REVERSING COLD MILLS

References
SMS group Cold rolling mills
YOUR CHALLENGE

As a plant operator, you face the challenge of economically manufacturing high-quality cold strip in standard and special grades. Furthermore, you want to be able to respond extremely flexibly to market requirements regarding material, strip thickness, and quality. You’re looking for ways to operate your plants at maximum cost and resource-efficiency, producing consistently high yields.

OUR SOLUTION

FLEXIBLE PLANT DESIGNS FOR ANY CAPACITY AND APPLICATION

Whatever the material or output you require, our X-Roll® program offers the right cold mill for you. Ideal for an annual production of 100,000 to 500,000 t are our single-stand reversing mills (RCM). Depending on your product spectrum, they come in four-high or six-high design with CVC® plus. What makes single-stand reversing mills stand out is their very broad product spectrum. They are the best option for efficient rolling of silicon steel and special grades. That’s because you can freely determine the number of passes and the rolling speed to suit the material. To facilitate threading the strip in and out of discontinuous mills and to accelerate rolling the target thicknesses, SMS has developed the Total Roll Gap Control (TRC®) threading assistant. Using TRC® demonstrably and significantly reduces off-gage lengths and increases yield. Compared to multi-stand rolling mills, RCM require a lower investment.

Easily achievable are higher production yields at lower cost with our two-stand Compact Cold Mills (CCM®) or multi-stand tandem mills (TCM). Alternatively, you can simply combine them directly with a pickling mill to create a pickling tandem mill (PLTCM). It’s also possible with our flexible extension package to upgrade an RCM into a CCM® at reasonable cost. This expansion strategy has generated, especially in recent years, strong demand from customers in young, emerging markets.

<table>
<thead>
<tr>
<th>RCM</th>
<th>CCM*</th>
<th>TCM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 500,000 tpa</td>
<td>500,000 to 900,000 tpa</td>
<td>Over 900,000 tpa</td>
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</tbody>
</table>

Cost-optimized production capacity.
OUR SOLUTION

Also available is the option of converting your reversing CCM® into a tandem mill right up to fully continuous PLTCM using our intelligent, durable plant technology. Yet SMS supplies smart technology not just for any production capacity, but also for impressive product variety.

Especially for rolling a very broad product program ranging from IF grades to high-strength steels including stainless steels, SMS group has developed the CVC® plus M 18/4 multifunctional stand type that can even be integrated into existing stands. It features easy and rapid-change packages with roll sets in CVC® plus four-high and 18-roll design. This means you can expand your product spectrum at low cost to supply even small batches that cannot be produced profitably on specialized mills.

PROVEN TECHNOLOGICAL CONTROL ELEMENTS AND MEASUREMENT SYSTEMS

High production, stable and resource-saving operations, as well as excellent strip quality in terms of thickness, flatness, and surface quality – that’s what the tried-and-tested technological control elements we install in our X-Roll® cold mills guarantee. Included here are:

- Hydraulic Gap Control (HGC)
- CVC® plus roll shifting system
- Work-roll bending, and – depending on the stand type – intermediate-roll bending
- Edge Drop Control (EDC®)
- Multizone cooling
- Dry Strip system (DS system)

What’s special about EDC® is it minimizes the typical thickness reduction in the strip edge area, reducing trimming losses. The DS system is the ideal contact-free way to remove the rolling emulsion from the strip. It uses a controlled air flow that also dries the strip surface. You benefit because DS systems from SMS are both energy-saving and low-noise. T-roll process technology precisely records the processes in the roll gap. That enables you to design more energy-efficient cold rolling – thanks to exact advance calculation of rolling temperature, rolling force, lubrication behavior, and surface roughness.
As a result, you can reduce friction in the roll gap by precisely adjusting the application of cooling lubricant. Innovative, high-precision measurement systems such as our X-Shape flatness measuring roller and our system for measuring residual oil on the strip guarantee the strip quality or help save operating materials.

EFFECTIVE MECHATRONIC SYSTEMS

Drawing on our holistic system competence in mechanics as well as electrics and automation, we develop for and with you flexible, cost-competitive, tailor-made solutions.

Key elements are:
- X-Pact® modular automation packages
- Plug & Work testing
- Energy distribution and drive systems
- Hardware design
- Central control stations

OUR LATEST DEVELOPMENTS ENSURE YOU STAY IN THE LEAD

As a plant operator, you face high competitive pressure that demands the most efficient, flexible production possible.

