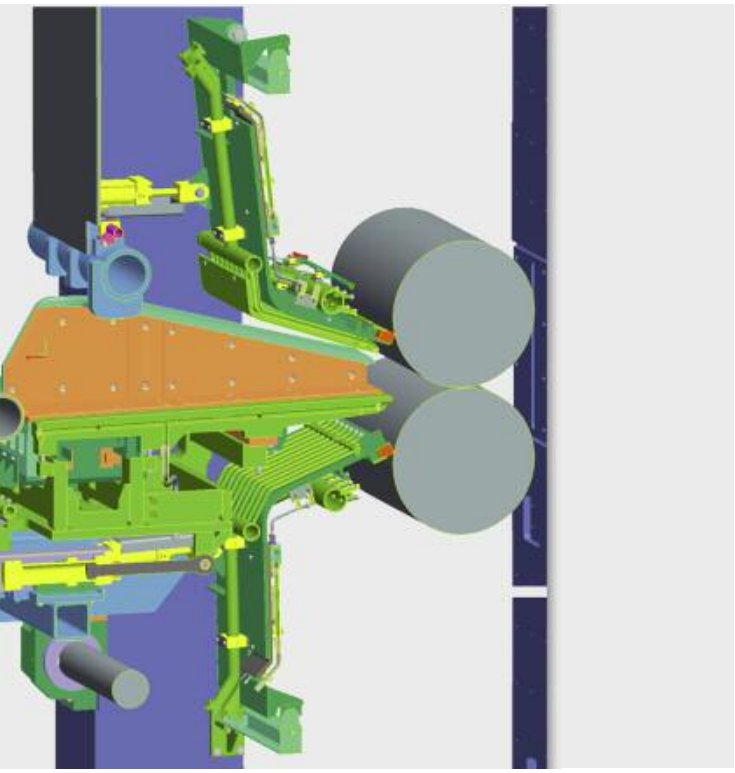




Top: Operating modes of roll-gap lubrication.

Top right: Interstand area with hydr. looper.

Bottom: Design of interstand area in 3D.



Technical data

• Strip width	650 to 2,200 mm
• Strip thickness	1 to 25.4 mm
• Strip temperature	800 to 1,100 °C
• Cooling water consumption	300 to 1,000 m^3/h
• Pressure	up to 10 bar at the nozzle

Features

- Optimal strip guiding
- Optimal roll cooling
- Lower rolling forces
- Optimized rolling-force distribution
- No vibrations
- Thinner finished strip gauges
- Longer rolling campaigns
- Air knives at the rolls
- Cooling of the rolled material

Options

- Interstand descaling
- Fume exhaust system
- Entry guide height adjustment

Loopers
for hot-strip finishing mills

Loopers arranged between the finishing stands of a hot strip mill safeguard the correct mass flow to help ensure stable rolling down to a finished strip thickness of < 1 mm. The loopers are driven by hydraulic cylinders.

Our differential tension measurement (DTL) feature detects strip tension differences between the drive and operator sides. Then, the top roll set swivels to eliminate the problem. When tension differences are low, unthreading is more reliable so there are fewer tail-end crashes.

Since 2000, we have installed loopers in a total of 32 hot strip mills.

Technical data

• Strip width	650 to 2,200 mm
• Strip thickness	1 to 25.4 mm
• Strip temperature	800 to 1,100 °C
• Speed	up to 20 m/s

