FIGURES
of the SMS group

Order intake by Business Areas in million EUR

- Total
- SMS Siemag
- SMS Meer
- Industrial participations
- Other

<table>
<thead>
<tr>
<th>Year</th>
<th>Total</th>
<th>SMS Siemag</th>
<th>SMS Meer</th>
<th>Industrial participations</th>
<th>Other</th>
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</thead>
<tbody>
<tr>
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<td>3,235</td>
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<tr>
<td>2011</td>
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<td>2,007</td>
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</table>

Sales

- Total
- SMS Siemag
- SMS Meer
- Industrial participations
- Other

<table>
<thead>
<tr>
<th>Year</th>
<th>Sales</th>
<th>SMS Siemag</th>
<th>SMS Meer</th>
<th>Industrial participations</th>
<th>Other</th>
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<tbody>
<tr>
<td>2006</td>
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<td>4,994</td>
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<tr>
<td>2007</td>
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<td>–</td>
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<td>2008</td>
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<td>–</td>
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<td>2009</td>
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<tr>
<td>2011</td>
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<td>3,205</td>
<td>390&lt;sup&gt;1)&lt;/sup&gt;</td>
<td>54</td>
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</tbody>
</table>

Order backlog

- Total
- SMS Siemag
- SMS Meer
- Industrial participations
- Other

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<thead>
<tr>
<th>Year</th>
<th>Order backlog</th>
<th>SMS Siemag</th>
<th>SMS Meer</th>
<th>Industrial participations</th>
<th>Other</th>
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</thead>
<tbody>
<tr>
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<tr>
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<td>3,205</td>
<td>390&lt;sup&gt;1)&lt;/sup&gt;</td>
<td>54</td>
</tr>
</tbody>
</table>

Employees<sup>2)</sup>

- Total
- SMS Siemag
- SMS Meer
- Industrial participations
- Other

<table>
<thead>
<tr>
<th>Year</th>
<th>Employees</th>
<th>SMS Siemag</th>
<th>SMS Meer</th>
<th>Industrial participations</th>
<th>Other</th>
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<tbody>
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<td>2006</td>
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<td>3,205</td>
<td>390&lt;sup&gt;1)&lt;/sup&gt;</td>
<td>54</td>
</tr>
</tbody>
</table>

Figures in accordance with International Financial Reporting Standards (IFRS)
<sup>1)</sup>Including other/consolidation
<sup>2)</sup>Year average with apprentices
<sup>3)</sup>Pro rata consolidation of elexis as of August 2011 (Employees on the reporting date of 12.31.2011: 943)
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<tr>
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<td>40</td>
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<tr>
<td>Strip Processing Lines</td>
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<td>Furnace Technology</td>
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### BUSINESS AREA SMS MEER

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<td>Nonferrous Metals Plants</td>
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<td>Heat Treatment Technology</td>
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<td>Service</td>
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<td>Technological Development</td>
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### SMS GROUP

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<td>Employees</td>
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### CONSOLIDATED FINANCIAL STATEMENTS

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<td>Addresses, Products, and Services Business Area SMS Siemag</td>
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<td>Addresses, Products, and Services Business Area SMS Meer</td>
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<tr>
<td>Addresses, Products, and Services Industrial Participations</td>
<td>135</td>
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The global economy showed further strong growth in the first half of 2011. However, from the summer onwards the consequences of the debt crisis put increasing strain on the real economy.

Gross domestic product only increased by 1.5% in Europe in 2011. With growth of 3%, the German economy outperformed the euro zone as a whole. The principal reasons for this were continuing strong exports and increased domestic demand. However, in the fourth quarter total production decreased by 0.2% in Germany as well.

The main drivers for declining global growth (GDP +2.8%; 2010: +4%) were once again the emerging countries with average growth of 6%.

At the year-end, the ECB clearly released the tension in the liquidity situation on the banking market with the medium-term refinancing option for European banks with a volume of almost EUR 500 billion. This put a stop to rising capital market interest rates in the peripheral countries and, although an unconventional measure, helped to stabilize the capital markets to a certain degree.

Global crude steel production increased sharply by 6.8% reaching a new high of 1.53 billion t.

Steel production rose steadily in the first half of 2011. Global production decreased thereafter due to growing economic uncertainty. Overcapacity in Europe and the USA resulted in some facilities being shut down. In addition, steel producers are facing considerable pressure on prices due to rising costs of raw materials over recent years.

Global production of primary aluminum, at 43.4 million t, is up 7% on the previous year. With a share of more than 40%, China is the leader in this area as well. Global production capacity for primary aluminum is expected to increase by approximately 10% by 2014. This emphasizes the increasing importance of aluminum as a material.
The market for metallurgical plant and rolling mill technology recovered further in 2011. Primary markets are China, India, and Southeast Asia. There is increased demand for plants for the aluminum industry in China.

Business with new plants continues to be slow in the industrialized countries. The technological trend towards higher grades of steel has boosted the revamp business.

There is increased demand for innovative products in the field of environmental technology and energy-efficiency solutions.

The development of the global economy will primarily depend on whether, and how quickly, a solution can be found to the sovereign debt crisis in Europe and the USA. Approval of the new EU fiscal pact is a first step. Implementation of and adherence to the pact may prove a decisive move towards greater credibility. If this does not work then another setback cannot be ruled out.

According to current estimates, 2.6 % growth is expected for the global economy in 2012, which would only be just below the figure for 2011. Under normal conditions, growth drivers will once again be China, India, South America and the Middle East.

China, India, and Latin America will also be the primary markets for suppliers to the metallurgical plant and rolling-mill industry. The business with new plants in China, as the leading steel market in the world, will gradually slow down. More stringent demands in terms of qualities and steel grades will increase the pressure on older plants in North America, Europe, and China to modernize.
FORECAST

Despite widespread restraint in the placing of large-scale contracts, we anticipate – in a period of lively project activity – an order intake at the same level as the 2011 business year.

In the context of a high order intake and looking at sales and profit for the next two years, we envisage levels roughly the same as in 2011. Our strategic focus is on a steady expansion of our services business as well as energy and green technology. Development of the services business will lead to a moderate increase in employee numbers.

ORDER INTAKE

Order intake increased by 17 % (EUR 492 million) compared with the previous year to EUR 3,423 million in 2011. With effect from the date of initial consolidation in August 2011, elexis AG contributed EUR 67 million to the order intake for the SMS group.

This is how order intake broke down according to global regions:

- Europe including Russia: 28 %
- Asia: 57 %
- America: 14 %
- Africa: 1 %

SALES

Sales in the SMS group amounted to EUR 3,070 million in 2011, the same level as in 2010 (EUR 3,036 million).

In the Business Area SMS Siemag, sales decreased by 14 % or EUR 287 million to EUR 1,817 million. The Business Area SMS Meer increased sales by 24 % to EUR 1,197 million (2010: EUR 962 million).

ORDER BACKLOG

Order backlog increased by EUR 402 million to EUR 4,862 million. Due to the long processing time, this represents a good basis for further capacity utilization.

EMPLOYEES

The average number of employees\(^1\) in 2011 was approximately 10,477 (previous year: 9,209). The increase was primarily the result of initial consolidations as well as our expansion of personnel in the growth markets China and India. In addition to the increase in the two business areas, the number of employees increased due to the consolidation of the elexis group.

Due to the further increase in order intake, all business areas were working at full capacity in the prior year. The continuing high order backlog ensures our design and manufacturing capacities will be fully utilized through to the second half of 2012.

The number of employees in Business Area SMS Siemag increased against the previous year by 276, reaching an average over 2011 of 6,828 (2010: 6,552). That breaks down into 4,082 employees in Germany and 2,746 abroad. Two Russian service providers (SMS Siemag Services LLC and SMS Siemag Metallurgical Services Magnitogorsk LLC), SMS Siemag Strip Processing Lines Shanghai Ltd. in China, and Metix (Pty) Ltd. in South Africa were consolidated for the first time. The personnel was expanded at the site in India.

\(^1\) Year average with apprentices
In the Business Area SMS Meer, the average number of employees in 2011 was around 3,205 (2010: 2,599). In China, the number of employees increased further on account of the new workshop in Shanghai. In total, we now have 2,043 employees in Germany and 1,162 abroad.

**FINANCIAL RESULTS**

The SMS group closed the 2011 business year with net profit at EUR 265 million just slightly above the level of the previous year (EUR 262 million). The profit on sales remained at the previous year's level of 8.6 %.

The equity ratio increased in 2011 to 17.5 %. This was primarily due to high profit retention.

**LIQUID ASSETS**

Securities and liquid assets were almost unchanged at EUR 2,571 million (previous year: EUR 2,583 million). The inflow of funds from business operations totaled EUR 314 million. That was accompanied by an outflow of funds from investing activities to the amount of EUR 265 million and from financing activities to the amount of EUR 9 million and exchange-rate- and consolidation-related changes to the amount of EUR 52 million. All this results in net liquidity after deduction of financial liabilities of EUR 2,466 million (2010: EUR 2,504 million).

**INVESTMENT**

Investments in property, plant, and equipment and intangible assets in the 2011 business year came to EUR 84 million (2010: EUR 85 million). There was a focus in Business Area SMS Siemag – as in 2010 – on investment in buildings and machinery to upgrade our facilities in Hilchenbach and to further expand our manufacturing and service facilities in China, India, Brazil, and the USA. The Business Area SMS Siemag is building a new assembly and manufacturing site in Zhangjiagang, China. This site is planned to start operations in mid-2012. The Business Area SMS Meer invested in the project Production 2020 in Mönchengladbach and in the development of a workshop in India.