SMS group meets these requirements through constant improvement of our well-known, proven X-Roll® technology. Now there is a fresh generation of X-Roll® cold mills that offers numerous optimizations and innovations. New for you are, for instance:

- Sieflex®-HT drive spindles for transferring high rolling torques even with small roll diameters
- Cost-effective strip blowing using less compressed air
- ECU – the new space and energy-saving compact emulsion system
- TRC® threading assistant for fast rolling start and fewer off-gage lengths
- ECO Mode and Energy Advisor provide the transparency required for more effective works and plant operation
WICKEDER WESTFALENSTAHL, Germany

CVC® PLUS 6-HS REVERSING COLD MILL FOR STEEL FOILS

Wickeder Westfalenstahl GmbH in Wickede/Ruhr, Germany, is a cold strip producer specializing in high-quality products. One of its key products is high-strength cold strip for the automotive industry. A major specialty is 0.05 mm-thick steel foil for shadow masks used in TV sets.

These are demanding specifications that Wickeder Westfalenstahl meets with our X-Roll® high-tech, six-high mill stand. To suit the very wide material spectrum – from alloyed high-grade steels up to and including heavily decarburized mild steels – the work-roll diameter can vary between 140 and 240 mm. Designed to attain extremely low final thicknesses, the stand reduces frictional forces to a minimum. Plus there is the direct drive of the back-up rolls and of the reversing coilers to ensure highly dynamic and non-slip operation.

Wickeder Westfalenstahl achieves flatness tolerances of a mere +/- 1 m for its ultra-thin steel foils. This extreme accuracy to size is due to our practice-proven CVC® technology on the intermediate rolls as well as horizontal work-roll stabilization (HS system). Specifically, the HS system enables objective positioning of the intermediate rolls for each pass, stabilizing the rolling process and minimizing horizontal deflection of the work rolls.

That’s how the HS adjustment makes it possible to use small-diameter work rolls. The plant features two separate emulsion systems for roughing and finishing passes with speed-controlled feed pumps, our practice-proven vacuum filters, magnetic separators, and skimming devices to produce top-class surfaces.
TYPE CVC® PLUS 6-HS
REVERSING COLD MILL

Commissioning: 1998

Production data
Rolled stock: Low carbon, stainless
Strip width: 400 to 1,000 mm
Strip thickness:
  Entry: 3.3 to 4.0 mm
  Exit: 0.05 to 0.5 mm
Coil weight: max. 18,000 kg

Technical data
Stand type: CVC® plus 6-HS
Rolling speed: max. 1,000 m/min
Roll separating force: max. 10,000 kN
Motor rating: 2,400 kW
Roll diameter:
  Work rolls: 140 mm to 240 mm
  Intermediate rolls: 360 mm to 400 mm
  Backup rolls: 800 mm to 860 mm
Capacity: 100,000 t/year

Technical features
- CVC® plus technology with axial intermediate-roll shifting and roll bending
- Horizontal shifting of intermediate rolls to stabilize the work rolls (HS system)
- Dry-Strip system
- Oil bearings
- Backup-roll drive
The single-stand X-Roll® reversing cold mill at KYCR Coil Industries in Chittagong, Bangladesh, went on stream in January 2002. It’s the first cold mill in Bangladesh and mainly supplies the parent KDS group’s galvanizing line with cold strip.

KYCR chiefly rolls strip from low-alloy steels on the six-high stand and specializes in strip thicknesses of 0.15 mm and less. Although some 60% of its products are within this thickness range, KYCR generates an annual output of over 140,000 t, which is well in excess of the guaranteed annual capacity of 100,000 t.

The six-high mill is equipped with the control elements CVC® and HS (Horizontal Stabilization), plus work-roll and intermediate-roll bending for excellent surface and flatness qualities as well as minimal thickness tolerances.

What stood out here was the short project handling time of just 18 months from contract signing to the first coil.
FLEXIBLE EXPANSION STRATEGY

The follow-up order came in May 2013. That was when KYCR contracted SMS group to convert its RCM into a two-stand Compact Cold Mill (CCM®). It was a big advantage for KYCR that we designed the foundations from the start to take the second mill stand. This means only the exit-side equipment such as coiling reel, coil transfer car, and belt wrapper had to be moved. Included in the scope of supply are X-Pact® electrics and automation.