Features

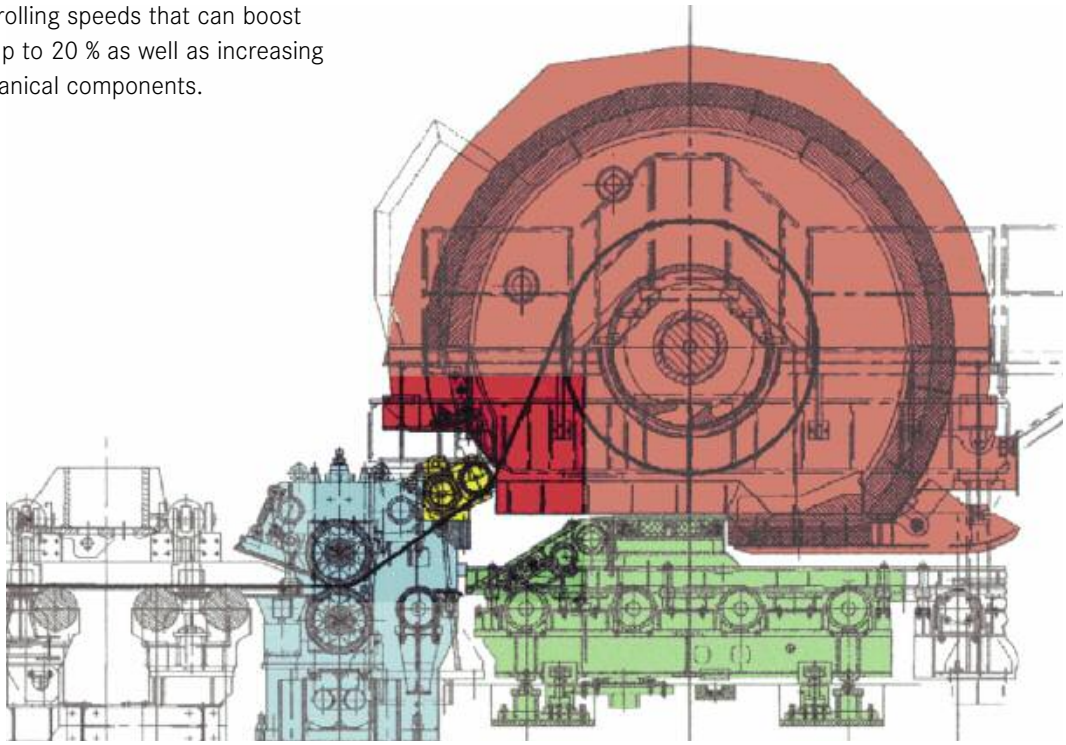
- Minimum moment of inertia due to optimized design using FEM
- Patented design for differential tension measurement
- Low friction design

Standard looper.

Differential tension looper (DTL).

Loopers
at the entry end of Steckel mills

Steckel loopers are located between the pinch roll unit and the Steckel furnace in Steckel mills. They eliminate tension fluctuations produced by the furnace drum. You benefit from higher rolling speeds that can boost hot strip production by up to 20 % as well as increasing the lifespan of the mechanical components.



Arrangement of Steckel looper roll.

Steckel looper roll.

CVC®plus technology

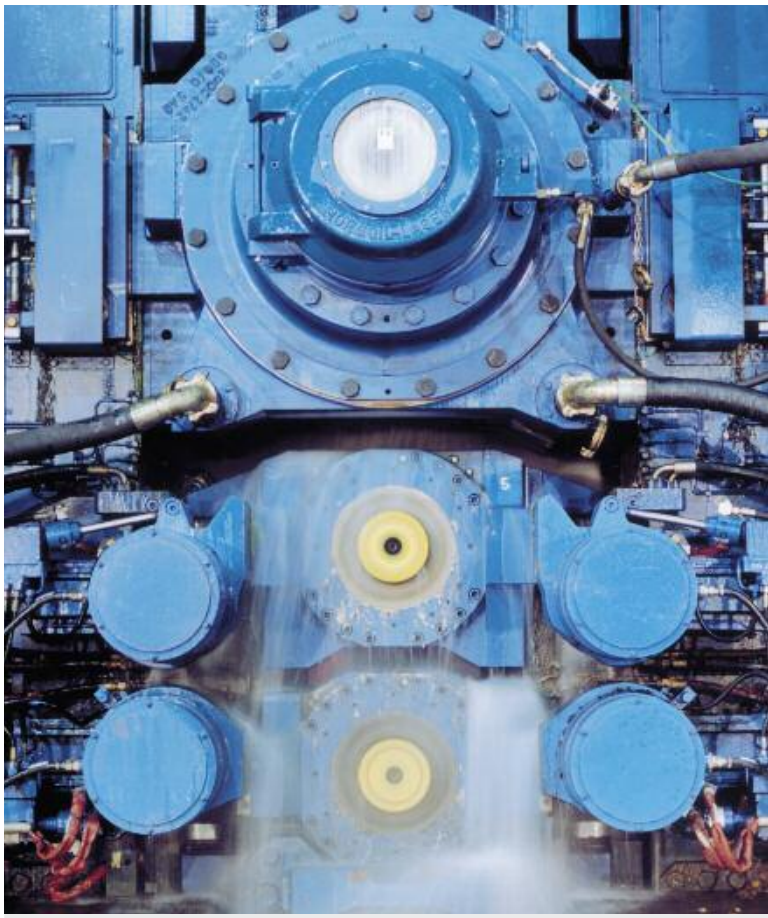
Over recent years, the demands on the profile, thickness, flatness, and surface of hot strip have increased dramatically. To meet this challenge, we enhanced our CVC® technology, which is successfully used in more than 800 stands. Now it comes with even better mechanical systems and process models.