Equally significant was spending on improving IT and introducing new software in both business areas in order to increase the efficiency and cost-effectiveness of business processes.

For 2012, total investments of EUR 128 million are planned. A large portion of this sum relates to buildings and machinery as part of the Workshop Concept 2020 in Mönchengladbach and the development of service facilities.

Financial investments in the 2011 business year totaled EUR 192 million (previous year: EUR 13 million). These related primarily to the acquisition of shares in elexis AG, Germany (share as at December 31, 2011: 90.9 %) and in Metix (Pty) Ltd., South Africa (share as at December 31, 2011: 70 %).
## STRUCTURE OF THE SMS GROUP

<table>
<thead>
<tr>
<th>METALLURGICAL PLANTS</th>
<th>CONTINUOUS CASTERS</th>
<th>HOT ROLLING MILLS</th>
<th>COLD ROLLING MILLS</th>
<th>ALUMINUM PLANTS</th>
<th>STRIP PROCESSING LINES</th>
<th>FURNACE TECHNOLOGY</th>
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<tbody>
<tr>
<td>• Reduction metallurgy</td>
<td>• Continuous casting technology for slabs</td>
<td>• Hot strip rolling mills</td>
<td>• Tandem cold rolling mills</td>
<td>• Hot rolling mills</td>
<td>• Pickling lines</td>
<td>• Furnaces and cooling systems</td>
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<tr>
<td>• Converters</td>
<td>• CSP® technology</td>
<td>• Steckel rolling mills</td>
<td>• Reversing rolling mills</td>
<td>• Tandem cold rolling mills</td>
<td>• Hot-dip galvanizing lines</td>
<td>for heat treatment of flat steel</td>
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<td>• Filter and environment protection plants</td>
<td>• Heavy plate mills</td>
<td>• Individual stands</td>
<td>• Individual stands</td>
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<td>• Filter and environment protection plants</td>
<td>• Skin-pass mills</td>
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<td>• Thin strip stands</td>
<td>• Coating lines</td>
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<td>• Multi-roll mills</td>
<td>• Annealing lines</td>
<td>• Annealing lines</td>
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<td>• Regeneration, filter and</td>
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### ELECTRICS AND AUTOMATION

- Control technology
- Quality assurance systems
- Drive technology
The SMS group is, under the roof of SMS Holding GmbH, a group of global players in plant construction and mechanical engineering for the steel and nonferrous metals processing industry. It consists of the Business Areas SMS Siemag, SMS Meer, and the industrial participations. As the financial organization, SMS Holding GmbH is responsible for strategic planning and controlling. The sole owner of the SMS group is Siemag Weiss GmbH & Co. KG, the holding of the Weiss entrepreneurial family.
Business Area SMS Siemag was able to increase its order intake over the past business year by 16% to EUR 2,007 million. Sales were slightly below the previous year’s level, however the market for metallurgical plants and rolling mill technology recovered in 2011. The main markets are China, India, and Southeast Asia. There is a stronger demand for aluminum processing plants in China. The technological trend toward higher steel qualities continued to drive modernization business. However, continuing uncertainty in the global economy means that our customers are delaying investments or shelving them altogether. Ever-tougher competition and price pressure characterize the bidding for projects on the market.

There is an increasing demand for our innovative environment protection products and solutions for improved energy efficiency. At the same time, we were able to expand our global service business and our electrics and automation range. To expand our competence in the heat treatment of flat products, we created a new Furnace Technology Division at the beginning of 2011 that includes our subsidiaries Drever International in Belgium and Ares in China. Rounding off our range in this field, we acquired the know-how of aerodynamic and thermal dynamic process technology company GATV in June 2011.

Committed to responding even more flexibly and directly to the specific requirements of our customers and to expanding our product expertise, we restructured our Divisions as follows:

- Metallurgical Plants
- Continuous Casters for Flat Products
- Hot Rolling Mills
- Cold Rolling Mills
- Aluminum Plants

- Strip Processing Lines
- Furnace Technology
- Electrics and Automation
- Service
To secure our competitiveness, we continued to cut our overheads. Simultaneously, we further reduced manufacturing costs by promoting production-optimized design, efficiency in logistics, and increased productivity in engineering and production.

In recent years, SMS Siemag also invested heavily in the expansion and modernization of our Hilchenbach production location in Germany. This is where we develop and produce very complex and therefore quality-determining core components for our plants and machinery.

Other key topics are targeted investment in technological development, energy and green technology, service and revamp strategies, as well as on-the-job training and qualification of our experienced core personnel, and vocational training of our apprentices. This guarantees a pooled transfer of information and expertise between all parties involved and between theory and practice. Included here are trials of new developments on an industrial scale in joint projects with customers. One example of this is the strip caster we developed for Salzgitter Flachstahl.

In concrete terms, this means: We develop and improve technologies with a very close eye on market requirements, in this way securing our leading position in the development of new and improved technologies. With these activities, we strengthen our ability to supply technologically and economically effective plant and machinery construction designs that enable our customers to produce even more competitively.

GLOBAL EXPANSION OF MANUFACTURING AND SERVICE CAPACITIES

At the same time, we are expanding our presence by continuing to hire qualified personnel and by building manufacturing and service facilities, for instance in our markets in India or China. This is how we meet our customers’ demands for locally produced parts and services.
This contributed to an increased order intake in our Metallurgical Plants Division in 2011 compared to the previous year. Especially when it comes to steelmaking plants, we attracted a large number of mostly smaller projects, above all for revamping and extending converters. There was a focus here on quality improvements of the products manufactured on our plants.

It seems clear that investment in new plants will remain the exception for the foreseeable future. There is a focus instead on revamps and extensions of existing plants. What our customers aim for here is to further increase the quality of their products and reduce their environmental impact.

Due to the special boom in the production of NF metals, we booked a high order intake for submerged-arc furnaces.

We are responding to this with a whole series of improvements in our range of products and services.

The special boom in the manufacture of nonferrous metals continues, leading to a high order intake for submerged-arc furnaces for special metallurgy. To expand our range in this field, we acquired a majority share in South African company Metix, (Pty) Ltd.

This acquisition supports our systematic buildup of services in the area of submerged-arc furnace technology for the production of ferrous alloys, silicon metals, nonferrous metals, and calcium carbide. Active for some ten years in plant construction for the ferrous alloy industry, the company is a leading player in South Africa in the modernization of submerged-arc furnaces. Its scope of products and services covers the entire planning and supply of equipment and plants, especially for the production of ferrochromium and ferromanganese, as well as sintering plants for chromium and manganese ores.
SECONDARY METALLURGY – ORDERS FOR VD AND RH PLANTS

There was cause for satisfaction at our Russian customer NLMK in Novolipezk when an RH-Top plant from SMS Mevac was successfully commissioned there. The duplex plant is capable of treating heats with nominal weights of up to 320 t and will mainly be used to produce ultra-low-carbon steels and low-alloy grades. The planned capacity is more than 4 million t per year.

Included in the supply scope were the basic engineering, the core components, the basic automation, and Level-2 process automation, as well as supervision of the assembly and commissioning.

NEW VD PLANT – SMS MEVAC ATTRACTS ORDER FROM DILLINGER HÜTTE

As part of its modernization campaign, AG der Dillinger Hüttenwerke awarded SMS Mevac an order in February 2011 for a general overhaul of its secondary metallurgy equipment. This was another chapter in our long-standing cooperation. Dillinger Hütte is Europe’s leading producer of heavy plate and renowned for its high quality standards.

The order comprises the supply and assembly of a 190-t ladle vacuum degassing (VD) plant, a complete alloying plant, a filter system, and the option of a further VD plant. These measures will ensure the necessary vacuum capacities in the long term. Furthermore, with our new filter and dedusting systems, we meet the high requirements of our customer for efficient environment protection. Equally important in view of the residential area around Dillinger Hütte are the special noise-reducing features we will install.

THE NEW PRODUCT TERTIARY METALLURGY

Starting from its strong position in secondary metallurgy, SMS Mevac in 2011 expanded its product and service portfolio to include tertiary metallurgy.

The purpose of tertiary metallurgy is manufacturing so-called isotropic materials, in other words materials with uniform physical and mechanical properties. These products are used in currently relatively small but steadily growing market segments. The main customers are certain sectors of the key industries aerospace, energy generation, automotive, and oil and gas exploration and extraction.
Encompassing various processes, tertiary metallurgy refines raw materials such as ingots or electrodes into higher-quality grades.

Chief among these processes are VIM (Vacuum Induction Melting), ESR (Electric Slag Remelting), and VAR (Vacuum Arc Remelting). They round off our range for the production of highly complex materials and open up new markets with a promising future.

BOF CONVERTER STEEL-WORKS – KNOW-HOW AND NEW CONCEPTS

PT Krakatau Posco, a joint venture between Pohang Iron and Steel Company (Posco), Korea, and Indonesian steel producer PT Krakatau Steel (PTKS), awarded us a contract for the supply of a BOF steel-works with converter change technology, plus a plant for converter gas cleaning.