TYPE CVC® PLUS 6-HS
REVERSING COLD MILL

Commissioning: January 2002

Production data

<table>
<thead>
<tr>
<th>Description</th>
<th>Details</th>
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<tr>
<td>Rolled stock</td>
<td>Low carbon</td>
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<tr>
<td>Strip width</td>
<td>600 to 1,050 mm</td>
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<tr>
<td>Strip thickness</td>
<td></td>
</tr>
<tr>
<td>Entry</td>
<td>1.6 to 3.0 mm</td>
</tr>
<tr>
<td>Exit</td>
<td>0.12 to 0.5 mm</td>
</tr>
<tr>
<td>Coil weight</td>
<td>max. 22,000 kg</td>
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Technical data

<table>
<thead>
<tr>
<th>Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stand type</td>
<td>CVC® plus 6-HS</td>
</tr>
<tr>
<td>Rolling speed</td>
<td>max. 1,000 m/min</td>
</tr>
<tr>
<td>Roll separating force</td>
<td>max. 10,000 kN</td>
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<tr>
<td>Motor rating</td>
<td>1,200 kW</td>
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<td>Roll diameter</td>
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<td>Work rolls</td>
<td>200 mm to 240 mm</td>
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<tr>
<td>Intermediate rolls</td>
<td>360 mm to 400 mm</td>
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<tr>
<td>Backup rolls</td>
<td>800 mm to 860 mm</td>
</tr>
<tr>
<td>Capacity</td>
<td>100,000 t/year</td>
</tr>
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</table>

CCM® Daten

- Strip thickness exit 0.12 bis 0.09 mm
- Capacity 170,000 t/year

Technical features

- CVC® plus technology with axial intermediate roll shifting and roll bending
- Horizontal shifting of the intermediate rolls to stabilize the work rolls (HS system)
- Dry-Strip system
- Intermediate-roll drive
Probably the most modern plant of its type at the time, the single-stand X-Roll® reversing cold mill at China Steel Corporation (CSC) in Kaohsiung, Taiwan, went on stream in 2003. This enabled CSC to expand its existing capacity for cold-rolled steel to include silicon steels as well as medium and high-strength carbon steels in low final thicknesses. The six-high RCM is designed for strip widths of 600 to 1,270 mm at final thicknesses of 0.15 to 1.6 mm. It can produce a total of 200,000 t/year.

Included in our scope of supply were not only the mechanical equipment, but also all technological process models for precise presetting of the control elements. That comprises the complete technology strategy for cold rolling special steel grades. To meet the high demands above all for strip thickness and flatness, the mill stand is fitted with hydraulic control elements, intermediate-roll shifting with CVC® plus system, work-roll and intermediate-roll bending, and multizone cooling.

The EDC® (Edge Drop Control) prevents reduced thickness at the strip edges caused by variation of the roll flattening. To achieve this, the barrel of each work roll is tapered at one side using a special grind. The control system shifts the taper into the edge zone of the strip, compensating the edge drop.

It took just six months to install and cold-commission the plant. All this was possible thanks to the modular design of the mill.
TYPE CVC® PLUS 6-HS  
REVERSING COLD MILL

Commissioning: January 2003

Production data
Rolled stock: Silicon steels, carbon steels  
Strip width: 600 to 1,270 mm  
Strip thickness:  
Entry: 1.0 to 3.5 mm  
Exit: 0.15 to 1.6 mm  
Coil weight: max. 25,000 kg

Technical data
Stand type: CVC® plus 6-HS  
Rolling speed: max. 1,200 m/min  
Roll separating force: max. 16,000 kN  
Motor rating: 4,200 kW  
Roll diameter:  
Work rolls: 290 mm to 340 mm  
Intermediate rolls: 440 mm to 500 mm  
Backup rolls: 1,100 mm to 1,220 mm  
Capacity: 200,000 t/year

Technical features
- CVC® plus technology with axial intermediate-roll shifting and roll bending  
- Horizontal shifting of intermediate rolls to stabilize the work rolls (HS system)  
- Edge Drop Control (EDC®)  
- Dry-Strip system  
- Multizone cooling  
- Intermediate-roll drive
CSN, Brazil

CVC® PLUS 4 REVERSING COLD MILL FOR NEW COLD-STRIP COMPLEX

The new cold-strip complex of CSN (Companhia Siderúrgica Nacional) started operation in Araucária in the state of Paraná, Brazil in 2003. It receives hot strip from the main CSN plant which it then pickles, cold-rolls, and refines. Most of the products go to the Brazilian construction industry.

