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Two heavy-plate levelers for OMK pre-assembled

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Jiangsu World Group orders crankshaft hardening machine
WHB orders second EloCrank™ hardening machine
New softening stirrer for strip casting plant
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Aluminum Plants
Helical ultrasonic inspection stations delivered
Dubal, UAE: Homogenizing plant for billets
Vedanta Aluminium, India: New homogenizing and sawing lines
Aluminum smelting furnaces for Otto Fuchs

Copper Plants/Bright Steel Production Plants
ProConTube: Eccentricity minimized – costs reduced
Drawing, grinding and peeling lines for new works in India
Ascometal relies on PM technology

Long-product Mills
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Stahlwerk Annahütte with new cut-to-length group
Universal mill for Novokuznetsk
Hmisho: Ebros® system installed in rebar mill
Celsa section mill: “Technical Control System” – in top form thanks to service contract

Minimills
Tung Ho Steel: Minimill for rebars

Service
Electronic spare parts catalog now available free-of-charge
Extrusion press upgrade with new “butt knockers”
125th hydraulic check carried out

Tube Plants/Service
Tenaris produces first tube on new PQF® plant
Improved piercing mill performance
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Know-how for large-diameter pipe producer ChTPZ

Tube Welding Lines
Putin inaugurates production line for large-diameter pipes
Severstal TPZ Sheksna: 300,000 t of tubes on new line
Atlas Tube: Roll change in just 55 minutes

Spiral Pipe Plants
Spiral pipe welding plant for Shandong Shengli Steel Pipe

Seamless Tube Plants
BHEL, India: Modernization of seamless tube plant
EBS de Tubos Acero orders five finishing lines

Ring Rolling Mills
Ovako Tube & Ring starts up ring rolling plant

Forging Plants
Taiyuan Heavy Industry orders wheel rolling line
Schöneweiss modernizes 4,000-t eccentric press

Manufacturing Shops
New location in Shanghai opened

Trade Fairs/Events
Aluminium 2010 Essen: 8th World Trade Fair and Congress
Buenos Aires: ILAFA 51 and ILAFA Expo 2010
Moscow: 16th International Metal-Expo 2010
Düsseldorf: Annual meeting STAHL 2010
Baghdad: International Fair 2010
Shanghai: Wire China and Tube China 2010
Düsseldorf: METEC 2011 – Preview

New Publications and Videos
Leaflets and videos
“Samsung” is a Korean conglomerate, known in Europe mostly as manufacturer of trendy Smartphones and flat screens. But the family-owned company with its head office in Seoul, Korea, has more to offer: for example the “Industry and Infrastructure Division” of its subsidiary “Samsung Engineering”, whose President, Byung-Bok Sohn, recently visited the Mönchengladbach site of SMS Meer, with a delegation. After a long talk about future cooperation opportunities, Dr. Joachim Schönbeck and Jens Barth, Members of the Managing Board, took the visitors from the Far East on a guided tour through the workshop. In the construction of the new minimill in Bahrain, Samsung is partner of SMS Meer. The “SULB” project has a total volume of EUR 1.2 billion. The new mill will be built outside the city of Hidd. “Samsung is responsible for civil engineering, erection and infrastructure,” Dr. Schönbeck says. “In this field, our Korean partner has a lot of experience in this region which we also want to use in other future projects.”
SMS Meer since one year in Brazil

Successful start

The establishment of our own subsidiary in Brazil, the largest South American country, has been achieved perfectly and quickly. "We could build on the existing customer relations," says Thomas Schanz, General Manager of "SMS Meer Metalurgia do Brasil Ltda.," as the company is officially called, "and that was a great advantage."

Naturally, the startup of our business was successful first with major customers known worldwide such as ArcelorMittal, Gerdau and Votorantim, which had been business partners with SMS before. With the smaller market participants, various activities were beneficial, for example a symposium focused on "long products of steel" in order to increase a necessary awareness in the market.

After one year, the Brazilian subsidiary of SMS Meer is already well established in business.

Contact partner for the entire product range. SMS Meer Metalurgia do Brasil Ltda. represents the entire product range of SMS Meer and has put great emphasis on establishing a service team. This is a concept that has proved its worth, for example in the selling of spare parts which developed very satisfactorily. Increasingly, the new subsidiary is also gaining a foothold in the new installations business where the market also develops well – and SMS Meer plays an active role. Thomas Schanz: "In this context, we do not plan to build large rolling mills but intend to handle smaller customer orders for modernizations directly on site."

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SMS Logistiksysteme GmbH

Acquisition of know-how from Rocla Oy

SMS Logistiksysteme, Netphen, Germany, has acquired the know-how for automatically guided (driverless) vehicles in the heavy-load sector from Rocla Oy, Finland (see Article on page 75).

SMS Innse S.p.A., Milan

Alberto Bregante
new CEO

With effect from November 1, 2010, Alberto Bregante was appointed CEO of SMS Innse S.p.A. in Milan, Italy. He still heads the Advertising and Sales Division of the company. A. Bregante is the successor of Franco Damiani who retired on October 30, 2010. We thank Mr. Damiani for the many years of dedicated and successful cooperation.
Technical developments at SMS Siemag

Innovations for steelworks and continuous casting plants

Constant innovations and steady improvements run through the over 140-year history of our company and have largely contributed to SMS Siemag’s position as the global leader in metallurgical plant and rolling mill technology.

Dieter Rosenthal, a member of our Managing Board, explains the successful corporate philosophy as follows: “Task-related, interdisciplinary cooperation in know-how networks leads to the required innovations in equipment, automation and process technologies, and hence produces the solutions that our customers demand.”

Flexible R&D organization
SMS Siemag’s research and development activities are organized into various task fields and implemented through interdisciplinary cooperation. Depending on the goal of a research project, the experts of our own technical departments team up with plant users, universities or research institutions.

The task fields relate to:
- Fundamentals and models
- Methods and processes
- Plant concepts and components
- Electrics and automation
- Environment and energy

Fundamentals and models
The developers of SMS Siemag’s “Fundamentals and models” field are mainly working to create process models which describe as a whole the complex physical processes taking place during process control. Dr.-Ing. Markus Reifferscheid, General Manager of the Specialist Department Fundamentals and Models Melting/Casting, explains how these process models are translated into new developments. “One of our research areas investigates the causes of crack formation in the slab during continuous casting. By simulating microstructures and materials, we delve deeply into the microcosm of solidification up to the growth of dendrites and the formation of precipitations. This gives us profound knowledge and understanding of the metallurgical processes which we can then use for the plants we build and for optimized process control.” Our findings go directly into the process models, for example to control secondary cooling in continuous casting plants. Another field deals with the development of burner and injector systems.

New generation of SIS burners and injectors
For control of the metallurgical process during the flat-bath phase, a modern electric arc furnace is equipped with additional facilities for oxygen and pulverized-coal injection. In the past years, we have systematically pushed developments in this field, and today we equip reference plants with latest-generation SIS burner and injector systems (Siemag Injection System). Special feature: the operating mode of the burner and injector systems can be changed over flexibly whereby the consumption of electrical energy is significantly reduced.

“Sustainability and energy efficiency are increasingly the driving force for innovations in metallurgical plant and rolling mill technology,” emphasizes Dieter Rosenthal.
Methods and processes

More flexibility in process control and overcoming existing process limits: that’s what the experts of our “Methods and processes” department are working to achieve – with great success. For a long time, a hot strip width of maximum 1,680 mm was considered the absolute upper limit achievable by a CSP® plant. Meanwhile, a width of 1,880 mm has already been reached, and now the market is calling for 2,150 mm. Another example of how process limits can be overcome is LCR Plus. LCR (Liquid Core Reduction) stands for infinite thickness reduction of the thin slab in the strand guide system of the CSP® caster during casting. Thickness reductions of up to 30 mm are achievable today. This gives the plant user immense flexibility to produce minimum and maximum finished-strip thicknesses.

Plant concepts and components

For the development of “Plant concepts and components”, the Technical Development Central Department closely cooperates with the Divisions. Development projects particularly worth mentioning include the Belt Casting Technology (BCT) and new technologies for CSP® plants featuring e.g. three casting strands.

Belt Casting Technology (BCT) for the production of HSD steel

We are cooperating with Salzgitter AG to implement near-net-shape casting on a new plant. Other than in conventional continuous casting, the novel process uses a traveling mold. The liquid steel is cast directly from a casting system via a special casting nozzle horizontally and freely onto a conveyor belt. The conveyor belt is held on both ends by two rollers and water-cooled from below.

Two synchronously traveling dam block chains which are also water-cooled limit the width. After solidification, the cast strip is directed to an equalizing section and is then rolled in a rolling mill. Advantages: near-net-shape strip in innovative steel grades can be produced, the strip is produced without any bending stresses, and there is no need for casting powder.

Further developments: CSP® plants with three strands, and DP steels

Since the start of the first CSP® plant at Nucor 21 years ago, we have expanded the complete technology and hence the spectrum of producible steel grades.

While it was only low-carbon steels that could be produced in the beginning, stainless steels, tube grades and HSLA steels soon followed, and the latest development stage now allows the production of Si and DP steels. Another innovation is the use of three parallel casting strands for an annual production of 3.5 million t of hot strip.
One example of the development of plant components is the measurement of bearing blocks in the strand guide segments of a casting plant. The integrated measuring sensors help detect the solidification point in the strand guide system. This provides a more precise measuring method for control of the secondary cooling system and/or for more precise hydraulic segment adjustment when the caster uses Dynamic Soft Reduction®. This makes it possible to improve not only the performance of the plant, but also its yield and the product quality.

Electrics and automation
On the electrics and automation side, activities focus on control strategies and model developments for all plants. Our general approach is to use computer simulations to develop in an offline process control models and strategies, which are later tested in practical operation jointly with the customer. A prime example of this is the detection of longitudinal cracks as part of the functions of the Mold Monitoring System.

Environment and energy
Suitable processes and technologies need to be developed to account for global social issues such as global warming, CO₂ reduction, waste avoidance and energy savings. An excellent example of holistic thinking with a strong focus on recycling are the foamy-slag briquettes. Made of meltshop residues, they are recycled into the production process somewhere else, in this case the electric arc furnace for the production of stainless special steels. These briquettes help optimize energy input and hence energy yield during the melting process.

10 % higher furnace productivity through foamy-slag briquettes
The foamy-slag briquettes patented by us are used in the production of stainless special steels. Charged into the melt, they cause a reaction similar to that created by the injection of pulverized coal and oxygen during the production of carbon steel: foamy slag forms. The results include increased furnace productivity by up to 10 % through improved energy input, optimized chromium yield, and longer service lives of refractory lining and electrodes in the EAF.

Networking of special fields of expertise
In everyday business, the R&D Central Department ensures the required networking of competences. In addition, questions arising during plant development have to be communicated to the universities’ fundamental research departments so that suitable answers can be found. Exemplary in this context is the research project with RWTH Aachen which deals with the formation of vibrations on the AOD converter (argon-oxygen decarburization).
As part of this project, flow conditions for stirrer positions and stirring rates are visualized, and their impacts on the vibration behavior are measured. Markus Reifferscheid comments: “This is an ideal situation: the customer provides us with measured values from practical operation. We, as plant builder, use our analysis and simulation methods to test suitable solution approaches in advance on the physical model at the university.” This gives us a fundamental understanding of the process and substantially minimizes technical risks during plant or process optimization.

Engineering in the virtual room

The “Digital Workshop” we set up some time ago allows us to utilize the advantages of “Virtual Engineering”. In specially equipped projection rooms, state-of-the-art 3D process and product simulations provide informative representations – in original size and real time. This gives customers and engineers the chance to watch all plant components, processes or logistics simulations jointly in three-dimensional form, and even to ‘dive’ into individual process sequences. The result: collisions, functions and interfaces can be analyzed much more efficiently both in the planning and the handling stage so that planning time, production or manufacturing work and investment costs can be reduced.

Future developments

It is our development engineers’ job and responsibility to translate the findings into reliable and profitable solutions for the plant users. Close contact with customers is of vital importance in this context. Dieter Rosenthal: “Our focus is on the development of innovative solutions, but also on the enhancement of existing procedures or processes for the economical benefit of our customers.” And Dr. Erich Hovestädt adds: “Timing is very important. We must develop the right ideas and concepts at the right time. Plus, we need a partner in the industry who is able to prove the advantages of an innovation in practical operation.”

Dieter Rosenthal sums up:

“Against the background of increasing customer requirements and market demands, networking of individual development issues, research areas and expert knowledge is of growing importance for plant builders. We are well prepared for this highly dynamic process.”

An example of this is the ongoing development of our new strip casting plant with Belt Casting Technology (BCT) for the production of special high-strength steel grades. Now there are specific applications demonstrating that this new technology is ready for the market, for instance in lightweight automotive construction.
Current developments in the fields of rolling mill technology and strip processing lines include new multi-functional cold rolling mills of the CVC® 18-HS type, new engineering solutions such as drive components, eco-friendly and energy-saving technologies, the further development of microstructural and process models as well as minimum-quantity lubrication for skin-passing mills.

Simulations cut development time
With dedicated software tools and proprietary programs, our R&D Central Department simulates all key processes, such as casting, rolling or even the coiling of hot strip, and the mechanical and hydraulic behavior of the plants. These simulations not only provide deep insight into the processes but also enable new developments to be tested and optimized. This approach cuts development times and minimizes the risk for the customers during plant commissioning.

Technical developments at SMS Siemag
Innovations for rolling mills and strip processing lines

Dr. Olaf Jepsen, Vice President Research & Development, explains the tasks of the department:

“First of all, we must have in-depth understanding of the underlying processes of our plants. This knowledge is critical for a suitable design and the further development of a machine. For all this, we have the special know-how.”

Fundamentals and models
The development of innovative materials such as HSD® steels and the call for lower-cost and resource-saving production, for example enabled by microalloyed steels, face the plant engineers with ever growing challenges. Jochen Schlüter, responsible for the entire technology of the first strip casting plant for HSD® steel, which is currently under construction at Salzgitter Flachstahl GmbH, explains: “We research, develop and continuously refine our process models with the objective in mind to investigate as efficiently as possible new manufacturing processes or modify existing plants to meet the requirements of new materials.” This is illustrated by the following two examples from hot rolling.

Example: Microstructural model
The microstructural model is a key element of the hot rolling strategy, as it facilitates fast and efficient implementation of new materials. Our model uses input parameters such as a simulated temperature curve, forming conditions, initial grain size and the future state of solution of the micro-alloying elements. The output parameters that can be calculated are, for example, grain sizes, work hardening and softening state, ferritic/austenitic contents and mechanical properties.

Example: Material model, and work hardening and softening model
Another criterion to be taken into account when introducing new materials is rolling stability. The material model as well as the work hardening and softening model deliver the material parameters for the pass schedule model. In the first iteration step, the typical process parameters for the rolling process in the finishing mill are determined by means of the pass schedule. If the recrys-
tallization behavior is not stable, an iterative process will be used to develop a stable pass schedule. The thus created pass schedule will be relayed to the profile and flatness model for verification whether rolling is possible, taking into account the stability criterion “inter-stand flatness”. When this criterion is fulfilled, the set-up data are transmitted to the control systems. Otherwise a new pass schedule will be generated.

Strip surface analysis by physics-based process models
In cold rolling the quality of the strip surface is of utmost importance. For the analysis of this criterion, physics-based process models are available. They relate to continuum-mechanical, thermal and tribological aspects, taking into account the interaction between the roll and the strip surfaces. The process model is being verified by process data measured in different cold rolling mills and provides a wide-ranging and in-depth understanding of the physics of the rolling process. This also facilitates the process of developing the optimal design for a cold rolling mill and its operating conditions.

Process technologies
At this stage, the potentials of new process technologies in terms of economic and energy efficiency as well as production flexibility are evaluated.

Minimum-quantity lubrication
Minimum-quantity lubrication for skin-passing mills, for example, requires only one fifth of the amount of lubricants used by conventional systems, while achieving a reduction of the rolling force of up to 40%. We developed the technology in cooperation with a partner and recently installed the first unit of this prototype-tested system at a customer’s rolling mill. Innovative nozzles and volumetric flow control valves enable the application of quantities of lubricants smaller than the surface roughness of the strip. This provides the benefit that the roll gap is no longer flooded with oil, eliminating the effort of collecting and conditioning the used oil. Roll gap lubrication has become a clean process, which not only reduces roll wear but also gives high-strength and thin strips excellent flatness with outstanding transfer of roughness during skin-passing. As an option, minimum-quantity lubrication can be combined with a cleaning process which works by spraying liquid nitrogen through nozzles onto the strip and/or roll surface. The nitrogen freezes and cracks the particles of dirt adhering to the surfaces.

Counter-current channel cooling
Similar efficiency increases can be achieved by counter-current channel cooling applied in cold rolling mills. This type of strip cooling system is installed within a channel and works on the principle of a forced current. Nozzles apply the coolant to the strip surface in the direction opposite to the direction of strip travel. This results in the benefits of minimized coolant consumption, higher strip speeds and higher pass reductions. A prototype is already successfully in operation in an aluminum cold rolling mill. Generally, this technology is an excellent option for high-capacity cold rolling mills, as it effectively counteracts the rise in strip temperature.
Plant concepts and plant components
As matter of course, our development program also covers new plant components and machines that save investment costs and increase plant flexibility.

Innovative shearing line
An example is our innovative shearing line with integrated plate leveling machine. While cutting up to 25-mm-thick plates made of high-strength tube grades X80 thru X120, this shearing line reduces the residual stresses in the material.

Flat-neck spindle with length compensation
The rolling of plates made of ultra-high-strength API steels requires rolling equipment in the heavy-plate mills that is laid out for very high torques. We have developed flat-neck spindles that are specially designed for transmitting the enormous forces from the engine to the roll. In the latest development stage, we have now also integrated the possibility of compensating the spindle length. This is a necessary precondition for realizing axial roll shifting for our new rolling process with CVC® plus equipment. The new flat-neck spindles are already in operation at MMK in Russia, Minmetals Yingkou in China, Dongkuk Steel and Hyundai Steel in South Korea.

Uni plus coiler
Further new developments are, for example, our Uni plus high-capacity coiler and the multifunction cold rolling mill of the CVC® 18-HS type. We have already reported about these two new developments on various occasions.

Multi-part backup roll
Also long delivery lead times for large components may give rise to innovations. This was the reason for us to develop a multi-part backup roll for heavy-plate mills. The advantages are easier procurement due to the fact that the parts are smaller, and a reversible process for later renewal of the sleeve. Two such backup rolls with 5 m barrel length are successfully in operation in Russia in the heavy-plate rolling mill of MMK in Magnitogorsk.
**Electrics and automation**

With our recent orders, we have successfully reached our strategic target to equip all plants with our proprietary X-Pact® automation system as well as our process models and technological controls.

**X-Pact® – from the meltshop thru to the heavy-plate mill**

As part of the large-scale project at MMK in Magnitogorsk, the complete steelmaking and rolling mill complex was equipped with cross-plant and plant-specific systems from level 0 thru level 2. For the new heavy-plate mill we supplied the control centers with twelve main control desks featuring the new ergonomic design, all measuring and control equipment, 68 local control stations as well as fully equipped and wired-up control cabinets. Moreover, all process models for the plants and the complete material tracking system were provided by us.

**Now X-Pact® also in cold rolling mills**

Thanks to our intensive development activities, we are now in a position to also realize effective electrical and automation systems in cold rolling mills. The tandem mill for cold strip at our customer Bilstein is controlled by a total X-Pact® automation solution based on our technological controls and process models.

**Environment and energy**

A core focus of our R&D activities is energy and environmental technology. For rolling mills and strip processing lines, this means that each process will be put on the test rig. Dr. Olaf Jepsen, Vice President Research and Development, explains the procedure: “The objective is to achieve high material yield with low energy input through optimized process control. To this end, we must subject each individual process step of each plant to an analysis that takes all these aspects into account. For all our plants we must create efficient and eco-friendly circuits.” According to the R&D expert, also the coupling of processes holds significant potentials. “Here, our energy-saving CSP® plants serve as a convincing example,” Jepsen states.

**Innovation – a competitive factor**

Rather than following the trend of cutting or freezing R&D expenditure, we opted for a different strategy and kicked off a development program. Already in the booming phase of our industry, we prepared the ground for this move and allocated the necessary resources with a long-term perspective.

Our development program is not a short-term campaign. Dieter Rosenthal characterizes SMS Siemag’s future R&D strategy:

“We want to take our R&D activities, which are already of a very high standard today, to the next level. For us, a supplier of production plants and machinery, innovations are a crucial competitive factor.”
Guodian International Economics & Trade Company of China awarded us the order to supply four submerged arc furnaces for the production of calcium carbide. The works will be operated by Guodian Ningxia Younglight Ningdong Coal Based Chemistry Company. The new facilities will be erected at a site near the city of Yinchuan in the province of Ningxia, which is rich in coal resources.

With a power input of 46.5 MW each, the new furnaces are currently the largest of their type in China. Guodian Ningxia Younglight plans to produce approximately 500,000 tpy of high-quality calcium carbide for the local market with these plants. Commissioning is planned to take place in mid-2012.

In addition to the basic and detail engineering for the complete furnace plant, we will also supply the electrode columns, the high-current lines, the hydraulic plants and the automation technology.

The produced calcium carbide will be locally processed into acetylene in a newly erected works complex. Acetylene is an important raw material for the plastics and foam industry. In the acetylene production process from calcium carbide, mineral oil will be substituted by locally available raw materials. The province of Ningxia and neighboring Inner Mongolia boast vast resources of coal and limestone – both raw materials suitable for carbide production.

Accounting for more than 90 % of world calcium carbide production, or 16.4 million tpy, China is currently the world’s number one producer of calcium carbide. A major part of the production in China takes place in small units. The small-capacity furnaces are likely to be replaced by larger submerged arc furnaces in the medium term for environmental protection reasons. SMS Siemag is market leader as supplier of submerged arc furnaces for large-scale production of calcium carbide.
Doubling of annual production

New EAF meltshop at Peiner Träger on stream

In July, 2010, Peiner Träger GmbH, a company of the Salzgitter Group and located in Peine in northern Germany, successfully commissioned the new X-Melt® electric steelworks built by SMS.

The new facilities will almost double the previous production capacity of some 1 million tpy. The melting and vacuum treatment facilities are designed to fulfill high steel quality standards.

**EAF and LF with our X-Pact® electrical and automation equipment.** Our scope of supply included a 125-t Arccess® electric arc furnace with additives supply system, two 125-t ladle furnaces and the complete X-Pact® electrical and automation system, including the technological process models (level 2).

**Vacuum degassing plant from SMS Con- cast.** SMS Concast also supplied a 125-t twin-tank vacuum degassing plant, which was started up at the same time as the meltshop. The mobile vacuum tanks travel between the ladle furnace and the vacuum cover. This solution supersedes the ladle transport by crane between the ladle furnace and the vacuum plant.

A modularly designed, mechanical vacuum pump serves both treatment lines. This markedly reduces cooling water and energy consumption.

The use of mechanical vacuum pumps fitted with efficient off-gas filtration has become widespread practice internationally.

The use of secondary metallurgy facilities provides the basis for the production of high-grade steels. The EAF meltshop thus covers a wide product range, including high-grade quality steels.

**Benefits of Arccess® series EAFs.** The electric arc furnaces of the Arccess® series are optimized for highly efficient electricity use and equipped with trend-setting burner and oxygen injection technology. The metallurgical process model FEOS® (Furnace Energy Optimization System) controls the furnace process with the objective of achieving high furnace productivity at low production costs.

**Prior commissioning of combined slab and beam-blank caster.** Already in March this year, the combined X-Cast® slab and beam-blank casting machine converted by SMS Siemag had been commissioned at Peiner Träger GmbH. The range of products made at the facilities in Peine includes the worldwide-known Peine beams and a variety of other steel sections, such as Europe beams, piling sections and special sections.
Transport of a 100-t converter

No passing of oversize load
Rotary converter for copper recycling at Aurubis

One flatbed truck loaded with the converter core and one with two upper and lower shells each, screwed together for the transport.

On the way to the port of the city of Brandenburg.

City port of Lünen: loading of the vessel support frame.

The load is being fixed for the transport.
Key components were manufactured for a converter to be used for copper recycling at German Aurubis AG in the city of Lünen. In September, the transport of the bulky converter components started in Magdeburg, Germany. The first part of the journey was via road on three flatbed trucks. The vehicles had to be maneuvered with an accuracy of a millimeter on roads hardly wider than the loads they were carrying. For the next stage of the journey, the cargo was loaded on a ship at the port of the city of Brandenburg and shipped down the canal “Untere Havel” to the city port of Lünen on the Datteln-Hamm-Canal. The city of Lünen, where our customer is based, is located in the eastern Ruhr region. The port was only a stone’s throw away from the works where the upper and lower shells, the converter core and the vessel support frame were unloaded according to schedule.

Aurubis AG had ordered the rotary converter for its recycling facilities in Lünen in early 2009. Erection at the customer’s site is well underway.
In short succession, ThyssenKrupp Steel Europe in Duisburg had two reasons to celebrate: On August 25, 2010, the oxygen steelmaking plant in Duisburg-Bruckhausen produced its 150 millionth t of crude steel. Just one month later, on September 25, the 200 millionth t of crude steel was produced at the nearby oxygen steelmaking plant in Beeckerwerth. In the company’s press releases the gigantic magnitude of these production volumes is illustrated by two interesting comparisons: With 150 million t of steel, 15,000 Eiffel Towers could be built, and 200 million t of crude steel would be enough to build 2,400 Golden Gate Bridges.

Both steelworks use equipment from SMS Siemag: The Bruckhausen works operates two 380-t converters from SMS, and at Beeckerwerth we replaced three converter vessels in 2003 and 2004. The original converter vessels had been supplied by us thirty years before.

Production milestone at the Duisburg-Bruckhausen BOF meltshop

On August 25, at 11:51, the 150 millionth t of crude steel was produced at the oxygen steelmaking plant in Bruckhausen. “We’re proud that our plant and the team have reached this milestone,” says Heinz Liebig, head of crude steel production at ThyssenKrupp Steel Europe in Duisburg. “After all, our core meltshop equipment dates from 1969, making it 41 years old. Through continuous upgrading my predecessors and my team have always kept it state-of-the-art, in particular with regard to meeting environmental standards.” At Bruckhausen, steelmaking is based on two converters with heat weights of 380 t each.

The meltshop was one of the first to be equipped with systems for converter gas recovery and recycling as well as dust treatment for complete recirculation. “Our facility in Bruckhausen is one of the few oxygen steelmaking shops able to produce high-silicon electrical steels as well as regular quality steels,” adds Liebig. “Per year, more than three million t of liquid steel are cast into up to 2.6-m-wide slabs on the SMS Siemag continuous caster and then cut inline to the lengths and widths required by our customers.” For eleven years, the meltshop has also supplied the company’s CSP® plant with liquid steel.

Excerpt from a press release issued by ThyssenKrupp Steel Europe on August 27, 2010.
Production milestone at the Duisburg-Beeckerwerth BOF meltshop

Shortly after their colleagues at the nearby Bruckhausen BOF meltshop, the production team at the Beeckerwerth BOF meltshop of ThyssenKrupp Steel Europe in Duisburg also had reason to celebrate: At 2:37 on Saturday, September 25, the facility produced its 200 millionth t of crude steel.

The Duisburg-Beeckerwerth meltshop has a capacity of 5.9 million tpy of steel at an average heat weight of 265 t. It was built exactly 48 years ago as an LD meltshop with two converters; a third converter was added in 1971. In 1987, the meltshop was modernized with a converter gas recovery system and new primary and secondary dust collection systems. At the same time, a first steel degassing plant was put into operation. A second one began operation in late 2001.

The Beeckerwerth oxygen steelmaking shop produces high-grade starting material for high-strength steels, ULC and IF steels as well as tinplate, sheet, tube grades and quarto plate.

Excerpt from a press release issued by ThyssenKrupp Steel Europe on September 27, 2010.
From ArcelorMittal we received the order for a comprehensive revamp of the gas cleaning equipment at the steelworks in Kryviy Rih, Ukraine. The project will be realized in several steps, covering one converter at a time. The first of six hydro-hybrid filter systems is scheduled to be operational in 2012.

Innovative hydro-hybrid filter system. The works operates a total of six 160-t BOF converters. Presently, the dust-laden converter gas is cleaned by means of conventional wet-type scrubbers. Within the framework of the current modernization project, the filter systems will be converted to the innovative hydro-hybrid filter technology, which we developed together with SMS Elex. The new filter system builds on the positive experience gained from more than 30 reference plants fitted with wet-type electrostatic precipitators for converter gas.

Ideal for retrofits. This technology is an excellent option for retrofits of existing plants in order to bring them up to increasingly stringent environmental standards. By retrofitting an electrostatic precipitator (ESP) suitable for this application and integrating it smoothly with the existing wet-type scrubber, residual dust contents can be brought down to such levels that even the most exacting legal requirements are complied with. Investment costs are distinctly lower than those for a newly erected primary-gas cleaning plant using dry-type electrostatic precipitators. Usually, even the operating costs of the gas cleaning system can be reduced. A further advantage is the compact design of the filter, facilitating installation in existing plant environments with confined space conditions.

Also new off-gas cooling system with new water cooling circuits. In addition to modernizing the off-gas cleaning system, also the off-gas cooling system complete with the water cooling circuits will be renewed. Per converter, one new wet-type scrubber will be supplied. The existing water treatment plant will be used without any modifications for both the wet-type scrubbers and the wet-type electrostatic precipitators. Further, the SMS Siemag scope comprises the basic and detail engineering and the supply of all core components. The six wet-type electrostatic precipitators will be supplied by SMS Elex. The conversion concept provides for the possibility of retrofitting a converter-gas recovery plant at a later stage to further enhance the economic efficiency of the facility.