Included here are a 300-t BOF change converter, another changing vessel, a converter changing carriage with a load-bearing capacity of 1,200 t, the converter tilting drive, and the entire X-Pact® electronics and automation. According to our customer, the converter change technology has cut production and investment costs by 30 %. What is more, it increases plant efficiency because the converter vessel can be changed over a short path in just eight to ten hours.

This is the first time the new generation of our converter gas dry dust extraction system has been used. The supply package comprises a gas conditioning tower as well as a dry-type electrostatic precipitator with patented core components developed by SMS ELEX. This new generation of converter gas dry dust extraction ensures high availability and increases the efficiency of the overall system.

REFRACTORY LINING SYSTEM FOR SALZGITTER FLACHSTAHL

We attracted an order from Salzgitter Flachstahl, Germany, for a new converter vessel for converter A in the Salzgitter steelworks. Also included in the scope of supply is a mechanical refractory lining machine with telescopic lifting system that will make lining much easier in the future.

NEW SOLUTIONS FOR ELECTRIC-ARC FURNACES

In October 2011, we signed a cooperation agreement with SiCon, Germany. The company is a specialist in the treatment and recycling of scrap, plastic, and electric waste, as well as residual substances from the steel and paper industries. We aim to jointly market a treatment method for recycling scrap that can then be used in electric-arc furnaces. What makes these plants special is that they achieve a recovery of up to 100 % of the metal contained in waste scrap. That represents a high level of productivity and profitability.

Increasingly important to SMS Siemag is implementing green technologies in its steelmaking plants to improve their ecological footprint. This cooperation agreement enables customers to comply with future standards of plant and environmental technology.

Today, scrap is a raw material traded globally and is increasingly important for future steel production. Recycling rates are on the rise worldwide, yet this results in ever more scrap types that have limited utility for quality steels. If electric steel manufacturers want to ensure their future competitiveness, they must be able to count on sufficient supplies of raw materials from high-quality scrap at moderate prices.
The efficiency of scrap treatment is essential to the accuracy of the analysis and purity of the scrap. Various process stages reduce the unwanted scrap byproducts to a minimum. Most importantly, substances that cause serious problems in waste gas purification, such as plastics, are removed.

**GREEN TECHNOLOGY SETS NEW STANDARDS**

As the importance of environment protection increases in society around the world, the demand for new green technology products grows. That is because our customers must meet ever-tougher anti-pollution regulations while still working profitably.

We attracted an order from ArcelorMittal to extensively modernize the gas cleaning systems at the company’s location in Kryviy Rih, Ukraine.

The steelmaking facility uses a total of six 160-t BOF converters. Currently, the dust-laden converter gas is cleaned with conventional wet scrubber technology. Now, as part of the revamp project, an innovative hydro-hybrid filter system developed jointly by SMS Siemag and SMS ELEX is being installed.

It is ideal for retrofitting in existing facilities. This involves integrating an ESP (Electro Static Precipitator) that works together with the existing wet scrubber to reduce residual dust content to a level that complies with even the toughest environment legislation.

Also included in the Kryviy Rih modernization project are the waste gas cooling system complete with water cooling circuits, plus a new wet scrubber for each converter. Furthermore, the upgrade plan allows for later integration of a converter gas recovery plant that will additionally boost efficiency.
MAJOR NEW PRODUCTS

**SEAF electric-arc furnace**
The further development of the electric-arc furnace has resulted in completely new opportunities for saving energy and production costs as well as reducing emissions.

The SEAF is a stationary electric-arc furnace consisting of a bottom vessel with tapping system, a cover that can be placed onto the bottom vessel, and an AC or DC electrode system. It is designed for continuous operation with 100% power-on time over multiple heats, in other words for sequence smelting. Crucial here is the continuous operation without power-off times. This means the supply voltage is maintained and the furnace runs without interruption during raw material charging, tapping, or readjustment of the electrodes. The result? Minimum energy input and corresponding cost savings.

Because the SEAF remains closed during the smelting process, it uses less primary gas. Consequently, the extraction power required is several times lower than that for a conventional EAF.

The only time the continuous operation has to be interrupted is for maintenance. That involves positioning the bottom vessel without the cover onto a carriage. As a result, there is no need for heavy-load cranes or expensive shop floor structures.

**Vacuum converter for stainless steel, low-carbon ferromanganese, and ferrochromium**
We developed the vacuum converter to market maturity in 2011. It combines the AOD process (Argon Oxygen Decarburization) with the VOD process (Vacuum Oxygen Decarburization). The two process stages of main decarburization in the converter and intensive decarburization under vacuum take place in sequence in a single vessel. Due to the optimized metallurgical conditions, refining under vacuum is faster, and this improves the yield of chromium and the total yield with low gas and carbon contents in the steel. That in turn shortens the treatment time, significantly reducing investment and running costs.

**Primary energy smelting of scrap for use in EAF or BOF**
Currently, we are developing a new method of smelting steel scrap in shaft furnaces with primary energy. Using mainly primary energy in the form of natural gas, coke-oven gas, or oil, the strategy avoids most of the losses that occur during electricity generation. First the scrap is melted in the shaft, then heated in another unit such as an EAF or LF for further processing. This saves more than 20% of the energy and significantly reduces CO₂ emissions.
SPECIAL METALLURGY/SUBMERGED-ARC FURNACES
- Guodian Youninglight, China; two calcium-carbide submerged-arc furnaces
- RSE, Kirgiztan; two submerged-arc furnaces
- Posco, Korea; one 30-MVA submerged-arc furnace
- Xstrata Lio, South Africa; electrode guide system

STEELWORKS/SECONDARY METALLURGY
- Dillinger Hütte, Germany; 190-t VD plant
- Vale Alpa, Brazil; engineering of a converter steelworks
- ArcelorMittal Gent, Belgium; converter tilting drive
- Jindal South West Steel, India; alteration of a converter steelworks
- Nucor Hickman, USA; 155-t twin VD plant
- Tata Steel, India; two converter drives and two trunnion rings as well as sublances
- EPSSN, Venezuela; engineering phase III of electric steelworks
- PT. Krakatau Posco, Indonesia; supply of a BOF steelworks with converter change technology and a plant for converter gas cleaning
- China Steel Corporation, China; 270-t double ladle furnace
- Tata Steel, Kalinaganar, India; continuation of phase 1: supply of an LD converter
- Acerinox, Spain; modernization of an EAF and an AOD converter
- Salzgitter Flachstahl, Germany; BOF converter and refractory lining system
- ArcelorMittal Gent, Belgium; BOF converter vessel
- ThyssenKrupp Steel, Germany; alteration of a BOF converter
- Tisco, China; 80-t RH plant
- Safas, Italy; 20-t AOD converter
- Gallatin, USA; Modernization of a DC EAF
- Ellwood Group, USA; 40-t VOD plant

ECO-TECHNOLOGY
- ArcelorMittal Kryvyi Rih, Ukraine; six gas cleaning plants with wet electric filters
- Bhushan Energy, India; gas cleaning for SAF

SPECIAL METALLURGY/SUBMERGED-ARC FURNACES
- Vale, Brazil; one FeNi smelting furnace
- Anglo American do Brasil, Brazil; one FeNi smelting furnace
- Kazzinc, Kazakhstan; one AC round furnace for Cu slag
- Aurubis, Germany; 100-t copper converter
- Jindal Stainless, India; Fe-Cr EAF and AOD converter
- Etirom, Turkey; two AC round furnaces for FeCr
- Vale MOP, Brazil; two rectangular furnaces for FeNi

STEELWORKS/SECONDARY METALLURGY
- Peiner Träger, Germany; electric steelworks, EAF
- Severstal Columbus, USA; electric steelworks, EAF and LF
- Maghreb Steel, Morocco; electric steelworks, EAF and LF
- Essar, India; Conarc steelworks, phase II
- PNTZ, Russia; electric steelworks, 120-t EAF incl. 120-t VD plant
- NLMK, Russia; 320-t duplex RH-Top plant
- Bhushan Steel, India; 180-t RH-Top plant
- MaSteel, China; 120-t duplex RH plant

MAJOR ORDERS

COMMISSIONING PROJECTS

ECO-TECHNOLOGY
- ArcelorMittal Kryvyi Rih, Ukraine; six gas cleaning plants with wet electric filters
- Bhushan Energy, India; gas cleaning for SAF
NEW STEELWORKS IN MOROCCO

In October 2011, we successfully commissioned an electric steelworks for Maghreb Steel, Morocco. With the new complex, our customer covers the entire product range from liquid steel to the final product, significantly expanding its capacity as well as the value-added chain.

Designed for an annual production of one million t, the plants supply the Steckel rolling mill with input stock. The steelworks produces low and medium-carbon as well as high-strength, low-alloy steels for the company's own use and for export.

The supply package comprised a 120-t electric-arc furnace with modern ARCESS® technology, a 120-t ladle furnace, a gas cleaning plant, the material supply system for alloying material, and a single-strand slab plant.

What's special about these furnaces from the ARCESS® series is that they are designed for ultra-efficient electricity utilization and equipped with groundbreaking burner and oxygen injection technology. The bottom line is high productivity.

Included in our supply package were the detail engineering, the mechanics, hydraulics, and the entire X-Pact® electrics and automation along with process models.
Investment to boost productivity and quality.

Compared to the previous year, 2011 saw an increase in order intake for continuous casters. After a hesitant start, we attracted a number of major orders in the second half of the year. They were split equally between new plants and revamps. Particularly worth mentioning was an order from Dillinger Hütte at the end of 2011 – it was the largest order in the history of continuous casting.