The single-stand X-Roll® reversing cold mill (RCM) with an annual capacity of 350,000 t constitutes the facility’s cold-rolling stage. Included here is a four-high stand equipped with CVC® plus technology and work-roll bending for flatness control. The plant achieves strip widths ranging from 700 to 1,600 mm and final thicknesses between 0.2 and 1.55 mm.

The entire complex, located in the South of Brazil, was erected on a turnkey basis by an international consortium under the leadership of SMS group. Besides the reversing cold mill we supplied further units such as pickling line, continuous hot-dip galvanizing line, color coating line, lab equipment, water system, and roll workshop. Moreover, we were responsible for plant commissioning and staff training.

Shipment of the finished coils.

Reversing cold mill.

Works entry.
TYPE CVC® PLUS 4
REVERSING COLD MILL

Commissioning: 2003

Production data

- Rolled stock: Low carbon, IF-steels, microalloyed steels
- Strip width: 700 to 1,600 mm
- Strip thickness
  - Entry: 1.5 to 5.0 mm
  - Exit: 0.2 to 1.55 mm
- Coil weight: max. 25,000 kg

Technical data

- Stand type: CVC® plus 4
- Rolling speed: max. 1,350 m/min
- Roll separating force: max. 22,000 kN
- Motor rating: 6,000 kW
- Roll diameter
  - Work rolls: 400 mm to 450 mm
  - Backup rolls: 1,150 mm to 1,250 mm
- Capacity: 350,000 t/year

Technical features

- CVC® plus technology with axial intermediate-roll shifting and roll bending
- Work-roll drive

Quality assurance.
TUBOS EUROPA, Spain

CVC® PLUS 4-HIGH REVERSING COLD MILL - READY FOR ANYTHING

Tubos Europa S.A. in Jerez de los Caballeros in the southwest of Spain has established its own cold-strip production by purchasing a single-stand reversing cold mill. It’s a four-high reversing mill that not only supplies the company’s galvanizing line and its pipe manufacturing plant with cold strip, but can also be operated both as a reversing and a skin-passing mill.

That’s a sound basis for producing strip in widths ranging from 700 to 1,560 mm and a minimum final thickness of 0.4 mm. The plant has an annual capacity of some 400,000 t.

As a systems supplier, SMS equipped this highly flexible and super-efficient plant with specially designed mechanical equipment as well as X-Pact® electrics and automation. All pass schedules were calculated using our T-roll® package based on the process know-how distilled from more than 20 years of experience. Now, due to CVC® plus technology and work-roll bending in conjunction with multizone cooling, our customer can rely on outstanding strip flatness within narrow tolerance limits. Added to this is the advantage that CVC® plus enables the Spanish company to produce many different sizes without time-consuming roll changes.
TYPE CVC® PLUS 4
COMBINED REVERSING AND SKIN-PASS COLD ROLLING MILL

Commissioning: January 2005

Production data
Rolled stock: Low carbon
Strip width: 700 to 1,560 mm
Strip thickness
  Reversing mode
    Entry: 1.2 to 6.0 mm
    Exit: 0.4 to 3.0 mm
  Temper mode
    Entry: 0.4 to 3.0 mm
    Exit: 0.4 to 3.0 mm
Coil weight: max. 30,000 kg

Technical data
Stand type: CVC® plus 4
Rolling speed: max. 1,200 m/min
Roll separating force: max. 20,000 kN
Motor rating: 5,500 kW
Roll diameter
  Work rolls: 400 mm to 450 mm
  Backup rolls: 1,150 mm to 1,250 mm
Capacity: 400,000 t/year

Technical features
- CVC® plus technology with axial intermediate-roll shifting and roll bending
- Dry-Strip system
- Multizone cooling
- T-roll®
- Work-roll drive
BENXI IRON & STEEL, China

TWO IDENTICAL-DESIGN
CVC® PLUS 6-HS
REVERSING COLD MILLS

This was an order for not one, but two X-Roll® reversing cold mills in six-high design – placed by Benxi Iron & Steel of Liaoning Province in northern China. What clinched the deal was our seamless overall solution consisting of mechanical equipment, utilities, plus X-Pact® electrics and automation from one source. There is enough capacity available to produce 250,000 t/year. The first of the two cold mills went on stream in December 2007, and the second followed in March 2008.