Award for eco-friendly production. ArcelorMittal Kryviy Rih sets great store by sustainable and eco-friendly production processes. In recognition of its commitment exercised in the past, the company was awarded the title “Environment Protection Leader 2009” within the framework of the program “Ecology, environment and nature management in Ukraine”.

Contract signing in Ukraine.
Continuous casting plant No. 5 modernized

Dillinger Hüttenwerke:
With 450 mm, the world’s thickest slab

After modernization and extension of the casting range to include 450-mm-thick slabs, Aktien-Gesellschaft der Dillinger Hüttenwerke successfully put back on stream its continuous casting plant No. 5. For this project, SMS Siemag supplied a comprehensive engineering package encompassing new components for the revamp. With slab formats from 230 to 450 mm thickness and 1,400 to 2,200 mm width, this vertical continuous caster produces the thickest slabs in the world. The plant, originally designed for thicknesses up to 400 mm, was supplied by us in 1998.

Our scope for the modernization comprised the modification of the vertical casting machine to enable a casting thickness of 450 mm, reinforcement of the withdrawal and straightening units and various spare parts. We also provided the X-Pact® electrical and automation package, including planning, production, programming and complete installation of the electrical equipment, commissioning, personnel training and supervision of trial operation. Within the revamp, the control equipment for the hydraulic mold oscillator, the hydraulic adjusting systems for the segments, for the bending unit and for the withdrawal and straightening units, and the load compensation control for the strand-drive group were renewed.

Christian Geerkens, Executive Vice President of the Steelmaking and Continuous Casting Division of SMS Siemag, states: “The successful casting of the 450-mm slab once again proves the performance ability of our continuous casting technology. This applies to both the vertical continuous casting machine supplied by us in 1998 and the recent enlargement of the casting thickness. The segment technology, newly implemented at that time and involving soft reduction, has remained a guarantor for a uniform product quality till the present day. We are proud that, together with Dillinger Hütte, we have realized this seminal achievement.”

Dr. Norbert Bannenberg,
Board Member Technical of AG der Dillinger Hüttenwerke:

“After twelve years of trouble-free production of high-quality 400-mm slabs we felt that we were in a good position to tackle this project. This advancement underpins Dillinger Hütte’s leading position in continuous casting of thick slabs used as input material for the production of high-grade heavy plates.”

In 2005, SMS Siemag put into operation a continuous caster in China for the world’s widest slab and now, also on a caster from SMS Siemag, the world’s thickest slab has been produced.
In 2008, SMS Siemag in Pittsburgh had been awarded two caster modernization projects by ArcelorMittal, the world’s largest steel producer. Both projects were recently successfully concluded. **Project 1.** The first project was for an upgrade of the two-strand slab casting machine No. 1 at the plant located in Burns Harbor, Indiana/USA. Our scope of the project included upgrades to the upper containment area, providing new, longer molds and new hydraulic oscillators.

**Burns Harbor and Lázaro Cárdenas**

**Two ArcelorMittal casters in North and Central America revamped**

Mold and oscillator for the continuous slab casting plant at Burns Harbor

In an effort to increase production, improve quality, and reduce maintenance costs, SMS Siemag LLC designed and supplied new molds and hydraulic oscillators for the existing two-strand continuous casting machine No. 1 at ArcelorMittal Burns Harbor (AMBH). The order also comprised modification of the 0-segments. The

**Project 2.** The second project was for the plant in Lázaro Cárdenas, Mexico. Here SMS Siemag replaced the lower containment zone of the two-strand casting machine No. 2 with new segments utilizing dynamic soft reduction technology.
project incorporated installation of new technologies such as hydraulically adjustable mold width, advanced thermocouple-based mold sticker detection and hydraulic oscillation.

Mold length increased to 900 mm. Mold length was increased from 700 to 900 mm. The original mold length had been a limiting factor when attempting to increase casting speed and production. An innovative copper plate was developed utilizing three-dimensional modeling of the thermal and mechanical behavior for optimum heat transfer for the duration of the copper life.

Stainless steel mold. For potential future improvement measures, AMBH chose a mold design allowing for subsequent installation of an electromagnetic stirring and flow modification system. This design consideration drove the mold to be manufactured from stainless steel. In designing the oscillation drive, the additional weight of the electromagnetic coils was taken into account.

Reliable slab width adjustment. Adjustment of the narrow faces of the mold is by means of closed-loop position-controlled hydraulic cylinders. The system has proved to provide smooth operation for both inward and outward width changes at production casting speeds, and allowed near limitless adjustment of narrow face taper.

First oscillator using water glycol. The proven hydraulic oscillator technology provides for on-line adjustability of both the stroke and frequency, enabling tailor-made practices to be developed. The oscillation springs provide highly accurate guiding of the mold and are virtually wear-free. This oscillator is the first-ever application of SMS Siemag technology with the use of water glycol as hydraulic fluid.

Equipment mock-up. A key to successful implementation of the project was the pre-installation equipment mock-up, which was conducted at the SMS Millcraft facility in Gary, Indiana/USA.

The molds and oscillators were completely tested with the temporary set-up of the independent hydraulic and automation control systems. Our proven “Plug & Work” concept once again enabled a successful start-up at the customer’s facility.
Cont’d.: Two ArcelorMittal casters
in North and Central America revamped

Soft reduction for continuous casting plant at Lázaro Cárdenas

ArcelorMittal Lázaro Cárdenas (AMLC), Mexico, supplies slabs for the international marketplace. Influenced by the ever increasing demands on the internal quality of slabs, AMLC contracted SMS Siemag LLC to modernize the lower portion of the existing two-strand continuous casting machine No. 2. The project’s goal was to improve the internal quality of the slabs by replacing the existing lower-end caster segments. The new segment design was to provide for better strand support, allowing for the implementation of dynamic soft reduction. AMLC also wished to enhance automation control with the application of new technological control systems including Dynamic Solidification Control (DSC) to control the application of spray water and calculate the final solidification point.

Converted to 14-point unbending. The casting machine was converted from 4-point to 14-point unbending to reduce the solid-liquid interfacial strain caused by the unbending process. Strand bulging, and the resulting strain, was reduced by replacing each of the existing five segments with segments containing seven double-split roll pairs. Each segment also utilizes Hydraulic Segment Adjustment (HSA) for on-line roll gap adjustment, enabling dynamic soft reduction.

Positions 7 and 8: Segments with fixed side frames. Two basic segment styles were utilized in the modernization project. A traditional segment design, utilizing fixed side frames, was employed in the unbending positions 7 and 8 of the machine. The reduced unbending forces now provide the ability to perform soft reduction in this region of the machine, enabling improvements to be realized for grades cast at reduced speeds and where final solidification is realized earlier in the containment zone.

Positions 9 thru 11: Cyberlink segments with link rod. In the horizontal portion of the containment zone, segments 9 thru 11, Cyberlink segment technology was utilized. This segment design eliminates the traditional side frames in favor of a link rod connecting the top frame to the bottom frame. This solution allows the top rolls to be adjusted for position without restriction.

Smooth integration of new segments. In both applications the segments were designed specifically to work with the machine’s existing infrastructures. Existing foundation frames, segment removal rails, cooling chamber and segment drives were re-used with minimal modifications. While mating the new segments to the existing carrier frames, the segment centerline positions were maintained. To this end a hydraulically activated pin and wedge segment anchoring system was utilized. Water adapter plates were added to the existing piping to make the automatic spray and machine water connections with the new segments.

Installation and commissioning. Both plants have recently been commissioned. Fine-tuning and performance testing are proceeding according to the original project schedule.
We successfully commissioned a single-strand casting machine for the production of slabs made of stainless steels at the Salem Steel Plant in India. Salem Steel is a company of SAIL (Steel Authority of India). The machine casts slabs with thicknesses from 140 to 200 mm and widths from 600 to 1,300 mm. Maximum casting speed is 1.5 m/min. The plant is designed for an annual production of 300,000 t.

Our order scope encompassed the supply of the complete plant including all media systems as well as the complete X-Pact® electrical and automation system with the process models.

Salem Steel in the state of Tamil Nadu, which is the southernmost state of India, offers a wide range of hot and cold rolled as well as surface-treated stainless steel strip. The ongoing demand for slabs will from now on be covered by the new continuous casting plant.
Anshan Iron & Steel Company in Bayuquan

**RH plants Nos. 7 and 8 successful**

At Anshan Iron & Steel Company in Bayuquan, province of Liaoning in northwest China, the RH degassing plants No. 7 and No. 8, supplied by SMS Mevac, have been operating highly successfully since their commissioning in November 2008 and April 2009 respectively. These RH plants are predominantly used for the treatment of steels for flats production. Recently, our photographer had the opportunity to take photos of the plants.
Ladle in the treatment position.

Ladle turrets of the RH degassing plants 1 and 2.

TOP-lance stroke equipment with vacuum-tight passage to vacuum vessel.

Control room with operator pulpit.

Four-stage steam-ejector vacuum pump with the stages 1 and 2 as well as the condensers 1 to 3.
Both RH degassing plants are designed as fast-vessel-exchange units with hydraulic ladle lifting system. The movement of the ladles between the transfer position and the treatment position is by means of a ladle turret, i.e. two ladles are transported at the same time.
Gas cooler with dust discharge device.

Temperature measurement of steel bath and sample taking.

Bunker system for storing additives and ferro alloys.

Pre-heating burner in the stand-by position.

Piping for lift-gas at the vacuum vessel.

This design concept increases the availability of the RH plants and reduces the number of transports by cranes. Each plant is equipped with a metallurgical TOP lance. The vacuum is generated by a four-stage steam-ejector pump. An alloying system with different vacuum bins is provided for ferro-alloy addition under vacuum.
The duplex RH-TOP plant supplied by SMS Mevac to BeiTai Iron & Steel Company of China, Beigang for short, was recently successfully commissioned at the steelworks in Benxi. The new plant will be primarily used for the treatment of steels for flat production.

Successful completion of cold and hot commissioning

In September 2010, we successfully completed cold and hot commissioning of the new RH degassing plant installed at the steelworks of BeiTai Iron & Steel Company.
This plant differs from most of the RH plants supplied to China in that it features a special vessel exchange solution. The treatment plant is made for heats with a nominal weight of 135 t. Each of the two treatment positions features a hydraulic ladle lifting device, a metallurgical TOP lance, a system for quick addition of alloying elements and a vacuum lock system.

Unlike the typical vessel exchange procedure by means of a bay crane, this plant has been equipped with a specially designed vessel change frame arranged on the ladle car. The vessel is moved out of the plant by means of the change frame. The actual vessel exchange is accomplished by slewable hydraulic clamps and consoles arranged on the vessel platform. The lifting movement required for this operation is realized by the ladle lifting cylinder. The vacuum is generated by a steam-ejector vacuum pump with variable pressure reduction for optimized process control. The vacuum pump makes for low consumption of water for steam generation and condenser cooling.
On July 21, 2010, the new 175-t hot-metal desulphurization unit at Bhushan Steel in Meramandali in the Indian state of Orissa was commissioned. The unit was designed and supplied jointly by SMS Mevac UK and SMS India Pvt. The facility is a twin station designed to deep-inject lime, calcium carbide and magnesium in combination, through an immersed refractory lance, to reduce the sulfur content in the hot metal. The unit can be used in mono-, co- and eco-injection modes.

Desulphurization is carried out in the transfer ladle which is supported on a fixed stand in either of the two treatment enclosures. Once the ladle is in position, the enclosure is sealed by a self-propelled enclosure cover and the lances are slewed out from a parked position over the ladle.

Following the injection, the ladle is tilted in the stand about its bail arms by a hydraulic tilting hook. The slag is then removed by a remote-controlled deslagging machine into a slag pot below.

The new unit is now treating all the liquid iron being supplied to the Conarc plant built by SMS Siemag.
On February 2, 2010, the newly installed deep-injection facility on the 300-t ladle furnace No. 3 at Corus Scunthorpe in the United Kingdom was hot-commissioned. The system was supplied and commissioned by SMS Mevac UK. Technological steelwork and erection were provided by Corus.

The injection system is designed to inject either calcium silicide (CaSi) or Calinjex into the ladle for desulphurization and calcium modification purposes.

The equipment consists of two day storage silos, one for each material type. Both silos gravity-discharge into a common injection dispenser designed to handle both materials. The dispenser is fully automatic. Even emptying to accept the second material without cross-contamination takes place automatically. Injection control is carried out by SMS Mevac’s in-house developed powder flow control valve.

SMS Mevac UK also supplied the slewing injection lance unit, the valve stations, electrical control equipment and technological know-how.
In La Louvière, Belgium, Duferco operates a 90-t electric arc furnace, a ladle furnace and two continuous casting machines, one for slabs and one for billets. All these plants were supplied by companies of the SMS group. Most recently, a VD plant was added.

At the end of 2009, the Belgian company commissioned a VD plant for exact secondary metallurgy treatment of the melts supplied by SMS Concast. The steel producer will use this treatment plant primarily to objectively set the hydrogen and nitrogen contents in the steel and bring down the sulfur content.

**Excellent treatment results.** During metallurgical tests with Al-killed steel grades, the sulfur content was reduced to 10 ppm. At the end of the vacuum treatment, hydrogen was consistently below 1.5 ppm and nitrogen below 55 ppm. These are excellent values for an electric steelworks.

**Noise emission of less than 80 dB(A)**

**Duferco: New VD plant reaches hydrogen content of 1.5 ppm**

Single-tank design with provision for future VOD application. The new VD station is designed as a single-tank unit. However, provisions have already been made for the installation of a second tank and all auxiliaries for future VOD application. The plant is equipped with a bag filter complete with a built-in dust cyclone and a suction line, which comprises all features to accommodate a heat exchanger for future VOD treatment. The pumps are arranged on five skids. Each skid carries two Roots pumps and one screw-type pump. The second-stage pump is equipped with a heat exchanger.

Already more than 15 comparable plants installed. The design of this vacuum treatment plant incorporates the consolidated experience from more than 15 installations of similar plants worldwide. Suitable system volumes and the control logic have led to minimized pumping times. Inside the bag filter a vacuum is maintained, while the tank is undergoing atmospheric operation. Thanks to the simple design of the pumps, complete evacuation is performed in less than five minutes, reaching a pressure of less than 0.67 hPa in the tank.

Noise protection included. The pump installation includes a silencer on the exhaust line. Insulation of the pump room is in accordance with the European noise emission regulations, requiring noise emission values of less than 80 dB(A).
In early 2010, Dragon Steel Corporation, which belongs to Taiwanese China Steel Corporation (CSC), brought on stream a ladle furnace and a vacuum tank degassing plant from SMS Concast at its steelworks in Taichung Hsien. The new plants are intended to enhance the quality of the steel produced at the works.

**Production of superior grades to include SBQ**

**Dragon Steel, Taiwan: Ladle furnace and VD plant on stream**

The original steel producing route at Taichung Hsien was composed of a 150-t electric arc furnace for hot metal charging, a twin ladle furnace, a six-strand billet caster with a 9-m radius, supplied by SMS Concast, and a bloom/beam blank casting machine.

The new ladle furnace (LF 2)
The second ladle furnace will improve the productivity of the existing twin ladle furnace (LF 1), as from now on there will be two fully independent refining units. LF 2 is equipped with a 26-MVA transformer and 380 V maximum secondary voltage, enabling a heating rate of more than 5 °K/min.

The specially designed furnace roof minimizes oxidation of the electrode columns and protects the steel and slag against air oxidation and nitrogen pick-up. Its optimized design will also reduce ladle handling time.

The two ladle furnaces are located next to the vacuum treatment station, in line between the electric arc furnace and the continuous casting machine.

The vacuum tank degassing plant
The two-tank degassing plant is designed to comply with the quality requirements typical of SBQ (Special Bar Quality) grades. Both vacuum tanks feature a separate cover. They provide for final wire additions and inclusion control after the vacuum degassing period.

The vacuum is generated by steam ejectors and water ring pumps. With a pump capacity of 370 kg/h the entire system can be evacuated in less than 5 min to below 1.0 hPa.

High environmental protection standard
The system is in full compliance with the applicable environmental standards and regulations. Process dust is separated by a dry bag filter before reaching the pumping unit. This minimizes pump maintenance and lowers the cost of treating the hot well residues.

Preparations for VOD functions included
The vacuum system is designed for a future upgrade of the equipment to include VOD functions, for example the pressurized alloy addition bin, the oxygen injection lance and the heat exchanger.
New order

**Process control system for Ellwood Quality Steels**

Ellwood Quality Steels (EQS), an innovative producer of forging ingots located in New Castle, Pennsylvania/USA, has contracted SMS Concast for the supply of a process control system for its steelworks. This investment is intended to strengthen the company’s leading position as a producer of high-quality steel ingots. Commissioning is slated for the first quarter of 2011.
Located in New Castle in Pennsylvania, Ellwood Quality Steels (EQS) was one of the first companies in North America to apply modern and highly productive split ladle furnace and vacuum station technology to the manufacturing of forging ingots. Since then, the company has made and is making major investments in new equipment to expand the applicability of ladle furnace technology and further improve its efficiency.

*The company supplies leading specialty equipment manufacturers in the United States and worldwide. Key industries served by EQS include oil and gas, mining, metals processing, power generation, aircraft, railroad, automotive, tooling, water transportation and defense.*
Heating rate of 4.5 °K/min

Brazil: Ladle furnace for Gusa Nordeste

The Brazilian Grupo Ferroeste, a well known producer of pig iron, has awarded SMS Concast an order for the supply of steel plant equipment. SMS Concast will supply equipment for a secondary metallurgy center to be installed in the new "Gusa Nordeste" minimill to be erected in Açailândia in the Brazilian state of Maranhão. The new steelworks will produce billets for rebar production.

The works in Açailândia will be designed to produce 600,000 tpy of liquid steel. It will comprise an LD converter plant, the new ladle furnace from SMS Concast and a continuous casting plant. The 60-t ladle furnace, which SMS Concast will supply, will be equipped with a transformer of 7 MVA +20 %. It will reach a heating rate of 4.5 °K/min. On top of the complete mechanical and electrical equipment, the order also comprises the supply of the automation system. Supervision of erection and commissioning as well as training of the operating personnel also form part of the contract. Commissioning is planned to take place in the middle of 2011.

Major orders received by SMS Concast

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<tr>
<th>Customer</th>
<th>Plant</th>
<th>Commissioning</th>
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<td>M Metals, Thailand</td>
<td>4th strand for existing billet caster</td>
<td>End of 2010</td>
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<tr>
<td>Steel of West Virginia, USA</td>
<td>Revamp of oscillator</td>
<td>End of 2010</td>
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<td>Teksid do Brasil, Brazil</td>
<td>EAF revamp</td>
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<td>V&amp;M Star, USA</td>
<td>Revamp of torch cutting machine</td>
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<tr>
<td>Welspun, India</td>
<td>Two 2(3)-strand billet casters</td>
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</tr>
<tr>
<td>Kamineni Steel &amp; Power, India</td>
<td>Minimill + 2(3)-strand continuous caster for rounds together with SMS Siemag</td>
<td>Early in 2011</td>
</tr>
<tr>
<td>Customer</td>
<td>Plant</td>
<td>Commissioning</td>
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<tr>
<td>Qatar Steel Company, Qatar</td>
<td>Finishing/discharge equipment</td>
<td>Mid-2011</td>
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<td>Warren Steel Holding, USA</td>
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<td>Gusa Nordeste, Brazil</td>
<td>One 50-t LF</td>
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<td>SULB, Bahrain</td>
<td>Minimill</td>
<td>End of 2012</td>
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The growing demand for steel in the Arabian Gulf region is reason for Qatar Steel Company to revamp its steel production facilities in Mesaieed, some 45 km to the south of the capital of Doha. As part of this modernization initiative, SMS Concast recently received the order to renew the company’s continuous casting machine No. 3. Modernization will be realized in two stages. The first stage is scheduled to be completed as early as in mid-2011.

Boosting production to up to 35 heats per day

SMS Concast to upgrade billet caster at Qatar Steel

Phase 1

Renewal of the discharge area
The first construction phase will comprise renewal of the complete discharge area of the four-strand billet caster. SMS Concast will supply a new cross transfer system, a new turnover cooling bed, a new billet marking machine and related hydraulic and electrical equipment. With the new discharge equipment, discharge and consignment of the 130-mm and 150-mm square billets will be optimized.

Phase 2

Renewal of the casting machine
The second modernization phase will involve conversion of the casting machine from the mold through to the discharge area. This will boost production to up to 35 heats per day.

Qatar Steel Company

The company was founded in 1974 as the first integrated steelworks in the Arabian Gulf region. Steel production started in 1979. Located in the center of the modern industrial city of Mesaieed, some 45 km to the south of the capital of Doha, the works today operates four electric arc furnaces, two ladle furnaces and four continuous casting plants.
SMS Concast recently revamped the continuous casting machine at Steel of West Virginia Inc. in Huntington, West Virginia, USA – a wholly owned subsidiary of Steel Dynamics Inc. (SDI) and leading supplier of structural beams, channels and special-shape sections. The three-strand, 6.1-m radius continuous casting machine casts a wide range of section sizes from 100 mm square up to 200 mm square.

More reliable operation and less maintenance

**New oscillators at Steel of West Virginia up and running**

**Electromechanical oscillators**

The revamp included new electromechanical oscillators with short lever arm system and pneumatic deadweight compensation to provide improved accuracy to the true casting radius during oscillation. The newly installed oscillator boasts a number of enhanced design features. It has already shown to provide highly safe and reliable operations with minimal maintenance in numerous applications.

**Variably adjustable stroke**

The system operates with variable frequency controlled AC motors for an oscillation frequency of up to 300 cycles/min. A double eccentric shaft arrangement generates a defined oscillation movement with easily adjustable stroke from 5 to 15 mm.

The oscillator table was designed to accommodate future cartridge mold assemblies and furnished with an adaptor plate to accommodate the existing mold assemblies.

Installation of the new equipment took place in November 2010.
Bhushan doubles hot strip production to 1.6 million t
Second casting strand, sixth finishing stand and second coiler now in operation

Successful extension

In July and September 2010, Bhushan Power & Steel, located in the Indian province of Orissa, successfully started up the equipment of the second construction stage of its CSP® plant. The new facilities comprising a second casting strand, a sixth finishing stand and a second coiler make it possible for Bhushan Power & Steel to double its capacity to 1.6 million tpy and to add ultra-thin strip to its product spectrum. The order for this extension had been placed with us shortly before the commissioning of the CSP® plant.

In its first construction stage, the CSP® plant which had started up in April 2008, attained an annual capacity of 800,000 t of hot strip with a maximum width of 1,300 mm.

Milestone: 1.0 mm
In July 2010, the extension work got into full swing with the installation of the sixth finishing stand and the additional coiler. After a revamping time of merely 22 days, the CSP® plant went back on stream, attaining full production after a few days.

In the next step, Bhushan Power & Steel and SMS Siemag jointly optimized the plant so as to ensure reliable rolling of thinner strip. The minimum final thickness was reduced step by step until, on July 19, 2010, Bhushan Power & Steel successfully produced the first strip with a thickness of 1.0 mm.

Second casting strand
Installation of the second casting strand and the second furnace got underway in June 2010 and was carried out during ongoing
production. Then, on September 19, 2010, the second strand went into operation, casting the first thin slab with a thickness of 58 mm.

Just like strand 1, the new casting strand has a metallurgical length of 6,340 mm and comprises three segments. Thanks to Liquid Core Reduction (LCR3), the new strand is able to produce thin slabs with infinitely variable thicknesses between 58 and 50 mm.

We are erecting a new CSP® plant at Tata Steel in Jamshedpur in the Indian state of Jharkhand. Foundation work and construction of the bays are well underway. Upright setting of the mill housings is scheduled to start in December. The new two-strand CSP® plant is designed for the production of 2.4 million tpy of hot strip, with widths of up to 1,680 mm. The new production line will complement the conventional hot strip mill supplied by us in 1993 for the same location. The CSP® plant will predominantly produce a high-grade product range including strips made of Si steels, tube grades and dual-phase steels.
In August 2010, SMS Siemag has received the acceptance from ThyssenKrupp Steel Europe in Bochum for a new edger in the hot strip mill including the completely new X-Pact® electrics and automation in the entire roughing train.
Better hot strip quality and higher productivity

Since 1966, ThyssenKrupp Steel Europe has produced a highly demanding range of strips made of carbon and special steels at its Bochum plant. To further improve the quality of hot strip, the company commissioned us to modernize the roughing train of the plant including the automation. The installation of a new heavy edger as well as the renewal of the automation system were the focal points of the reconstruction.

High-tech roughing train automation

We have replaced the complete old automation system of the roughing train. The process model for an optimal pass schedule structure and the width setup is an essential part of the new X-Pact® electrics and automation. Moreover, the Automatic Width Control (AWC) provides a constant transfer bar width and the Short Stroke Control (SSC) minimizes the cropping losses on the head and tail end of the transfer bar. Additionally, the new process automation system includes a new pacing control to optimally utilize the capacity of the hot strip mill.

As regards the mechanical equipment, we also supplied the drives, new hydraulic side guides and work roller tables in the roughing-stand area in addition to the edger itself. Furthermore, we renewed key components in the four-high reversing stand.

The new fully hydraulic edger is designed for an edging force of 8,500 kN and a maximum rolling speed of 7 m/s.

Reconstruction concept for short plant downtimes

For the modernization, we developed a reconstruction concept combining the mechanical equipment with the X-Pact® electrics and automation. The new edger was assembled during continuous operation next to the rolling line and regular maintenance shutdowns were used to carry out partial assemblies on the horizontal stand. During a major shutdown the old free-standing edger was dismantled.

The complete new unit could be advanced to the final position by means of a transporting system and flanged to the roughing stand.
Process-IO Server (PIOS) for modernizations

For the replacement of the automation we use an innovative method which significantly reduces the downtimes, ensures ongoing production and accelerates the commissioning. The basis for this is a process-IO server which is installed in customer’s plant during scheduled plant downtimes. Owing to this automation “centerpiece” – a type of electronic terminal strip with software switch – the shadow mode and a gradual switching to the new signal paths or the new automation can be performed.

With the parallel setup of a new and old automation, switching between the two automation systems can be realized during the test phase, whereby production is ensured for the duration of the trial period. In addition to the mechanical equipment, the new key functions and controls were connected, tested and optimized at ThyssenKrupp Steel Europe during the reconstruction phases.

Already before delivery, we tuned the new automation of the roughing train to the plant of the customer with the aid of the Plug & Work procedure. After the quality check had been completed, the new automation system was installed in parallel to the old one at the Bochum plant in order to be incorporated and optimized in the existing process.
After the revamp: Closer tolerances, no cambering, higher productivity

Thanks to the modernization, the geometric tolerances of the transfer bar could be enhanced and particularly transfer-bar cambering could be prevented. In this way, the stability of the rolling process in the finishing train is improved. The edger attached to the horizontal stand and the new sequence control system enable shorter reversing times and optimized operating cycles. This significantly improved the productivity of the roughing mill.

Follow-up order

After the successful modernization of the roughing train, SMS Siemag was commissioned by ThyssenKrupp Steel Europe to modernize the finishing train and the laminar cooling system of the hot strip mill.

The modernization concept of SMS Siemag provides security to the plant operator with regard to an optimized reconstruction progress and gives the assurance that all modernization goals are achieved.

Technical data of the new edger

<table>
<thead>
<tr>
<th>Parameter</th>
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<tbody>
<tr>
<td>Diameter of edging rolls</td>
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<td></td>
<td>min. 1,000 mm</td>
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<tr>
<td>Edger opening during operation</td>
<td>600 to 2,000 mm</td>
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<tr>
<td>Total rolling force</td>
<td>to 8,500 kN</td>
</tr>
<tr>
<td>Rolling speed</td>
<td>to 7 m/s</td>
</tr>
<tr>
<td>Pass reduction</td>
<td>to 100 mm</td>
</tr>
<tr>
<td>Rated drive output</td>
<td>2 x 2,000 kW</td>
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</tbody>
</table>

The edger in full production.
Chinese steelmaker Taiyuan Iron & Steel has placed an order with SMS Siemag for the supply of a UNI plus coiler which was specially designed to wind strip of high-strength tube grades at low strip temperatures. The new coiler of Taiyuan Iron & Steel will be one of the most powerful in China.

Premier in China
UNI plus coiler for Taiyuan Iron & Steel

The compact hot strip mill made by SMS Siemag went on stream in Taiyuan in the Chinese province of Shanxi in June 2006. Taiyuan Iron & Steel uses the mill to produce strip of carbon steels and a wide spectrum of stainless steel grades. In the future, the company wants to focus on the growing market for high-strength steels. To ensure reliable coiling of these materials, Taiyuan Iron & Steel commissioned us to extend the mill by installing a UNI plus coiler. The new equipment is scheduled to start up in November 2011.

Tube steels at low strip temperatures

Based on the results of extensive investigations, the UNI plus coiler was specially developed to coil extra-thick strip of high-strength materials. The coiler for Taiyuan will be extremely strong and powerful to be able to coil strip of tube grades up to the X100 strength class at strip temperatures of around 400 °C. In addition, it will be able to handle direct-hardened strip up to a thickness of 10 mm.

The fully hydraulic UNI plus coiler is of 3-roller design and comes with our Automatic Step Control system to ensure material-friendly and equipment-protecting coiling of the initial windings. For reliable removal and processing of the coils it is equipped with an enhanced coil car and an optimized coil strapping machine.
Specially developed for coiling high-strength, thick tube grades: the UNI plus coiler.