There was a clear trend in modernizations toward complete revamps, in some cases involving full replacement of the old plants. Considering the uncertain economic climate, it seems likely our customers will continue to hold back investments in the current business year. However, we also expect them to invest increasingly in improving quality and boosting productivity. This is where our new or improved developments come in – above all our innovative CSP®-flex system (Compact Strip Production).

**WORLD’S WIDEST CSP® PLANT WITH SECOND CASTING STRAND**

For Severstal Columbus, USA, we supplied and successfully commissioned a second production line featuring a second CSP® continuous caster. Using this production line, the company can supply the market with 2.7 million t of high-quality-grade steel per year. The plant produces auto body plates and high-strength steels for the automotive industry, API grades for tubes, and deep-drawing steels.
ESSAR STEEL: CSP® PLANT SETS NEW STANDARDS

On July 15, 2011, the second strand of the CSP® plant for Indian steel producer Essar Steel Ltd. was successfully commissioned at the Hazira location in the state of Gujarat.

The CSP® plant with the first strand went into production on March 31, 2011, and the third casting strand is due to be installed in the course of this year.

As Essar Steel reports, on the first day after going online, the new CSP® caster cast twelve heats of 200 t of liquid steel each. The second sequence consisted of ten heats. The second strand produced without breakouts and on commissioning already achieved 75% of its rated capacity.

Even in the first sequence, the thickness reduction process (Liquid Core Reduction, LCR®) and the width adjustment were used successfully. Equipped with the CSP® plant, Essar Steel can now produce hot strip in widths of 950 to 1,680 mm and thicknesses ranging from 1.0 to 25.4 mm. This means the product range covers both carbon steels and pipe grades, silicon, and dual-phase steels. The CSP® process is ideal for the cost-effective production of high-quality steel grades.

Included in the scope of supply were engineering, manufacturing the mechanical equipment, the entire electrics and automation, as well as supervision of assembly and commissioning. Our tried-and-tested Plug & Work process prepared the X-Pact® automation in advance. Plug & Work simulates the production sequence and makes it possible to test and optimize the automation functions under realistic conditions before installation in the factory.

FIRST SLAB AT MAGHREB STEEL IN MOROCCO

At Maghreb Steel in Morocco, the continuous slab caster successfully went into production in October 2011. With the new complex, our customer covers the entire product range from liquid steel to the final product, significantly expanding its capacity as well as the value-added chain. The unique feature of the plant design is that the production flow divides into two after the slab stage so that the blank products can be processed either into strip in the Steckel rolling mill or into plates in the heavy plate rolling mill.
Designed for an annual production of one million t, the plants supply the Steckel rolling mill with input stock. They produce low and medium-carbon as well as high-strength, low-alloy steels for the company’s own demand and for export.

Included in the scope of supply were the detail engineering, the mechanical and hydraulic systems, as well as the entire X-Pact® electrics and automation complete with process models.

**PT. GUNUNG ORDERS CONTINUOUS SLAB CASTER**

PT. Gunung, Indonesia, ordered a single-strand slab caster for its Bekasi location (in the Indonesian province of West-Java).

Designed for an annual production volume of 1.2 million t of slabs, the plant will produce slabs in thicknesses of 220 and 250 mm and widths ranging from 800 to 2,100 mm. The product spectrum covers structural steel as well as tube and heavy plate qualities.

PT. Gunung will use the new plant to produce quality slabs for further processing in its own Steckel and heavy plate rolling mill. So far the company has had to buy in its slabs, now it can achieve more added value and better quality.

Our supply package covers the engineering, the mechanical and hydraulic systems, and the X-Pact® electrics and automation including commissioning according to our Plug & Work solution. The start-up is scheduled for the middle of 2013.

Also in operation at the PT. Gunung Bekasi location are a line for long products and wire plus a flat product line for heavy plate and tubes. All the main production lines were supplied by SMS group companies.

**COMPLEX INNOVATIONS**

**Belt casting plants become reality**

Right now, the first BCT® (Belt Casting Technology) plant is being pre-assembled and tested in our Hilchenbach workshop. Functional testing has been under way since November 2011. According to plans, the plant will go into production at Salzgitter Flachstahl in October 2012.

**CSP® flex bow-type caster**

For more than 20 years, CSP® has been the most successful minimill concept for the manufacture of hot strip. Its main advantages are its cost-effectiveness, broad product range, and the high quality of the hot strip produced. A total of 27 reference plants are evidence of the global success of this technology.

Now the modular CSP® flex concept offers our customers even more flexibility, giving them the means to meet new market requirements. Based on the proven plant design consisting of vertical caster, roller-hearth furnace, and compact rolling mill with five to seven mill stands, CSP® flex opens up the option of new, more flexible plant constellations.

To enable a variation of production capacity and slab thicknesses beyond what is possible today, the CSP® flex solution gives customers the freedom to choose a plant with a vertical caster or a bow-type caster. Featuring an annual capacity of some 1.5 t per strand, the vertical bending machine is the most economical version.

However, higher annual production rates of up to around 2.0 million t per strand are possible with the bow-type caster.
Mold with fiber optic monitoring system —
insights in all casting situations

New on the scene is a further development of our
Mold Monitoring System. MMS plus combines ex-
tensive monitoring and analysis with the option of
directly influencing the casting process and making
corrections. The thermal elements we have devel-
oped make it possible to detect surface cracks and
predict breakouts.

Specially designed copper plates with integrated
fiber optic temperature sensors provide high-quality,
high-resolution measurements. The use of fiber op-
tics means the mold can be monitored over its full
height. A shielded fiber optic cable channel in the
copper plate reduces the maintenance requirement.

The innovative mold is suitable for continuous casters
for long and flat products, including thin slabs. The
first trials have produced positive results.
In November 2011, Dillinger Hütte commissioned us to supply a thick slab caster. The vertical caster with two strands is scheduled to go into production in early 2014.

Altogether, Dillinger Hütte is investing some EUR 300 million in the manufacture of quality slabs for high-grade heavy plate production.

SMS Siemag is supplying the casting platform, mold, hydraulic oscillation, strand guide, edge-controlled secondary cooling, and the position-controlled segment adjustment, as well as the cold and hot strand drivers.

Also included in the supply scope is the entire X-pact® electrics and automation including commissioning. The continuous caster will be equipped with our proven technological systems for mold level control, hydraulic oscillation, hydraulic segment adjustment with Dynamic Soft Reduction and load balancing. Especially for this continuous slab caster, we teamed up with Dillinger Hütte to develop a hydraulic control system for the drivers.

To ensure optimum internal quality of the semi-finished products, our customer will apply the Dynamic Soft Reduction solution. This involves the strand shell being compressed during casting, ensuring homogeneous material properties right through to the core.

The adjusting mechanisms usual in continuous casters are here supplemented by an extra dimension based on
At the end of November 2011, a contract for the supply of a new continuous slab caster was signed.

Top row (right to left): Dr. Ralf Bruckhaus, Steelworks Managing Director, Dillinger Hütte; Dr. Oliver Bode, Steelworks, Dillinger Hütte; Dany Labar, Director of New Construction Dept., Dillinger Hütte; André Styga, New Construction Dept. of Dillinger Hütte; Dr. Alois Streisselberger, Production Director, Dillinger Hütte; Lothar Schaps, Overall Project Management, Electrics and Automation, SMS Siemag; Dirk Austermann, Overall Project Management, Sales, SMS Siemag; Hans Günther Thurm, Overall Project Management, Order Processing, SMS Siemag. Bottom row (left to right): Dittmar Wächter, Managing Director, DSD Montagetechnik; Claude Pirson, Holding Supervisory Board, DSD Montagetechnik; Dr. Norbert Bannenberg, Technical CEO, Dillinger Hütte; Dr. Karlheinz Blessing, CEO, Dillinger Hütte; Burkhard Dahmen, President & CEO, SMS Siemag; Christian Geerkens, Executive Vice President, Continuous Casting Division, SMS Siemag.

experience from rolling technology. The result is a further increase in soft reduction rates, as successfully used in the CC5 plant in Dillingen.

A particular customer specification here was that the vertical outer walls of the deep foundations were built on a circular rather than the usual rectangular layout. Due to the self-supporting effect of this cross-sectional shape, the structure does not need costly and time-consuming horizontal anchors, which speeded up work on the construction site.

Essentially, the design of the CC6 is the same as the CC5 continuous caster. This results in substantial synergy effects in operation, maintenance, and servicing.

Vertical continuous caster technology has now proven its worth over 50 years. As far back as 1961, we supplied the first vertical continuous slab caster to Dillinger Hütte. That was followed in 1964 by a bow-type caster, then by two more vertical continuous slab casters, in 1968 and 1998.

As of 1998, Dillinger Hütte used the CC5 to produce the world’s thickest slabs, at 400 mm. Now, after the revamp of the CC5 in 2010, the machine casts 450-mm-thick slabs. What is more, the CC6 means Dillinger Hütte can expand its market leadership in heavy plate production.

As of 1998, Dillinger Hütte used its continuous slab caster Nr. 5 to produce the world’s thickest slabs, at 400 mm. The revamp in 2010 means the company continues to hold the record. Now the plant casts slabs 450 mm thick.
Good prospects for our improved thin slab technology in Asia and the Middle East.