CVC®plus technology comprises:

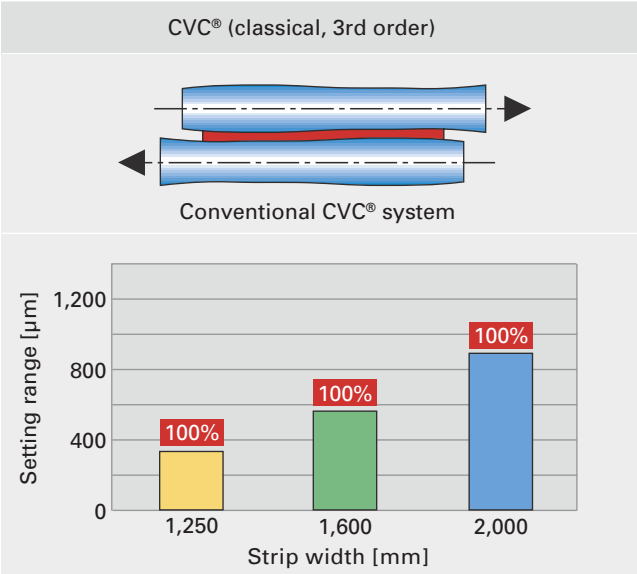
- Work-roll shifting systems
- CVC®plus work roll contour with a much wider setting range
- Work-roll bending systems integrated in the fixed / shifting blocks
- CVC®plus back-up roll contour to reduce roll loads (line loads)
- Process model for optimal utilization of CVC®plus technology
- Shape-optimized shifting strategies to prevent profile anomalies and extend rolling campaigns

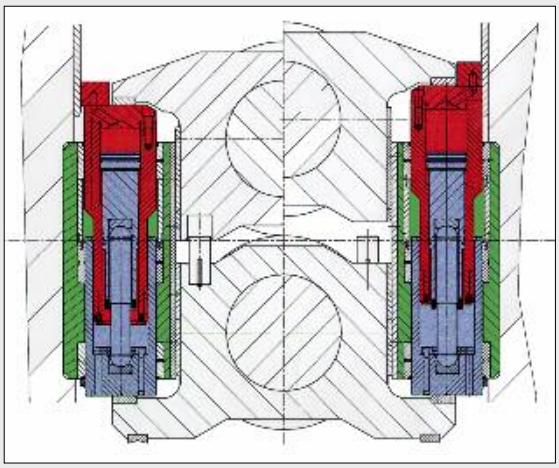
We supply all the finishing stands in our new plants with CVC®plus systems. Yet it's also possible to retrofit CVC®plus systems into existing plants without any major modifications to the mechanical equipment.

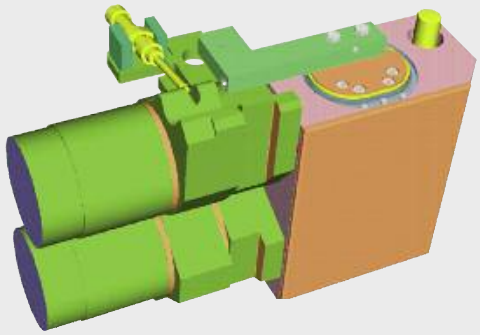
The separation of the axial roll guidance and spindle head clamping makes roll changing simple and fast.