Designed for an annual production of 4.0 million t: the compact hot strip mill of Taiyuan Iron & Steel.
Hot Rolling Mills

Higher rolling forces, closer thickness, profile and flatness tolerances

Modernization at ThyssenKrupp in Bochum

ThyssenKrupp Steel Europe, in short TKSE, chose SMS Siemag to upgrade the finishing mill of its hot strip mill in Bochum, Germany. The order comprises the supply, installation and commissioning of new mechanical equipment as well as the renewal of the level-2 automation system. The three main goals of TKSE’s modernization project are: higher rolling forces, better thickness, profile and flatness tolerances, and shorter roll changing times.

Modernization of the finishing mill

With this order, TKSE is continuing the upgrade of its Bochum hot strip mill which was put on stream in 1966. The mill’s special production focus is on stainless steels. Over the last years, we already installed a new edger in the roughing mill and a flying crop shear, and are now going to modernize the stands of the finishing mill. The four forward stands will receive hydraulic adjusting systems to increase the maximum rolling force. To ensure reliable accommodation of the increased rolling forces, we

Installation of CVC® plus and hydraulic adjusting systems

Closer hot-strip tolerances at NLMK, Russia

In the summer and fall of 2010, we carried out two important revamping steps in the hot strip mill 2000 of the Lipetsk Metallurgical Combine (NLMK). The four forward finishing stands were equipped with hydraulic adjusting systems, and F2 received a new mill pinion gear and new Sieflex® gear-type drive self-aligning spindles.

The finishing mill is modernized in several steps with the main goal of improving the tolerances of the hot strip. This will make it possible for the Russian company to expand its position as a supplier to the automotive industry.

We are using the current modernization phase to install hydraulic adjusting systems on stands F1 to F4 as well as CVC® plus sys-
will equip the stands with new Morgoil® bearings of the KLX® series. A new, modern hydraulic system will feed the adjusting cylinders and other consumers with hydraulic oil.

Furthermore, finishing stands F3 to F5 will be equipped with CVC® plus systems, stronger work-roll bending systems as well as our Sieflex® gear-type self-aligning spindles which, thanks to their continuous circulating oil lubrication, are optimally lubricated and cooled. In addition, the roll changing equipment will be modernized so that the time needed for roll changing will reduce considerably in the future. The revamping scope also includes the renewal of the interstand equipment. And in a future modernization stage, stands F1, F2, F6 and F7 will be fitted with CVC® plus and modified work-roll changing devices.

On the E&A side, our supply package comprises a new level-2 automation system for the finishing mill, including profile and flatness model.

**Improvements through modernization**

The upgrading measures will lead to improvements especially in the following three areas:

- Greater thickness precision through installation of hydraulic adjusting systems
- Better strip flatness, contour and profile through CVC® plus and stronger work-roll bending systems
- More time for production due to less time for roll changing

**Time schedule**

The modernization of the finishing mill will be implemented in two phases that will be completed by spring 2012. In March 2011, we will do the preparatory milling work on stands F1 to F4. And a year later, the new equipment will be installed during a 17-day shutdown. From mid-2011, the new automation system will be operated in parallel with the existing system. Through shadow-mode operation and switchover between the old and the new automation, the unobjectionable functional performance of the new automation system can be tested and safeguarded.

The finishing train was partly modernized already in the 1990s so that, after completion of the ongoing revamping work, all of the finishing stands will incorporate hydraulic adjusting systems and work-roll bending systems and, with the exception of F1, CVC® plus.

The ongoing modernization phase is divided into three steps. In the first step in June 2010, we equipped stands F1 to F4 with the new hydraulic adjusting systems to enable quick and precise roll-gap setting and correction. It took merely seven days to mount the systems and to connect them to the previously installed new hydraulic station. The new equipment performed flawlessly right from production start, and was instantaneously accepted by the customer.

Next, in October 2010, we carried out the second revamping step which comprised the installation of a new mill pinion gear and new Sieflex® gear-type self-aligning spindles on finishing stand F2. Also during this revamping stoppage we did the required milling work on stands F2, F6 and F7 for accommodation of the CVC® plus shifting systems which we will install in the third revamping step in October 2011.

In the future, the new hydraulic station will feed the complete finishing mill with hydraulic oil.
On June 15, 2010, Çolakoğlu Metalurji A.S., headquartered in greater Istanbul, Turkey, produced the first coil on its new hot strip mill. Thanks to the all-inclusive supply of mechanical, electrical and automation equipment by SMS Siemag, the new mill could be ramped up quickly, attaining excellent strip quality right from the start.

With the commissioning of the hot strip mill, Çolakoğlu Metalurji A.S. has opened a new chapter in its corporate history. The company has its roots in steel trading and, in the 1960s, began manufacturing long products at several of its locations. The new hot strip mill in Gebze near Istanbul now makes it possible for Çolakoğlu Metalurji to add flat products to its portfolio.

Designed for an annual capacity of 3 million t, the new rolling mill produces hot strip 800 to 1,650 mm wide and 1.2 to 25.4 mm thick. The product mix covers a broad spectrum of carbon steels, including HSLA grades, tube steels, DP and TRIP steels.

Compact mill through coilbox

The compact hot strip mill is only 330 m long so that it could be accommodated on the existing works site. The short mill length was made possible by the mandrel-less coilbox installed between the reversing roughing stand and the finishing mill. Coiling of the transfer bar between roughing and finish-rolling moreover leads to equalization of the material temperature which in turn ensures nearly constant conditions during finish-rolling.

Modern technologies

The complete mill is fitted with equipment and technologies as required for the economical production of high-quality hot strip. The four-high reversing roughing stand with edger features hydraulic adjusting systems for precise setting of the transfer-bar thickness and width. All of the seven finishing stands use our CVC® plus equipment which, in combination with work-roll bending systems and the profile, contour and flatness control system, enable optimal strip geometries. The two downcoilers are equipped with Automatic Step Control for smooth strip winding. Coil transport to the coil yard is accomplished by our innovative pallet conveyor system.
Automation system

In addition to the level-1 and level-2 automation for the complete hot strip mill, we supplied the main and auxiliary drives (converters and motors in each case), inclusive of roller-table distribution boxes. Technological measuring systems as well as instrumentation and sensors plus a common HMI were also part of our package for the hot strip mill.

After a mere 7 weeks: 1.2-mm-thick strip thanks to Plug & Work

Prior to delivery, the entire automation system had been tested using our Plug&Work concept. And the benefits of pre-optimization and pre-commissioning soon became obvious: As early as the second month after start-up, the mill attained nearly one-third of its nominal production. And only seven weeks after production start, Çolakoğlu Metalurji rolled strip with the desired minimum final thickness of 1.2 mm.

The measuring results of such a strip show that its thickness, width and final rolling temperature remain within very close tolerances over the full length of the strip. And the coiling quality was excellent as well.

99 % of all strips meet specified tolerances

Thanks to the perfect orchestration of mechanical equipment and automation systems, strip with excellent quality could be produced already in the first weeks of operation. Already in the third month after start-up, the thickness, width, profile and flatness of 99 % of all strips were in compliance with the agreed tolerances.
ArcelorMittal Dunkirk, France

New gear unit installed in rougher R5

On September 1, 2010, we concluded the installation of a new gear unit for the roughing stand R5 of ArcelorMittal’s Dunkirk hot strip mill. This modernization measure ensures the operational reliability of the drive train, prepares the mill for a future extension and reduces mill maintenance.

The rougher R5 is the last of four non-reversing stands in the five-stand roughing mill of ArcelorMittal’s hot strip mill in Dunkirk, France. After many years of service, the old gear unit of the stand required an immense amount of maintenance and no longer met today’s high load requirements.

Replacement of the complete drive train. In July and August 2010, we replaced the complete drive train of this stand, including motor and gear. Owing to the extensive foundation work required for the new motor, the revamping work took a total of 36 days, half of which were part of the annual mill shutdown. In the remaining days, the hot strip mill was operated without roughing stand R5.

Higher output torque. The new single-stage gear unit of R5 is able to permanently transmit a significantly higher output torque than the old gear. It was completely manufactured, assembled and aligned in our Hilchenbach shops and has a total weight of 90 t. The large wheel alone with the coupling weighs over 50 t and has a diameter of 3.8 m.

Completely analyzed. Prior to modernization, we carried out an extensive study to analyze all mechanical and electrical drive components of the roughing mill. Based on the future product mix and the associated pass schedules, we determined the required powers and torques, and dimensioned all components accordingly. In addition, we ran simulations to investigate into and optimize the dynamic behavior of the drive trains.

Step-by-step upgrade

Modernization at BlueScope Steel nearing completion

In March 2011, we will replace the last of altogether nine gear units in the finishing mill of the hot rolling mill in operation at BlueScope Steel, Port Kembla, Australia. Since 2007, we have replaced the three main gears and the mill pinion gears of the six-stand finishing mill in several steps with modern and more powerful drives made by SMS Siemag. A detailed report will be included in the next issue of our Newsletter.
Stahlwerke Thüringen issues FAC
Gear unit for section mill in Unterwellenborn, Germany

Representatives of Stahlwerke Thüringen and SMS Meer came to SMS Siemag’s Hilchenbach workshops in September 2010 to officially accept a new high-performance gear unit. All the components of the combined spur-gear mill pinion gear had been manufactured and assembled in our shops. The spur-gear mill pinion gear will drive a new roughing stand which SMS Meer is supplying for the Unterwellenborn long-product mill of Stahlwerke Thüringen.

The existing roughing stand was driven by the motor directly via a mill pinion gear without a reducer stage. To be able to install the new, larger gear on the existing foundation, in other words to save space, we accommodated a spur gear unit and a mill pinion gear in a common housing. The two gear stages will be arranged vertically so that the existing foundations can also accommodate the new motor.

Shop manufacture completed
Vyksa Steel, Russia:
Four-stage gear units for plate turner

The new heavy-plate mill we are currently installing at Vyksa Steel in Russia will be equipped with two plate-turner gear units which were manufactured in our workshops. The two four-stage gears have a transmission ratio of 1:224 and a weight of 38 t each. As requested by the customer, they come with splash lubrication.
As-rolled width up from 1,880 to 2,000 mm

**Salzgitter hot strip mill:**
Major revamping measure completed
In June 2010, we revamped three areas of Salzgitter Flachstahl’s hot strip mill at the same time: We completed the modernization of the finishing mill, installed the main gear unit of F1 and started up the new coil transport system. In total, we installed more than 650 t of new equipment during the 12-day shutdown.

Built in 1963, but incorporating cutting-edge technology thanks to constant modernization: The hot strip mill of Salzgitter Flachstahl, Germany.
Installation of the main gear unit on F1

As part of the revamp, Salzgitter’s finishing mill will receive a completely new drive system. Following renewal of the drive train of F3 in December 2009, we installed the new 150-t main gear unit of finishing stand F1 in June 2010. Until mid-2011, we will additionally supply the two speed reducers for F2 and F4 as well as new intermediate couplings for F5 to F7. After the revamp, Salzgitter Flachstahl’s finishing mill will be one of the most powerful worldwide.
Revamping of the finishing stands

One goal of this modernization job was to increase the width of the finished strip from 1,880 to 2,000 mm. To this end, we made the opening gaps of the finishing stands wider and renewed all equipment in the interstand area. For stands F2 to F5, these measures had already been carried out in previous revamping stages, and so we used the recent phase to modernize stands F1, F6 and F7. Moreover, F1 was equipped with our CVC® plus system so that all of the stands now use this modern adjusting element or actuator for profile, contour and flatness control.

Exhaust systems in the rear stands prevent the emission of rolling dust and fume.

Differential-tension loopers throughout the complete finishing mill together with the automatic leveling control system increase the stability of the rolling process.

Stands F1 to F7 use CVC® plus.

View on the finishing mill.
Coil handling system

During the mill stoppage in June 2010, our subsidiary SMS Logistiksysteme connected the new coil handling system to coilers Nos. 1 and 2. Now a system comprising coil cars, walking beams and a transport chain conveys the coils with their axes in horizontal position, substantially replacing the previous chain-type conveyor system. Starting with coiler No. 3, the new coil handling system had been installed and operated in parallel with the old system for a few months. This ensured that the new system was perfectly functional by the time it took over the entire coil transport function. Following shutdown of the old transport system, SMS Logistiksysteme installed a new inspection line in the place of the old chain-type conveyor.
The new walking-beam conveyor transports the coils with their eyes in horizontal position, partly underpassing tracks and roads.

The very part of the old plate-type chain conveyor, which leads to the existing material store, was maintained. A new tilting chair transfers the coils from the walking-beam to the chain-type conveyor.

An innovative device pushes protruding strip wraps back into the ideal contour.

The new equipment was installed in large pre-assembled units.

Inspection line with roller table and strip turner.
Electrical and automation equipment

On the E&A side, the revamping concept included several measures to safeguard mill availability and full productivity after commissioning of the new equipment. For instance: during start-up of the automation system of coilers Nos. 1 and 2, switchover was possible between the old and the new system. The control systems of the finishing mill were pre-tested up to the hydraulic blocks. The pre-assembled elements of the coil handling system were cabled and tested prior to the standstill; so all that had to be done during revamping was to install them in the desired location, and to connect them. The result: smooth re-start.
With 50 MN leveling force the most powerful machine from SMS

Two heavy-plate levelers for OMK pre-assembled

After the heavy-plate mill stand (see Newsletter 2/2010), the heavy- and the cold-plate leveler with two additional plant components for the heavy-plate mill to be supplied by SMS to Vyksa Steel Works, Russia, passed through our workshop in summer 2010. The two leveling machines were completely pre-assembled, piped and tested. Consequently, the assembly time in the customer’s plant is reduced and the functionality of the machines during commissioning is guaranteed fully. With a leveling force of 50 MN, the cold-plate leveler is one of the most powerful machines ever built by SMS Siemag.
For higher production and better quality

Outokumpu orders cold-plate leveler and plate finishing equipment

Outokumpu Stainless has placed an order with us for the supply of a cold-plate leveler, a cooling bed and various roller tables, including the associated electrical and automation equipment. The new facilities are intended for our customer’s works in Degerfors, Sweden.

This new order is part of a modernization project which Outokumpu Stainless has launched to improve product quality and raise production. In addition to the cold-plate leveler, Outokumpu Stainless will install a second heat-treatment line so that the finishing equipment has to be adapted and extended. The revamping work will be carried out during the mill’s annual summer shutdowns and shall be completed by 2013.

Leveler for better flatness. Coming in our 9-/5-roll design, the new cold-plate leveler will process the plates from both heat-treatment lines. Its main hydraulic adjusting system is supplemented by the separate hydraulic adjusting systems of the nine leveling rolls. In addition, all leveling rolls will be individually driven. In combination with our X-Pact® automation system, this enables a variety of leveling strategies to remove all kinds of flatness defects. Separate adjustment also allows to take individual rolls out of the leveling process so that the machine can be operated with nine or five rolls.

Renewal of finishing equipment. Transport of the plates to the second heat-treatment line, the cold-plate leveler and the shipping bay will be accomplished by means of a new cooling and transfer bed, a new piling crane and new roller tables. All planning work and detail engineering for this will be done by SMS Siemag. Moreover, the area will receive our X-Pact® electrical and automation equipment.
**Designed for 920,000 t per year**

**India: Rourkela orders equipment from cooling bed to plate finishing area**

The Steel Authority of India, SAIL for short, has commissioned us to supply equipment for a new 4.3-m heavy-plate mill which is under construction at the Rourkela location. The order comprises the process equipment from the cooling bed to the plate finishing line.

Designed for a total capacity of 920,000 tpy, the new mill is scheduled to start production at the end of 2012. The works layout already makes provision for future extension to boost production.

Our supply package for the first construction phase includes a cooling and inspection bed, the shear line comprising a double-side trimmer and a dividing shear, and the plate finishing area incorporating a cold-plate leveler, including leveler automation.

Cooling and inspection bed. The cooling bed in disk-roller design will accommodate the plates coming from the rolling mill. On the downstream inspection bed, the plates can be turned for inspection of both plate sides.

Shear line for high-strength plates. The shear line will process plates between 6 and 50 mm thick with strengths of up to 1,200 N/mm². Before the plate edges are trimmed by the double-side trimmer, an ultrasonic device checks the plates for internal defects. Plate positioning is accomplished with the aid of lasers marking the cutting lines for the operator.

The dividing shear cuts the plates to the desired finished size. Just like the double-side trimmer, it operates to the rolling-cut principle ensuring precise cuts and perfect plate edges. The housing of the dividing shear is of closed design which reduces deformation of the shear during cutting. In this way, cutting precision and edge quality are further improved.

In a future construction stage, the shear line can be extended by a crop shear and a slitting shear. In addition, it is planned to install a second shear line.

Finishing area with cold-plate leveler. For the plate finishing section, we are going to supply the cold-plate leveler as well as all transport systems, the pre-piler, an inspection bed and a rail-bound car to carry heavy-gage plates to the shipping bay.

The cold-plate leveler is designed to handle plates with thicknesses between 6 and 50 mm and has a maximum leveling force of 29,000 kN. It features the 9-/5-roll design which means it can be operated with nine leveling rolls for lighter high-strength plates, and with five leveling rolls for thicker plates. Changeover between these two operating modes takes place automatically and involves no time losses.

Operation with nine and five leveling rolls is made possible by the fact that the leveling rolls come with individual drives and separate hydraulic adjusting systems which latter supplement the main hydraulic adjusting system. This combination enables the ideal curvature to be selected for each plate. Calculation of the adjusting function and drive torques is accomplished by means of SMS Siemag’s leveling model which has access to a data base in which the characteristic material-behavior data of all steel grades is stored.

The Rourkela steelworks in the Indian state of Orissa was set up at the beginning of the 1960s with support from Germany. SMS Siemag supplied a 2.5-m heavy-plate mill. Originally designed for an annual production of 1 million t, the works was later extended and modernized. Today, it attains a yearly production of some 2 million t. Over the next years, total capacity will be boosted to more than 4 million tpy.

S. S. Verma, Executive Director (Projects) of Rourkela Steel Plant, and Gerhard Horn, General Manager (Sales), Heavy-Plate Mills, SMS Siemag, after contract signing.
All our extensive R & D work ultimately has one goal: to improve customer benefit. Yet another excellent example of this is the multi-part backup roll for heavy-plate stands which we developed for the order placed with us by MMK, Russia. Thanks to on-time implementation of this innovation, MMK’s heavy-plate mill could go into production at the early point the customer had requested. In the future, the multi-part backup roll will open up new possibilities for the production of heavy plates.

Shorter delivery periods, new materials, wider stands

Heavy-plate production: Multi-part backup roll at MMK meets all expectations

Long delivery periods for backup rolls avoided

In July 2009, Russian Prime Minister Vladimir Putin pressed the “red button” and, together with Alexander Titov of MMK and Dr. Heinrich Weiss, Chairman of the SMS group, gave the symbolic go-ahead for MMK’s 5.0-m heavy-plate mill. However, when MMK was ready to place the order in 2006, it was quite clear that it would be difficult to meet the customer’s desired start-up date: because at that time, the delivery period for extra-heavy one-part backup rolls was six to seven years!

Needless to say that SMS Siemag was keen to meet MMK’s desired deadline, i.e. summer 2009, and so we used our best efforts to develop a multi-part backup roll. The idea was to split the roll into two or more parts, each with a lower unit weight, so that a greater number of foundries and forging shops would be able to accomplish the job of roll manufacture.

Optimal design through FEM simulation

In a first step, our engineers teamed up with experts of the Technical University of Chemnitz to develop different versions of a multi-part backup roll, which were then compared using FEM simulations (Finite Elemente Method). The most favorable design version proved to be a roll consisting of a roll shell and two roll necks which are held together by means of a tie rod.
Joining through compressed oil process

When it came to the manufacture of the backup rolls for MMK’s heavy-plate stand, the central question was: how can the 5-m-long roll shell and the two roll necks be joined reliably and precisely? Thermal joining methods were no option because the heated parts do not shrink uniformly so that absolute roundness is not guaranteed. Therefore, we decided to employ the compressed oil process. In this process, oil is forced at high pressure between the mating surfaces until a separating oil film forms. Then the two roll necks are pulled into the shell by means of a tie rod. For our multi-part backup rolls, this process takes merely two hours and requires joining forces of up to 25,000 kN.

Trial runs on our test roll stand

To learn more in advance about the requirements of installation by means of the compressed oil process and about the operating behavior of our innovative backup roll, we fabricated test rolls in a scale of 1:10 and tested them in a testing roll stand for several months under specific loads conforming to those occurring in a 5.0-m stand. The findings obtained from these trials went into the design of the original rolls.
Only few roll foundries are capable of manufacturing single-part backup rolls for heavy-plate stands with a width of 5.0 m and over. This leads to delivery times of several years.

Key data of the backup rolls

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<th>Value</th>
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<tr>
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<td>Bearing distance</td>
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<tr>
<td>Roll necks</td>
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</tr>
</tbody>
</table>

Joining of the multi-part backup roll required forces of up to 25,000 kN.
Rolling forces up to 120 MN

Our supply package for MMK’s heavy-plate stand included a total of two multi-part backup rolls. To date, they have performed excellently in the tough routine of day-to-day operation. Since July 2009, MMK has supplied over 700,000 t of heavy plates. For several months now, MMK has produced exclusively plates of thermo-mechanically rolled, high-strength steels for tube or pipe manufacture. This involves high loads acting on the mechanical equipment, including the backup rolls.

Multi-part backup roll to tap further potentials

Owing to the lower weights of its individual segments, our new multi-part backup roll features a shorter delivery period than conventional backup rolls for heavy-plate stands 5.0 to 5.5 m wide. Plus, the manufacturing risk is diminished. Plus, it opens up new possibilities for the operation and capacity of heavy-plate mills. A multi-part backup roll which has been ground down to minimal diameter, for instance, can be made serviceable again by giving it a new shell. Plus, it is possible to use novel materials for the shell to thereby extend the service lives of the rolls.

Even wider stands are possible

Not least of all, our multi-part backup roll can be the key element for the construction of heavy-plate stands with a width in excess of 5.5 m. This is the limit today, partly because the roll foundries have reached the limits of their manufacturing capabilities. In contrast to this, multi-part backup rolls for stands wider than 5.5 m can be fabricated on existing manufacturing equipment at reasonable cost. In this way, our multi-part backup rolls open up new possibilities.
Hot Rolling Mills / Heavy-Plate Mills

First-time application at Ilsenburger Grobblech

Oil-air lubrication for flat-neck spindles cuts consumption and protects people and the environment

Can you imagine a system that protects health and the environment and, at the same time, cuts operating costs? Here it is: SMS Siemag’s innovative oil-air lubrication system for flat-neck spindles.

Ilsenburger Grobblech, a company of the Salzgitter Group. Ilsenburger Grobblech GmbH produces around 800,000 t of heavy plates per year. Its product spectrum includes general structural steels, heat-resistant and low-temperature steels for pressure vessels, shipbuilding steels, case-hardened and heat-treatable steels, stainless and acid-resistant steels, cryogenic steels as well as high-strength and wear-resistant steels.


A flat-neck spindle severely contaminated through oil-mist lubrication.

Oil-mist lubrication in old plants

Many of today’s heavy-plate mills employ oil-mist lubrication to lubricate the sliding plates of flat-neck spindles. For this purpose, the lube oil is atomized to aerosols near the parts to be lubricated. Experience shows, however, that oil mist cannot be prevented from spreading beyond its immediate place of use, so that this method leads to contamination of the surroundings and involves a high consumption of oil of 25 to 30 l/day. Another drawback lies in the health hazard: during breathing, aerosol particles – owing to their small size – can get into the lungs. Therefore, many countries no longer approve oil-mist lubrication systems for new plants.
The principle of oil-air lubrication.

Innovative solution by SMS: Oil-air lubrication

To solve the problems described above, we developed an oil-air lubrication system for flat-neck spindles. Here’s how it works: compressed air is used to transport oil in small droplets to the lube point. The oil film “creeps” in the form of streaks over the inner wall of a pipeline until it reaches the lube point. There are no health-endangering aerosols involved, and the oil employed gets to its intended point of use without any losses. The consumption of lubricant is hence significantly reduced. The oil-air mixture is fed by a separate system which can also be used for work-roll lubrication.

Successfully tested

We teamed up with Rebs Zentralschmiertechnik to develop the oil-air lubrication system for flat-neck spindles. The resultant design solution was successfully tested in a laboratory of Dresden Technical University.

Oil consumption down 50 % in practical operation

In March 2010, we began testing our innovation in practical operation. In the heavy-plate mill of Ilsenburger Grobblech GmbH, the upper drive spindle of the finishing stand was revamped from oil-mist lubrication to our new oil-air lubrication. And soon afterwards, the operating results confirmed the expected benefits of our oil-air lubrication system: less contamination, no aerosols, and 50 % lower oil consumption already in the testing phase.
For better plate flatness
Baosteel orders two pre-levelers and one cold-plate leveler

Keen to extend its two heavy-plate mills, Chinese steelmaker Baoshan Iron & Steel (Baosteel) contracted us to supply two pre-leveling machines and one cold-plate leveler, including automation and leveling models. Both plate production lines had been built and supplied by SMS Siemag. Now, the 4.2-m mill will receive a pre-leveling machine, and the 5.0-m mill a pre-leveler and a cold-plate leveler. Baosteel is making this investment to further improve the plate quality.

The heavy-plate lines. The two heavy-plate mills in Shanghai were started up in 2005 and 2008 respectively. Each mill comprises one roughing and one finishing stand, a combined spray and laminar cooling system, a hot-plate leveler, a shear line operating to the rolling-cut principle, and a cold-plate leveler. They produce high-quality heavy plates.

The pre-leveler for the 4.2-m mill. The 4.2-m heavy-plate mill will be equipped with a 7-roll pre-leveler which will be arranged in the entry area of the spray cooling section. Pre-leveling removes any unflatness and thereby contributes to uniform cooling over the length and width of the plates. This in turn has a positive impact on the plate flatness after cooling.

The machine is designed to level plates up to a maximum length of 52 m in thicknesses between 5 and 100 mm and widths of 1,200 to 4,200 mm. For this purpose, it comes with a leveling force of maximum 19,000 kN. The pre-leveler will be fitted with a hydraulic adjusting system and a supporting mechanism to compensate leveling-roll deflection.

The new pre-leveler will start operation in March 2012. Before that, it will be assembled next to the line, tested, started up, and then shifted into the rolling line. All this will require a shutdown of only nine days because the foundations have already been provided in the first construction stage.

The levelers for the 5.0-m mill. Coming with a leveling force of 22,000 kN, the pre-leveler for the 5.0-m heavy-plate mill will be a little stronger than that for the sister mill. It will be designed to level plates between 8 and 100 mm thick and up to 4,900 mm wide. Otherwise, it incorporates the same technological functions. After having been pre-assembled next to the rolling line, this leveler will also start up in January 2012.

The new cold-plate leveler will go on stream in March 2012. It will double Baosteel’s leveling capacity in the finishing line of the 5.0-m mill and extend the leveling range: the new machine can be employed to level thicker plates in the range from 7 to 60 mm with higher strengths. Plus, its leveling force of 50,000 kN is distinctly higher than that of the existing machine (35,000 kN).

In addition to the main hydraulic adjusting system, the new 9-/5-roll cold-plate leveler will be equipped with a separate adjusting system for each of its leveling rolls. Furthermore, all leveling rolls will be individually driven so that, in combination with our leveling models, the ideal curvature for each plate can be set. Another advantage of this design is that individual rolls can be taken out of the leveling process so that the machine can be operated with nine or five leveling rolls. This ensures a very large leveling range.
In September 2010, SMS Logistiksysteme received an order from Bhushan Steel Ltd., India, to extend the pallet conveyor system for hot-strip coils at the Angul location in the state of Orissa. The scope of supply covers the complete engineering, manufacture, erection supervision and commissioning of the transport equipment, including automation and material tracking system.

SMS Logistiksysteme had supplied the first coil transport system to Bhushan Steel in 2009 which was installed in the hot strip mill made by SMS Siemag. This transport system was subsequently connected to the storage bays through a pallet conveyor system. The goal of this current extension project is to connect a further bay to the existing system so that the equipment accommodated there, for example shear lines and levelers, can be optimally fed with hot-strip coils.

The coils will be transported through a tunnel underneath a road. Then a lifting table lifts them to the level of the store where they will be carried along the bay columns to the crane takeover positions.

**Modular and very flexible**

**Bhushan Steel extends pallet conveyor system**

*Pallet conveyor systems made by SMS Logistiksysteme are of modular design and feature great flexibility so that they are excellently suited for the extension of existing mills.*
Logistics Systems

Tailor-made system for 1,400 coils

Luoyang Wanji Aluminium, China: Order for 250-m-long high-bay storage system

SMS Logistiksysteme, headquartered in Netphen, received an order from the Chinese Luoyang Wanji Aluminium Processing Company for the supply of a fully automated high-bay storage system and a transport system with freely navigable A.C.T.® vehicles. The equipment is intended for a new aluminum works in the eastern Chinese province of Henan. The high-bay store will go into service in mid-2012.

Total storage capacity: 1,400 coils. The high-bay store will have three storage rows on six levels for a total of 1,400 coils. Two storage & retrieval devices navigate in the two aisles at a speed of up to 200 m/min. The great length of the store of 250 m is due to the arrangement and space requirements of the adjacent cold rolling mills and of the finishing area.

Two driverless A.C.T.® vehicles (Automatic Coil Transporter) convey and distribute the coils within the finishing area. They receive their travel orders from the warehouse management system which we will also supply.