In 2011, order intake for hot rolling mills was higher than the figure for the previous year. As always, sales developed in line with order intake after a time lag and increased slightly on the previous year. We expect order intake and sales to reach the same level in 2012.

The market for new plants remains weak in 2012, with only a few projects ready for contracting. We can look forward to new plant projects above all from Asia. Here a number of projects for thin slab plants are in the pipeline. Our CSP® and advanced CSP® flex technologies open up promising opportunities for us on these markets. It is also good news that demand remains strong for individual machines and complex revamps with our electrical and automation systems.

HEAVY PLATE ROLLING MILL: EXTENSIVE MODERNIZATION WITH NEW ELECTRICS AND AUTOMATION

We secured a contract from NLMK DanSteel A/S, Denmark, for the extensive modernization of its heavy plate mill in Frederiksvaerk. Included in the order is the installation of a new 4.2-m heavy plate mill stand and a new hot plate straightener, plus the revamp of the transport equipment and the associated X-Pact® electrics and automation. All this makes the modernization at NLMK DanSteel one of the largest investments in a European heavy plate mill in the last 20 years. When it is finished, NLMK DanSteel will be able to extend its product range while also improving quality. The new 4.2-m heavy plate mill stand will replace the existing 3.6-m stand. Furthermore, it will be the third heavy plate mill stand in Europe equipped with the CVC® plus system. However, this is the first time the shifting system has been designed to
move vertically with the work roll. The advantages are a very large roll lifting height and an extremely compact design. The entire alteration work will take place during an already planned shutdown in summer 2012, keeping production losses to a minimum. To ensure a short construction time, we have modified the equipment in such a way that most of it can be erected on the existing foundations. Furthermore, we are preparing for the conversion with extensive pre-installation and testing in our production shop in Hilchenbach, Germany.

**NEW 4.3-M HEAVY PLATE ROLLING MILL AND EXTENSION OF THE 5.0-M MILL**

In May 2011, we booked an order from Hyundai Steel to build a new 4.3-m heavy plate rolling mill as well as to expand the 5.0-m mill supplied in 2009. This shows that the South Korean steel producer is relying entirely on our expertise for the expansion of its heavy plate production to 3.5 million t per year. The new systems will go into operation in 2013. Then Hyundai Steel will use them above all to manufacture plates for shipbuilding.

The 4.3-m heavy plate mill is designed to work with X-Pact® Level-1 and Level-2 automation. Chief among the machines to be installed are a descaler, the four-high reversing stand with edging stand, the plate cooling with pre-leveler, the hot plate straightener, a cooling bed, the shear section, and the cold plate straightener. The 4.3-m mill stand has a rolling force of 90 MN and features hydraulic screwdowns, work roll bending, and the CVC® plus system. When choosing the plate cooling system, Hyundai Steel went for pure spray cooling, the latest innovation in this field. The cooling system comes with high-pressure cooling at the front and low-pressure cooling at the back, producing fast cooling rates and a wide range of cooling patterns. The cooling strategies are determined by the X-Pact® cooling model. Because the plates are fed between pressure rolls, good plate flatness is achieved even at high cooling rates. There is a pre-leveler at the entry side of the plate cooling section that also contributes to uniform cooling.

In the 5.0-m heavy plate mill for Hyundai Steel, we are installing a new rougher with an edging stand, expanding the plate cooling system, and building an additional cooling bed, a second cross-cutting shear, and new stacking devices and roller tables in the plate store. The supply package also includes the entire X-Pact® automation for this equipment. Originally supplied by us complete with the electrical and automation systems, the 5.0-m plant has been in operation since December 2009.

**MODERNIZATION FOR PRODUCTION OF HIGH-STRENGTH PIPE STEELS**

Having decided to concentrate on the growth market of high-strength steels, Taiyuan Iron & Steel, China, placed an order with us to revamp its laminar cooling system and to supply a UNI plus coiler. The compact hot strip mill we supplied went into production in August 2006. Now it will be upgraded with a new cooling section with more powerful cooling zones along its entire length. Only the trimming zones at the end of the section will remain in place.

With the new cooling groups, Taiyuan Iron & Steel can apply greater volumes of water to the strip to achieve the kind of faster cooling necessary for the production of high-strength grades or dual-phase steels.
We specifically designed the UNI plus coiler for coiling high-strength steels at low strip temperatures. That means the coiler can handle pipe grades up to strength class X100 at strip temperatures of around 400 °C. Furthermore, it is able to process direct-quench strip up to a thickness of 10 mm. That will make it one of the most powerful coilers in China.

ESSAR STEEL, INDIA: COMMISSIONING OF THE FIRST 3-STRAND CSP® PLANT

On March 31, 2011 Essar Steel produced the first strip on its new CSP® plant in Hazira, in the state of Gujarat. After its completion, it will feature three casting strands and have an annual capacity of 3.5 million t.

With the CSP® plant, Essar Steel is expanding its hot strip production that started in 1996 on the conventional hot strip mill we supplied. Before delivery, we ran the entire X-Pact® automation through our proven Plug & Work solution. That involved simulating the production sequence and testing the automation functions under near-reality conditions.

It was down to the good preparation prior to commissioning that Essar Steel achieved a steep runup curve and was quickly able to start producing hard-to-roll grades. As early as the fourth month after commissioning, Essar Steel produced sequences of over 30 strips with final thicknesses of 1.1 mm and less. All the strips complied with the final rolling temperature that is technologically necessary.

To achieve particularly fine cooling control, each cooling group features six valves that regulate the water volume. In the first four cooling groups, the water flow can be adjusted steplessly using control valves. This means the cooling rate can be set extremely accurately. The coiler temperature is finely adjusted in the trimming zone at the end of the cooling section.

With the commissioning of the laminar cooling system, we completed our revamp of the entire exit side of the hot strip mill in Borlänge. We had already supplied two coilers for high-strength strip in 2006 and 2010. In 2010, SMS Logistiksysteme overhauled the complete coil transport process and installed a modern lifting beam system.

NEW SOLUTIONS FOR HIGH-STRENGTH STEEL GRADES

What mainly drives the further development of our hot rolling mills is the demand for new, high-strength steels, for instance for the automotive industry and pipeline construction, and the search for wear-resistant grades. We help hot strip and heavy plate mill operators meet future market demands with a range of innovations.

SSAB, SWEDEN: LAMINAR COOLING FOR DIRECT-QUENCH STEELS

Since summer 2011, the hot strip mill of SSAB in Borlänge, Sweden, has been in operation with a new laminar cooling system and a new water supply system. They give our customer the capacity to significantly expand its range of high-strength, low-wear hot strip.

Above all, the production of direct quench (DQ) strip of up to 10 mm makes new challenges on the cooling section design. SSAB’s laminar cooling system achieves the high cooling rates required for DQ grades with a much higher specific water application than conventional cooling systems. We adjusted the X-Pact® cooling model to the SSAB-specific steel grades and extended it to more accurately detect the metallurgical processes.

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HIGH-PERFORMANCE SPINDLE

It is vital for the production of thin hot strip from high-strength grades to achieve large reductions and high rolling torques and rolling forces, above all in the front stands of the finishing train. This is why we have improved the geometry of our Sieflex® spindles and now manufacture them in even higher-quality materials.
The modifications almost double the torque capacity of the new high-performance spindle compared to older types. These spindles can be used both in new plants and for revamps.

FLEXIBLE STRATEGIES FOR STRIP COOLING

Strip cooling systems must enable a wide range of cooling rates for a large variety of products. They must be capable of very fast cooling for direct quench strip as well as lower cooling rates for other qualities. But that’s not all – customers also demand good controllability of the equipment for flexible cooling strategies as well as precise maintenance of the temperatures required in the process.

We meet these requirements with a multi-step cooling concept. It is based on a laminar cooling solution with trimming zones for fine adjustment of the water volume and correspondingly the coiler temperature. The next stages in laminar technology are reinforced cooling and super-reinforced cooling. Then there is our compact cooling system for even higher cooling performance. This consists of pressure cooling, which applies very large volumes of water to the strip over a short path.

SAFE SAMPLING FOR HIGH-STRENGTH, THICK HOT STRIP

We have successfully launched our UNI plus coiler on the market for coiling high-strength, thick hot strip. Challenges in this area are opening the coils, taking samples, binding the coils, and handling the sample pieces. When developing the sampling station, our top priority was the safety of the operator. The sampling station is designed as an offline unit to be used for instance in the coil store. Throughout the process, an eight-roll cage holds and secures the coil. A robot takes the sample and handles it as well as the scrap pieces. It grips the unwound strip end and cuts off pieces with a plasma burner. Using a plasma burner means that the strip end must only be pulled away from the coil by a very short distance. Finally, an integrated heavy binding machine binds the coil again for further transport.
**Annual Report 2011**

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**MAJOR ORDERS**

- Baotou Iron & Steel, China; hot strip mill
- TKSE Bochum, Germany; modernization of cooling section in hot strip mill
- Taiyuan Iron & Steel, China; modernization of cooling section in hot strip mill
- DanSteel A/S, Denmark; modernization of heavy plate rolling mill
- Hyundai Steel, South Korea; 4.3-m heavy plate rolling mill and extension of 5.0-m heavy plate rolling mill
- Nanjing Iron & Steel, China; 4.7-m heavy plate rolling mill
- Salzgitter Mannesmann Groeblach, Germany; new cross-cutting shear for heavy plate rolling mill
- Vyksa Steel, Russia; shuttle car for heavy plate rolling mill
- ArcelorMittal Dunkirk, France; Modernization of R2, R3, R4 drives and F1 mill stand in hot strip mill

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**COMMISSIONING PROJECTS**

- Voestalpine Stahl, Austria; replacement of drive in hot strip finishing train
- SSAB, Sweden; laminar cooling and water supply system for hot strip mill
- Panzhihua Iron & Steel, China; hot strip mill
- Shougang Jingtang United, China; slab sizing press for hot strip mill
- Essar Steel, India; CSP® plant
- Severstal Columbus, USA; CSP® plant, 2nd strand
- Vyksa Steel, Russia; 5.0-m heavy plate rolling mill
- Industeel, Belgium; cold plate leveler for heavy plate rolling mill
- Baoshan Iron & Steel, China; pre-leveler for 5.0-m heavy plate rolling mill

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**SPECIALIZED IN PIPE GRADES**

On November 25, 2011, Vyksa Steel of Russia inaugurated its new, 5.0-m heavy plate rolling mill that was supplied entirely by us. A member of the OMK group, the company now uses the mill at its Vyksa location to manufacture high-strength heavy plates, which it then directly processes into large pipes on the plants from SMS Meer.