Both X-Roll® reversing mills are specifically designed for cold rolling carbon steels down to low final thicknesses of 0.18 to 1.6 mm at strip widths of 750 to 1,300 mm.

Included in our supply package were two identical, powerful CVC® plus mills in six-high design with horizontal work-roll stabilization (HS system) and intermediate-roll drive, complete with the entire X-Pact® electrics and automation. Standout features of the automation are the innovative setup model for maximum yield as well as the technological control elements specially tuned to each other.
TYPE CVC® PLUS 6-HS
REVERSING COLD MILL

Commissioning: December 2007/March 2008

Production data
Rolled stock: Low carbon
Strip width: 750 to 1,300 mm
Strip thickness:
  Entry: 1.8 to 3.0 mm
  Exit: 0.18 to 1.6 mm
Coil weight: max. 22,000 kg

Technical data
Stand type: CVC® plus 6-HS
Rolling speed: max. 1,000 m/min
Roll separating force: max. 18,000 kN
Motor rating: 6,000 kW
Roll diameter:
  Work rolls: 290 mm to 340 mm
  Intermediate rolls: 440 mm to 500 mm
  Backup rolls: 1,150 mm to 1,250 mm
Capacity: 250,000 t/year

Technical features
- CVC® plus technology with axial intermediate-roll shifting and roll bending
- Horizontal shifting of intermediate rolls to stabilize the work rolls (HS system)
- Edge Drop Control (EDC®)
- Dry-Strip system
- Multizone cooling
- Intermediate-roll drive
WISCO, China

CVC® PLUS 6-HS REVERSING COLD MILL FOR SI-STRIP

Already one of China’s largest steel companies, Wuhan Iron & Steel Corporation (Wisco) has steadily increased its cold strip production over recent years. To highlight a perfect example, the combined pickling/tandem mill we supplied in 2005 comes with an annual capacity of 2.3 million t, producing chiefly material for the automotive industry.

Then there is the single-stand X-Roll® reversing cold mill (RCM) for a production of 306,000 t/year that went into production at Wisco in summer 2008. This plant is used specifically for rolling silicon strip with a Si-content of up to 3.5% in HNGO (high non-grain-oriented) and HIB (high grain-oriented) qualities. What makes the powerful mill so effective are the CVC® plus technology, EDC® system, horizontal work-roll stabilization (HS system), and intermediate-roll drive installed.

Crucial reasons for awarding SMS group the contract were the design geared to the production of electric-quality strip as well as the advanced control elements. Equally significant is our setup model specially configured for rolling silicon strip, which maximizes yield. Furthermore, the plant features our flatness measuring rollers optimally adapted to the increased strip temperature generated during rolling silicon strip.
TYPE CVC® PLUS 6-HS
REVERSING COLD MILL

Commissioning: summer 2008

Production data
Rolled stock  Si-steel (HNGO, HIB)
Strip width  750 to 1,280 mm
Strip thickness
  Entry  1.3 to 3.0 mm
  Exit   0.2 to 0.85 mm
Coil weight  max. 20,000 kg

Technical data
Stand type  CVC® plus 6-HS
Rolling speed  max. 900 m/min
Roll separating force  max. 18,000 kN
Motor rating  5,500 kW
Roll diameter
  Work rolls  290 mm to 340 mm
  Intermediate rolls  440 mm to 500 mm
  Backup rolls  1,150 mm to 1,250 mm
Capacity  306,000 t/year

Technical features
- CVC® plus technology with axial intermediate-roll shifting and roll bending
- Horizontal shifting of intermediate rolls to stabilize the work rolls (HS system)
- Edge Drop Control (EDC®)
- Dry-Strip system
- Multizone cooling
- Intermediate-roll drive
INTERNATIONAL STEEL LIMITED, ISL, Pakistan

PAKISTAN’S FIRST X-ROLL®-RCM

New on the books in April 2008 was an order from International Steels Limited (ISL) for Pakistan’s first ever X-Roll® reversing cold mill (RCM). ISL is one of the country’s leading companies, and has so far specialized in the production of tubes for pipeline production as well as for machine and vehicle construction. It chose the single-stand four-high reversing cold mill to expand its product range by high-quality cold strip. There will probably be a focus on deep-drawing grades.