CVC®plus shifting and bending system in a finishing mill stand.

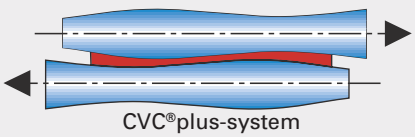


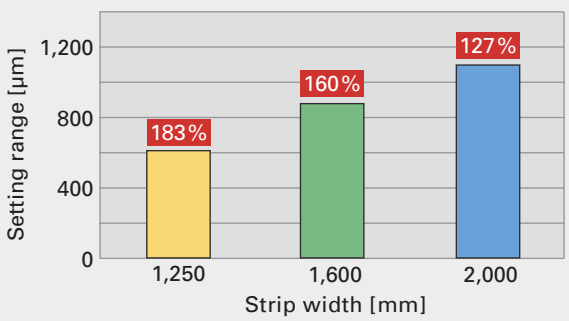




Patented CVC®plus shifting and bending system; shifting stroke: ±150 mm.

CVC®plus (higher order)





Technical data

• Strip width	650 to 2,200 mm
• Strip thickness	1 to 25.4 mm
• Speed	up to 20 m/s
• Bending force	0 to 1,500 kN per side
• Shifting stroke	±100...150 (200) mm

Features

- Robust design
- Small number of wear parts due to fixed-block design (up to 150 mm stroke), no couplings to the work-roll chock
- Reliable sealing against scale
- Long service lives
- Low maintenance efforts
- Constantly small clearance between WR chocks and stand housings
- Smooth functioning of the WR chocks
- Friction-free, high-dynamic bending system

Since 2000, we have equipped a total of 162 mill stands with CVC®plus systems.

Exit-end equipment
Laminar cooling system, edge masking

Located between the finishing mill and the coiler in a hot strip mill, the exit area takes care of material transport and temperature setting. This is crucial for the mechanical properties of the strip. Selection of the roller spacings as a function of the strip thickness range ensures reliable transport, especially of the strip head.

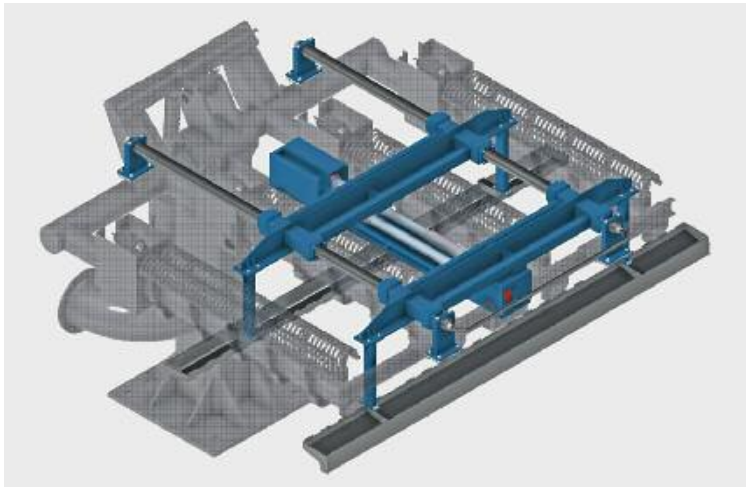
Operating in conjunction with a highly efficient cooling model, the laminar cooling system here sets the required coiling temperature. It also cools according to preselected cooling strategies to achieve the desired rolled stock properties.

Various systems are available that achieve different cooling rates depending on the metallurgical requirements. Essentially, the cooling systems differ in their specific water volumes of between 40 and 160 m^3/m^2h. Settings are made step-wise or in a continuously variable way.

Supplementing the laminar cooling system with an asymmetrical edge masking system prevents excessive cooling of the strip edges. That minimizes stress differences across the strip width. The result is better cold strip flatness.