The Vyksa Steel heavy plate rolling mill is designed for pipe grades up to strength class X120. Large pipes for transporting natural oil and gas are high-tech products that demand extremely high quality in terms of mechanical and geometric properties as well as plate flatness.

**5.0-m mill stand**

The mill stand rolls the plate down to its final dimensions in as few passes as possible. To achieve these high reductions, the rolling mill features exceptionally strong main drives with a drive performance of two times 12,000 kW and a maximum rolling force of 120 MN.

The CVC® plus technology integrated in the mill stand means Vyksa Steel can apply high rolling forces right through to the final passes. That results in fewer passes and increased productivity.

**Innovative plate cooling**

The plant’s cooling section is divided into one high-pressure and one low-pressure cooling unit. Top cooling rates are achieved by a powerful high-pressure station
and special cooling beams in the front section of the cooling unit. There are special pinch rolls that prevent unevenness in the plates.

An X-Pact® cooling model calculates the cooling strategy. The model is based on the mapping of the physical processes in the rolled material and the dynamic behavior of the cooling. This is how it guarantees the required properties within close tolerances.

High-performance levelers
To achieve good flatness, the plant features three levelers. The cold plate leveler in 9/5 design can level plates up to a yield strength of 1,200 n/mm² in a single process. In combination with the X-Pact® leveling model, the system can identify the ideal leveling strategy for each plate.

First X65 produced in October
Just two weeks after the start of hot commissioning, Vyksa Steel produced the first thermo-mechanically rolled plate of strength class X65. It was subsequently processed into a pipeline tube. The Vyksa Steel Quality Assurance department confirmed that the plate had excellent metallurgical properties.
Growing demand for new plants in India, the Middle East, and the Asian emerging economies.

Following the crisis years of 2009 and 2010, we registered a noticeable upturn in order intake in 2011. This shows that the long-term growth trend in order intake for cold rolling mills has resumed. Sales development follows order intake after a time lag, and again increased slightly on the previous year. Considering this background, we expect a stabilization of order intake and sales in the current business year.

Demand for our plants in India, the Middle East (including Turkey), and the Asian emerging economies grew steadily. As a result, we were able to attract orders for major reference projects to build up cold rolling capacities in the growth regions of India and Turkey. Especially in the Asian developing countries, we expect growing demand for smaller cold rolling capacities with corresponding expansion opportunities. Important here above all is increasing production and improving product quality.

The trend toward product specialization among our customers in the industrialized countries is set to boost our modernization business.

2.3 MILLION TONS OF COLD STRIP ANNUALLY IN WIDTHS OF UP TO 1,890 MM FOR THE AUTOMOTIVE INDUSTRY

At the beginning of February 2011, JSW Steel Limited of India awarded us a contract to supply a pickling/tandem mill for its location in Tornagallu Vidyanagar (Bellary) in India. That makes this the third cold rolling plant, after a Compact Cold Mill (CCM®) and a skin-pass mill, that we have supplied to JSW Steel Limited.
JSW Steel Limited will use the new pickling/tandem mill to produce high-quality cold strip for the automotive industry. The process section of the pickling plant consists of three pickling tanks, each 35 m in length, one cascade rinsing unit, and one strip drying section. The turbulence pickling technology used here ensures descaling at low energy and acid consumption as well as low maintenance and operating costs.

All five mill stands in the tandem mill are of six-high construction type and include our new combined CVC® plus/ESS technology. Furthermore, the mill stands are already prepared for the later integration of Edge Drop Control (EDC®). Perfect flatness is achieved by CVC® plus, as well as multi-zone cooling in the final mill stand, while our Dry-Strip System produces an almost emulsion-free strip surface.

The carousel coiler at the exit end of the tandem mill coils the strip after it has been rolled to a minimum thickness of 0.3 mm. The advantage of this carousel coiler is its compact, robust construction type. Furthermore, only one coil carriage system is necessary to transport the finished coils.

Also included in our supply scope for JSW Steel are the auxiliary plants, consisting of the coil transport system, the binding machine, the extractor systems, the media systems, and a Rotary Inspect inline strip inspection line for reliable, prompt checking of strip quality.

GEARED TO GROWTH: NEW COLD AND HOT COMPLEX FOR GAZI METAL, TURKEY

We attracted an order in April 2011 from Gazi Metal Mamülleri for the erection of a new production facility for cold strip near the town of Karazu, in Turkey. This is where the company plans to produce cold strip made from carbon steel and silicon steel as of 2013. Initially, the plant capacity will be 350,000 t per year. Gazi Metal Mamülleri is set to supply, for instance, the automotive industry and manufacturers of household appliances.

We are supplying all the process equipment including drive systems and automation for the cold rolling complex. With this order, Gazi Metal is counting on our extensive experience in the field of cold rolling, especially of silicon steels.

The complex is designed to produce cold strip with a minimum final gage of 0.25 mm and widths of 600 to 1,500 mm. The entry thickness of the hot strip ranges from 1.5 to 6.0 mm.

In the first construction stage, we are supplying a semi-continuous pickling line, a six-high reversing mill, and a four-high skin-pass mill.
The reversing mill is equipped with CVC® plus technology, positive/negative bending of the work and intermediate rolls, preparation for Edge Drop Control (EDC®), multi-zone cooling, and a DS system. All these systems ensure the strip meets high quality requirements in terms of profile, flatness, and cleanliness.

In the second construction phase, Gazi Metal will increase its annual production capacity to 700,000 t per year with a second reversing stand. Simultaneously, the semi-continuous pickling line will be converted to a fully continuous line. Equally important, the skin-passing mill will be upgraded to a DCR (Double Cold Reduction) line for the planned production of tinplate for beverage and food cans. This two-stand rolling mill type achieves the final thickness reduction in the first stand and the skin-passing in the second stand that are necessary for the production of tinplate.

To prepare for further construction phases, all the required foundation work is already being carried out.

**HIGH-QUALITY STAINLESS STEEL STRIP FOR MALAYSIA**

In February 2011, Bahru Stainless placed an order with us for a new cold rolling mill for high-quality stainless steel strip. Currently, the new cold-rolling complex of Bahru Stainless, a subsidiary of the Spanish Acerinox group, is being erected in Johor Bahru, Malaysia. The company ranks among the world’s largest stainless steel producers. As part of this expansion project, we are supplying a 20-roller cold rolling mill of type MB 22B-52®. It will increase annual production to 240,000 t. Bahru Stainless aims for a capacity of 600,000 t per year.

This is a compact and robust plant design that stands out for its excellent stand rigidity. The new cold rolling mill is designed to roll austenitic and ferritic strip grades with a maximum width of 1,320 mm to a minimum final gage of 0.15 mm. It achieves a top rolling speed of 800 m/min.

What won over the customer above all was our extensive expertise covering design, manufacturing, assembly, and commissioning of the mechanical equipment. Also included in the supply package are the auxiliary and additional plants. Our Supafine filter system will ensure eco-friendly cleaning and cooling of the rolling oil. The plant is scheduled to go into production in December 2012.

**MMK, RUSSIA: COLD ROLLING COMPLEX FROM ONE SOURCE**

On May 31, 2011, a full six months before the official deadline, MMK was able to produce the first coil on its new pickling/tandem mill. This was only possible because, as a complete supplier, we supplied the mechanical, electrical, and automation systems in a closely coordinated package.