“Record-breaking” high-bay stores. The new high-bay store for our Chinese customer is yet another of a whole series of record-breaking storage systems made by SMS Logistiksysteme: in the early 1990s, we supplied to the former company of Bregal the highest storage system which was able to accommodate up to 15 vertically stored coils conforming to a storage capacity of over 4,000 coils; the high-bay store we supplied to the Ping’An Group in 2007 is the one located at the highest altitude in the world, namely in the Tibetan highlands; and now, with the 250-m-long store for Luoyang Wanji, we can add the world’s longest high-bay store for coils to our reference list.
Responding to an order we received from Shandong Nanshan Aluminium Company in August 2010, SMS Logistiksysteme will expand the storage and transport capacity of our customer’s Longkou works in Shandong Province. The capacity has to be increased to account for the requirements of further rolling mill equipment which Nanshan Aluminium ordered at the beginning of 2010. Now the storage capacities of the flat store and of the high-bay store will be increased. SMS Logistiksysteme will supply not only the mechanical equipment but also the complete automation equipment and the logistics software.

Automatic crane, storage & retrieval devices, structural steelwork and cooling system. In addition to the auto-crane for the flat store and two S/R devices for the high-bay store, the scope of supply of SMS Logistiksysteme also includes all structural steelwork for the storage facilities, including roof and wall lining, as well as a cooling system.


Monitoring by means of logistics software. After a rolling run, the still-hot coils are cooled in a controlled manner by means of a ventilation system to minimize the dwell times between the individual rolling processes. Monitoring of the cooling process, coil management and material tracking are accomplished by the logistics software developed by SMS Logistiksysteme.

Strengthening our market leadership

Acquisition of know-how for heavy-load vehicles from Rocla Oy

SMS Logistiksysteme has acquired from Rocla Oy, Finland, its know-how in the field of automatically guided (driverless) transport systems in the heavy-load range of over 10 t. The SMS company will combine this know-how with its own A.C.T.® technology (Automatic Coil Transporter) for freely navigable transport vehicles. With this move, SMS Logistiksysteme strengthens its position as the market leader for automated heavy-load vehicles in the steel, aluminum and nonferrous metals industries.
In July 2010, we booked an order from Novelis do Brasil Ltda., based in Pindamonhangaba in the Brazilian state of São Paulo, covering the supply of a new two-stand cold mill for the production of strip from aluminum alloys.

Intended for the existing Pindamonhangaba complex near São Paulo, the new mill represents the core element of an investment package which Novelis do Brasil embarked on to boost its cold-rolling production by more than 330,000 t annually. Once up and running, the new rolling mill will produce can strip up to 2,000 mm wide and with a minimum final thickness of 0.15 mm for the beverage industry.

Our customer already uses and appreciates a number of SMS Siemag technologies previously supplied: in 1999, the winding of the first hot-strip coil marked the start-up of the aluminum hot strip mill in 1+4 arrangement (1 roughing stand plus 4 finishing stands) which had been relocated and extensively modernized by SMS Siemag.

The two-stand tandem cold rolling mill now ordered will be the first of its kind in South America and underlines the position of Novelis do Brasil’s Pindamonhangaba works as the technology leader in the production of aluminum strip for beverage cans. The rolling mill will incorporate state-of-the-art actuators: both four-high roll stands, for example, will be fitted with our high-efficiency work-roll bending systems and powerful roll cooling systems.

Also included in our supply package for this mill are a coil preparation station, a coil inspection line as well as a pallet conveyor system.

The roll stands and all key components of the mill will be manufactured, pre-assembled and tested in SMS Siemag’s Hilchenbach workshops. In this way we make sure that our customer will receive a top-quality mill for top-quality end products.
U.S. aluminum producer Alcoa and the Saudi Arabian Mining Company, also known as Ma’aden, have formed a joint venture to implement an ambitious greenfield project in Ras Az Zawr, Saudi Arabia. The project covers the construction of an aluminum plant which, in the first construction stage, will produce some 400,000 t of aluminum cold strip for cans. The joint venture operates under the name of Ma’aden-Alcoa. SMS Siemag is also on board for this project and will supply a hot rolling mill and a cold rolling facility.

Stage 1:
Smelter and rolling mills
Stage 2:
Bauxite mine

The vast site of the future works in Ras Az Zawr is situated 90 km north of Jubail on the Arabian Gulf coast. The first stage of the greenfield project will see the implementation of an aluminum smelter and an aluminum rolling mill for strip up to 2,100 mm wide. Both plants are scheduled to go on stream at the end of 2012. And only a year later, the second project stage comprising a bauxite mine with refinery in Az Zabirah is scheduled to be completed.

Initial focus on growth markets in the Middle East. The Ma’aden-Alcoa JV concentrates on the growth markets for aluminum flat products in the Middle East, but also aims to join the ranks of the world’s leading producers of aluminum finished products. The high-tech rolling mills made by SMS Siemag are perfectly geared to these goals. The integrated hot and cold rolling complex for aluminum flat products, the first of this type in Saudi Arabia, will be one of the world’s technologically most advanced production facilities for aluminum strip for the beverage can industry.

All-inclusive supply with E & A. Our package includes the supply of the complete mechanical, hydraulic, electrical and automation equipment for a hot rolling mill comprising a roughing stand and a four-stand finishing mill, as well as a four-stand tandem cold rolling mill. The key components of the plants which determine the quality will be manufactured in our own workshops in Germany.

A decisive criterion which tipped the scales in favor of SMS Siemag was our successful and long-standing cooperation with Alcoa. Some of Alcoa’s major production sites, such as Davenport or Knoxville, use hot and cold rolling mill equipment from SMS Siemag with great success.

In addition, our expertise in the closely linked sectors of R&D, mechanical equipment, E & A and service convinced the customer. Equally important for Ma’aden-Alcoa is the fact that the key components will be manufactured in our own shops according to our high quality standards. Added to this is the possibility of know-how transfer through intensive training, both classroom and hands-on, which we can offer our customer.
Ma’aden-Alcoa: Mega project in the Kingdom of Saudi Arabia

Hot rolling mill for 2,200-mm-wide strip

Its main equipment comprises a roughing stand, one heavy and one light crop shear, a four-stand finishing mill and a coiler.

Four-high roughing stand. The four-high reversing roughing stand comes with a rolling force of maximal 40 MN to roll the incoming aluminum ingots with a thickness of up to 635 mm and a maximum weight of 32.5 t. The number of reversing passes depends on the material and the ingot thickness. The rolls of the rougher will be driven by a main “Twin-Drive” with a drive rating of 2 x 4,500 kW. In this way, the mill attains a maximum rolling speed of 270 m/min.

Two crop shears. The rolling mill will be equipped with one heavy and one light crop shear, both hydraulically operated. If required, the heavy shear arranged downstream of the roughing stand removes the transfer-bar head and tail between the reversing passes. The light shear crops the transfer bar at its head or tail before it runs into the finishing mill.

Four-stand finishing mill. The finishing mill comprises four four-high mill stands which roll the around 30-mm-thick transfer bars in one pass down to final thicknesses between 7.0 and 2.0 mm. On its last stand, the mill attains a maximum rolling speed of 600 m/min. The mill features a maximum rolling force of 40 MN and a drive power of 5,000 kW per stand. Our high-tech actuators ensure closest strip thickness tolerances, an optimal strip profile and perfect strip surfaces.

Coiler and pallet conveyor system. In the exit section of the finishing mill, the aluminum hot strip, previously rolled down to final thickness, is trimmed and then placed on a coiler with belt wrapper for winding. Still at rolling temperature, the coils are then carried away by means of coil cars and a pallet conveyor system, both made by SMS Logistiksysteme.
Cold rolling mill for 400,000 t of aluminum strip for cans

The tandem cold rolling mill will have a total annual capacity of some 400,000 t of aluminum strip for can manufacture. One of the special features of the mill is that it will operate in discontinuous mode in the first project stage. However, the mill concept will be such that the mill can be converted into a fully continuous facility, including carousel reel, in a later expansion stage.

Coil preparation station and double-expanding-head reel.
A pallet conveyor system carries the hot-strip coils to the coil preparation station of the tandem cold rolling mill. After the strip head has been prepared, the coil is conveyed to the payoff reel and pushed onto the reel mandrel. The payoff reel is of double-expanding-head type and fitted with systems for strip centering control.

Four-stand rolling mill for up to 2,100-mm-wide strip. The strip running into the four-stand tandem mill has a width between 1,050 and 2,100 mm. The four-high stands of the mill incorporate CVC® plus systems and roll the strip to minimum final gages of 0.15 to 2.0 mm.

The tandem mill will also be equipped with our proven actuators such as hydraulic adjusting systems as well as positive and negative work-roll bending systems. In addition, it comes with our CVC® plus equipment, which is another important actuator enabling axial shifting of the work rolls. These high-tech adjusting systems or actuators ensure optimal strip flatness, closest strip thickness tolerances and flawless strip surfaces.

This equipment ensures the production of high-quality aluminum cold strip at a maximum rolling force of 20 MN and rolling speeds of up to 1,900 m/min in the last roll stand. The drive rating on stands 1 to 3 is 5,000 KW, the last stand is driven with a power of 7,000 KW.

Reeling on sleeves. In the exit area, a tension reel winds the finished strip on sleeves. Reeling completed, a coil car transfers the coils to the pallet conveyor system which carries them to the offline strip inspection station which will also be supplied by us and serves for strip surface inspection.
Ma’aden-Alcoa: Mega project in the Kingdom of Saudi Arabia

AluControl – Electrical and automation systems with powerful multi-core processors

Both the hot rolling mill and the tandem cold rolling mill will be equipped with all open-loop and closed-loop controls required for reliable control of the fully automatic rolling process.

Tailored to the process requirements.
The AluControl system we will provide is an automation system that is specially tailored to the requirements of the aluminum rolling process. AluControl is not a new system, but a system within SMS Siemag’s proven X-Pact® electrics and automation. It comprises open-loop and closed-loop process controls which are specially geared to aluminum rolling and are accommodated on powerful multi-core processor systems (X-Pact®-embedded). AluControl is designed to optimize system structures in a process-oriented way so as to make them more transparent. For both mills, AluControl covers level 0 to level 2.

From power supply to drive control. For power supply, SMS Siemag’s scope comprises high-performance transformers and low-voltage distribution systems. All of the stand drives will be supplied complete with transformers, converters and main motors. In addition, all roller table drives including motors, converter systems and drive control systems are included in our package.

Level-1 system with safety control. The X-Pact® level-1 system covers not only the technological control systems for thickness, profile and flatness, but also the controls for the shears and the media systems plus all operating and sequence controls.

The key instrumentation of the mills includes:
- X-ray instruments to measure the strip thickness and profile
- Temperature measuring devices
- Flatness measuring rolls
- Laser-speed measuring facilities
- Load cells for strip-tension measurement

To ensure safe and reliable mill operation, a safety concept will be developed based on a previous in-depth hazard analysis; the safety concept will be implemented with the aid of a separate safety control for the hot and cold rolling mills. The main focus of the concept is on protecting people plus ensuring easy operation and maintenance friendliness of the mills.

Model-based level-2 systems. Our level-2 systems are completely model-based and comprise the pass-schedule calculation function and the process models needed for an optimal strip profile or flatness. Communication with level 1 or the customer’s higher-level production planning system is implemented through the proven shell structure of the level-2 system.
Training center with complete offline automation system

Particularly worth mentioning is the training center which is also part of our E&A scope. The system we are supplying serves for on-site training, similar to the simulation systems that SMS Siemag uses for Plug & Work testing and on which the customer’s operating personnel can be trained after a comprehensive system test.

The training center will make it possible for Ma’aden-Alcoa to train its own personnel in plant handling and to intensify the training sessions. For this purpose, we will provide Ma’aden–Alcoa with a complete offline automation system with all the functions of the real plant.

Furthermore, the customer can train or familiarize its staff with the operating mode and operation of the mill by connecting the plant automation with the process simulator in the same way as in the integration test. On the monitors of the reproduced control pulpit, all relevant process variables are displayed in the original HMI system which enables quasi-realistic plant operation. The training center can be configured for simulation of both the hot strip mill and the cold rolling mill.

Erection and commissioning as early as the end of 2012

The modular design, which includes the hydraulic and media systems, ensures easy accessibility, great operating ease and maintenance-friendliness. Extensive pre-assembly and function tests in our Hilchenbach shops ensure smooth and reliable site erection with quick commissioning as a consequence. The hot and cold rolling mills will go on stream as early as the end of 2012.

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### Technical data

**Material**
- Aluminum and Al-alloys

**Hot rolling mill**

- **Roughing stand**
  - Ingot thickness: 500 to 635 mm
  - Ingot width: 1,050 to 2,100 mm
  - Ingot length: 5,000 to 9,000 mm
  - Ingot weight: max. 32,500 kg
  - Rolling force: max. 40 MN
  - Rolling speed: max. 4.5 m/s (270 m/min)

- **Finishing mill**
  - Rolling force: max. 40 MN per stand
  - Final strip thickness: 2.0 to 7.0 mm
  - Strip width
    - untrimmed: 1,050 to 2,200 mm
    - trimmed: 1,050 to 2,100 mm
  - Coil weight: max. 32,000 kg
  - Rolling speed: max. 600 m/min

**Tandem cold rolling mill**

- Strip width: 1,050 to 2,100 mm
- Strip thickness
  - ingoing: 2.0 to 6.0 mm
  - outgoing: 0.15 to 2.0 mm
- Coil weight: max. 32,000 kg
- Rolling force: 20 MN per stand
- Capacity: approx. 400,000 tpy
Recently we received an order from Zhongfu Industrial Co. Ltd. for the installation of a 1+4 hot rolling mill for aluminum strip comprising 1 roughing stand plus 4 finishing stands. The new production line comes with our CVC® plus equipment, and will be integrated in a new works complex located in Gogyi in western Zhengzhou in the Chinese province of Henan, which predominantly rolls aluminum hot strip for the production of cans. The hot rolling mill will be designed for an annual capacity of over 760,000 t.

New order

760,000 tpy of strip up to 2,400 mm wide

Henan Zhongfu orders 1+4 aluminum hot rolling mill

The key equipment of the rolling mill will include a reversing roughing stand in four-high design and a four-stand finishing mill, likewise with four-high stands. It will be designed to roll aluminum hot strip 2,400 mm wide and with a minimum final thickness of 1.8 mm.

The four roll stands of the finishing mill will be equipped with hydraulic adjusting systems, CVC® plus with integrated work-roll bending systems and multi-zone cooling systems. A strip cooling system provided on the entry side of the finishing mill controls the strip temperature for special products so as to safeguard a high production.

Our supply package is completed by a one heavy and one light crop shear, each with a scrap removal system, a trimming shear, a fume exhaust system, a coiler, a coil handling system and various utility systems. The mill will go on stream at the beginning of 2013 to produce high-quality aluminum hot strip made from a wide spectrum of grades and alloys for the manufacture of beverage cans.
Follow-up order for aluminum cold rolling mill
Northeast Light Alloy orders six-high CVC® cold rolling mill

In August 2010, an order came in from Northeast Light Alloy Company (NELA), China, covering the supply of an aluminum cold rolling mill in six-high design with CVC® plus equipment. It will be one of the key production facilities of NELA's new complex in Harbin in the Chinese province of Hailongjiang.

The contract for this follow-up order was wrapped up on August 12, 2010. In 2006, we had already received an order from Northeast Light Alloy for the supply of an aluminum-plate hot rolling mill. The new mill will make it possible for NELA to move into the state-of-the-art production of aluminum flat products. Besides various other finished products, the CVC® plus six-high rolling mill will also roll starting stock for foil production.

The rolling mill will be designed for an annual capacity of 85,000 t of cold strip with a maximum width of 1,900 mm. The ingoing strips with a maximum thickness of 8 mm will be rolled down into finished strip with a minimum final thickness of 100 μm. The maximum coil weight will be 21 t.

The six-high roll stand will incorporate CVC® plus for shifting the intermediate rolls. Our HES system (Hot Edge Spray) serves to influence the strip flatness in the strip edge area in a controlled way. The DS system (Dry Strip) provided on the exit side ensures clean strip surfaces with minimal oil residues. In addition to the rolling mill itself, we will also supply a coil preparation station, the coil handling equipment and the complete media system.
PrimeLub C 80 and PrimeLub C 40

Cold-rolling oil for copper mills

In September 2010, SMS Lubrication received two orders for the supply of rolling oil for copper rolling mills: Shanghai Copper in China ordered rolling oil for the initial filling of its six-high cold rolling mill, and Mansfelder Kupfer und Messing GmbH (MKM), based in Hettstedt, Germany, will receive rolling oil for the refilling of its two-stand tandem cold rolling mill. With these two orders, SMS Lubrication has established itself as a supplier to the copper rolling industry.

PrimeLub C 80 for Shanghai Copper

When Shanghai Copper’s six-high reversing cold rolling mill made by SMS Siemag will start production in December 2010, the first coil will be rolled using our PrimeLub C 80 rolling oil. We will supply this oil at the express request of Shanghai Copper that all technologically relevant components of the new rolling mill be provided by SMS Siemag. This includes the mechanical, electrical and automation equipment, the rolling-oil filtering system and, last but not least, the rolling oil. In this way, Shanghai Copper has a single contact partner for any and all questions relating to rolling technology.

PrimeLub C 40 for MKM

On stream since 2000, the two-stand tandem cold rolling mill of Mansfelder Kupfer und Messing GmbH (MKM) will be refilled with our PrimeLub C 40 rolling oil. Already during the start-up of this mill, SMS Siemag had done extensive development work to optimize the rolling process through suitable modification of the additivation of the then used rolling oil. Our lower-viscosity PrimeLub C 40 rolling oil will reduce the viscosity of the oil so far used in MKM’s rolling mill which has risen over time. In the cold rolling of copper, exact compliance with the specified viscosity of the rolling oil is vital for the quality and surface of the rolled products.

MKM’s decision in favor of rolling oil made by SMS Lubrication is not least down to our comprehensive technological partnership.
At the beginning of August 2010, site erection got underway of the new pickling line/tandem cold rolling mill of Russia’s Magnitogorsk Metallurgical Combine (MMK) in the southern Urals. Its technical equipment and annual capacity of 2.1 million t make this plant one of the most productive PL-TCMs worldwide.

Installation of PL-TCM in full swing

**MMK: Soon over 2 million t of pickled cold strip from Magnitogorsk**

From mid-2011, the mill will pickle and roll cold strip in widths of 880 to 1,880 mm. The starting stock will be hot strip between 1.2 and 6.0 mm thick that will enter the pickling section at a speed of up to 700 m/min. The processing speed in the pickling line will be 280 m/min. After pickling, the strip will run into the five-stand tandem cold rolling mill at a speed of maximal 330 m/min. The tandem mill will be equipped with four-high roll stands incorporating our CVC® plus systems. They will attain a maximum rolling speed of 1,500 m/min and reduce the strip to minimum final gages of 0.28 to 3.0 mm. The strip material will range from low-alloy carbon steels to high-strength steel grades.
Erection start at Magnitogorsk

SMS Siemag’s supply package for the new cold strip complex of MMK also includes a continuous hot-dip galvanizing line, a combined hot-dip galvanizing and continuous annealing line, a recoiling and inspection station and two packing lines.

140 m: The world’s longest turbulence pickling line

A laser-type welding machine will join the strips to an endless strip. Horizontal strip accumulators upstream and downstream of the pickling section will uncouple the pickling process from the discontinuous operating sequences in the entry and exit sections so that pickling can be done at constant speeds. Prior to pickling, a scale breaker will break up the scale surface to improve the strip flatness. Four pickling tanks, each 35 m long, will make the turbulence pickling line the longest facility of this type in the world. It will pickle both easy-to-pickle and hard-to-pickle hot strip without any over-pickling, meeting highest quality standards. This will be ensured by a special process model for active control of the key parameters of the pickling process such as temperature, turbulence and acid concentration.
Three HCl regeneration plants with a total capacity of 16,500 l/h

For recovery of the huge amounts of spent pickling acid, three regeneration plants will be provided, each with a capacity of 5,500 l/h and operating to the fluidized-bed principle. The iron oxide obtained in this process will be re-smelted, while the regenerated pickling acid will be fed back into the process.
The powerful stand drives (45 MW for roll stands and reels) of the five-stand tandem mill make this PL-TCM the strongest in the world. The four-high mill stands come with CVC® plus systems and a rolling force of 35 MN per stand. Thanks to its numerous high-tech components, the tandem mill stands for maximum flexibility, productivity and quality.

The equipment of the tandem mill includes:

- Four-high roll stands with CVC® plus as well as positive and negative work-roll bending systems to set the roll configuration in keeping with the required roll-gap geometry
- Multi-zone cooling system on the last stand for optimal strip flatness
- Dry-Strip system for flawless surfaces with minimal emulsion residues

Two tension reels arranged in the exit area of the tandem mill will serve for continuous strip winding. Prompt, reliable and easy quality checks will be ensured by our patented Rotary Inspect inline inspection system which offers a number of advantages over conventional inspection facilities: Strip samples can be taken during rolling at a speed of 100 m/min; after clamping, the sample need not be moved by hand; the inspection platform is of ergonomic design, permitting easy and reliable inspection of both strip sides.
Electrics and automation

The entire cold strip complex will be equipped with E&A made by SMS Siemag. Our scope includes the power supply and distribution systems, drives, X-Pact® level-1 and level-2 systems plus our flatness measuring rolls. As early as during manufacture and installation of the mechanical equipment, the automation systems were set up in our test fields for testing according to our Plug&Work concept. Thanks to the quasi-realistic simulation of the production processes, all functions of the automation could be tested and pre-optimized.

At the same time, MMK's operating personnel was trained on the original control desks using the original software. And our customer was also involved when it came to the arrangement of the hardware, the location of the control desks, and their start-up. The uniform operating concept as well as the interface and function tests using the customer's production planning system created the basis for quick ramp-up of the plant.

Technical data of the PL-TCM

<table>
<thead>
<tr>
<th>Material</th>
<th>low-alloy C-steels and high-strength steels</th>
</tr>
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<tbody>
<tr>
<td>Strip width</td>
<td>900 to 1,880 mm</td>
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<td>Pickling speed</td>
<td>max. 280 m/min</td>
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<td>Regeneration plant</td>
<td>fluidized-bed principle</td>
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<tr>
<td>Capacity</td>
<td>3 x 5,500 l/h</td>
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<td>Rolling speed</td>
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<td>Strip thickness – entry</td>
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<td>– exit</td>
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<td>Rolling force</td>
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<td>Coil weight</td>
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<td>Capacity</td>
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The close meshing of mechanical, electrical and automation equipment – thanks to supply of the complete scope by SMS Siemag – ensures maximum cost-effectiveness of all plants. Furthermore, the modular design of our equipment along with substantial pre-assembly of key components and extensive function testing create optimal conditions for smooth erection and quick start-up. Commissioning will get underway in mid-2011.
A new cold strip complex is currently under construction in Handan, China, which will be operated by the Hansteel Group Hanbao Iron & Steel (HBIS). At the end of July 2010, the coupled pickling line/tandem cold rolling mill (PL-TCM) made by SMS Siemag successfully pickled, rolled and coiled the first strip. This success was celebrated with a festive ceremony.

Installation of the equipment at our customer’s site went quickly and without a hitch thanks to the modular design of our equipment and pre-assembly including extensive function testing of the key components in our Hilchenbach shops. And last but not least, the excellent cooperation with the customer throughout all phases of the project contributed to smooth transaction as well as quick and successful commissioning.

As many as 300 coils in merely three weeks

In the first three weeks after the first coil, some 300 hot-strip coils were processed into cold strip. The hot strip used covered the full thickness range between 1.8 and 6.0 mm. Part of the annual production of 2.15 million t of cold strip goes to the automotive industry. The mill stands out for its high production capacity, the large widths of the strip produced, and the very wide material spectrum.
Speedy project handling

- January 2008: Order placement
- September 2009: Start of erection at the HBIS works complex
- March 2010: Start of commissioning of the tandem mill
- End of July 2010: Start of production of the PL-TCM

Pickling line with 105-m-long turbulence pickling channel

The entry section of the line accommodates two payoff reels and one laser welding machine. The downstream tension leveler serves to break up the scale on the strip surface and to improve the strip flatness. Next is a horizontal strip accumulator which is filled at a rate of up to 700 m/min during coil unwinding. In this way it is ensured that continuous operation in the entry area of the processing section can take place at constant speed. In a 3 x 35-m-long turbulence pickling channel, hydrochloric acid is applied to the strip surface whereby all residual scale is removed. Following this, the acid is rinsed off, and then the strip is dried by means of hot air. A further strip accumulator is provided for interim storage. The downstream equipment includes the trimming shear to set the exact strip width and an inspection stand for quality checks. Continuous strip feed to the downline tandem mill is ensured by a further horizontal strip accumulator.

Technical data

<table>
<thead>
<tr>
<th>Material</th>
<th>low-alloy C steels and high-strength steels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strip width</td>
<td>900 to 2,080 mm</td>
</tr>
<tr>
<td>Strip thickness</td>
<td></td>
</tr>
<tr>
<td>– entry</td>
<td>1.8 to 6.0 mm</td>
</tr>
<tr>
<td>– exit</td>
<td>0.3 to 2.5 mm</td>
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<tr>
<td>Strip speed</td>
<td></td>
</tr>
<tr>
<td>– entry</td>
<td>700 m/min</td>
</tr>
<tr>
<td>– process</td>
<td>270 m/min</td>
</tr>
<tr>
<td>– exit (pickling line)</td>
<td>320 m/min</td>
</tr>
<tr>
<td>– exit (tandem mill)</td>
<td>1,400 m/min</td>
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<tr>
<td>Rolling force</td>
<td>max. 33 MN</td>
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<tr>
<td>Drive rating</td>
<td>38 MW</td>
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<tr>
<td>Capacity</td>
<td>2.15 million tpy</td>
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</tbody>
</table>
Pickling line/tandem mill at Hanbao Iron & Steel
Five-stand six-high tandem mill with CVC® plus equipment

The five-stand rolling mill produces cold strip 0.3 to 2.5 mm thick and 900 to 2,080 mm wide. It is able to handle a very wide material spectrum ranging from low-alloy carbon steels to high-strength grades. The strips produced go among others to the automotive industry so that they have to meet very high quality standards.

To ensure these high standards, the tandem mill is equipped with a whole range of high-tech adjusting elements or actuators which make the cold rolling mill of HBIS one of the world’s most powerful in terms of annual production and product quality. The six-high roll stands incorporate our CVC® plus equipment as well as positive and negative work-roll and intermediate-roll bending systems to set the roll configuration in keeping with the required roll-gap geometry. In addition to these actuators, the multi-zone cooling system in the last stand contributes to optimizing the flatness of the outgoing strip. The Dry-Strip system on the exit side of stand No. 5 ensures a clean and dry strip surface, free from nearly all emulsion residues. Then a drum-type shear divides the endless strip. The carrousel reel arranged in the exit section ensures continuous winding of the finished strip, with or without sleeves just as required.

Numerous ancillary facilities

SMS Siemag’s supply package also includes coil handling systems, the strapping machine, fume exhaust systems, media systems plus a modern offline strip inspection station. Our modular media systems stand out for low investment costs, quick and smooth start-up, easy maintenance and excellent accessibility.
On June 30, 2010, the Chinese Wuhan Iron & Steel Corporation (Wisco) issued us the Final Acceptance Certificate for the reversing cold rolling mill in CVC® plus 6-HS design made by SMS Siemag. The mill has proved a top performer, rolling strip of sophisticated silicon steel grades during the performance tests.

The mill rolled different silicon steel strips, attaining top results in terms of strip thickness, flatness and surface cleanness. The values achieved in part distinctly surpassed the exacting guarantee values.
Wisco proves top performance

The powerful CVC® plus 6-HS reversing mill is designed to produce strip in widths of 750 to 1,280 mm and final thicknesses between 0.85 and 0.2 mm. Wisco uses the new mill predominantly for the rolling of silicon strip in different grades with Si contents of up to 3.5%.

The rolling mill incorporates an array of high-tech components. These include the six-high mill stand with CVC® plus equipment, a positive and negative work-roll and intermediate-roll bending system, a strip cooling system as well as a system for selective cooling of the work rolls to set the roll configuration in keeping with the required roll-gap geometry. The HS system (Horizontal Stabilization) permits to set the horizontal forces acting on the rolls and enables the use of very slim work rolls. The job of our Edge Drop Control® system is to minimize the natural edge drop in the area of the strip edges which reduces material losses during subsequent trimming.

SMS Siemag’s supply package also included the complete X-Pact® electrical and automation systems for the reversing mill, in particular:

- Main drives in MV design with AFE infeed technology (Active Front End)
- Speed-controlled auxiliary drives
- Complete level-1 automation including HMI equipment (Human Machine Interface)
- Technological thickness and flatness controls
- Measuring systems and sensors
- Local Ethernet network
- Level-2 setup system

In particular the innovative design solutions of the technological controls and of level 2 make it possible for our customer to produce top-quality strip. With this new mill, Wisco will be able to attain an annual production of over 300,000 t of silicon cold strip featuring closest tolerances. It was not least thanks to our expertise as a system supplier that Wisco decided in favor of equipment and technology made by SMS Siemag.