The plant is capable of processing strip in widths of 700 to 1,250 mm and a maximum starting thickness of 5.0 mm. It achieves a minimum finished strip thickness of some 0.25 mm, and comes with an annual capacity of 248,000 t. Right from the start, we made all the provisions for a future upgrade to a two-stand Compact Cold Mill (CCM®).

The four-high mill stand features one payout reel and two reversing reels. Vital to product quality is precise thickness control, achieved here with hydraulic adjusting cylinders that can apply a maximum total roll-separating force of 15,000 kN. Our CVC® plus technology and work-roll bending ensure excellent strip flatness within close tolerance limits.

We supplied the mechanical equipment in cooperation with our Indian joint venture partner. This company was responsible for the entry and exit components, the ancillaries and utilities, as well as the work-roll change equipment.

To guarantee top quality, we supplied all the core components, such as the mill stand, the reversing reels, and the high-pressure-hydraulics valve stands. The plant was commissioned in Karachi in mid-2010.

COST-EFFECTIVE EXPANSION TO CREATE CCM®

Next, in February 2014, ISL contracted us to expand the RCM. This will give ISL a CCM® and increase its annual capacity by 40 percent. Now the original provisions for future expansion we made when we designed the RCM are paying off. They allow us to efficiently integrate a second mill stand. Most important here was the preparation of the foundations and media systems. As a result, we only need to shift the coiler/reversing coiler and coil wagons before the upgrade.
TYPE CVC® PLUS 4
REVERSING COLD MILL

Commissioning: 2010

Production data
Rolled stock: Deep-drawing grades (CQ, DQ, DDQ)
Strip width: 700 to 1,250 mm
Strip thickness:
  Entry: 1.6 to 5.0 mm
  Exit: 0.25 to 2.0 mm
Coil weight: max. 25,000 kg

Technical data
Stand type: CVC® plus 4
Rolling speed: max. 1,200 m/min
Roll separating force: max. 15,000 kN
Motor rating: 5,800 kW
Roll diameter:
  Work rolls: 360 to 400 mm
  Backup rolls: 1,000 to 1,100 mm
Capacity: 248,000 t

Technical features
- CVC® plus technology with axial intermediate-roll shifting and roll bending
- Work-roll drive

For the expansion into a CCM®, a second mill stand will be erected next to the existing stand.
CHINALCO SHANGHAI COPPER, China

CHINA’S FIRST RCM WITH CVC® PLUS FOR COPPER STRIP

Starting in January 2011, Chinese copper manufacturer Chinalco Shanghai Copper has been operating a single-stand reversing cold mill supplied by SMS group complete with mechanical equipment, X-Pact® electrics and automation, and process know-how. Included in the package was a tailor-made pass schedule calculation system based on technological experience gained from previous SMS copper mills as well as on expertise from our own research and development work. Apart from the fluid systems, SMS group supplied cooling lubricants manufactured to suit the Chinalco Copper process requirements. Also incorporated in the plant is an MPF 1-16-type Multiplate® filter that cleans the cooling lubricant.

The six-high cold mill stand with CVC® plus technology was integrated into the Chinalco production plant in Shanghai. Equipped with all our advanced rolling technology, it rolls copper and copper alloy strip from a starting thickness of up to 4.0 mm down to final thicknesses of as little as 0.15 mm. The annual capacity exceeds 100,000 t.

Mr. Wang Yuejin, General Manager of Chinalco Shanghai Copper, commented: “Our reversing plant from SMS can roll strip widths of up to 880 mm. Here in China, only very few manufacturers have this capability. Most of them process strip in narrow and medium formats up to a width of 650 mm. Compared to that, we’re able to meet almost all cold strip requirements.”