With its technological features and an annual capacity of 2.1 million t, the pickling/tandem mill is one of the world’s most powerful plants of its kind. It processes strip from carbon steel, including high-strength grades, in widths ranging from 880 to 1,880 mm. The initial material is hot strip with gages of between 1.2 and 6.0 mm. The strip is fed into the entry area of the pickling/tandem mill at a maximum speed of 700 m/min. The process rate in the pickling section is a maximum of 280 m/min. Next, the strip runs into the tandem mill at a maximum rate of 350 m/min, and achieves a speed of up to 1,500 m/min at the exit area. The tandem mill is equipped with four-high mill stands that operate with CVC® plus technology. Featuring a high rolling force of 35 MN, they are among the most powerful anywhere in the world. Furthermore, all mill stands come with positive and negative work roll bending. Reliable fine adjustment of the strip flatness is guaranteed by our flatness measuring rollers as well as a multi-zone cooling system in the final mill stand. The Dry Strip system in the exit area of the tandem mill ensures a clean strip surface. Immediate, reliable, and easy quality control of the rolled strip is guaranteed by our patented Rotary Inspect inline inspection line.
The factors responsible for the smooth installation and early commissioning were the plant design, extensive pre-assembly of key components, and thorough functional testing. Even during manufacturing and assembly of the mechanical equipment, we already set up the automation systems in our test fields and put them through their paces according to our Plug & Work concept. Using near-reality simulation of the production processes, we were able to test and pre-optimize all the automation functions. At the same time, we trained the MMK operating personnel on the actual control desks and with the original software. We were also able to perform the interface and functional tests with the customer’s production planning system and the automation system in the test field. This preparation works lays the foundations for rapid plant runup curves.

For the MMK cold strip complex we are also building a continuous hot-dip galvanizing line, a combined hot-dip galvanizing and continuous annealing line, a coiling and inspection line, and two packaging lines.

This is where our scope as a general contractor and consortium leader benefits the customer because we are also supplying the entire supply systems and auxiliary equipment. They include:

- Acid regeneration plant
- Plant for electricity generation and distribution
- Hydrogen plant
- Rolling emulsion recovery plant
- Wastewater treatment plant
- Water desalination plant
- Lab equipment
- Emergency cooling water system
- Indoor crane system with 32 gantry cranes
HIGH PLANT EFFICIENCY AND BETTER PRODUCT QUALITY IN STAINLESS STEEL ROLLING

Ever since the 1950s 20-roll cold rolling mills have been part of our supply scope. Needless to say, since then we have improved many details of the technology to meet the demands of stainless steel producers for increased product quality and productivity.

Here are three current examples of possible ways we can optimize plants:

- High-performance oil wiper system
- Self-cleaning rolling oil filter equipment
- Online sensors for detection of rolling oil contamination

HIGH-PERFORMANCE OIL WIPER SYSTEM

Rolling oil wipers are used in cold rolling mills to minimize the residual oil left on the rolled metal strip. This is where NIPCO™, our new high-performance squeezing system, comes in. Developed and tested jointly with Voith, it ensures an even contact pressure using individual hydrostatic supports that are precisely set to the strip width to be rolled. That eliminates the squeezing roll bending that occurs in conventional wiper systems. Compared to existing wipers, the new system reduces the residual oil on the strip by between 30 and 60 %. Often the rolling speed is limited by the oil wipers, so the NIPCO™ oil wiper system enables a faster process.

ONLINE SENSOR TECHNOLOGY: CONTAMINATION SENSOR FOR ROLLING OIL

With our Rolling Oil Contamination Sensor (ROCS), we have developed an innovative online sensor system that measures rolling oil contamination and has already proven its worth in practical application. The device makes it possible to determine the quantity and size of particles in the rolling oil. It was developed in cooperation with HYDAC International. The measuring principle behind it is the so-called light transmission process. Applying the measured values, it is possible to quickly optimize the operation of the filter system, in this way also optimizing the surface quality of the cold-rolled strip. What is more, the efficiency of alternative filtering means can be tested.

MULTIFUNCTION ROLLING MILL CVC® PLUS M 18/4

To give plant operators the flexibility to produce different products, from simple carbon steels to high-strength or stainless steels, we developed our CVC® plus M 18/4 multifunction rolling mill. The mill stand design allows for switching from CVC® plus 4-high to CVC® plus 18-HS operation during regular roll changes. The intermediate and work rolls are installed with the side support rolls in a replacement cartridge that is changed as a single unit. This avoids shutdowns or adjustment times for aligning the rolls and support rolls.

The advantages of our CVC® plus M 18/4 mill stand design are low investment costs, the option of a broad product range from soft to ultra-hard materials, and high productivity.
MAJOR ORDERS

- JSW Steel Limited, India;
  CVC® plus six-high pickling/tandem mill
- Gazi Metal, Turkey;
  CVC® plus six-high RCM (reversing cold mill)
  and four-high SPM (skin pass mill)
- Starcore, Thailand; CVC® plus four-high RCM
- Shougang Jingtang, China;
  two DCR plants (double cold reduction),
  of which one inline CVC® plus four-high
  and one offline CVC® plus four-high
- Bahru Stainless, Malaysia;
  20-roll mill, type MB 22B-52"
- TKN Nirosta, Dillenburg, Germany;
  Nipco oil wiper system for 20-roll mill
  (as part of revamp)
- TKN Nirosta Düsseldorf, Germany;
  modernization of a 20-roll mill, type MB 21BB-64"

COMMISSIONING PROJECTS

- Shougang Jingtang, China;
  CVC® plus six-high pickling/tandem mill
- MMK, Russia;
  CVC® plus four-high pickling/tandem mill
- Posco, South Korea;
  CVC® 1B HS continuous tandem mill
- BSSB, China; 20-roll mill, type MB 22B-52"
- Goldsky Titanium Metal, China;
  20-roll mill, type MB 22B-52"
  (titanium rolling mill)
- China Far, Taiwan; 20-roll mill, type SB 22-54"
- TTSS (formerly TPCO), China;
  two 20-roll mills, type MB 22B-54"
SUCCESSFUL STARTUP OF 20-ROLL COLD ROLLING MILL

On June 25, 2011, Chinese steel manufacturer Hunan Xiangtou Goldsky Titanium Metal rolled the first titanium strip on its new 20-roll cold rolling mill of type MB 22B-52". The first titanium coil was rolled from 2.5 mm entry thickness down to a final thickness of 1.0 mm. Also worth mentioning is that the plant was able to go into production eight days before the contractually agreed date. Now, with the new cold rolling mill, Goldsky Titanium Metal produces high-quality titanium strip of grades TA1, TA2, and TA3.

Crucial to the fast assembly and commissioning was the fact that the key plant assemblies were shipped to the construction site as preassembled and function-tested supply units.

The cold rolling mill operates with our latest Supafine® filter technology, which removes even the finest abraded material from the rolling oil circuit. This ensures a very good strip surface quality.
Strong demand for aluminum plants.

The growing demand for our aluminum plants that started at the beginning of 2010 continued in 2011. We were able to further increase both order intake and sales. The good market development looks set to continue in 2012. For example, our Alu Control electrics and automation systems that are specially tailored to aluminum rolling mills helped us attract major orders as a system supplier on the Chinese market.

Apart from continued investments in plants for packaging material and beverage cans made of aluminum, we expect a stronger demand in the vehicle manufacturing and transport industries. There are interesting projects in the pipeline above all for plants that produce aluminum plates for the aviation industry, or aluminum strip for the automotive industry. It is true to say that aluminum will in general play a key role in the manufacture of lighter-weight vehicles in the coming years. This means that ships, autos, trains, or planes will use less fuel, simultaneously reducing emissions.

FURTHER ORDER FROM NOVELIS: TWIN-STAND ALUMINUM COLD ROLLING MILL FOR SOUTH KOREA

Novelis do Brasil Ltda., Brazil, placed an order with us in 2010 for a new twin-stand cold rolling mill for aluminum alloys. Then, in July 2011, the company ordered another tandem mill of the same type for its Yeongju location in South Korea. The new rolling mill will produce can strip for the beverage industry. These products come in a maximum width of 2,000 mm and a minimum final thickness of 0.15 mm. The tandem mill will be equipped with cutting-edge control elements.
Both stands in four-high design come with our highly efficient work roll bending system. A Hot Edge Spray (HES) system for strip edge treatment and a roll cooling system complete the technology package.

Also included in our supply scope for the rolling mill are a coil preparation station, a strip inspection line, a pallet transport system, high and low-pressure hydraulics, as well as media for rolling oil and cooling water.

Because the mill stands and main core components are manufactured in our SMS Siemag production shop in Germany, our customer can be sure of excellent plant quality for rolled end products that meet the highest requirements.

EXPANSION OF ALUMINUM FLAT PRODUCTS RANGE

Investing in new hot and cold rolling mills for aluminum strip, Shandong Weiqiao Aluminium & Electricity Co. Ltd. is extending its manufacturing range and positioning itself as a fresh vendor on the market for aluminum flat products in China.

Currently the Zouping rolling mill complex is under construction in the Chinese province of Shandong, on the lower Yellow River. SMS Siemag is supplying a 1+4 hot rolling mill, a three-stand cold-tandem mill, and two single-stand cold rolling mills for aluminum strip. Our customer plans to primarily manufacture material for aluminum cans.

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

The 1+4 aluminum hot rolling mill consists of an edging stand, rougher, cropping shears, four-stand finishing train with CVC® technology, plus runout equipment with trimming shear and coiler. To check the strip quality, the hot rolling mill comes with an inspection line. It will produce aluminum strip with a maximum width of 2,200 mm and a minimum thickness of 2.0 mm.

Cold rolling mills for final thicknesses of down to 0.1 mm

After project completion, Shandong Weiqiao Aluminium & Electricity Co. Ltd. will own three cold rolling mills in CVC® plus six-high design for rolling the aluminum hot strip to thin final gages. One single-stand cold rolling mill can produce minimum final thicknesses of 0.1 mm, while the tandem mill can achieve gages of 0.15 mm.