Maintenance

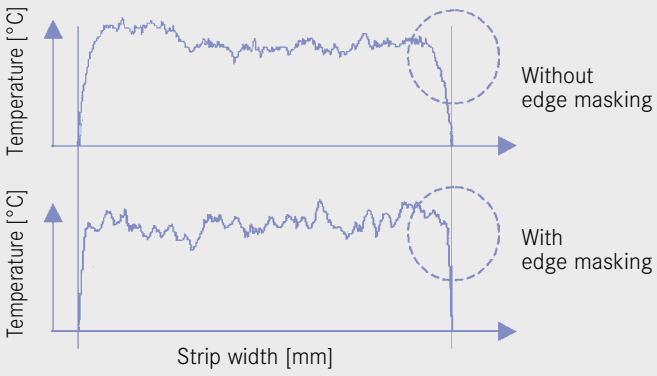
The swing action of the top headers of the laminar cooling system (almost 90°) provides ready access to the roller table. That leaves plenty of space for changing the rollers using a crane. The rolls come as a complete quick-change unit with a motor so they can be changed extremely rapidly.



Top: Laminar cooling system.

Bottom left: Laminar cooling groups with edge masking.

Bottom right: Temperature profiles across the width upstream of the coiler without and with edge masking.



Technical data

• Strip width	650 to 2,200 mm
• Strip thickness	0.8 to 25.4 mm
• Coiling temperature	50 to 900 °C
• Speed	up to 22 m/s
• Specific water volume	40 to 160 m^3/m^2h
• Flexible cooling rates	20 to 150 K/s
• Pressure	0.7 bar

Features

- Flexible cooling section with large cooling range
- Water volume can be set stepwise or in continuously variable way
- Setting of the mechanical properties through computer-model-aided cooling strategies
- Saving of alloy components
- Production of high-strength, microalloyed, dual-phase and multi-phase steels
- Compact design
- Maintenance-friendly due to swing-action cooling system headers
- Fast roll changing

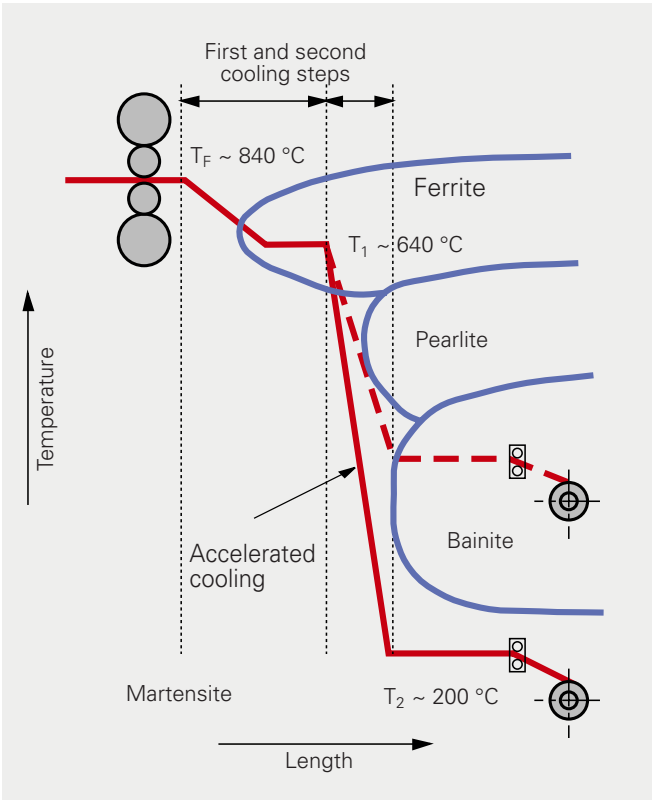
Since 2000, we have installed a total of 37 laminar cooling systems in hot strip mills.