### Technical data

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material</td>
<td>Si steel</td>
</tr>
<tr>
<td>Strip width</td>
<td>750 to 1,280 mm</td>
</tr>
<tr>
<td>Strip thickness</td>
<td></td>
</tr>
<tr>
<td>- ingoing</td>
<td>1.3 to 3.0 mm</td>
</tr>
<tr>
<td>- outgoing</td>
<td>0.85 to 0.2 mm</td>
</tr>
<tr>
<td>Coil weight</td>
<td>max. 26.2 t (incl. sleeves)</td>
</tr>
<tr>
<td>Rolling speed</td>
<td>900 m/min</td>
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<tr>
<td>Capacity</td>
<td>306,000 tpy</td>
</tr>
</tbody>
</table>

Happy faces at the presentation of the FAC. Markus Gümpel, SMS Siemag Project Manager, and Cao Yang, Director of Wisco’s Silicon Steel Plant, shaking hands.
For production sites in South Africa and Pakistan

Esmech starts up galvanizing lines for two customers

In Q3 2010, Esmech successfully commissioned two continuous galvanizing lines for aluminum-zinc coating. One line is now operating at Safal Steel Pty Limited in Kwazulu Natal, South Africa, the second one at International Industries Limited in Karachi, Pakistan.

The galvanizing line of Safal Steel, South Africa

This line is designed to coat strip up to 1,250 mm wide and 0.18 to 1.2 mm thick with aluminum-zinc. Attaining a maximum process speed of 160 m/min, the line achieves a capacity of 30 t/h. Thanks to its compact design, the line makes optimal use of the available space. Its most important features are:

- compact “C” layout, productively utilizing the entire area under the furnace
- electrolytic spray cleaning section with vacuum-roll system instead of hot air dryers to ensure perfect cleanliness of the strip before it enters the furnace
- ceramic-lined zinc pot with induction heating system with separate pre-melt pot for pre-melting the aluminum-zinc
- four-high wet skin-passing mill with special provisions for on-line removal of work rolls without line stoppage
- tension leveler for perfect leveling of the strip
- motorized actuation of the air knives
- strip edge masks to control strip-edge coating
- automatic coil loading, weld tracking and sequencing of group functions, such as belt wrapper actuation etc.

The features of this line are comparable to those of Safal Steel’s facility. An important difference, however, is that this line currently uses one ceramic-lined zinc pot with induction heating system, but has the provision built in to add a two-pot system with shifting and lifting devices. In this way, the line will be able to produce both galvanized strip and aluminum-zinc-coated strip in the future.

The galvanizing line of International Industries, Pakistan

The line attains a process speed of 160 m/min and in its present design serves to galvanize strip using pure zinc. The strip processed has widths of up to 1.250 mm and thicknesses between 0.18 and 1.2 mm. Provisions have already been made to enable coating with aluminum-zinc in the future (after addition of certain equipment).
As early as the end of March 2010, field installation of the continuous turbulence pickling line got underway at Tokyo Steel in Japan. All key components of the line including the laser welding machine as well as all ancillary facilities plus an acid regeneration plant (ARP) were supplied by SMS Siemag. Installation of the mechanical equipment was halfway completed by October 2010, and from April 2011, the line will descale hot-rolled low-carbon steel strip. In continuous operation, the pickling line will attain an annual production of 1.8 million t. It is designed so that it can be coupled to a tandem mill which may be installed in a further expansion stage. For this purpose, space is already being provided for another strip accumulator, and the foundations need not be modified.

Japanese steelmaker Tokyo Steel is building a new complex in Tahara in the Aichi Prefecture on the Atsumi Peninsula. The works is intended to turn out predominantly flat rolled products. The region’s booming industry also includes a number of carmakers. Tokyo Steel’s new complex is situated on an artificial peninsula and covers an area of more than 1 million m². Some of the equipment items, for example the laser welding machine, were delivered to the site via the works’ own port.

Key equipment of the line. The key mechanical equipment comprises: two entry-end payoff reels, laser welding machine, horizontal entry-end accumulator, hydraulic scale breaker, turbulence pickling section with downstream five-stage cascade rinse, horizontal exit-end accumulator, side-trimming shear, DUMA oiling machine, flying crank shear and two tension reels.

Acid regeneration plant using the spray-roasting process. Operating to the spray-roasting method, Tokyo Steel’s new ARP will regenerate 10,000 l/h of spent pickling acid and feed it back to the
Technical Data

<table>
<thead>
<tr>
<th>Material</th>
<th>Low-carbon steel strip</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strip width</td>
<td>780 to 1,630 mm</td>
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<tr>
<td>Strip thickness</td>
<td>1.5 to 6.0 mm</td>
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<tr>
<td>Capacity</td>
<td>1,800,000 tpy</td>
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<tr>
<td>Speeds</td>
<td></td>
</tr>
<tr>
<td>– entry section</td>
<td>700 m/min</td>
</tr>
<tr>
<td>– process section</td>
<td>280 m/min</td>
</tr>
<tr>
<td>– exit section</td>
<td>450 m/min</td>
</tr>
</tbody>
</table>

Two payoff reels alternately unwind the strips which then run into the line.

Lining of the pickling tanks.

process. A byproduct of regeneration is red iron oxide powder which can be sold to manufacturers of, for example, paints, ceramics, catalytic converters or concrete. In this way, the regeneration plant contributes to making the pickling process more economical and eco-friendly.
Advanced solutions for complex production routes

Processing lines for grain-oriented electrical strip

The demand for silicon steel strip – also called electrical strip – is steadily growing. Featuring favorable electro-magnetic properties, this material is ideally suited for use in electrical engineering because it improves energy efficiency significantly. However, grain-oriented electrical strip is a very demanding material to produce, requiring sophisticated processing concepts. Thanks to SMS Siemag’s wealth of experience in this field, we can offer our customers technologically advanced solutions ensuring top-quality products. Support comes from Duferco who has, for many years, contributed its know-how and latest technologies for the production of all kinds of electrical strip grades.

Strip processing lines

Recrystallizing, pickling, cold rolling, decarburizing, setting the texture and applying an insulation coat are the key process steps depending on the production route. Each process must meet high quality standards to set the required microstructure and magnetic properties of the end material. In the recent past, SMS has built numerous strip processing lines for the production of grain-oriented electrical strip whose mechanical equipment was perfectly geared to the special requirements of electrical-strip production.

Energy efficiency in electrical engineering

A high degree of purity, a limited amount of alloying elements and special production steps are vitally important for achieving the desired properties of electrical strip. The addition of silicon increases the electrical resistance so that the induced eddy currents and thus also the core losses reduce. When used in electrical systems, electrical strip helps save energy resources.

Grain-oriented and non-grain-oriented electrical strip

Differentiation is made between non-grain-oriented (NO) and grain-oriented (GO) electrical strip. In NO electrical strip, the grain distribution is irregular so that the material features substantially isotropic mechanical and magnetic properties. It is therefore predominantly used in rotating machines such as electric motors and generators with changing field orientation. In GO electrical strip, the crystals are oriented in cold-rolling direction so that the so-
The uniform orientation of the grains gives the electrical strip a preferred direction of relatively easy magnetization. Owing to the high permeability and the lower losses in the direction of magnetization, grain-oriented electrical strip is used in static machines, for instance transformers. To actually achieve these properties, the grain growth has to be precisely set and controlled.

**Growing demand for grain-oriented electrical strip**

The demand for GO electrical strip is constantly increasing because the need to save energy has become more important than ever. As a result, energy supply systems are expanded and their efficiency is increased. In addition, electric power demand in emerging economies is on the rise.
Strip processing lines for grain-oriented electrical strip

Concepts for all types of lines

Depending on the production route and the desired end material, different types of strip processing lines are used for the production of grain-oriented electrical strip. SMS Siemag’s portfolio includes all types of lines, from preparation lines to lines for the re-crystallization, decarburization and nitriding of the material to special surface-treatment lines. The line concepts most often employed for grain-oriented electrical strip are:

- Annealing and pickling lines with a capacity of up to 500,000 tpy depending on the product spectrum
- Decarburizing and coating lines with a capacity of up to 120,000 tpy
- Final annealing and coating lines with a capacity of up to 120,000 tpy

Tailor-made line components

As the global leader in strip processing lines, SMS Siemag supplies the complete spectrum of tailor-made line components for the treatment and processing of grain-oriented electrical strip. Our vast knowledge of the requirements of electrical-strip processing goes into the design of our equipment which represents the state of the art. All line components are designed to complement each other and to maximize the capacity and performance of the lines.

Special equipment

An example of special equipment is the adaptation of the turbulence pickling system to the particular challenges posed by silicon oxide sludge. A special configuration of the basin and suitable facilities in the circulation system ensure substantially automatic desludging. Our roll coaters for electrical strip are equipped with high-precision and fully automated adjusting systems for the coater rolls. Top coating quality is additionally ensured through precise temperature control of the coating medium in the circulation system. The high-strength electrical strips are precisely joined by means of a specially designed stitcher during a short standstill. Strip damage is prevented...
through a strip-edge heating system. Special-diameter deflector rolls keep mechanical loads away from the strip. The horizontal accumulators come with strip or loop trolleys to permanently support the strip and prevent surface defects.

Wisco’s intermediate annealing line for 180,000 t of grain-oriented electrical strip

On stream since November 2006, the intermediate annealing line of Wuhan Iron & Steel Corporation (Wisco) processes 180,000 t of pickled and cold-rolled GO electrical strip per year. In this line, the strip is cleaned by means of alkaline media and then decarburized in a heat-treatment facility. A special feature of the line is the horizontal furnace with two strip levels, one above the other, which permits two strips to be simultaneously treated. To account for this furnace design, all equipment in the line’s entry and exit areas and in the cleaning section is provided in duplicate.

Four lines for grain-oriented electrical strip in continuous operation at Baosteel

In December 2009, following successful acceptance tests, four strip processing lines for GO electrical strip were put into continuous operation at Baoshan Iron & Steel Group (Baosteel), China. The lines made by SMS Siemag comprise:
- one annealing and pickling line with an annual capacity of 360,000 t which also processes NO electrical strip
- one decarburizing line for just under 90,000 tpy
- a combined intermediate annealing and decarburizing line for 90,000 tpy
- one final annealing line, including an insulation-coating facility, with an annual capacity of 106,000 t

All components of the lines were tailored to the special requirements of electrical-strip production. As a result, they ensure high-quality end products plus eco-friendliness plus cost-effectiveness. All four lines meet the strict European standards on air pollution. Equally important, waste water and residual substances are either properly disposed or fed back into the process. And special built-in filter systems guarantee smooth and eco-friendly line operation.

Further references

SMS Siemag is currently building seven lines for the treatment or processing of grain-oriented electrical strip for a customer in Asia. Eight lines were recently completed, one of them at ThyssenKrupp Electrical Steel. Also on our list of references are several lines for the treatment or processing of non-grain-oriented electrical strip: in 2002, U.S. Steel Košice in Slovakia and, in 2005, Taiwanese steelmaker China Steel Corporation each ordered an annealing and coating line for non-grain-oriented strip.
In August 2010, SMS Siemag started erection of a new continuous color coating line at JSC Severstal’s operations in Cherepovets in the Wologda District in the northwest of Russia. Besides the roll coaters for paint application, our scope of supply also included powerful drying ovens and the required electrical equipment. The new line will go on stream in July 2011.

The new color coating line is identical in design to a facility which Severstal had ordered from us in 2003 and which went into operation at the end of 2005. Our customer will use the new CCL to process a further 200,000 tpy of hot-dip and electrolytically galvanized cold strip at high speed into color-coated strip for use in the construction and household appliances industries.

Four roll coaters with precision control system. The new line will incorporate a total of four roll coaters: one chem-coater, one prime-coater and two finish-coaters, each equipped with a high-precision control system to ensure exact dosing and uniform application of the liquid media. In addition, the line comes with extra-low-emission flotation ovens for curing or hardening the paint coat. The entry- and exit-end strip accumulators are designed according to the patented column principle and ensure smooth and stable strip travel. In the exit area, the strips can be additionally provided with a protective foil.

The process. The strips are unwound alternately by two payoff reels. As they run into the line, a stitcher joins them to an endless strip which is directed into a vertical strip accumulator. Next, the strip surface is degreased through spray-cleaning and brushing, followed by chromating in the chem-
On September 30, 2010, at 14:30 local time, the first strip was successfully annealed in the new continuous annealing line of our Chinese customer Handan Iron & Steel Group. The steel strip was 1.2 mm thick and 1,250 mm wide. The line then processed further strip. A detailed report on the start-up of this CAL will be included in the next issue of our Newsletter.

Technical Data

<table>
<thead>
<tr>
<th>Material</th>
<th>Hot-dip and electrolytically galvanized cold strip</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strip width</td>
<td>600 to 1,650 mm</td>
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<tr>
<td>Strip thickness</td>
<td>0.3 to 1.0 mm</td>
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<tr>
<td>Capacity</td>
<td>200,000 tpy</td>
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<tr>
<td>Speeds</td>
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<tr>
<td>– entry section</td>
<td>200 m/min</td>
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<tr>
<td>– process section</td>
<td>150 m/min</td>
</tr>
<tr>
<td>– exit section</td>
<td>200 m/min</td>
</tr>
</tbody>
</table>

The first coil produced on the new annealing line.
ThyssenKrupp Electrical Steel, Gelsenkirchen, Germany

Successful upgrading of TCS systems on CVC® mill for Si steels

A four-high CVC® cold rolling mill for grain-oriented silicon strips has been equipped with new automation equipment from SMS Siemag at ThyssenKrupp Electrical Steel in Gelsenkirchen, Germany. In August 2010, the specialist of electrical steel has started production with the new automation system from SMS Siemag for the first time after the company had opted for an upgrade of the TCS systems (Technological Control System) at the beginning of 2010.

For this modernization project, the short delivery time for the new TCS equipment of less than four months was particularly demanding. But just three months after the beginning of the project we successfully integrated the new control systems for changeover from the old to the new automation system in the plant.

After commissioning, we have optimized the technological controls in changeover operation as from mid-August 2010. On September 15, 2010, and thus two weeks prior to the scheduled date a trial operation with availability test began in the plant. In terms of the newly supplied equipment, the availability was 100 %. Before the trial operation started we had proven the product tolerances with the new system which had been achieved by the old system. After the acceptance (FAC) has been received the software will be optimized in another modernization step.

The cold rolling mill in CVC® 4-HS design (Horizontal Stabilization) for the reduction of strips from grain-oriented silicon steels has already been operating with our X-Pact® electrics and automation system for some time now.
In mid-June, Turkish steelmaker Ço- 
lakoğlu Metalurji A.S started up a com-
pact hot strip mill incorporating a coil-
box equipped with an innovative X-
Pact® automation system made by SMS 
Siemag.

Our innovative coilbox automation system 
is the pilot application of an advanced au-
tomation structure which is characterized 
by a simplified configuration of the func-
tional levels. As a result, the complexity of 
the solution could be markedly reduced 
while its standardization potential was in-
creased. In this way, our key goal was 
achieved: it will be possible in the future to 
utilize the software application on several 
systems in the form of a so-called “embed-
ded structure” – linked via real-time bus 
systems.

The coilbox features a high level of modu-
larization according to mechatronic char-
acteristics. This ensures great flexibility in 
modifying the equipment to account for 
future extensions or modernizations.

In the event of a fault or disturbance, our 
X-Pact® embedded structure enables 
short-time interruption and flexible con-
tinuation of the process after possibly re-
quired manual interventions by the oper-
ating crew. In combination with the use of 
a re-designed interactive HMI, we man-
aged to reduce the number of transfer bars 
that cannot be further processed due to 
process disturbances.

Even though this is a pilot application, we 
succeeded in achieving a very short com-
misioning time and a steep ramp-up 
curve thanks to advance-testing of the au-
tomation equipment by our proven Plug & 
Work concept.

Reduced transfer-bar losses 

Coilbox with innovative X-Pact® 
automation with embedded structure
The need to detect and prevent breakouts early is as old as the continuous casting technology itself. For this purpose, temperature measurement by means of thermocouples on the copper plates of the mold has proven to be the most reliable procedure. In this case, not only the actual temperature sensor is decisive for a successful temperature measurement but a proper assembly of the sensor with regard to the rough operating conditions during continuous casting also plays an important role. Therefore, SMS Siemag has developed thermocouples which provide a safe contact with the copper plate and allow the mechanical equipment to be easily replaced.

The mold monitoring system which has been constantly further developed for more than a decade includes three key functions: breakout detection, longitudinal surface crack detection as well as display of the mold temperature. For all functions, a robust functionality of the devices – particularly on the mold itself – and proper installation are required. In addition to this, a mobile diagnostic instrument for easy and quick diagnosis of the entire touch sensor system is needed without the mold and the casting machine having to be dismantled.

Equipment on the molds

With an increasing need for top-quality steel products the number of temperature sensors in the mold has also increased significantly. While two rows of thermocouples were normally used at the outset of the development process, today these are up to five rows. Therefore, it is not uncommon that individual molds are equipped with 100 or more thermocouples. The high number of temperature sensors requires an optimized cabling and coupling which implies the application of the field bus technology on the mold.

Spring-loaded thermocouples – easily exchangeable

The patented thermocouples of SMS Siemag consist of a spring and a bayonet lock ensuring safe contact with the copper plate and easy replacement of the mechanical equipment. Furthermore, each thermocouple provides a separate sealed connector with which individual thermocouples can be easily exchanged. The elements are also suitable for CSP® casters. Since the CSP® molds are funnel-shaped and may optionally provide an electromagnetic brake a clamping bush is used for length adaptation, whereby different thermocouple lengths are equalized. Thanks to this technology, it is extremely easy to maintain a thermocouple.

Prefabricated cable set – time-saving maintenance

For a time-saving maintenance, SMS Siemag offers a ready-to-install prefabricated cable set. When the cabling has to be exchanged on the mold the thermocouple can remain in the mold and the use of such a cable set ensures quick and trouble-free assembly.

Field bus technology on the mold – minimal cabling for broad data transmission

Thanks to the newly developed data transmission system from SMS Siemag, considerable progress was made in view of the reduced cabling and maintenance costs. By the use of the compact field bus assemblies for decentralized pre-processing of the data a digital data recording is accomplished already on the mold.

Permanently installed equipment in the plant

Previously applied main cables (with a large number of cores) as well as multipole connectors were replaced by a so-called hybrid connection combining data transmission and energy supply in one cable. Two hybrid connector sets for harsh environmental conditions replace the multipole connectors susceptible to malfunctions.
After the completion of a sequence a mold change may be re-quired. Before a mold change, the hybrid coupling must be dis-connected. Park adapters are provided to make sure that a con-tamination of the hybrid contacts is prevented.

A firmly installed terminal box underneath the casting platform includes an energy supply component which supplies the field bus assemblies with electric power. It also serves as a connection for transmitting field bus signals to the computer system.

The evaluation system – real-time database with reproducing function

All process-relevant data in addition to the temperature e.g. the casting speed and the position of the liquid level as well as the stopper rod are stored in a real-time database where they are archived for several weeks. Besides the online evaluation, the system provides also an analysis of previously recorded data of complete casting sequences. Consequently, the process and the system can be adapted to changed circumstances which include new steel grades, casting powder and casting speed. The plant operator thus receives detailed information for the operating practice.

Mobile sensor diagnostic system – fault detection before the occurrence of malfunctions

In the application of a mobile sensor diagnostic system, it is a pri-mary benefit that transportation to a test stand is no longer re-quired. Instead, the test is performed with the installed mold on the casting machine. For checking the thermocouples, the data is transmitted to the diagnostics system in a wireless manner.

During the test, the temperature behavior of each temperature sensor is examined, displayed and stored. Apart from the admin-istrative data (name of examiner, mold number, date, time etc.), an automatically generated test report includes also the details of the state and temperature behavior of each temperature sensor.

The data of several molds can be managed. The test equipment can be employed in new plants as well as for reconstructions. With this apparatus, faults can be prevented and time and money be saved, when examining the thermocouples. The costs for mainte-nance of the thermocouples and the respective cabling can be re-duced considerably.
An optimal process control demands detailed information on all input parameters. A large number of steelworks shows high fluctuations with the limiting conditions; e.g. with the weight and the analysis of hot metal, the type and analysis of scrap, the analysis of additives and coolants as well as with changing converter conditions. All these factors may vary from heat to heat while in some steelmaking plants many of the key parameters are often not known.

The process model for BOF converters developed by SMS Siemag, however, helps to reach all process engineering targets by means of an exhaust gas analysis and a correction measurement towards the end of the main decarburization phase.

Due to inaccurate starting conditions, the true carbon content and the real temperature of the melt may deviate from the estimates. Therefore, the experts from SMS rely on a correction measurement and the exhaust gas analysis to correct the process.

### Correction measurement

During the blowing process a correction measurement is performed to be able to reach the required target values near the end of the process. For the further process time, it is the task of this measurement to adequately correct the amount of blown oxygen and of coolants or heating substances. The end of the main blowing time is scheduled perfectly for a correction measurement.

### SMS process model for BOF converter

Considering these experiences, SMS Siemag has developed a model whose structure and properties allow a transfer to other plants and facilities. Our BOF converter model has been developed for a completely computer-based blowing process. The operator is informed on all current processes in an easy and comfortable manner. Moreover, the product quality and the productive capacity are improved. The process control system from SMS is based on the calculation of the charge materials and the oxygen quantity to be blown in. At the same time, an optimal process diagram is specified which takes the limiting conditions of the process into account.

#### The automatic process control of the converter model from SMS Siemag ensures a precise setting of the following process variables:

- Steel temperature
- Steel weight
- Carbon content
- Phosphorus content
- Final analysis after tapping
- FeO content in the slag

In terms of the charge materials and the available plants a sophisticated process can only be controlled optimally by means of process models as applied in a BOF converter, where the models are based on metallurgical, physical and mathematical equations. Some steelmakers have developed their own process models which are particularly tailored to their plants with special environmental conditions. Experience has shown, however, that a transfer of such models to other steelmaking plants with technological conditions deviating therefrom does not lead to the desired targets.

An optimal process control demands detailed information on all input parameters. A large number of steelworks shows high fluctuations with the limiting conditions; e.g. with the weight and the analysis of hot metal, the type and analysis of scrap, the analysis of additives and coolants as well as with changing converter conditions. All these factors may vary from heat to heat while in some steelmaking plants many of the key parameters are often not known. The process model for BOF converters developed by SMS Siemag, however, helps to reach all process engineering targets by means of an exhaust gas analysis and a correction measurement towards the end of the main decarburization phase.

Due to inaccurate starting conditions, the true carbon content and the real temperature of the melt may deviate from the estimates. Therefore, the experts from SMS rely on a correction measurement and the exhaust gas analysis to correct the process.

### Technology

**Target values achieved even under adverse conditions**

**New process model for BOF converter**

On meeting all the quality and safety requirements and in view of a constantly rising pressure for cost reduction in the steel industry, automation plays a decisive role. This means, for example, that the process model is the key component for process optimization and control in an oxygen steelmaking plant. The BOF process optimization system developed by SMS Siemag monitors and optimizes the steel production on the BOF converter and provides maximum efficiency, quality and productivity of the plant even under adverse conditions.
Evaluation of exhaust gas information

With the aid of an exhaust gas analysis, the model detects the transition from the main blowing to the dynamic blowing phase and thus determines the ideal switch-off point to hit the targeted carbon.

Predictive process calculation

One of the most important features of process calculation is the predictive calculation. It includes an overview of the charge materials, the process gases as well as the technological measures which have to be performed within the scope of the treatment. Calculated are the setpoints for:

- Hot metal weight
- Scrap weight
- Composition of the required scrap to customer-specific scrap menus
- Weight of iron ore and/or direct-reduced iron (DRI)
- Weight of additional heating materials (C, FeSi)
- Quantity of lime, dolomite or other materials added during blowing
- Basicity of final slag
- Process gases oxygen, argon and nitrogen
- Blowing diagram

Automatic horizontal and vertical adaptation of the blowing diagram

SMS Siemag has developed an automatic horizontal and vertical adaptation of the blowing diagram which goes beyond the material and oxygen calculation of the converter model, and realized it in the process model. The height of the oxygen lance (distance to steel bath) and the duration of the blowing stages are automatically adapted during the blowing operation in accordance with the input data regarding the silicon and phosphorus, the targeted phosphorus and the final carbon contents and with regard to the number of heats since relining. Owing to a horizontal and vertical adaptation of the blowing model, the efficiency factor of dephosphorization is improved (P≈0.005 %).
Small service packages with a huge impact

Repair service for drum-type shears

A perfect cut ensures safe functioning and stable production

The productivity of a hot rolling mill and the quality of a hot-rolled strip depend among others on a proper and safe entry into the roll gap. A cleanly cropped head and tail end of the transfer bar is a prerequisite to achieve this objective.

Intact drum-type shear as prerequisite for a perfect cut

For achieving a perfect cut and thus also for the entire process of a plant, the correct functioning of the drum-type shear is of major importance. An incorrect strip entry into the roll gap may result in damage to the rolls and the mill guides which then requires additional roll changes and leads to unwanted stoppages up to production losses.

Causes for an unclean or imperfect cut

During daily operation the drum-type shear is subject to considerable strain. An abrupt strain or reduction of strain during a cutting cycle and the environmental influences such as a changing thermal load by starting material, an abrasion by water from the descaler impinged with scale or corrosion by cooling water, lead to crack formation and deformations on the drum shaft. As a result, its mechanical strength and the cutting result are negatively affected.

When the deformation is too high the knife gaps can no longer be adjusted which in turn leads to inadmissibly large burs. Then, the crop end can no longer be safely cut off. Possible consequences may be unsatisfactory product quality due to surface defects, production failures up to a plant downtime due to roll breakages in the mill stand.

Prevention of production losses by inspection

To prevent such consequences a regular maintenance of the drum-type shears of our customers is required after production of approx. 8 to 10 million t, as practice has shown. We offer an inspection of the drum shear including the repair of all defective components. By regular inspections our team of experts can recognize possible damage early to make sure that consequen-
Owing to the combination of inspection, repair and modernization, an optimal utilization of a maintenance standstill is possible. For our customers this means time and cost saving at the same time.

Integral parts of our high-quality repair are among others:

- Non-destructive testing of components e.g. by ultrasonic inspection
- Finite-element calculation of the drum shafts weakened by cracks and of the other components
- State assessment of the antifriction bearings
- Measuring of synchronized gear wheels on our 3D measuring machine
- Possibly required remachining of gear wheels in our workshops
- Advice and information for modernization of shears. An option would be the installation of our novel knife clamping devices ensuring safe knife fixation and shorter knife changing times
- Remachining of damaged components on CNC-controlled machines
- Remanufacture of damaged components in our workshop
- Reassembly and adjustment of the drum-type shear to precise cutting
- Change of all seals
- Installation of new piping
- Renewal of fastening elements

Benefits of our service package (Inspection and repair)

- Stable production by perfect cut
- Reduction of additional costs by safe rolling operation
- Predictable performance of repair instead of unforeseeable downtimes
- Prevention against mechanical consequential damage and thus reduction of economic losses
- Cooperation with customers in order to implement individual requirements such as a rise in output and expanded production
- Platform for an access to modernizations and technical innovations

Benefits to our customers

- Securing the rolling operation
- Refurbishment of components
- Competent execution of repair
- Installation of OEM components (Original Equipment Manufacturer)
- Full service directly on site
- More than 100 years of experience in shear and rolling mill construction and know-how from more than 60 drum-type shears built
- Utilization of our know-how from numerous repairs and modernizations of drum-type shears

Repair as an opportunity for modernization

Our engineers and designers are constantly looking for modernization solutions and advancements for our plants. In case of a pending repair we inform our customers about these innovations. If there is interest, we work out individual modernization solutions together with our customer.
Maintenance means more than to repair machines. It is the idea to ensure that a machine failure is prevented at all.

Reliability-Centered Maintenance
With ME-RCM to success

Maintenance Engineering – Reliability-Centered Maintenance ME-RCM by SMS Siemag

It is in every producer’s interest to reach an optimum plant performance and secure this status. This is done in terms of safety, environmental protection, production output (energy efficiency), product quality and customer service.

There are four basic types of maintenance:
- prospective
- preventive (time-based)
- corrective
- detective (condition-based)

Classical RCM

RCM is regarded as a systematic approach to determine the maintenance requirements of a plant or the equipment in their operating/application environment. So this is preventive maintenance. RCM recognizes that the consequences of failures are the fundamental criterion for which maintenance tasks are selected and which parts are given priority! Once the functional failures and their consequences have been identified, RCM offers structured decision logics to control the selection of cost-effective maintenance tasks.
**Idea of RCM**

The frequency of a status-oriented maintenance should be based on the failure development period ("lead time of failure" or "P-F interval").

The PF curve (see sketch) is based on the fact that most of the failures do not occur suddenly but that it can rather be observed that a failure is initiated at the last stages of status degradation. The time between P and F is specified as P-F interval and thus determines the frequency of the status inspection which has to be correspondingly shorter.

**Basic elements of a classical RCM**

- Definition of partial system relations and interfaces (partitioning)
- Realization of failure risk assessments (failure types and examination of consequences, determination of Risk Priority Number by means of criticality matrix, see page 114)
- Application of failure risk management (decision logics tree)
- Planning of continuous improvement (age exploration)

**Individual analyses**

1. **Functions and performances:**
   Which functions and associated performance standards are fulfilled by the plant taking into account the current operating conditions?

2. **Type of failure:**
   How can the plant be troubled in fulfilling this function?

3. **Causes:**
   What is causing the malfunction?

4. **Consequences and effects:**
   What consequences does the failure have? Examples: protection and warning devices which are not fail-proof. Failures representing a risk to the safety or the environment and failures impairing production or operation (production output, product quality or customer service). Failures causing direct repair costs.

5. **Effects:**
   How will the failure have an effect?

6. **Prevention of failure:**
   How can a failure be prevented?