Asked about his experience with the RCM, he replied: “With the six-high RCM, we’re proud owners of a state-of-the-art cold mill. In terms of product mix, thickness tolerances, and flatness tolerances, the strip we produce here is exactly what the international market wants.”
TYPE CVC® PLUS 6
REVERSING COLD MILL

Commissioning: 2011

Production data
Rolled stock Copper and copper alloys
Strip width 600 to 880 mm
Strip thickness
Entry 0.40 to 4.0 mm
Exit 0.15 to 3.0 mm

Technical data
Stand type CVC® plus six-high
Rolling speed 600 m/min
Roll separating force max. 8,000 kN
Capacity 107,000 t

Technical features
- CVC® plus technology with axial intermediate-roll shifting, work-roll and intermediate-roll bending
- Multizone cooling
- Level 2 (offline)
- Automatic work-roll and intermediate-roll changing
- Paper winder
- PrimeLub C80 rolling oil
- MPF 1 - 16 Multiplate® filter

The compact Multiplate® filter cleans extremely effectively and stands out for its assembly and maintenance-friendly design.
GAZI METAL, Turkey

THE HEART OF THE NEW COLD STRIP COMPLEX

Gazi Metal Mamülli contracted SMS group, in 2011, to build a new production plant for carbon and silicon steel strip near Karazu in Turkey. In September 2014, the plant – with an annual capacity of 350,000 t – went on stream. Gazi Metal Mamülli supplies among others the automotive industry and manufacturers of household appliances.

SMS supplied all the core components for the cold mill complex, including the drive technology and X-Pact® automation with model-based pass schedule calculation and visualization. Aware of our extensive experience in silicon steel rolling, Gazi Metal Mamülli trusts in our expertise. Included in the scope of supply and services were a semi-continuous pickling mill with attached acid regeneration plant, a CVC® plus six-high reversing mill (RCM), and a four-high skin-pass mill.

The single-stand reversing cold mill in six-high design rolls a broad spectrum covering both low-alloyed carbon steels and non-grain-oriented silicon steels. The plant is capable of rolling carbon steel strip to a minimum final thickness of 0.25 mm and non-grain-oriented silicon steel down to 0.30 mm. It achieves a top rolling speed of 1,200 m/min.

To achieve this performance, the RCM is equipped with numerous high-tech components. The six-high mill stand features CVC® plus technology as well as positive and negative work-roll and intermediate-roll bending for adjusting the roll configuration to the required roll gap geometry. This is how the plant meets the high requirements for profile and flatness of the rolled strip. Moreover, the mill stand is prepared for Edge Drop Control (EDC®). Especially when it comes to rolling non-grain-oriented silicon steel strip, EDC® helps increase productivity. The exit end includes multizone cooling to improve strip flatness as well as a Dry Strip system (DS system).

Well ahead of delivery to the construction site, the components of the modular-design RCM were preassembled and tested in the SMS group Hilchenbach workshop. That reduced the time required for final assembly and commissioning, ensuring rapid return on investment for our customer.
CVC® PLUS 6
REVERSING COLD MILL

Commissioning: 2014

Production data
Rolled stock       Carbon steel, non-grain-oriented (NGO) silicon steel
Strip width        600 to 1,500 mm
Strip thickness
   Entry          1.5 to 6.0 mm
   Exit           0.25 to 3.0 mm
Coil weight        max. 30 t

Technical data
Stand type         CVC® plus six-high
Rolling speed      max. 1,200 m/min
Roll separating force max. 18,000 kN
Capacity           350,000 t

Technical features
- CVC® plus technology with axial intermediate-roll shifting, work-roll and intermediate-roll bending
- Multizone cooling
- DS system
- Preparation for Edge Drop Control (EDC®)
NINGBO XINGYE, China

FOUR-HIGH DESIGN FOR THICK COPPER STRIP

Ningbo Xingye Copper awarded SMS group an order for two reversing cold rolling mills in different designs for copper and copper alloys. The company is a member of the Xingye Copper International Group Limited, a leading manufacturer of top-quality copper strip and plate products in China.

Copper is a valuable material whose resource-saving processing tests the limits of plant technology. Equally important, the customers of Ningbo Xingye Copper have high expectations of the strip thickness and flatness tolerances as well as surface qualities. There is also a large variety of material types to be rolled. They include not only copper and copper alloys such as brass and bronze, but also alloys with exotic elements such as copper beryllium and copper iron. All of these materials are rolled on the new cold mills at Ningbo Xingye Copper.

To be able to process the valuable material cost-effectively, the SMS rolling mills are designed to ensure maximum material utilization and minimum off-gage lengths.

FOUR-HIGH REVERSING MILL

The four-high reversing mill is supplied with input stock from semi-continuous casting plants or from the hot rolling mill. The strips, which are up to 16 mm thick, are wound into loose coils with variable inner diameters, then transported to the cold mill, where they are transferred to the payoff station.