Compact cooling systems

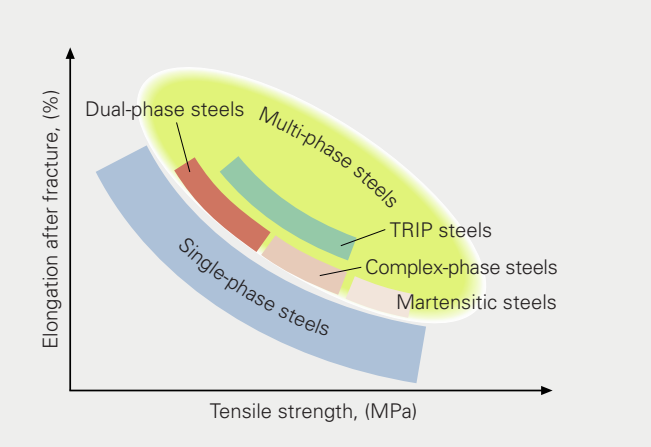
Many cooling systems are no longer adequate to deliver the cooling rates demanded for innovative materials with lower alloy contents. Furthermore, a flexible cooling system is required that offers shorter cooling rates similar to laminar cooling and also reacts dynamically to changing rolling parameters.

The latest generation of compact cooling systems meets all these demands – thanks to an optimal arrangement of pressure pumps and fittings. Switching on extra cooling systems, also at maximum water volume, and rapidly altering flow volumes make easy work of the job. The strip is cooled directly over a steep ramp downstream of the finishing mill. That saves expensive alloying elements in the production of high-strength, micro-alloyed steels.

Compact cooling system (open).



Cooling strategies.



New materials featuring high strength and good deformation behavior.

Installing the compact cooling system at the end of the cooling section allows production of dual-phase and multi-phase steels (incl. TRIP steels) – even under difficult process conditions such as high strip speeds. Compact cooling provides high cooling capacities in the second cooling step for targeted adjustment of the microstructure. That achieves excellent mechanical properties combined with good formability.
If required, the top side of the compact cooling system can be swung open to provide ready access to the roller table.

Technical data

• Strip width	650 to 2,200 mm
• Strip thickness	0.8 to 25.4 mm
• Speed	up to 22 m/s
• Specific water volume	40 to 250 m^3/m^2h
• Flexible cooling rates	20 to 400 K/s
• Pressure	3.5 bar

Features

- Flexible cooling section with very large cooling range
- Top cooling rates with highly dynamic control
- Compact design
- New microstructures possible
- Production of dual-phase and multi-phase steels
- Saving of alloying elements
- Easy maintenance due to swingable top side

Since 1999, we have installed and commissioned a total of 3 compact cooling systems in hot strip mills.

High-grade steels for carrying car body parts are produced with the aid of modern cooling lines.

Hot strip coilers

It's essential to center the strip before it enters the coiler station. This is exactly what our hydraulically adjustable entry guide at the terminal end of the runout roller table does. As it runs in at finish-rolling speed, the strip is reliably gripped by the pinch roll unit and directed onto the coiler mandrel. There is a holddown roll on the entry side of the pinch roll unit to prevent the strip (especially heavy-gage strip) from bulging ahead of the pinch rolls.

Customers demand hot strip in a wide range of dimensions (thicknesses from 1 to 25.4 mm; widths between 650 and 2,200 mm). Considering this and the costs of coiler station maintenance, the three-roll coiler offers the largest number of practical benefits. We successfully built 4-roll coilers at customers' requests.

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

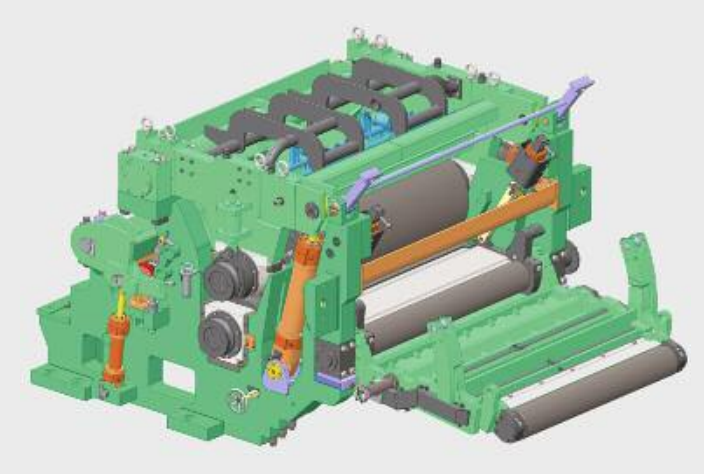
Not only sturdy and reliable, our coilers stand out above all for impact-free operation and good coiling results. Smooth entry of the strip head is guaranteed through exact setting of the sideguides, the pinch-roll-unit gap, the wrapper roll gap, and the associated drive speeds. Our Automatic Step Control solution adjusts the wrapper rolls so that the strip head does not produce any marks on the strip. It also minimizes the mechanical loads acting on the system, especially on the mandrel. Full strip tension builds up after just two to three windings and is kept constant over the entire strip length. That ensures tightly wound, straight-edged coils.