7. **Alternative preventive solutions:**
   What needs to be done when no acceptable preventive solution can be found? The effort invested in failure prevention determines the type of maintenance: condition-based maintenance, planned overhaul and replacement measures, troubleshooting measures, design modification or "break/fix".
With ME-RCM to success

SMS Siemag ME-RCM

Based on the developments of a described classical RCM, the ME-RCM of SMS Siemag is a true-to-life method specifically developed for the plants in the steel and rolling mill industry which has been executed by experts with many years' experience. This method concentrates on the prioritized measures with necessary documentation and it is therefore more efficient than the classical method. It is specifically focused on an information exchange between SMS experts and the customer team. In just a short amount of time, ME-RCM leads to insights whose implementation delivers phenomenal results.

Prerequisite for effective Maintenance Engineering (ME-RCM):

- Enormous operational experience of the experts is on hand
- The users of this methodology have specialized knowledge of the part to be examined
- The quality of the results of this methodology is based on team formation between experts and customers as well as the implementation of the measures developed in the future

### Maintenance Task Table.

<table>
<thead>
<tr>
<th>Equipment Group ID</th>
<th>MERCM REF#</th>
<th>Equipment No.</th>
<th>Equipment / Component</th>
<th>Failure</th>
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<tbody>
<tr>
<td>CLCS</td>
<td>1201010</td>
<td>000</td>
<td>Car</td>
<td>5 5 2</td>
</tr>
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<td>CLCS</td>
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<td>Car</td>
<td>5 5 2</td>
</tr>
<tr>
<td>CLCS</td>
<td>1201010</td>
<td>000</td>
<td>Unsteady movement of car</td>
<td>3 2 2</td>
</tr>
<tr>
<td>CLCS</td>
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<td>000</td>
<td>Unsteady movement of car</td>
<td>5 2 2</td>
</tr>
<tr>
<td>CLCS</td>
<td>1201010</td>
<td>000</td>
<td>Rails blocked</td>
<td>3 8 2</td>
</tr>
</tbody>
</table>
If applied correctly, ME-RCM provides the following potential opportunities:

- Greater safety at work and better environmental protection
- Higher operating performance and greater efficiency of maintenance work by increasing availability and reliability
- Increased service life of cost-intensive plant components
- Creation of a comprehensive and easily understandable maintenance database
- Finding failures before they occur
- Higher individual motivation
- Better teamwork
- Explain why malfunctions of the equipment occur and how they can be prevented

The greatest benefit of ME-RCM is that it helps to prevent unnecessary maintenance tasks regarding structural factors and that it reduces the life cycle costs of the plant operator.

Maintenance experts utilize ME-RCM as a structured, exact and overall analyzing method to specify optimal measures for a plant from the points of view of efficiency, quality, production output, safety, environmental behavior and customer service.
With ME-RCM to success: Example Hulamin, South Africa

Hulamin based in South Africa, is Africa’s leading independent manufacturer of semi-finished and finished aluminum products. The company supplies mainly the South African market as well as other niche markets around the globe.

Hulamin’s business strategy (or corporate goal) is to surpass the expectations of the shareholders. For this purpose, the company creates values with the manufacture of high-quality semi-finished aluminum products. Major products are:

- Can-end sheet
- Heat-treated plates
- Sheets for automotive products including heat exchanger
- Thin-gage and foil products
- Building sheets

Although Hulamin Rolled Products and Hulamin Extrusions make up more than 90% of the Hulamin Group, the corporation also operates a number of downstream companies including two companies. All these business activities are concentrated on the South African market.

One good example is the supply of material for the construction of the Moses Mabhida Stadium in Durban which has been particularly newly built for the World Cup in 2010.

From June 8 thru 24, 2010, a ME-RCM training and a small ME-RCM analysis has been performed by our experts on selected equipment of the hot strip mill of our customer Hulamin in Pietermaritzburg, South Africa. Chosen by Hulamin, the production-critical facilities of the roughing and the finishing trains were the focus of the analysis. During a kick-off meeting, the procedure of the analysis was discussed and it was agreed that currently occurring failures of the selected equipment and the existing measures are to be examined first by the so-called root cause analysis. Next, other failure types were studied and additional preventive maintenance measures defined.

**Execution:**
- Definition and selection of facilities/component parts depending on their importance for the production
- Collection of technical data and documents such as related drawings, maintenance instructions etc.
- Examination of the documents and the failure history
- Examination of existing maintenance plans
- Analysis of existing failure types, analysis of future potential failures
- Definition of preventive maintenance measures with regard to the above-mentioned failures
- Presentation of the results in ME-RCM comparison lists
- Update of the existing maintenance plans
- Verification of the data by Hulamin
A historical analysis of error messages and maintenance plans was carried out in teamwork. The result revealed the current status of maintenance and formed the basis for the development of different maintenance measures. To implement the measures a Continuous Improvement Plan (CIP) was created, the introduction of which will reduce the number of downtimes in the long term.

The maintenance experts prepared a detailed report on the checkup of the individual plant components, the consequences of ignored maintenance measures as well as the corresponding recommendations.

Furthermore, the hydraulic and oil lubrication systems were thoroughly investigated. The aim of this inspection was to analyze the current state of the systems in order to optimize them also on issues concerning maintenance, reliability and performance.

These included among others the following points:
- Reduce wear of parts
- Prevent overload
- Wear limits
- Spare parts
- Connection between wear and operation of the plant
- Method or material selection increasing the service life

The knowledge of the maintenance staff at Hulamin was very good and the willingness with regard to the ME-RCM study and to the implementation of the measures prepared on the basis of the results was very strong. This enabled our experts to cooperate in an excellent manner and to perform the measures in a highly efficient way.
SMS Siemag’s slab sizing presses for conventional hot strip mills allow a width reduction of up to 350 mm, thereby considerably reducing the number of continuous casting formats and thus increasing their production by up to 20%. The “dogbone” generated by sizing the material is much less than with a conventional edger, thus minimizing the cropping loss.

Maintenance of the slab sizing press of Salzgitter Flachstahl GmbH, Germany

The slab sizing press in the hot wide strip mill of Salzgitter Flachstahl GmbH, one of the largest steel producers in Germany, had been put into service by SMS Siemag in January 2002.

Since the commissioning, the customer has been intensively looked after, advised and supported by SMS with regard to optimization and maintenance of the slab sizing press. This included among others recommendations regarding regular maintenance work on the sizing press as well as proposals for spare parts procurement. Reports on latest developments and operational experiences were part in the daily association between Salzgitter’s plant personnel and the responsible Design and Service Departments of SMS.

From the very beginning, a trouble-free operation of the core components of the sizing press was continuously ensured. After an operating period of more than eight years an overhaul of the sizing press slide units with their eccentric shaft units and antifriction bearings was scheduled for 2010 within the scope of a preventive maintenance measure.

Within two working phases during regular plant downtimes the two sides of the sizing press were to be overhauled one after the other and major components replaced. The first phase concerning the operator side has been successfully completed in June 2010 and the second working phase regarding the drive side was scheduled for December 2010.

Sizing press with disassembled sizing press slide unit.
Since 1989, SMS Siemag has successfully put 13 slab sizing presses into operation.

For the planning of such downtimes our experts try to make sure that the production of the customers is affected as little as possible. The duration of the downtime has highest priority, whilst accurateness and the quality of work are never ignored.

Due to the emphasis of the time factor, our experts have included as much preliminary work as possible which could be realized already prior to the downtime such as the design and the supply of optimized assembly devices. In principle, they also comprise the assessment of necessary spare parts and their procurement. In addition to the common spare parts, an eccentric shaft unit has been provided in this case for one side as an additional standby unit.

Consequently, major preparation or overhaul work could already be executed prior to the downtimes. Due to an ongoing consultation by SMS Siemag, the long delivery times of such components known from experience have been taken into account and the components were therefore purchased in good time. Preassembly of additional conrods has already been performed in the workshop of SMS. In this way, a compact replacement could be realized during the downtime.

This solution is based on the principle of creating a procedure to optimize the standstill period which SMS is always aiming for to make sure that the downtimes of the plant are always kept to a minimum. The downtime was used mainly to change the eccentric shaft unit (including a change of the antifriction bearings) and to completely overhaul the sizing press slide. Furthermore, the scope also included status reviewing e.g. by crack tests on the intermediate crossbeam and various work on the press uprights, on the mechanical adjusting equipment and the guide crossbeams. All maintenance measures have been carried out around the clock. Besides, SMS handed a detailed status report over to the customer.

After the downtime, the two dismantled eccentric shaft units have been disassembled in our workshop, assessed and overhauled for assembly in December 2010.

Perfect interaction and uncomplicated exchange of information between the customer and us as well as the know-how of the specialized departments of SMS led to a successful completion after a downtime of ten days. Due to this joint organization, all plans could be maintained, concluded or even further optimized. Even during the standstill, additional unscheduled repairs were mastered at short notice in cooperation with the SMS workshop, while the plant downtime was only exceeded insignificantly.

We highly appreciate the continuously good cooperation with the customer, the discussions with the staff members on the plant and the smooth operations over recent years, causing great satisfaction on either side.

As a reliable partner, it is our aim to support our customers in the realization of preventive maintenance measures, in the setting up of an appropriate spare parts storage and in the planning and the realization of maintenance work. This is done in order to achieve optimized downtimes and to ensure the best possible plant availability.
Concerning the global supply of torpedo cars, SMS Siemag has a long tradition and in this scenario the Brazilian subsidiary SMS Siemag Serviços Industriais Ltda. plays a particularly important role.

In view of our reference list since 1967, SMS Siemag has supplied more than 400 Torpedo Cars (TCs) and as of 2000 alone SMS Siemag Serviços Industriais Ltda. has received a significant number of orders from its Brazilian customers:

- Companhia Siderúrgica Nacional: 7 TCs
- ArcelorMittal Tubarão: 3 + 3 TCs
- Gerdau Açominas: 1 TC
- ArcelorMittal Monlevade: 6 TCs
- Numerous modernizations of car components or complete cars

SMS Siemag Serviços Industriais pursues the philosophy of closely cooperating with the company’s headquarters in Germany where the basic engineering and the finite-element-calculation are developed. The detail design is prepared according to local standards and customer requirements. Torpedo cars are preferred by Brazilian steelmakers who are producing steel via a blast furnace route. Additionally, Brazil has one of the largest iron ore deposits worldwide with excellent quality.

The proven torpedo car technology of SMS Siemag offers an outstanding combination of toughness, reliability and highly user-friendly maintenance and operation procedures for all components of torpedo cars.

In addition to the supply of new cars, SMS Siemag Serviços Industriais Ltda. offers also extensive repair services. In the course of this standard reconstruction work we replace the wear components, carefully inspect the welding mainly on the vessel and the bridge and restore all structural components including sandblasting and repainting, if required.
Repair of a coiler
Assignment at Tata Iron & Steel

In 2009, SMS Siemag received the contract to examine abnormal noises in the coiler area of the Electrolytic Cleaning Line (ECL) at Tata Steel, Jamshedpur, India. The noises had already been present for some time. Their cause, however, had not been identified until then.

The coiler area was inspected in cooperation with the maintenance staff of Tata Steel and the team of SMS Siemag. Based on the FMECA (Failure Mode and Effects and Criticality Analysis), the problem was limited to the coiler mandrel and the causes were identified. In the course of this year’s plant downtime, the required maintenance work was performed and successfully completed by the same team.

Sunder K. Priyadarshi, Senior Manager, Mills & Utilities, CRM Cold Rolling Mill: “We sincerely thank the entire team of SMS Siemag for the very good support in eliminating the noises of our coiler. We were particularly concerned about this issue for a long time.”

Latest services in brief

- Aleris Aluminium Koblenz, Germany – Quality check following acceptance of new rolls
- Iskenderun Iron & Steel Works, Turkey – Mobile on-site machining of a converter trunnion
- Hydro Aluminium, Holmestrand, Norway – Change and commissioning of the new HGC cylinder of the cold rolling mill
- Dufepco, Belgium – Measurement of the mill stands and the coiler of the hot strip mill
- ArcelorMittal Brasil, Brazil – Inspection of the coiler of the hot rolling plant
- Outokumpu Stainless, Sweden – Coupling change on the main gear of a Steckel rolling plant
- Corus Strip Products UK, Port Talbot Works, Great Britain – Technical assistance to increase the plant availability
- CSN, Brazil – Accomplishment of a hydraulic training course
- Salzgitter Flachstahl, Germany – Technical assistance for the skin-pass mill stand and annual maintenance of hot-dip galvanizing line No. 2
- Ilsenburger Grobblech, Germany – Renewal of the E & A service contract for three years
- Salzgitter Flachstahl, Germany – Renewal of the E & A service contract for two years
- Outokumpu Stainless, Finland – Renewal of the E & A service contract for one year
- Pervouralsky Novotrubny Works, Russia – First E & A service contract concluded
- Baotou Iron & Steel, China – Supply of adjusting devices for the heavy-plate mill
- Iskenderun Iron & Steel Works, Turkey – Supply of a helical shaft-mounted gear and a helical-bevel gear unit for the slab caster
- Ilsenburger Grobblech, Germany – Revamp of the pinch-roll unit of the cross-cut shear
- CSC, Taiwan – Supply of the knife carrier for a conventional hot strip mill
- Wuhan Iron & Steel, China – Supply of articulated shafts and couplings for a conventional hot strip mill
- Siderúrgica del Orinoco, Venezuela – Supply of worm gear sets for a conventional hot flat rolling mill
- Handan Iron & Steel, China – Supply of a coiler mandrel and an upcoiler for the cold rolling mill
- Siderúrgica del Orinoco, Venezuela – Supply of a lifting device for the slab caster
- Ural Steel, Russia – Supply of the roller slewing ring for a slab caster

E-mail: technical.service@SMS-Siemag.com
"Subject: Newsletter"
Russia is a strategically important market for the SMS group since it has established a long tradition in metallurgy and offers enormous development potential for the future. Many Divisions of the SMS group have already opened to the Russian region, and in Russia SMS Siemag is regarded as a renowned company: a rolling mill was first supplied in 1936. Since that time, all Russian producers of steel products and NF alloys have started to use equipment from SMS Siemag.

Technical service in Russia

To get a better feeling for the requirements of the Russian customer SMS Siemag has decided to open a new service location in Russia, SMS Siemag Services LLC. Thanks to this organization, we are able to offer the possibility to conclude contracts for technical services and spare parts in rubles.

SMS Siemag Services LLC coordinates several service branches in Russia which render technical services for metallurgical plants. These include SMS Siemag Services LLC in Moscow as well as the service subsidiary SMS Metallurgical Service Magnitogorsk which has been established for project monitoring and execution of technical maintenance work for the CCM No. 6 in MMK and SMS Siemag Services LLC, Chelyabinsk branch, acting as key office to render services for metallurgical plants on the entire territory of the Russian Federation, the Ukraine and Kazakhstan. The portfolio includes technical maintenance, technical assistance, spare parts supply and all types of personnel training.

In the decisions as to which regional key office to select, the geographical location has been taken into account. Meanwhile Chelyabinsk has become one of the most important industrial centers in Russia. Metal products made here are well-known in all regions and republics of the former Soviet Union and outside the CIS states. This city produces nearly 25 % of large-diameter pipes manufactured nationwide, one-third of molten ferroalloys and ball-bearing steel and more than 60 % of stainless steel.

The new operative structure is active as from September 1, 2009, and the newly established team consists of 9 technical and commercial specialists. All staff members have been trained in accordance with SMS Siemag standard and the new organization is fully integrated in the database of SMS Siemag Service.
Teleservice

In March of this year, SMS Siemag Service, Chelyabinsk branch, has established a teleservice with a new team of specialists. The main target of the new team is technical support via a service portal (software for remote monitoring of the equipment). The new personnel was trained in the automation structure of the equipment, the component segment and the operational concept. After the training measure, a knowledge test was performed.

Our short-term plans consist of a service portal organization for several large plants in Russia. In addition to this new network infrastructure, a high-performance leased line from British Telecom will be made available for our Chelyabinsk branch in the near future which will make our activities more efficient.

Main projects

The service location of SMS Siemag in Chelyabinsk is always close to the customer and provides support for spare parts supply, technical assistance, maintenance advice, troubleshooting for equipment and offers comprehensive service solutions.

Already a few years ago, SMS Siemag in Russia has originated several projects. As an experienced service provider, a manufacturer of equipment and an expert in continuous casting technology, SMS Siemag has been commissioned to provide maintenance services for the new continuous casting plant for MMK (Magnitogorsk).

Since that time we have constantly extended the cooperation with this market leader of Russian metallurgy. A two-year supply contract covering spare parts for the plate mill 5000 has already been signed. The first parts were supplied in March 2010. Moreover, negotiations are currently conducted on teleservices and the technical support for the new cold rolling complex.

The next major project consists of a cooperation with the ChTPZ Group, one of the leading manufacturers of large-diameter pipes. This project started with the assessment audits for technical assistance in the two plants in Pervouralsk and Chelyabinsk (PNTZ and ChTPZ). See also Newsletter 2/2010. Following this assessment, a close partnership was established and a number of contracts were signed including an agreement on technical support. The implementation of the IMMS® system and the laser coding and tracking system was also decided.

For the most modern LDP plant of “Vysota 239" (ChTPZ, Chelyabinsk) SMS Siemag and SMS Meer will establish and apply an effective maintenance practice according to European standards.
SMS Siemag has again been commissioned to supply a complete oscillating unit. The customer this time is AL Ezz Dekheila Steel Company from Egypt. In 1999, SMS Siemag had built a one-strand CSP plant for this customer whose oscillating unit will be replaced in the near future after having been in operation for more than ten years.

The service package will include the implementation of the Integrated Maintenance Management System (IMMS®), a comprehensive tool for the entire maintenance management which is regarded as the basis for an advanced maintenance system.

Just like the technical support of the IMMS® system, personnel training and teleservice for the new electric steel production complex at PNTZ (Pervouralsk), SMS Siemag organizes the local spare parts storage and the spare parts management.

New order
Manufacture, test and supply of an oscillating unit for EZDK, Alexandria, Egypt

SMS Siemag has again been commissioned to supply a complete oscillating unit. The customer this time is AL Ezz Dekheila Steel Company from Egypt. In 1999, SMS had built a one-strand CSP plant for this customer whose oscillating unit will be replaced in the near future after having being in operation for more than ten years.

The oscillator which is still used for production was extensively examined in 2009 with the support of SMS service experts, when it was ascertained that a replacement would be required in the near future due to its long operating activity.

Since the existing short-lever construction had been proven as highly efficient our customer decided to already now order a short-lever oscillator as replacement unit from us.

As in 1999, the new oscillating unit including the hydraulic equipment and the grease piping has already been manufactured and assembled in our workshop in Germany. Moreover, the unit has been extensively tested for its intended use.
For such purposes we provide a specifically designed test field where the oscillating unit is set up and connected with all media under the same conditions as in the casting tower of the continuous caster. Then, all functions are run through. To make the oscillating condition even more realistic, our experts assemble a dummy tailored to the customer as mold substitute. Such a dummy enables a direct measurement of the resonance generated (actual amplitude on the oscillating mold). In addition to this, the hydraulic system will be checked with our testing facility, thereby exceeding the nominal load.

When using the original software “Motion Control”, the standby unit had to go through and withstand an extensive test program.

After all setpoints have been reached and their documentation has been prepared we have disassembled the oscillating unit in optimally refittable units, then packed and delivered to EZDK. It goes without saying that our service experts from the mechanical, hydraulic and automation departments are prepared to assist the customer when installing and putting the system into operation, if required.

SMS Siemag Service never stops to ask questions to improve plant profitability and product quality. Together with you, we are always ready to clarify and analyze the Return on Investment (ROI) with regard to our service solutions.”

To take the “make-or-buy strategy” of many leading manufacturers in the metallurgical industry into account, the SMS Siemag’s Service Division made the strategic decision to offer comprehensive service solutions to the Russian metallurgical industry. Customized service solutions are cherished by Russian customers and thus awaken their interest. Fulvio Michelutti, Branch Manager in Chelyabinsk, was very pleased with the progress which his branch is making: “As an active partner, we want to pass on our experience and knowledge to our customers and believe in the Technical Service of SMS Siemag which provides the technology and the know-how for plant engineering. On the basis of this perspective, we are prepared to meet the new challenges.

In the large-diameter pipe plant at ChTPZ: forming press of SMS Meer.

Test setup with dummy mold.
Global networking, a continued rise in IT penetration and individual customer requirements have contributed to the developments in the metallurgical and rolling mill technology for many years and this will be the case also in the future. The reasons for this are a strong global competition and increasingly shorter innovation cycles.

SMS Siemag meets the challenges of globalization among others by the establishment of engineering and service locations in the large markets of Europe, China, India, Russia and America.

With these globally interlinked engineering and service locations, SMS Siemag achieves a rapid development of products and services in the respective regions that meet actual market requirements.

Due to an increased application of condition monitoring systems, preventive maintenance is partly supplemented and/or cut back since production conditions can be detected and evaluated online which therefore enables a status-oriented maintenance. Relevant information at any time and location allows an optimal interplay of shared tasks within the entire manufacturing process and during plant operation.

The service portal

A tool for the integration of industrial services for commissioning, prospective maintenance and failure management over the entire life cycle of large plants.

Service portal and safety aspects

A safe and comfortable communication between plant operator and plant manufacturer is professionally supported by means of a service portal.

Already during commissioning SMS Siemag’s automation experts allow the staff members to have access to the site computers as if they were present on site (here, signal propagation time and bandwidth are the limiting parameters). For this reason, the service portal sets up a safe network connection between customer’s plant and SMS Siemag’s network. After clearance by the customer, high-security access to the plants (SSL-encrypted and password-protected) is possible at any time via this network with the aid of the service portal software.

Each action such as connection establishment and clearing or the utilization of a function parameterized in the portal is deposited in forgery-proof log files on each of the participating computers.
The internet access of the SP/1 PC must have the following features: access to the Internet only to a static IP address of SMS Siemag (central server); only one open port (7708); no other accessibility from the Internet.

This solution has the following benefits:
- The connection is initiated from the client’s network
  Greater client acceptance
- Owing to the static IP address of the client which can be filtered at SMS Siemag
  Greater safety
- Only users logged into the SMS network can use service portal connections
  Greater safety
- For a service connection a user and a password is additionally required
  Additional safety

A setup of portals already in the course of commissioning of large plants supports the engineers during hot commissioning and with the optimization of the plant parameters.

Service Entry Point

All the service activities of the respective regions are realized in the Service Entry Points (SEPs):
- Hotline/teleservice 24/7
- Technical assistance
- Spare parts

An optimal customer service with personnel familiar with customer’s plant and staff is given by means of local support points.

Owing to information technology networking, knowledge about special topics can be quickly exchanged worldwide which in turn improves the solution competence of the service staff enormously.

All activities are supported by a central support point in Germany.

Services and potentials for the life cycle

Many surveys among companies reveal that there are major trends and challenges in industrial services. A specific trend is an increasing professionalism in customer service that expresses in a long-term partnership between suppliers and clients. The most important trends are:
- Remote services
- Status-oriented maintenance
- Knowledge management

Customers and suppliers equally benefit through:
- Better utilization of tight personnel resources
- Reduction of ramp-up times of large plants
- Protection of the environment by avoiding unplanned travelling
- Fast troubleshooting
- Support in status-oriented maintenance

An early setup and the intensive use of the service portal during commissioning is of great advantage for the entire life cycle. The customer realizes the benefits for himself and for SMS Siemag and accepts service activities with portal support. In this way, the service engineers at the world-wide service locations are able to support the customers during plant operation and assist customer’s staff during maintenance with their knowledge on products, services and processes used.

A drastic rise in online times of SMS Siemag’s teleservice reflects the need for this technology and working method.

Summary

The service portal is a basic technology for many services and provides the opportunity to integrate processes for the professionalization of maintenance of large plants over the entire life cycle. The utilization of the service portal is a prerequisite for a plausible and quick handling of service tasks. A drastic rise in online times of SMS Siemag’s teleservice underlines this megatrend.
In July 2010, Jiangsu World Group, the largest Chinese private manufacturer of drive components, has placed an order with SMS Elotherm to supply the first induction hardening machine for crankshafts. Traditionally, Jiangsu World Group, with its premises in Danyang, Jiangsu Province, opted for the nitriding process to harden cranks. Tougher environmental requirements and the fact that it was impossible to integrate the nitriding process into the remaining manufacturing line for crankshafts were decisive for the change.

Flexible and energy-efficient process. The machine ordered is designed for shafts up to a length of 1,300 mm and stands out for its compact design: on two base frames, it consists of the hardening station and all auxiliaries. Within 240 seconds the plant can harden all center and pin bearings as well as the flange and the journal of a large four-cylinder crankshaft. Unlike the slow nitriding processes taking place in batch-type processing, the inductive hardening is directly positioned in the line in front of the subsequent grinding and finish-machining equipment.

Fewer test rejects. Another benefit of the ordered plant design is the patented effective power measurement on the workpiece (patent No. EP 0 427 879 B1). This special equipment allows Jiangsu World Group to dispense with many quality measurements destructive to the workpiece. Performance testing of the energy actually induced into the workpiece provides information on a uniform heating to the required austenizing temperature. This guarantees that the crankshafts bearings have always reached the correct temperature prior to the final quenching process.

Automatic gage setting. To attain more flexibility and reduced changing times with different crankshaft geometries, the hardening machine from SMS Elotherm is equipped with an automatic gage setting. Via control command the plant changes to various distances of main and pin bearings in fully automatic mode. A manual setting is no longer necessary and productivity of the plant increases considerably. The setting process is controlled via NC axes. This ensures very quick change and high-precision positioning of the hardening inductors – also securing the leading-edge quality of crankshafts which have been inductively hardened on SMS Elotherm machines.

Local presence. The machine will be delivered in spring 2011. The project is supported on site by SMS Elotherm Induction Technologies (Shanghai) Ltd. The local presence of SMS Elotherm and a broad base with sales and service up to in-house inductor production and a local spare and wear parts storage were important factors for Jiangsu World Group to decide in favor of SMS Elotherm. A prompt reachability in a service case and the option of invoicing in local currency were also important.

Each year, Jiangsu World Group manufactures nearly 3 million crankshafts for one- to six-cylinder engines. In the course of this, the crankshafts are partly manufactured in-house for heavy construction machines and agricultural vehicles – from combine harvester to lawn mower.

With the new SMS Elotherm’s hardening machine for crankshafts, Jiangsu World Group improves its competitiveness.

With a new hardening machine for crankshafts from SMS Elotherm, Jiangsu World Group improves its competitiveness.
Brazilian automobile-component supplier expands capacity

WHB orders second EloCrank™ hardening machine

In August 2010, the automobile-component supplier WHB Componentes Automotivos S/A in Curitiba, Paraná State, Brazil, has placed another order with SMS Elotherm, Germany, to supply a modular EloCrank™ machine for inductive hardening of car crankshafts. In the company’s crankshaft production it is already the second hardening machine from Elotherm. WHB particularly benefits from the machine’s energy efficiency, flexibility and functional design.

**Energy efficiency.** The hardening machine originates from the reengineered ModuLine™ series and stands out due to a compact design and reduced energy consumption. As a result, WHB sustainably reduces the unit costs of each crankshaft.

**Flexibility.** Owing to the flexible machine, WHB is able to react very quickly to modified crankshaft geometries. Equipped with a novel converter technology which allows an individual control of the heat output on each single bearing, the new EloCrank™ can now harden also crankshafts with radii. As a result, WHB sets new standards on the South American market and is able to react rapidly to respective customer demands. In general, crankshafts with radii in bearings provide a very compact configuration and additionally withstand higher mechanical pressure in the engine due to hardened radii. With these measures, car manufacturers ultimately achieve a reduction of the vehicle weight and the specified gasoline consumption.

**Functional design.** WHB was also convinced by the trend-setting and also functional machine tool design from SMS Elotherm. The fully enclosed machine allows a perfect view into the process and at the same time a comfortable access for the service staff.

**SMS technology also in the forge.** WHB Componentes Automotivos specializes in the production of precision components, predominantly for the Brazilian car industry. In addition to the crankshaft production, the company operates several casting lines and a forge for a number of car and truck components. In the forge, WHB relies also on the technology and quality of the SMS group and has installed closed-die forging equipment from SMS Meer.
In June 2010, SMS Siemag has commissioned SMS Elotherm, Germany, with the development, design and manufacture of an electromagnetic stirrer. The stirring system is integrated into a strip caster (Belt Casting Technology, BCT) which has been newly developed in a joint project by SMS Siemag and Salzgitter Flachstahl GmbH, Germany. The benefits: fewer rolling processes, improved resources efficiency and lower costs.

**Resources-efficient production by means of BCT process**

**New softening stirrer for strip casting plant**

In this novel plant, the cooperation partners test the horizontal casting concept on an industrial scale. For this purpose, they use the insights gained over the years in test series at the pilot plant of the TU Clausthal, Germany, and transfer this knowledge to a production output which satisfies industrial demands.

**Two stirring coils.** The electromagnetic stirring system from SMS Elotherm consists of two stirring coils: a transverse stirrer supporting the steady and speedy distribution of the casting material up to the strip edges and a longitudinal or softening stirrer synchronizing the movement of the rotating transfer belt of the strip caster and the movement of the melt. In this way, the stirrer ensures that an even gage of the cast strip is achieved. In both cases, the kinematic behavior of the melt is influenced when an electromagnetic field is induced.

**Fewer rolling processes.** After inductive stirring with the softening technique, a steel strip featuring less gage deviation and correspondingly high flatness is achieved so that the number of rolling operations can be reduced in subsequent refining stages. The strip can directly enter the finishing mill, whereby not only the complete production line is shorter but also the costs for the production process are lower thanks to improved resources efficiency. This means: the plant operators can produce high-quality HSD® steel strips at competitive conditions.