Due to the large strip thickness ranges, the entry and exit rollers consist of a combined payoff gear and payoff drum with various reel diameters. Whatever its thickness, the strip to be rolled is coiled under tension. Finished coils are finally wound onto the coiler drum and transported from there to further processing stations.
The four-roll mill stand processes strip between 420 and 680 mm wide with entry gages of 9 to 16 mm. It's a special feature of the rolling process that the strip is fed into the closed roll gap so that the mill rolls the thick, relatively short strip completely from end to end. Then the strip end leaves the roll gap and is re-threaded for the reverse pass. This is how the strip can be rolled to the target thickness across its entire length. That, in turn, minimizes off-gage lengths at the strip ends for maximum material utilization.

Proven control elements such as hydraulic screwdowns, positive and negative work-roll bending, swiveling of the mill stand, and multizone cooling ensure the required final gage of 0.5 to 4.0 mm, as well as perfect flatness. The annual capacity of the rolling mill is some 75,000 t. In November 2014, the reversing cold mill started operation in Ningbo City, Zhejiang Province.
20-ROLL REVERSING COLD MILL FOR COPPER THIN STRIP

In fall 2014, the 20-roll cold mill also rolled its first strip. This SB23-26” split-block plant further processes the material to produce thin strip.

The split mill stand design is ideal for this application. That’s because the split blocks supporting the 20-roll rolset transfer the process heat more effectively for better cooling. Furthermore, the larger roll gap facilitates strip threading. Equally convenient, the mill stand is very easily accessible, allowing the use of different work-roll diameters.

There is a reversing reel with a belt wrapper at both the entry and exit ends so that thin strip can also be wound onto reels. The strip measures 400 to 660 mm wide and has a maximum entry gage of 2.50 mm. Rolling takes place at a maximum rate of 800 meters per minute. Using the control elements – consisting of hydraulic roll adjustment, crowning adjustment of the A-D axes, and interim-roll shifting – the rolling mill ensures the strip complies with all required gage and flatness tolerances. After processing, the minimum final gage is 0.05 mm.

A practice-proven wiping system reliably removes rolling oil residues from the thin finished strip without damaging the sensitive surface. Also ready for use are paper winders to help ensure high-quality strip surfaces. Annual production capacity of the rolling mill totals more than 55,000 t.

SMS group supplied equipment and services for both rolling mills, comprising the entire scope of engineering, the mechanical components, X-Pact® electrics and automation for control and monitoring of the entire rolling process, plus all the measuring devices and drives. Also included in the four-high plant is our X-Shape flatness measuring system and a pass schedule calculation system tailor made for this plant type. That’s based on technological experience gained from other SMS copper rolling mills as well as insights from our own research and development activities. The 20-roll mill stand is also equipped with a Level-2 offline model. It comes with green, resource-saving technology in the shape of a Multiplate® filter with top filter fineness for cleaning the rolling oil.
## 20-HIGH SB23-26” REVERSING COLD MILL

Commissioning: 2014

### Production data

<table>
<thead>
<tr>
<th>Rolled stock</th>
<th>Copper, brass, bronze, copper-nickel-silver alloys, copper-beryllium, copper-iron, copper-nickel-silicon alloys</th>
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</thead>
<tbody>
<tr>
<td>Strip width:</td>
<td>400 to 660 mm</td>
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<tr>
<td>Strip thickness</td>
<td></td>
</tr>
<tr>
<td>Entry</td>
<td>max. 2.50 mm</td>
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<tr>
<td>Exit</td>
<td>0.05 to 2.50 mm</td>
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</tbody>
</table>

### Technical data

<table>
<thead>
<tr>
<th>Stand type</th>
<th>20-high SB23-26”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rolling speed</td>
<td>max. 800 m/min</td>
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<tr>
<td>Capacity</td>
<td>55,000 t</td>
</tr>
</tbody>
</table>

### Technical features
- HGC
- Crown adjustment of axes A-D
- Intermediate-roll shifting
- X-Shape flatness measuring and control system
- Reversing reel with belt wrapper
- Winding mode
- Paper winder
- Multiplate® filter type MPF 1 - 19
“The information provided in this brochure contains a general description of the performance characteristics of the products concerned. The actual products may not always have these characteristics as described and, in particular, these may change as a result of further developments of the products. The provision of this information is not intended to have and will not have legal effect. An obligation to deliver products having particular characteristics shall only exist if expressly agreed in the terms of the contract.”