At the strip tail, the pinch roll unit takes over the strip tension before the strip leaves the last finishing stand. Here, tension fluctuations are kept to a minimum to avoid any offset windings at the strip tail. Prior to coil removal, the outer windings are prevented from springing open by the wrapper rolls, which press on the strip while the last one to two windings are being coiled.

Three-roll coiler with Step Control.

Coiler mandrels

Also representative of the high technical standard of this mill area are the coiler mandrels. They withstand extremely high mechanical and thermal loads, plus they are dependable, low-maintenance, and very durable. The position-controlled device for pre-expanding and further expanding the mandrel contributes to a rapid buildup of strip tension. Finally, a coil car removes the finished coils from the coiler.



Technical data

- Strip width 650 to 2,200 mm
- Strip thickness 1 to 25.4 mm
- Coiling temperature 200 to 900 °C
- Speed up to 22 m/s
- Coil diameter 1,000 to 2,600 mm

Features

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
- Rapid changing of the pinch rolls and sideguides

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
- Long mandrel service lives
- Holddown rolls to prevent springing open
- Features for safe coil extraction

Since 2000, we have installed a total of 72 hot strip coilers, 28 of them in UNI PLUS design.

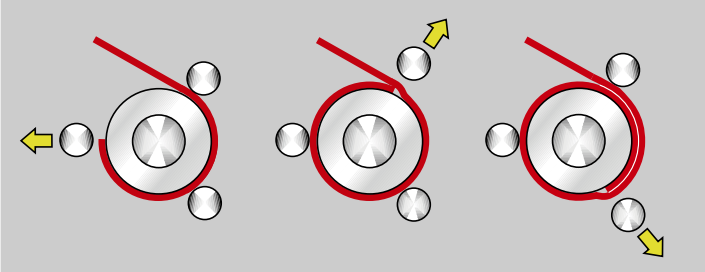


Diagram of Automatic Step Control.

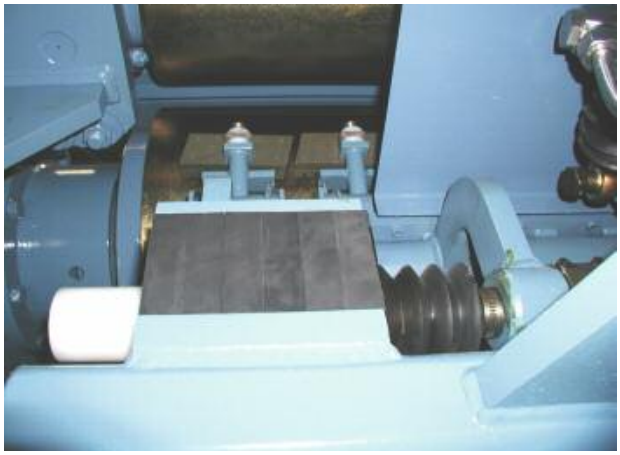
Polishing equipment
for pinch rolls

In recent years, customer demands on the surface quality of hot strip have increased steadily. As a result, optical surface inspection systems have been installed in a number of hot strip finishing mills. However, these systems can only detect defects but not eliminate them. Our roll polisher is different. It actively helps prevent surface defects.