**Close cooperation.** SMS Elotherm has accompanied the "strip casting" project from the very beginning and has continuously further developed the processes and plants for electromagnetic influencing of steel melts in close cooperation with SMS Siemag.

The objective of the Belt Casting Technology is the production of HSD® steel strips (High Strength and Ductility) free from any stress. HSD® steels have significant manganese, silicon and aluminum contents and provide high strength combined with high formability. HSD® is a brand of Salzgitter Flachstahl GmbH.

Simulations executed by SMS Siemag.

Stirring coil for electromagnetic influencing of steel melts.

Melt distribution in width direction without electromagnetic force being applied.

The electromagnetic force field acting on the melt distribution in width direction.
Non-slip induction hardening of bearing rings

**Optimal solution in terms of size and quality**

Whether wind power stations or construction machinery – modern applications demand from large-size antifriction bearings a higher load capacity, an improved running smoothness and a longer service life to an ever increasing extent. In order to meet these demands, the procedure of non-slip induction hardening of rings for large-size bearings developed by SMS Elotherm offers customized answers.

*Non-slip induction hardening enables the production of large-size antifriction bearings with which wind power stations with an even higher efficiency are built.*
Induction Technology

Optimal solution in terms of size and quality

Rising demands

For wind power stations in onshore and offshore installations the trend is towards increasingly efficient and thus larger plants which at the same time increases the demands for the installation technology, e.g. construction machinery or cranes. For all these applications the industry requires large-size antifriction bearings with increasingly large dimensions and load capacity, and with the patented non-slip induction hardening SMS Elotherm provides the right solution for the production of such large-size bearings. "Our procedure enables the manufacturers to produce bearings in a quick and cost-saving manner – also with large ring diameters," Dirk Schibisch, Head of Sales at SMS Elotherm in Remscheid, Germany, explains.

Innovative technology

The patented method is based on the use of two inductors: they are individually controlled and generate an uninterrupted hardening zone particularly at the starting and ending point of hardening ensuring running smoothness and a high load capacity of the large-size antifriction bearings. In addition to this, the process itself is highly resources-efficient: it saves time, energy and money and can therefore be used economically for large-diameter rings.

Economic benefits

Compared to traditional carburization and furnace heating processes followed by tank quenching, the machining time for non-slip induction hardening can be reduced from several days to less than one hour– even for ring sizes of up to six meters. Dirk Schibisch stresses: "Moreover, warpage is minimal after the hardening process and the required remachining by hard turning and grinding is notably less. This also saves valuable production time and, above all, costs for turning tools and grinding disks."

Quality guaranteed

To allow the manufacturers to examine the quality of large-size antifriction bearings already during the machining process, SMS Elotherm combines non-slip induction hardening with the measurement of the effective power in the workpiece. The likewise patented system monitors and records which effective electric power is actually available in the workpiece for the heating process enabling a 100 % quality check and a complete retraceability of parts. In this way, quality checks destructive to the workpiece are prevented and high demands of modern quality management systems are fulfilled at the same time.
Dirk Schibisch, Head of Sales, says with conviction:

“Further developments in renewable future technologies such as wind-energy and solar systems were only made possible by the non-slip hardening process. Our method supports manufacturers in fulfilling growing material requirement. Consequently, they work economically and provide at the same time a repeatable and recordable product quality.”
Dubai Aluminium Company (Dubal), UAE, has placed an order with Hertwich Engineering, Austria, for the supply and commissioning of a batch homogenizing plant for aluminum billets. The scope of supply comprises two furnaces as well as an air cooling station, and commissioning is planned for the end of 2010.

Owing to the reversal of the air flow with flap regulation, heating of the aluminum billets is 20 % faster and improved temperature uniformity is also achieved by the furnaces. The plant is fully automated and the heating system is controlled by measuring of the air and metal temperatures. The same concept provides an efficient cooling in the air cooling station.
Homogenizing, sawing and packing of extrusion billets – for these processes Vedanta Aluminium in the state of Orissa, India, required new homogenizing and sawing lines. For homogenizing, continuous furnaces were selected. The new equipment was supplied by Hertwich Engineering, Austria.

The supply package of Hertwich Engineering comprised three continuous homogenizing lines, two ultrasonic inspection stations as well as two saws for long and short billets and packing equipment. All the roller tables, log handling equipment and the complete control and automation technology were supplied by Hertwich Engineering. Total design production is 384,000 tpy of round billets in the diameter range from 152 to 229 mm. The new lines are part of the second expansion stage of the aluminum smelter in Jharsuguda. Assembly was commenced in April 2010.

Hertwich Engineering, Austria, has been commissioned by Otto Fuchs KG, Germany, a globally operating group of companies with plants in Germany and locations in Europe and overseas, to supply two turnkey aluminum melting furnace installations in two-chamber design. Commissioning is scheduled for the end of 2010.

The two furnaces will designed for an annual production of approx. 50,000 t. The furnaces of the Ecomelt type will feature lowest possible metal loss; allow a particularly economic melting operation and will replace obsolete induction furnaces.

Weseralu GmbH & Co. KG in Minden, East Westphalia, Germany, has placed an order with Hertwich Engineering, Austria, for the supply of a circular saw for round aluminum billets. The scope of supply includes feed magazine, billet saw, length gage system, stacker and pin marking unit.

The plant is designed for the sawing of round billets in the diameter range from 145 to 254 mm and commissioning of the new facilities is scheduled in December 2010.
In times of high raw-material costs, the minimization of the material input is one of the most urgent challenges in the copper tube industry. In this context eccentricity is crucial, i.e. the deviation from a symmetrical tube cross-section. Those who can reduce it and maintain closer wall thickness tolerances save material and thus costs. With ProConTube, SMS Schumag has developed a new plant technology allowing a permanent measurement and correction of the tube eccentricity during the drawing process.

New plant technology for copper tubes
ProConTube: Eccentricity minimized – Costs reduced

Demand recognized. After mother tube manufacturing, continuous monitoring and correction of the tube eccentricity is not standard practice when copper tubes are produced. With ProConTube, SMS Schumag has now developed a new plant technique allowing the manufacturers to reduce the eccentricity of copper tubes during the drawing process. In this way, thin-walled and high-quality tubes can be produced. The manufacturer not only benefits from an optimized material input but also stands out from the competition.

Rapid and high-precision measuring and control technology. The core element of ProConTube is a special sensor unit integrated in the drawing ring which permanently determines the wall thickness distribution over the periphery of the passing tube. The data measured online are processed immediately by the control system. This means: a mechanical unit continuously regulates the incoming material in order to reduce the existing eccentricity.

Functional design. ProConTube is a fully automated independent machine unit which is used preferably in pre-drawing machines. It is set up directly before the drawing unit. Due to its compact design, retrofitting in existing drawing lines can be realized.

Measurable success. The use of ProConTube in front of a pre-drawing machine from Schumag leads to a reduced eccentricity by several percentage points. The initial prototype of ProConTube is already successfully in operation at Silmet S.p.A., Italy. “We can confirm the potential in terms of material savings and quality control,” says Pieralberto Ghidini, Managing Director at Silmet.
Ascometal, France, upgrades and expands its spring bar production at the plant in Le Cheylas. As a manufacturer of spring steel, Ascometal relies on the PM peeling technology (PM = Peeling Machine) for the expansion of spring steel production. Thanks to the high peeling speed of the new PM installation from SMS Schumag, production is increasing considerably.

Ascometal is a renowned producer of spring steels and has already many years of experience in the production and processing of these materials. Up to now, the company has chiefly used peeling machines of older construction types from Kieserling, now Schumag.

The core element of the new coil-to-bar line is the peeling machine of the PM series: for the first time, it is built for a speed which is nearly 25% higher than that of comparable machines. Consequently, it provides a considerable increase in production. In addition, SMS Schumag supplies a two-roll straightening machine as well as the complete finishing line.

Bhushan Power & Steel Company in Thelkoloi, India, relies on technology of SMS Schumag: for the new plant for the manufacture of cold-finished steel products in the state of Orissa, SMS Schumag supplies several drawing, grinding and peeling lines. The new equipment will go into operation at the end of 2011. A corresponding agreement was signed in August 2010.

Bhushan Power & Steel Company utilizes the new lines for the setup of its cold-finished-steel production. In an intensive selection procedure, the lines were particularly convincing thanks to their high degree of automation in various diameter ranges. The new drawing, grinding and peeling lines will process feedstock with diameters up to 90 mm to cold-finished material. The feedstock will be delivered from the rolling mill currently under construction.

With the new peeling machine of the PM series, Ascometal increases manufacture of cold-finished steel products considerably.

Sanjay Singal (fourth from left), owner of Bhushan Power & Steel, and his team of technicians after signing of the contract with SMS Schumag.
In spring 2012, ArcelorMittal Hochfeld GmbH with headquarters in Duisburg, Germany, will commence production of a complete new wire rod mill in Duisburg-Ruhrort enabling a wire rod production of 690,000 tpy with only one rolling strand. Tailored accordingly, the wire rod blocks in this high-performance production line are equipped with the individual drive technology (MEERdrive®) developed by SMS Meer.

New order from ArcelorMittal
MEERdrive® – more flexibility and less costs

Loup Cooling Conveyor (LCC®).
The new wire rod mill has been designed to roll technically demanding grades, which are therefore of extremely high quality, to the closest tolerances. This line is characterized by compactness and efficiency and achieves an annual capacity of 690,000 t.

**Furnace, roughing and intermediate train**

The walking-beam furnace for the heating of billets measuring 155 mm square will have an output rate of 120 t/h. This is followed by a four-stand roughing train comprising HL (HousingLess) stands with downstream free runout and an intermediate train consisting of 14 CL (CantiLever) stands, each in horizontal and vertical arrangement.

**Equalizing section in loop arrangement**

The core element of the mill begins with the cooling and equalizing section in loop arrangement. Owing to this arrangement, an optimal run-in temperature for each steel grade can be preset in front of the wire rod blocks.

**Wire rod blocks with innovative MEERdrive® technology**

The wire rod finishing block with six rolling units and the FRS® block with four units (Flexible Reduction and Sizing) – both in UHD (Ultra-Heavy Duty) arrangement – are provided with our innovative individual MEERdrive® technology offering numerous benefits. The most important ones are:

- Total flexibility in roll pass designing
- Essentially simplified rolling ring management
- Reduced operational costs

**Cooling lines for high-quality finished products**

With the water cooling lines downstream of the wire rod block and the FRS® block as well as the 104-m-long LCC® (Loop Cooling Conveyor) for intensive and retarded cooling, all the requirements for the production of high-quality finished products are fulfilled. Furthermore, the required cooling strategies based on the CCT® model (Controlled Cooling Technology) developed by SMS Meer can be simulated, and then adjusted and controlled online during operation. The entire coil handling equipment designed to be particularly protective to the finished material is also adapted to the high-quality finished products.
ArcelorMittal Hochfeld orders wire rod mill

Temperature-controlled maximum rolling speed of 120 m/s

These facilities allow wire rod to be produced over the full size range from 5.5 to 25.0 mm by means of temperature-controlled rolling and at a maximum rolling speed of 120 m/s for 5.5-mm wire rod. This enables ArcelorMittal Hochfeld to acquire a leading position as supplier of wire rod for the following fields of application: automotive manufacture, mechanical engineering, offshore technology, plants for renewable energies and connective elements.

Opportunities and benefits

- Rolled metallurgical properties such as conventionally annealed wire rod
- Wire rod with characteristics comparable with quenched and tempered steel, but with improved formability
- Scale which can be easily removed mechanically or chemically
- Closer tolerances of ¼ DIN
- Reduced spreading width of mechanical properties
- Coil weight up to 3 t

Horizontal coil compactor.
Stahlwerk Annahütte with new cut-to-length group

Faultless bars at any diameter

Stahlwerk Annahütte, Germany, the oldest existing steel plant in Europe, is pleased about a new versatile and needs-based cut-to-length group from SMS Meer fully meeting the demands of the manufacturer of high-quality steel bars.

Constant quality

The new cut-to-length group has been put into operation in the bar mill at the Hammerau site in Southern Germany.

Ralf Becker, Head of Hot Rolling Mill Division at Annahütte: “The shear works flawlessly and we have had good experiences working with bars with very different diameters cut.”

The cut-to-length group comprises a pinch roll unit and a combined drum-type/two-crank shear as well as a scrap deflector and is able to cut round bars with temperatures up to 1,000 °C. For threaded bars i.e. rebars with a ribbing designed as thread, the temperature is approx. 200 °C and the maximum tensile strength of the bars is 1,800 N/mm².

High requirements met

The shear operates optionally as crank shear or as rotary shear with knife arms and cuts round bars with diameters from 12 to 50 mm.

“The machines supplied by SMS Meer are highly versatile and exactly meet our high requirements which we are having as supplier of the automotive and tool manufacturing industry. These bar steels are suited for numerous applications and range from alloyed and non-alloyed steels for case-hardened steel grades up to and including steels for springs, chains and ball bearings. The range also includes Q & T, cold upsetting and cold working steels,” Ralf Becker stresses.
Southwest Siberian Metallurgical Plant Novokuznetsk, a company of the EVRAZ Group, modernizes its production facilities for heavy sections in the city of the same name. To achieve this, the plant operator has placed an order with SMS Meer, Germany, for the supply of a new universal mill for rails and other sections. To set up Russia’s most advanced rail and section mill, the production with the old equipment will only be stopped for four months. Thereafter, the steel company will be able to produce 100-m-long rails.

As the largest rail producer in Russia, the customer intends to manufacture the rails with state-of-the-art processes which meet all current needs. Therefore, rail rolling operation will be modernized with a comprehensive program. By using our new rolling methods and advanced mill stand concepts, the productivity, flexibility and availability of the plant will be increased. In addition to that, top-quality finished products can be produced.

**Altogether, 1.3 million t of sections per year.** The new mill with a total capacity of then 1.3 million t of sections per year is scheduled to go into production in October 2012. 950,000 t of the annual production are rails, including 400,000 t with a maximum length of 100 m. Such long rails can be used for high-speed rail tracks or, with hardened rail heads, also for high axle loads on heavy goods trains. In addition, the new mill produces beams, channels, rounds and sections.

**Latest CCS® technology in the rolling mill**

Upgrading is realized in several sub-projects. For the rolling area of the section mill, SMS Meer supplies the rolling technology, the complete mechanical and electrical equipment and the automation system. The latest CCS® stands will be used in the universal mill. This stand type is characterized by high rigidity, hydraulic roll gap adjustment and fully automated stand changing devices. With the tandem reversing rolling group, it is possible to produce not only rails but also beams and channels in the universal rolling process. This cost-efficient beam production is performed by means of our proven XH® reversing rolling method.
Extensive additional supplies. The key components of the mill also include manipulators, grip-type tilters upline and downline the tandem stand group, transport facilities and a hot saw. For the quality check, a laser profile gage (Propgauge) is employed for inline measurement of the finished profiles. The supply package from SMS Meer also includes the supervision of erection and commissioning, the training of customer’s personnel, and spare parts.

Novokuznetsk on the Tom River is a large Russian city in the Coal Basin of Kusbass in the Kemerowo Oblast in Southwest Siberia. The city has a population of about 560,000 (as of 2009) and is situated approx. 300 km south of the regional capital Kemerowo.
At Hmisho Trading Group, Syria, SMS Meer has modernized the existing rebar rolling mill. Our engineers employed the Ebros® system for the endless rolling of sections, leading to a significant increase of the overall annual production by 5%.

A further benefit of the new system is: less crop-end losses and a reduced number of short bars, whereby the metal yield is improved by 1.5%. Moreover, less labor is required since fewer cobbles means less transports of non-conforming products.

Technology from rail construction. SMS Meer has developed the Ebros® system under a license agreement with Steel Plantech, Japan. It is based on the welding technology employed in the construction of tracks for high-speed trains. The two companies have transferred this technology to steelworks construction: to weld together consecutive hot billets (1,100 °C) as they come out of the furnace.

Benefits of endless rolling. This process makes "endless rolling" of sections possible, whereby productivity and material yield are increased and a higher plant utilization factor is achieved. At the same time it ensures a constant product quality. In the Hmisho mill, billets of 130 mm x 130 mm square and 12 m length are welded and the billet throughput is 60 t per hour.

Market leader in Syria. The complete rebar rolling mill of Hmisho equipped with HSD® (High-Speed Delivery) system was supplied by SMS Meer in 2007. The annual capacity is 350,000 t and it is the fourth plant which has been supplied by SMS Meer to Syria.
Section steel producer Celsa, Barcelona, Spain, has signed a service agreement with SMS Meer ensuring reliable functionality of the “Technical Control System” (in short TCS) and offering optimal support during rolling. The TCS provides an exact roll position and, consequently, allows top product quality.

The aim: Error prevention. The modules of the service contract with SMS Meer have been customized in cooperation with Celsa. The main goal is to make sure that problems on the plant are prevented in the first place. Should a fault occur despite all the efforts to prevent this, it will be eliminated quickly and expertly in a very short time.

Fast fault diagnosis. Thanks to advanced technology – per email, phone and internet system (VPN) – you can look at the plant directly. A fault diagnostics can thus be generated rapidly by our experts. Regular checks, maintenance measures and local staff training are rounding off the range of services.

Annual system check. The second module includes the annual system check. For this purpose, a technician from SMS Meer is on site for at least three days, installs new computer systems and then informs customer’s staff on their handling. Moreover, he also provides training.

Other customers. Besides Celsa, other customers rely on our service for TCS equipment, including among others Gerdau Ameristeel and Steel Dynamics in the U.S.A. as well as Changzhi in China.

In future, the section mill of Celsa will be taken care of properly by SMS Meer.

The TCS system provides an exact roll position.
Every year 72,000 t less carbon dioxide (CO₂)

Tung Ho Steel, Taiwan: Minimill sets new standards for rebars

In mid-2010, Tung Ho Steel Enterprise Corporation, Taiwan, has successfully taken a minimill for rebars into operation which has been built by SMS Meer and SMS Concast. What is so special is that the new minimill in Taoyuan near Taipei can be operated without a conventional reheating furnace. Instead, an inductive heating plant from SMS Elotherm has been integrated.

Consequently, Tung Ho saves energy and the environment is less polluted, since 72,000 t less carbon dioxide (CO₂) are produced. And the operational costs are also substantially lower.

Minimal energy consumption. For the generation of energy, Taiwan depends almost 100 percent on oil and gas imported from abroad. The country generates high emissions of greenhouse gases, and as a result of this, the government is making efforts to reduce energy consumption and the emission rate. In response to these efforts, we have materialized an innovative approach for the new minimill of Tung Ho in order to reach a minimum energy consumption.

Reheating furnace dispensed with. The new plant optimally implements the basic minimill concept: short ways and a direct linkage of the rolling mill to the steel plant. The hot billets running out of the continuous caster (with a capacity of 40 to 45 t/h per strand) are immediately brought to a uniform temperature in the inductive heating plant. Then, the billets run directly into the rebar rolling mill. In this way, a gas- or oil-fired reheating furnace upstream of the rolling mill could be dispensed with. Under certain conditions, even an inductive heating is not required since the billets are shaped in such a way that they hardly lose any heat during the subsequent production process.
Good for the environment and for returns. Every year the steel plant with electric arc furnace, ladle furnace and a five-strand billet caster from SMS Concast is producing 1.2 million t of billets and the rebar mill from SMS Meer has a capacity of 800,000 tpy. Due to the innovative energy concept, Tung Ho Steel every year reduces the emission rate of carbon dioxide (CO₂) by 72,000 t, of sulfur dioxide (SO₂) by 410 t and of nitrogen (Nox) by 225 t. In addition to this, the investment costs for the inductive heating plant are approx. 25 to 30 % less than with conventional furnace concepts. At the same time, the operational costs for each t of rebars are reduced by approx. 25.00 US dollars.

Excellent references. Dr. Joachim Schönbeck, President and CEO of SMS Meer: “This mill shows yet again that our customers benefit from integrated all-inclusive solutions of the SMS group. Two plant manufacturers which are leaders in their respective fields, SMS Concast and SMS Meer, join together their innovative concepts within a seamless process chain. In doing so, they spare our business partners from time-consuming and costly interface problems – and thus allow the mill to be put into operation early.”

In the minimill segment, SMS is one of the worldwide leading plant manufacturers with references in the whole world. Currently, we are building large plants in Bahrain and Saudi Arabia.

The innovative energy concept with inductive heating reduces the carbon dioxide rate every year by 72,000 t.
The electric steelworks built by SMS Concast provides a 120-t electric arc furnace with dedusting system. The power consumption of the furnace is 120 MVA. To supply additional energy, we apply our Conso oxygen technology (oxygen/gas burner) which reduces power consumption and increases productivity at the same time. The tap-to-tap time is 43 min.

Downstream of this is a ladle furnace which is used for exact temperature setting providing liquid steel for secondary-metallurgical microalloying.
Five-strand billet caster

The casting machine has five strands with a casting radius of 10.25 m. An expansion to six strands has been considered in the layout. The range of dimensions comprises square billets in the formats of 130, 150, 160 and 200 mm. The special equipment includes among others the Invex® mold tube technology for high-speed casting and the hydraulic mold oscillation systems. The casting machine is able cast billets in various sizes in a parallel mode.

Rebar mill for bars with diameters from 10 to 43 mm

In front of the rebar mill the billets are heated to an uniform temperature by the inductive heating plant, if necessary. The downstream rolling mill includes 14 mill stands in horizontal/vertical and tiltable configuration. A compact design of the "HL" stands ensures that close tolerances of the finished products are maintained. Bars with small diameters are finish-rolled in two finish-rolling blocks with six rolling units in V arrangement.

Straight bars are transported with up to 40 m/s to the cooling bed by the H.S.D.® (High-Speed Delivery) system. Then they pass through the finishing facilities.
Easy and quick access

Electronic spare parts catalog: Now for free for every new plant

Easier, quicker, more exact: With the new electronic spare parts catalog from SMS Meer, the identification and procurement of spare parts has been optimized considerably and the catalog is included by SMS Meer as CD in the supply package of each new plant free of charge.

All relevant plant data provided in an individual, machine-specific spare parts catalog are available on a CD, based on the software platform Docware. And by linking of the construction parts lists with the drawings and the machine documentation an easy and quick access to all the required information for spare parts ordering is ensured. The complex plant information is structured and presented in a user-friendly manner. As a result, the required parts with technical specification can be easily and quickly identified.

**Integrated search function.** The spare parts can be selected via mouse click in the drawing or by means of the integrated search function. Ordering of the parts is realized via an integrated shopping cart function. Here, all orders are also displayed clearly and can be sent directly as electronic document via email or as fax after being printed out.

**The result:** The ordering process is shortened considerably, whereby queries, misinterpretations or even wrong deliveries are reduced. The spare parts catalog can be operated intuitively, is comfortable to use and can be utilized without specific IT knowledge.
Simplified maintenance and higher reliability

Extrusion press upgraded with new “butt knockers”

As of now, SMS Meer Service Inc., U.S.A., offers “butt knockers” of the latest series for extrusion presses which stand out due to easy assembly and which increase the reliability as well as the efficiency of the plants. In addition to that, the operating safety of the machine has greatly increased and the knockers are more easily to maintain.

After each press cycle, the knockers remove press residues automatically by means of a flipper finger mechanism. Compared to older models, the press residue is wiped off with much less impact.

Thanks to the knockers, the operating safety has increased enormously since jammed press residues must no longer be removed manually.

The new models are very easy to install, either as replacement for obsolete knockers or as screw-on extension device of the press-residue shear. Jim Gates, General Manager Service Extrusion Presses at SMS Meer Service Inc., assures: “Owing to only a few single parts and easy accessibility, the new “butt knockers” are easy to maintain. The rugged design secures a smooth production and increases productivity, thanks to less susceptibility to faults. Due to low investment costs, the knockers represent an economically advantageous solution in order to increase the production safety significantly.”

The new “butt knockers” are standard features of all new extrusion presses of SMS Meer, however, they can also be purchased as an optional upgrade for older machines. In the latter case, either as a replacement for the existing models or as an extension of the existing shear systems.

Experience and technical know-how

125th hydraulic check carried out

It was the 125th hydraulic check on an extrusion press which was performed by SMS Meer at F.W. Brökelmann Aluminium GmbH in Ense-Höingen near Soest, Germany. Hermann Schumacher, Group Leader in maintenance service at SMS Meer: “We are pleased that our customers around the world make intensive use of our servicing and repair measures in order to maintain their plants on the highest technical level.”

The reason for this is the high benefit for the plant operators. For a hydraulic check, the electrical, mechanical and hydraulic state of the plant is inspected in a very detailed way. Then, the results achieved are made available to the customer in the form of a comprehensive report. All times are recorded before and after the optimization and productivity comparisons are drawn. Finally, the customer is given suggestions for improvement for how he can further increase the productivity, reduce non-productive times and therefore make production as a whole more efficient.

The operators of extrusion presses value the experience of the service technicians of SMS Meer in the checking of presses gained in the course of many years. Because: Technical know-how is the foundation to achieve optimal results.
The world’s largest seamless tubes manufacturer Tenaris, Mexico, has put a new PQF® seamless tube mill into operation. The 7” plant was supplied by SMS Meer and was erected in Veracruz in the Tenaris Tamsa plant (Tubos de Acero de México, S.A.). Meanwhile, SMS Meer has sold 20 plants of this type worldwide.

PQF® stands for Premium Quality Finishing

The advantages are obvious: Customers benefit from material savings, better quality and less energy consumption.

“With the PQF® technology, we are able to set new standards in seamless tube manufacturing in the western world for the first time”, says Norbert Theelen, Head of Seamless Tube Plants Product Division.

Since the beginning of the contract up to the first tube, the construction of the new plant at Tenaris in Veracruz took only 23 months. The seamless tube mill has a capacity of 450,000 tpy and is mainly used for the production of OCTG tubes (Oil Country Tubular Goods) for diameters from 48.3 to 177.8 mm.

SMS Meer supplied the complete PQF® plant from billet preparation right through to interim tube storage. In addition to that, SMS Meer took over the project management and the training of the operating staff.

Conferences in Beijing and Chelyabinsk: PQF® technology in the focus

The participants of the international tube conference in Beijing and the “Tubes 2010” in Chelyabinsk, Russia, were able to get an exact picture of this innovative technology. In Beijing, Frank Salomon from SMS Meer, presented the innovative features. In the presence of 150 renowned guests from Chinese and international tube manufacturers, he illustrated how energy can be saved with this technology. At the conference “Tubes 2010”, Stephan Hüllstrunk, Sales Representative at SMS Meer, presented the integrated plant solutions from SMS Meer. Nearly 120 representatives, predominantly from Russian tube manufacturers, attended this event. Following the talks, the participants had the opportunity to visit the large-diameter pipe mill of SMS Meer at the Chelyabinsk tube mill.
SMS Meer has revised the design of its bar steadier system. The optimized control system decreases downtime and significantly reduces wear out of bars. It also reduces failures of bar steadier roller bearings. Using closed loop position control hydraulic cylinders, the bar can be adjusted and is held firmly while rolling, without subjecting it to extreme mechanical loads.

Holding the bar steady while piercing can improve the wall variation tolerance. But holding the bar too tightly can lead to other problems such as worn out bars and bar steadier roller bearing failures.

Therefore, SMS Meer has improved the design of its bar steadiers to provide firm control of the bar while keeping loads on the bar to a minimum. Downtime is also decreased by using a modular design philosophy where each bar steadier operates individually and is adjusted and synchronized electronically. There are no mechanical interconnections between the individual bar steadiers. This allows for rapid adjustment or replacement. SMS Meer Service Inc., USA can now design and deliver a bar steadier system uniquely tailored to any of its North American customers’ application.

George A. Boy, Sales Engineer of SMS Meer Service Inc. assures:

“By using current technology as well as the best practices developed during our 100 years of seamless pipe mill equipment supply, customers will significantly benefit from an improved piercing mill performance.”
Potentials of PQF® technology fully utilized
Service contract concluded with Tagmet, Russia

Tagmet, Taganrog, Russia, the manufacturer of seamless tubes, intends to organize the maintenance better, to raise the output and increase the efficiency of the plant. Within the scope of the service contract for the PQF® seamless tube rolling mill, SMS Meer now supported Tagmet to reach these goals.

Only recently, the PQF® seamless tube rolling mill from SMS Meer has been taken into operation by Tagmet. Professional support in dealing with the advanced technology is extremely important particularly in the starting phase – after all, the potential of the machinery shall be fully utilized as soon as possible. As soon as the plant is subjected to greater stress, the demands on maintenance and servicing are increasing i.e. when smooth running cannot be always ensured, unplanned downtimes may occur.

Individual maintenance and servicing plan. At first, the experts from SMS Meer inspect the state and the function of the machines and of other plant components. Then, they develop an individual maintenance and servicing plan with recommendations with a view to e.g. the number, the qualification and the organization of the maintenance staff. The plan includes also details on the storage of spare and wear parts and the demand for tools and equipment. Moreover, our specialists provide advice on maintenance work.

Benefit from experiences and latest technologies. The service technicians on site continually exchange information and data with the maintenance staff of Tagmet and the design engineers of SMS Meer in Mönchengladbach. On the basis of their experiences and the measured values gathered, they come up with concrete proposals as to how the plant can be optimized sustainably and effectively. “A close contact between the local service team and the design and service departments of SMS Meer in Germany guarantees Tagmet additionally that the latest technics and methods of maintenance are always applied,” says Clement Peters, Head of SMS Meer Service in Russia.