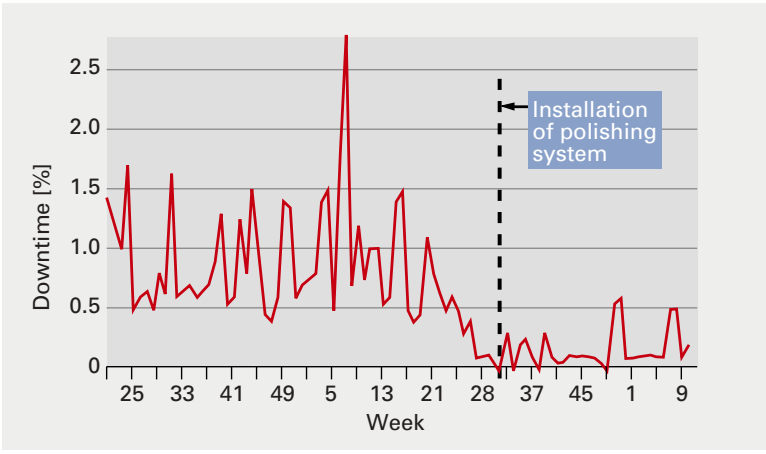
There is a particular risk during stainless steel hot strip production that microparticles can come loose from the strip edges due to contact with the entry guides. These particles can then get stuck to the pinch roll surfaces. There, the pickups cause surface defects. That's why the pinch rolls have to be cleaned at regular intervals. Typically, this has been done in the past manually during production stoppages.

Now our polishing device can be installed in the entry section of the pinch roll unit upstream of the coiler. Then it permanently cleans the pinch rolls and prevents pickups. You save valuable time you would otherwise need for cleaning – and production continues uninterrupted.

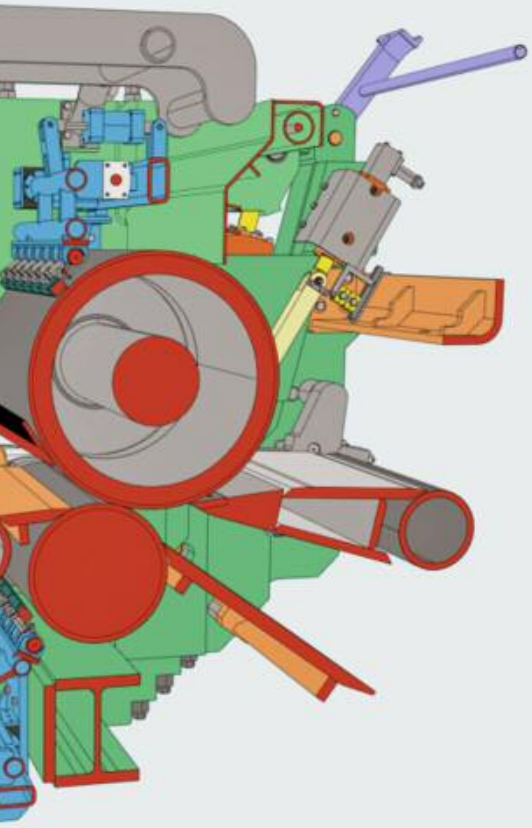
Furthermore, you produce fewer coils that have to be downgraded because of surface defects.



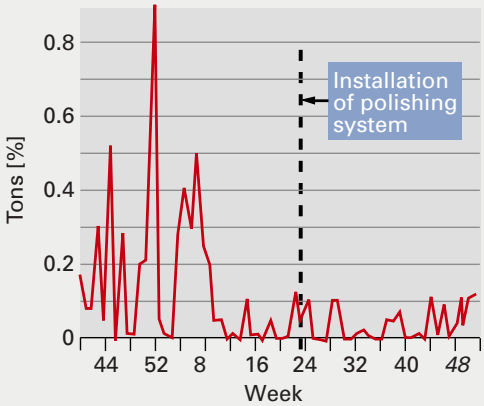
Polishing device on the pinch roll.



Coil maintenance times due to bottom pinch roll.
Source: ArcelorMittal.



Pinch roll polishers.



Downgraded coils due to pinch roll damage.
Source: Tata Steel, Ijmuiden.

Technical data

• Strip width	650 to 2,200 mm
• Temperature	200 °C to 900 °C
• Oscillation stroke	variable

Features

- Patented roll polishing procedure
- Extended service life between two regrinding operations
- Less downtime for manual pinch roll cleaning (50 – 60 h/y)
- Various polishing tools possible

Since 2000, we have installed a total of 35 polishing devices for pinch rolls in hot strip mills.

Brush coil for cleaning of wrapper rolls.

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