First PQF® plant in Russia. On Russian soil, Tagmet is the first ever plant operator using the advanced PQF® technology of SMS Meer for seamless-tube production. Founded in 1896, the company with its head office in Taganrog belongs to the TMK Group. In Russia, the Group is the largest and in the world the second largest company in tube production. The TMK Group produces mainly OCTG tubes (Oil Country Tubular Goods) for the extraction of oil and gas deposits.
In the summer of 2010, ChTPZ, Russia, has produced the first pipe in the new large-diameter-pipe production plant at the Chelyabinsk site. The Group plans to further expand its market share with high-quality pipes and believes in integrated solutions from SMS, not only for machines but also for maintenance. For this purpose, SMS Meer and SMS Siemag have jointly developed a comprehensive maintenance concept for the Russian company. The first of three steps has already been successfully implemented by the service team.

Three steps to success

Already before commissioning of the large-diameter-pipe production plant, SMS Meer and SMS Siemag have carried out a maintenance audit lasting several weeks. In the course of this, they have analyzed the existing processes and the staff’s know-how. On the basis of these data, the team has developed a three-step maintenance concept.

Step 1: Assessment of the professional and personal qualification of the staff.
Step 2: Introduction of a computer-based maintenance system.
Step 3: Technical assistance with trainings provided by experienced experts from SMS and support in establishing and maintaining the new processes.

Training needs assessed

The first step has been successfully completed: in a four-week test, SMS has intensively assessed the qualification of 35 maintenance managers and 16 workers. Process knowledge on maintenance, technical know-how on the plant installed and key qualifications (social, communicative and methodical competence, in short soft skills) of the staff members were at the focus. Thereafter, the qualifications identified were compared with the previously prepared requirements profile. The result: With its personnel, ChTPZ made a good decision. Training requirements still exist for the unique technical features of SMS Meer’s equipment and the advanced maintenance and improvement processes.

Steps 2 and 3 to follow. The insights gained from the audit are now applied in the next two steps of the maintenance concept: Within one year, seven experts from SMS will provide the necessary know-how by local trainings and will strongly support the setup of a maintenance system.
With 600,000 tpy, the most powerful plant in Russia
Putin inaugurates production line for large-diameter pipes

In the presence of Vladimir Putin, the metallurgical plant in Chelyabinsk, Russia, a member of the ChTPZ Group, has pushed the button for the start of the tube production in the new large-diameter-pipe plant in July 2010. At the festive opening ceremony, the Russian Prime Minister left digital tracks behind: he wrote his words of greeting to the company on a screen of the central control desk of the tube rolling mill. After this, on a guided tour, he assured himself of the high efficiency of the individual machines.

Large-diameter pipes for pipeline construction. The new plant produces large-diameter pipes with the JCOE® method. With an annual capacity of 600,000 t, it is the most powerful plant which ever has been built by SMS Meer in Russia. The new line produces longitudinally welded steel tubes with diameters from 508 to 1,422 mm and wall thicknesses up to 45 mm. The maximum tube length can be up to 18.3 m and the finished tubes are used for oil and gas pipelines.

Comprehensive delivery including level 2. SMS Meer supplied all key machinery for the new large-diameter-pipe plant. This included two JCO® pipe forming presses for 18.3-m- and 12.2-m-long tubes, a plate-edge miller, a plate-edge crimping press, two tack-welding machines, two mechanical expanders, a hydrostatic pipe tester, the facing and chamfering machines as well as the facilities for non-destructive testing. The level-2 automation system was also included in the supply package.

Low-cost flexible JCOE® method. In recent years, the JCOE® method with the JCO® pipe forming press as main forming unit has established itself on the market since it is very flexible and requires a smaller investment volume compared to the UOE method. With JCOE®, the previously edge-milled and edge-crimped plate is gradually formed to an open-seam tube in the pipe forming press. Then, the parallel longitudinal edges offer the best conditions for subsequent tube welding.

Competitive edge. With the new production line, the Chelyabinsk pipe mill is also well equipped for future market demands. The costs for the installation of pipes at a length of up to 18.3 m are low since the number of joint welds is smaller compared to shorter pipes. By use of the 12.2-m press, shorter pipes can be made extremely thick-walled, even with small diameter and are therefore best suited for offshore pipelines, where they have to withstand a higher pressure. As regards the quality, the tubes meet all common international standards.
In June 2010, Severstal TPZ Sheksna, Cherepovets, Russia, a subsidiary of Severstal, has successfully put on stream its new welded tube line, type RD-410. The advanced line opens up new market opportunities to the company.

"With an annual capacity of 300,000 t, the new plant is an important element in our strategy to develop high-quality products. Now we can use the rolled steel produced not only for export, but also for the Russian market," said Anatoly Kruchinin, CEO of Severstal Cherepovets, during the ceremonial commissioning in June. The welded tube line is the first production facility in the new plant.

Demand-oriented strategy. The new line produces predominantly structural tubes which are used e.g. as load-bearing elements for large buildings and stadiums. Michael Cottin, Vice President Welded Tube Plants at SMS Meer, underlines the importance of the new plant for the Russian market: "This line is a trendsetter and the demand for structural tubulars is enormous, the fields of application are very diverse which will lead to a lasting change in the Russian construction industry."

High production output of up to 45 m/min. The plant consists of the strip preparation, the spiral strip accumulator, the tube welding machine with straightedge forming section, the travelling cut-off unit and the transport facilities with automatic bundler. The mill stands are equipped with a quick-change system developed by SMS Meer. When pipe dimensions are changed, quick retrofitting is supported by the computer-aided CSS® Quicksetting system. Owing to this technology, rolls can be changed in a minimum of time when different pipe dimensions are needed. In combination with a high line speed of up to 45 m/min, the plant thus achieves a high production output.

Newly established Sheksna Industrial Park
In 2007, Severstal TPZ started the construction of the new plant in the Sheksna Industrial Park, about 50 km away from Cherepovets, Severstal’s headquarters (in English North Steel). The Northwestern Russian city of Cherepovets in the Vologda Oblast has a population of about 300,000 and is situated about 400 km north of Moscow and 450 km east of St. Petersburg.

Michael Cottin (right), Vice President Welded Tube Plants at SMS Meer, presents a certificate for the commissioning to Vitaly Shestakov, General Director of TPZ Sheksna Tube Plant.

Forming line and welding stand of the new welded pipe plant.
Tube manufacturers increasingly process orders with small lot sizes and changing pipe dimensions. Short resetting times are therefore crucial for the economic success. Online and offline quick roll change systems from SMS Meer fulfill these requirements.

With quick-change systems time and money saved

**Welded tube line at Atlas Tube, Canada:**
Roll change in just 55 minutes

**Horizontal quick-change systems for rolls at Atlas Tube**

A good example is the Canadian company Atlas Tube. On its 16"-ERW welded tube line the manufacturer uses its proven horizontal quick-change system for rolls from SMS Meer. For the plants with conventional concepts, companies have to consider a changing time from two to eight hours – Atlas Tube accomplishes the change to a new set of rolls for a modified pipe dimension from good tube to good tube in less than one hour.

**Record established for changing times**

This record is achieved by our efficient technology and the experience of our operating staff. As a result, Atlas Tube was able to minimize all working steps from stopping up to resuming of an ongoing production and to set a new record of 55 minutes for the changing times.
Within the Business Area SMS Meer, PWS GmbH, Germany, is responsible for special pipe machines and these plants are among the most modern in the world. For Shandong Shengli Steel Pipe Company, Rizhao City, Shandong Province, China, PWS will supply a two-stage spiral pipe forming and welding plant with particularly high energy efficiency. After completion of the plant in September 2011, Shandong Shengli will produce 240,000 t of spiral-welded pipes per year which are mainly used for natural gas and petroleum pipelines.

Pipes with diameters up to 64 inches from high-alloy steels. PWS supplies an integrated plant consisting of a spiral pipe forming and tack-welding machine for forming and pre-welding of hot-rolled steel strip and downline finish-welding stands. In the future, Shandong Shengli will thus be able to produce high-quality pipes with diameters of 24 to 64 inches from high-alloy steels.

Energy yield at record level. Thanks to the technology from PWS, the degree of energy yield during welding has reached a new record level. Michael Stark, Managing Director of PWS, explains: “We believe in welding current sources without transformers and an advanced process control by power electronics. In this way, we achieve efficiencies of more than 90 % resulting in an energy saving of more than 30 % compared to the older technology.”

Another benefit of modern technology: Shandong Shengli is able to increase the welding speed without compromising stability of the welding process. The pipes are used among others for the nearby Shengli oilfield, the second-largest petroleum basis in China.

**Energy yield of 90 %**

**Spiral pipe welding plant for Shandong Shengli**

Shengli Oil & Gas Pipe Holdings Limited is one of the largest petroleum and natural gas pipeline manufacturers in China. The company is one of the major producers of spiral submerged arc welded pipe for PetroChina Group and Sinopec Group. Shengli has been producing such pipes for 35 years. The production facilities are located in Zibo City, Dezhou City and Rizhao City in Shandong Province, China.
Bharat Heavy Electricals Limited (BHEL), India, has placed an order with SMS Meer to upgrade a 25-year-old push bench tube production plant. “We will retrofit the existing mill to an advanced and efficient CPE plant (Cross-roll Piercing and Elongating),” says Hubert Strank, Project Manager. Production start of the CPE plant is scheduled for the end of 2012.

To be able to benefit fully from the CPE technology, several changes are additionally planned:

- Extension of the reheating furnace
- Extension of the stretch-reducing mill
- Installation of a rotary saw downstream of the stretch-reducing mill
- A new rake-type cooling bed

Doubling annual capacity to 100,000 t

For high-quality power engineering plants such as boiler construction for power plants, BHEL is the market leader in India. Due to the economic growth, the energy demand in India increases rapidly. As a result, BHEL has strongly expanded its boiler construction capacities and therefore needs a corresponding number of high-quality boiler tubes. With the modernization of the seamless tube mill, BHEL is doubling the annual capacity to 100,000 t. At the same time, BHEL expands its product range.

Project Manager Hubert Strank highlights the quality:

“After the upgrade, BHEL is able to produce boiler tubes from high-alloyed materials such as 10CrMo910 or T91 which will raise the boiler efficiency. Consequently, there will be an increasing demand for the tubes. In addition to this, BHEL will be able to synchronize and manufacture all product developments in-house – from seamless tube to boiler.”
Benefits of new mill concept examined on reference plants in Germany

During a visit at SMS Meer, Mönchengladbach, Germany, delegates from BHEL were personally convinced of the benefits of this new plant concept. Sadagopan Karunakran, General Manager for modernizations, and Ranjan Sahi, Executive Director at BHEL, visited the production facilities in the Mönchengladbach workshop and also came to see two CPE reference plants. “We could convince ourselves how the new plant concept is functioning smoothly in practice and that the anticipated benefits are realized,” Sadagopan Karunakran said. “We are confident that, with SMS Meer, we have decided on the right business partner.”

Our scope of supply

Together with its foreign subsidiaries, SMS Meer India, Kolkata, and SMS Meer Engineering (China) Ltd., Shanghai, SMS Meer supplies the engineering and the mechanical key components. Moreover, we supervise the erection and commissioning in cooperation with the customer.
Concept of new CPE plant

After the revamp, the CPE plant will consist of the following key components: rotary-hearth furnace, new cross-roll piercer, push bench, mandrel reeler, extended reheating furnace, modernized stretch-reducing mill, new rotary saw and new cooling bed.

Since the maximum shell length increases from originally 12 to 16 m due to the modernization, the reheating and mandrel bar furnaces have to be extended accordingly. The driving power of the push bench is doubled by the installation of a second motor. The stretch-reducing mill is extended from 22 to 28 mill stands, while all stands are each provided with a single drive. Until now, there was one drive motor each for two stands. A rotary saw is installed downline of the stretch-reducing mill cutting the tube strand into single tube lengths synchronously with the high runout speed of the stretch-reducing mill.

Benefits of CPE technology

Together with the team from BHL, the experts from SMS Meer have worked hard on the modernization concept. By switching from a push bench plant to the modern CPE technology, BHEL will after all operate its plant with lower cost and less energy (see Figures).

As a globally leading plant manufacturer in the seamless-tube mill sector, SMS Meer offers the full range of plants including all machinery from a single source. With the CPE plants, a flexible and resources-saving solution is available to the plant operators, particularly for the production of smaller, thin-walled tubes when small lot sizes are concerned.
With CPE technology, the average material loss is 65% less compared with conventional technology. In addition, the weight of the input billets is increased so that less excess “ends” develop.

### Key technical comparison data

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<th><strong>Push bench plant</strong></th>
<th><strong>CPE plant</strong></th>
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<tr>
<td><strong>Input material</strong></td>
<td>183 mm x 183 mm and 223 mm x 223 mm square billets</td>
<td>200-mm-dia. round billets</td>
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<tr>
<td><strong>Shell length</strong></td>
<td>max. 12 m</td>
<td>max. 16 m</td>
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<tr>
<td><strong>Finished tubes</strong></td>
<td>- Diameter: 42.4 to 159 mm</td>
<td>26.7 to 159 mm</td>
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<tr>
<td></td>
<td>- Wall thickness: 3.2 to 12.5 mm</td>
<td>2.9 to 14.0 mm</td>
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<tr>
<td><strong>Annual capacity</strong></td>
<td>40,000 t</td>
<td>100,000 t</td>
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<tr>
<td><strong>Steel grade</strong></td>
<td>Carbon steels</td>
<td>Carbon steels, low-alloyed steels and high-alloyed steels</td>
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</table>
EBS de Tubos Acero Sin Costura orders five finishing lines

CVG International Filial Europea S.L. and Empresa Básica Socialista de Tubos Acero Sin Costura C.A., both from Venezuela, have commissioned SMS Meer and SMS Innse, Italy, to supply finishing lines for seamless steel tubes with diameters up to 13 3/8 inches.

The new lines will refine the hot-rolled seamless tubes to high-quality OCTG tubes (Oil Country Tubular Goods) which are required in a growing market for the extraction of oil and gas deposits, particularly in the newly explored territories near the South American coast. The annual capacity will be around 200,000 t and production is scheduled to start after only 24 months.

From upsetting and threading to hardening and tempering

The entire finishing facilities comprise five lines: heat-treatment line, tubing line, casing line, coupling line and upsetting line. In these five lines, the tubes and the tube ends can be adjusted and finished in many different ways. The range reaches from upsetting and threading up to hardening and tempering by means of heat treatment. Before dispatch, the tubes are subjected to strictest ultrasonic and hydrostatic testing. Furthermore, pipe couplings are manufactured in a specific coupling line. Thereafter, first-class tubes meeting highest quality criteria are ready for dispatch.

Scope of supply

The supply package of SMS Innse includes the engineering, the supply of the machines, supervision of erection and commissioning. For the new finishing lines, the adoption of customer’s existing equipment has been considered which will be adapted to the requirements of the new plant layout.

Good cooperation

In this project, SMS Innse closely cooperates with SMS Meer, Germany, and SMS Meer S.p.A., Italy. In the course of this, SMS Meer supplies the hot straightener, the threading machine, the pipe testing facilities and the upsetting machine. For heat treatment, SMS Meer S.p.A. provides the furnaces and the quenching and cooling equipment.

For 200,000 t of seamless tubes up to 13 3/8”

New order

Production line | Tube diameters
--- | ---
Heat-treatment line | 2 3/4" to 13 3/4"
Tubing line | 2 3/4" to 7"
Casing line | 4 1/2" to 13 3/4"
Coupling line | 2 3/4" to 13 3/4"
Upsetting line | 2 3/4" to 4 1/2"

SMS Innse, an Italian subsidiary of the SMS group, closely cooperates with SMS Meer in the seamless tubes sector.
Since the middle of 2010, a ring rolling plant is in operation in Hofors, Sweden, providing workpiece handling with the largest industrial robots in the world. Ovako Tube & Ring AB operates it and SMS Meer has supplied it.

World’s largest industrial robots in operation
Ovako Tube & Ring, Sweden, starts up ring rolling plant

Opening ceremony

The production start of the new plant has been celebrated by Ovako in summer 2010: Rickard Qvarfort, President of Tube and Ring Division of Ovako, and Barbro Holmberg, Governor of Gävleborg County, officially inaugurated the modern plant. “Planning, supply and assembly have taken just under three years – the start of production worked smoothly,” explains Robert Düser from the responsible Wagner Banning Ring Rolling Division of SMS Meer.

Largest robot on the market

Basically, the plant is operated fully automatic and consists of a ring blank press with three fixed workstations and a radial-axial ring rolling machine. What makes the plant so special is that the workpiece transfer within the press and between the forming units is handled with industrial robots. “We operate the largest robots currently available on the market. The robots have been equipped with special gripping pliers,” Robert Düser explains.

Rings with diameters up to 1,200 mm and a weight of 250 kg

The production line is able to produce both profiled rings and rings with rectangular cross-section. The external diameter ranges are between 200 and 1,200 mm with a maximum ring height of 350 mm and the weight may vary between 50 and 250 kg. The products are applied in the automobile and mechanical engineering industry.

Ring rolling machine No. 5 soon to follow

“Ring Mill No. 10”, this is how Ovako calls its new plant. It is the fourth ring rolling machine from SMS Meer in Hofors. The planned annual tonnage of all four production lines is 55,000 t. A fifth ring rolling machine, already ordered by Ovako, is scheduled for delivery in mid-2012.

The new production line of type RiWa 2000/80, is already the fourth plant which has been supplied to Ovako by SMS Meer.
Taiyuan Heavy Industry has ordered a high-performance rolling line for the production of railroad wheels from SMS Meer. The company plans to particularly supply Chinese manufacturers of the new high-speed trains, similar to the German ICE or the French TGV. All in all, Taiyuan Heavy Industry intends to produce 250,000 high-quality wheels in the future every year.

**Line layout.** The wheel rolling line mainly comprises two wheel blank presses with 100 and 50 MN press force, a wheel rolling machine for wheel diameters up to 1,250 mm as well as a piercing and dishing press with 50 MN press force. A 3D laser scanner monitors the quality achieved for each wheel and a respective robot is used for stamping. The entire process is coordinated from a central control room. A parts tracking system continuously documents every wheel produced.

**A know-how-driven choice.** From the initial inquiry to the completed contract, it took only six months – a very short time for such a complex project. In an international call for tender, SMS Meer won the contract against renowned competitors.

“The decision has been made in our favor since we have a competitive edge in know-how and have accumulated many years of experience,” Martin J. Kunz, Head of Product Division, says.

With a new wheel rolling line from SMS Meer, Taiyuan Heavy Industry plans to produce 250,000 wheels in the future every year. The photo shows a similar plant from SMS Meer at Lucchini RS, Italy.
New coupling and a new lubrication system

Schöneweiss modernizes 4,000-t eccentric press

Schöneweiss & Co. GmbH, Hagen, Germany, has commissioned SMS Meer to upgrade a closed-die forging press of type VEPES, with a press force of 4,000 t. Among others, the eccentric press will be equipped with a new coupling and a new lubrication system. The benefit for the customer: after the completion of the modernization work in mid-2011, the press will be as efficient as a new facility.

Preliminary examination of the parts in two steps. Our order covers the overhaul of all main assemblies and their repairs. Following an initial examination, the parts will be inspected for their reusability to make sure that valuable time and costs are saved. After dimensional, crack and wear inspection, retrofitting can start immediately. For example, the gearwheel bearing will be newly refurbished and the brake converted to a water-cooled shoe brake, whereby the press is easier to maintain.

Renowned automobile supplier. The automobile systems manufacturer Schöneweiss manufactures closed-die forgings from all current steel grades. The company produces chassis parts, steering elements and engine parts for commercial vehicles, and drive train components for passenger cars. The forging capacity is about 40,000 t per year. As a strategic partner of the car industry, Schöneweiss continually invests in optimizations and modernizations of the manufacturing plants.
SMS Meer has invested 22 million EUR in a new production site in Shanghai. The site, SMS Meer Engineering China Ltd., was officially opened on October 28, at a ceremony attended by 250 guests. SMS Meer, one of the two Business Areas of the SMS group, is the global market leader in plant and machine building for tubes, long products, forging, copper and aluminum production, and heating technologies. The Shanghai site will manufacture complete machines for the Chinese market and equipment components for customers around the world. Engineering and design operations will continue to be based in Europe.

At the opening ceremony, Dr. Joachim Schönbeck emphasized the advantages of the new site: “Our delivery speed will significantly improve. Local services are provided by our Chinese staff members and we are now able to offer more competitive solutions also for local projects.” In his acceptance speech, Dr. Schönbeck stressed the technical milestones which could be attained by SMS Meer in the past in close cooperation with Chinese customers. In the course of this, trend-setting plants have been developed offering the best possible combination of performance and efficiency. After the symbolic opening, the guests started with a tour of the production site.

Almost 250 guests at the opening ceremony of the new site in Shanghai.
Presently, SMS Meer Engineering China Ltd. employs 250 people and in the future machines will be produced in China for the Chinese market and equipment components for customers worldwide. “We thus secure our knowledge and are now able to provide accustomed SMS Meer quality to our customers at the same time.” From the Business Area SMS Meer, the Chinese staff members of SMS Elotherm and Schumag who had been working before at other locations in China are also resident at the new site in the Minhang District in the southwest of Shanghai.

**Direct access to all service features**
The new site provides a direct access to all services from SMS Meer to the Chinese customers – from erection and commissioning via maintenance management to the modernization of the plants. Friedhelm Bitter, Head of Service at SMS Meer: “The contact with the customers is now fully realized in Chinese and our personnel closely cooperate with our staff in Europe. In this way, our customers are able to rely on combined knowledge and quick local support from China.”

**Almost 120 interested people at the symposium “Long-product mills”**
After the opening ceremony, we held a symposium for the operators of long-product mills. Here, new developments and extended service offers of SMS Meer for wire rod and section mills were at the focus. Approx. 120 participants meant a new record for the series of events which had “moved on” from Mönchengladbach via India and Brazil to China. “We have thus reached our goal to present our new developments and the large service portfolio of SMS Meer in the long-products sector to our worldwide customers,” says Ulrich Svejkovsky, Head of Product Division. In addition to the latest innovations for section mills, the participants had the opportunity to convince themselves of the high service quality of SMS Meer in China. A continuation of the symposium series is scheduled for 2011.

SMS Meer has been active in China since the 1960s, and its plants and machines have been used for various large infrastructure projects, to make products including tubes, structural steel, railroad tracks, railway wheels and power plant components. The SMS group has had a presence in China since 1904.
Aluminium 2010 Essen: 8th World Trade Fair and Congress

The Aluminium trade fair is the world’s leading platform for the aluminum industry and its key fields of application. The trade fair joins producers, processors and technology suppliers along with consumers.

“Production increase as never before”

In his welcoming speech at the start of this year’s trade fair, Christian Wellner, Managing Director of the GDA (Gesamtverband der Aluminiumindustrie – Association of the Aluminum Producing and Processing Industry in Germany), alluded to the enormous growth in the aluminum industry. “In the first half of 2010 alone, the production of rolled and extruded products rose by a whopping 30% on the prior-year period, to around 1.2 million t – growth as we have never seen before.” Dieter Rosenthal, Member of the Managing Board of SMS Siemag AG, also pointed to the positive trend at the opening press conference. “The forecasts leave us optimistic. The worldwide use of aluminum will keep on rising steadily over the next few years. As a plant builder, we continue to have excellent market opportunities with our innovative equipment & technologies ensuring superior quality for our customers along with high availability and excellent profitability.”

Exhibitor and visitor numbers steady at high level

This positive environment was also reflected in the exhibitor and visitor numbers. With a total of 873 exhibiting companies from 47 nations, participation was up again by a small margin on the previous record in 2008. At 17,200, the total visitor number at the trade fair also climbed to an equally high level as the previous all-time best in 2008 (16,886). The number of foreign visitors, on the other hand, improved quite notably, up by almost ten per cent to reach the 50 per cent mark for the first time.
Positive result for SMS companies

The companies of the SMS group operating in the aluminum sector presented themselves at an attractive and comfortable two-story trade fair stand in hall 3.

Michael Schäfer, Vice President Aluminum Rolling Mills at SMS Siemag, gives a resumé: “We are highly satisfied with the 2010 Aluminium. Our numerous visitors turned our stand into a central meeting place. We were able in intensive talks to discern a continued enormous demand for our products, consolidate a number of ongoing projects and even kick off some new ones.”

Next event in Düsseldorf in 2012

The Aluminium will relocate from the Ruhr to the Rhine. Due to the steady increase in exhibition space required, the trade fair will move from Essen to the larger exhibition grounds in Düsseldorf on the Rhine. The next event will be held from October 9 to 11, 2012. Over 90 % of the exhibition space occupied in 2010 has already been booked.
Buenos Aires, Argentina: October 24 thru 26

**ILAFA 51 and ILAFA Expo 2010**

*New contacts made, existing relations intensified*

The Latin American Iron and Steel Institute ILAFA (Instituto Latinoamericano del Fierro y el Acero) is the organizer of an event which takes place every year in a different country. In October 2010, steel makers from the region and from around the world flocked to Buenos Aires, the venue of the 51st Congress & Exhibition.

Just before the Congress & Exhibition, a number of technology committees came together. SMS Siemag was represented by Dr. Jens Kempken, Executive Vice President Project Development, SMS Siemag AG, who held a talk on “Maximum success by minimill solutions”. Plus, the SMS group also participated in the associated exhibition, the ILAFA Expo 2010. At our stand, the representatives of the SMS companies made numerous new contacts and had lots of interesting conversations.

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Moscow, Russia: November 9 thru 12

**16th International Metal-Expo 2010**

*Symposium on type SMX radial forging machine successful*

From November 9 to 12, 2010, Moscow hosted the largest metallurgical forum of Russia and the CIS states. The central part of the event was the 16th international industry trade show Metal-Expo 2010 which showcased the entire spectrum of new plants, process technologies and products of the metallurgical and metal industry. The Metal-Expo has been considered a top platform for producers and consumers of metals from the CIS states and Eastern Europe for 16 years.

The companies of the SMS group took part with a joint stand where our representatives had many interesting talks. In addition, a symposium held by SMS Meer on November 11 revolved around the type SMX radial forging machine and attracted over 30 participants. Dr. Paul Nieschwitz of SMS Meer presented information on the special requirements and benefits of radial and tube forging based on several reference plants.
Düsseldorf, Germany: November 11 thru 12  
**Annual meeting**  
**STAHL 2010**  

150th anniversary of the Steel Institute VDEh

This year’s international annual meeting – STAHL 2010 – was devoted to the 150th anniversary of the Steel Institute VDEh and therefore took place under the motto “Progress is tradition”. The SMS group was represented at the accompanying poster show with its own stand which was the central contact point for meetings or conversations.

The talks presented on November 11 examined the latest developments and future prospects in the areas of metallurgy, forming techniques and plant technology, and looked at the potentials of the material steel in material and energy efficiency. The meeting on November 12 revolved around the question what the steel industry in Germany and Europe must do to defend and expand its position as the engine for innovations in the making and application of steel.

Baghdad, Iraq: November 1 thru 10  
**Baghdad International Fair 2010**  

**Talks with important ministries**

The motto of the Baghdad international fair was “The world’s opportunity for trading & investment in Iraq”. Against the background of the rebuilding of the country’s infrastructure and industry as well as the growing private consumption, international companies were given a platform to get into contact with decision-makers in Iraq and to establish business relations.

German companies are enjoying a good reputation and are welcome as business partners because their products, technical solutions and services are highly appreciated. In the German Pavilion, a total of 16 German enterprises presented their portfolios, among them the SMS group. In addition to the contacts made at the fair, the representatives of the German enterprises, as members of an official delegation of the Federal Ministry of Economics and Technology, had the chance to take part in discussions with ministries, state-owned companies and private enterprises in Baghdad.
Sometimes, it matters less how many come, but who. Under this aspect, the Wire & Tube in Shanghai was a great success for the Business Area SMS Meer.

**Shanghai, China: September 21 thru 24**

**Wire China/Tube China 2010**

**Quality over quantity**

“We had less customers visit our stand than expected,” says Heinz Zacharia, SMS Meer. “But those who came were highly interested, took their time and kicked off a number of exciting projects which we believe to be very promising.”

**Much time for talks**

Despite the public holiday, key customers from major companies still made a point of visiting the SMS stand – in their free time. “Normally, our customers have very little time when they turn up at our stand,” says Frank Salomon, China expert of the Seamless Tubes Product Area. “This time, it was different. Some of our business partners even flew to Shanghai at their own expense on their days off just to see us and discuss technical innovations.”

**New production site in Shanghai promoted**

The relevant parties responsible at SMS Meer also used the event to promote the opening of the new production site in Shanghai. “German technology, now made in China,” was the motto of a large graphic wall which could be seen even from afar in the largest trade fair hall.
The four international technology trade fairs Gifa, Metec, Thermprocess and Newcast will run from June 28 to July 2, 2011, under the motto “The Bright World of Metals”. The four fairs and their accompanying seminars will focus on the issue of energy and resource efficiency.

**Visit us**
The SMS group also has a lot to offer on this subject, and naturally on every other issue related to the world of metals. This will be demonstrated this year by a joint presentation put on by the companies of the SMS group at a large stand measuring some 2,000 m² with its own auditorium, a lounge and spacious seminar rooms. You will find us in hall 5. Please do come and see us.

**Come to our technology seminars**
The SMS group will again present its products and services in the form of a technology seminar directly at its own stand. A detailed program will be published shortly. Attendance is free, but places are limited. As our seminars are known to attract keen interest, we recommend that you book early.

**SMS also involved in InSteelCon and EMC**
The SMS companies will also take part in the accompanying congresses “InSteelCon 2011” and “EMC European Metallurgical Conference” where our representatives will present a series of talks.
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