The cold rolling mills are equipped with CVC® plus technology as well as work and intermediate roll bending. They also feature our Hot Edge Spray system (HES) that prevents tight strip edges. Working in combination with the multi-zone cooling system, the CVC® plus and HES solutions meet the highest strip flatness requirements. Another advanced feature is the Dry-Strip system for minimal oil residues on the rolled strip surface.

Setting standards in green technology

We care about the future as well as about cutting our customers’ operating costs. That’s why SMS Siemag filter systems are both eco-friendly and effective.
The mills contain a total of six multi-plate filters to clean the rolling oil, plus two Airwash filter systems to purify the exhaust air. All this adds up to clean and efficient plant operation in line with the best technology.

When it comes to equipment for coil storage and transport, SMS Logistiksysteme GmbH offers an extensive range. Take for instance the high-bay store with a capacity of 1,400 coils. Each storage space is designed to take coils with a weight of up to 30 t.

All the rolling plants are due to go into production in 2013. Their annual production capacity totals more than a half-million t.

**AIRWASH AIR CLEANING PLANT FOR LOGAN ALUMINUM INC., USA**

Logan Aluminum Inc. uses an active-carbon-based system to clean the exhaust air from its two aluminum cold rolling mills. To reduce its operating and maintenance costs, our customer decided to replace the air purification plant and in May 2011 awarded us a contract for our Airwash solution.

Compared to the active-carbon method, our Airwash system is extremely cost-effective. Using an absorption/rectification process, it recovers the rolling oil from the exhaust air stream. This oil can then be channeled straight back into the rolling oil supply. Not only does this save money, but the high cleaning performance also meets even the toughest environment protection regulations.

The Airwash system for Logan Aluminum can recover up to 300 kg of rolling oil per hour.

Finally, the supply package includes the Airwash Oil 300 from SMS Lubrication, which is used as washing oil in the Airwash system. The new exhaust air cleaning system is due to go into operation in July 2012.

**PRODUCTION STARTUP AT QINGHAI PING AN ALUMINIUM**

The CRM1 cold rolling mill is the first of three plants we erected for our Chinese customer Qinghai Ping An Aluminium High Precision Machining Industrial Company in its new rolling mill complex near Xining in northeastern China. The first strip successfully ran through the plant on April 1, 2011.

Apart from a second, almost identical six-high cold rolling mill (CRM2), we also supplied a semi-continuous 1+3 CVC® plus aluminum hot strip mill that was installed in 2011. It processes aluminum billets in widths ranging from 950 to 2,200 mm and thicknesses from 410 to 630 mm. The billets are rolled to a hot strip thickness of down to 2.5 mm. The annual capacity of the hot strip mill is 500,000 t.

**PRODUCTS**

Fully equipped with our CVC® plus-6-HS technology, cold rolling mill No. 1 rolls aluminum hot strip in widths of up to 2,100 mm and a maximum entry thickness of 10.0 mm to a minimum final gage of 0.25 mm. The rolled strip is used as foil input stock or finished strip material. It is also in demand from the printing industry as a surface-sensitive lithographic material. The rolling mill features our tried-and-tested regulation and control systems.

All the core components, such as drives, media systems, and modular-design mill stand pipes, were manufactured by us, then preassembled and tested in our Hilchenbach production shop in Germany. That made final assembly at the construction site and commissioning both easier and faster.

Also included in our supply package were coil weighing and binding machines as well as auxiliary plants. Specifically, our compact, high-performance multi-plate filters clean the cooling lubricants. Furthermore, the two plants are connected to a joint Airwash exhaust air cleaning system with a total performance rate of 240,000 m³/h. Both filter systems meet the toughest environment protection requirements.
SMS Siemag Logistiksysteme supplied a high-bay store with five levels and 700 storage spaces for aluminum coils weighing up to 18.5 t. After project completion, Qinghai Ping An Aluminium High Precision Machining Industrial Company will be the owner of three high-performance, state-of-the-art rolling mills.

SHANGHAI DATUN, CHINA: ALUMINUM COLD ROLLING MILL IN OPERATION

On July 14, 2011, the Shanghai Datun Energy Resources Co., Ltd. rolled the first strip on its new cold rolling mill in six-high design. This involved reducing strip with a width of 1,780 mm from an initial 3.5 mm to a final thickness of 2.2 mm.

The cold rolling mill was integrated into the new Shanghai Datun production location in Xuzhou in the Chinese province of Jiangsu. It was an important occasion for Shanghai Datun, because the commissioning was the start of the company’s move into producing aluminum flat products with an annual rated capacity of 110,000 t. The single-stand plant in CVC® plus six-high design rolls aluminum strip in widths ranging from 950 to 2,150 mm and initial thicknesses of 0.15 to 8.0 mm down to final thicknesses of 0.1 to 7.0 mm. It achieves a top rolling speed of 1,500 m/min. The product range covers finished products and input stock for aluminum foil.

The rolling mill is equipped with control elements from SMS Siemag. Combined with the work roll and intermediate roll bending system, the CVC® plus technology ensures the best possible roll gap geometry and therefore excellent flatness. Furthermore, our proven HES (Hot Edge Spray) system significantly reduces the strip edge tightening that is typical for aluminum rolling. Also integrated here is our DS (Dry Strip) system, which minimizes oil residues on the finished strip. All this ensures Shanghai Datun meets the high quality requirements of its customers.

Apart from the cold rolling mill stand with coiler, we also supplied Shanghai Datun with a coil preparation station, a coil transport system, a residual coil and spool handling system, as well as the media equipment.
CHINESE CUSTOMER GUANGXI ALNAN ALUMINIUM FABRICATION CO., LTD. ORDERS FIRST ALUMINUM HOT ROLLING MILL

Guangxi Alnan, headquartered in the Chinese town of Nanning in Guangxi province, produces aluminum foil and extrusion material. Now it plans to tap into the growing market for aluminum plate and strip with its first aluminum rolling mill. The company can supply the shipbuilding, container, and aerospace industries with its plates. To achieve this goal, Alnan Aluminium is counting on the experience and advanced technology of SMS Siemag as a system supplier. Our order comprises the full supply of the hot rolling mill, consisting of a rougher and a finishing stand, plus all the electrics and automation.

The four-high rougher with a rolling force of up to 65,000 kN and a drive power of two times 7,000 kW rolls aluminum billets with widths of up to 2,650 mm, thicknesses of up to 800 mm, and a maximum weight of 31 t in reversing mode. This input stock is processed into plates.

The finishing stand comes equipped with CVC® plus technology. It has a rolling force of 55,000 kN and a drive power of 8,000 kW. The transfer bars, with an entry thickness of approx. 25 mm, are rolled in reversing mode down to final gages of 2.2 to 12 mm.

New on the books in December 2011 was an order from Guangxi Alnan for a powerful single-stand cold rolling mill.
complete with electrics and automation. It will give the company more options for manufacturing aluminum cold strip.

The single-stand CVC® plus cold rolling mill in six-high design will roll a broad range of aluminum grades, including 2XXX, 5XXX, 6XXX, and 7XXX series, to minimum thicknesses of 0.20 mm. With its impressive maximum rolling force of 32 MN and high rolling torque, the plant is ideally equipped for processing thick and hard aluminum strip. Responsible for excellent flatness are the CVC® plus technology combined with work and intermediate roll bending, our Hot Edge Spray (HES) system, and multi-zone cooling.

Also included in the supply package is an Airwash filter system to clean the exhaust air, plus key auxiliary plants. The Alucontrol automation solution specially developed for aluminum rolling provides the basis for the electrics and automation of both plants.

It is important to our customer that we produce the quality-critical core components in our own production shop in Germany. Commissioning is scheduled for 2013.
High order intake despite difficult market climate.

Even in an unfavorable market climate with continued price pressure in 2011, we were still able to considerably increase our order intake. We attracted orders for a total of eleven strip processing lines. Furthermore, we received a number of orders to equip strip processing lines with technological key components. That secured our leading position on the market.

Compared to the two previous years, sales decreased slightly because we have now completed most of the orders placed in the record year of 2008. However, sales volume remains at a high level. This year, we anticipate a further increase in demand on a highly competitive market.

TINPLATE - ELECTROLYTICALLY TIN-PLATED FINE SHEET

Electrolytically tin-plated fine sheet (tinplate) is a cold-rolled, recrystallization-annealed, possibly reduced thin sheet made of carbon steel with a permanent coating of tin applied in an electrolytic process. The tin coating protects the base material from corrosion and after appropriate surface treatment also provides an excellent adhesion substrate for subsequent finishing.

Due to the fact that it is mainly used for packaging, tinplate is also known as packaging steel. The major application fields are cans for food and pet food as well as beverages. Furthermore, packaging for chemical products, spray cans for aerosols, and lids or crown corks are overwhelmingly made of tinplate.
ELECTROLYTIC TIN PLATING

This process involves applying the tin to the surface using electro-chemical separation while the strip runs through an acid electrolytic bath. The electrolytic bath functions as an ion conductor, as chemical processes occur due to the movement of the ions onto the electrodes as the strip travels through the bath. The thickness of the tin layer can be controlled very accurately by adjusting the electric current and the travel time, which is directly related to the strip speed. That makes it possible to very precisely apply extremely thin layers measuring just a few micrometers. Depending on requirements, different plate thicknesses can be deposited on the individual strip sides.

SOLUBLE ANODES ENSURE HIGH COST-EFFECTIVENESS

SMS Siemag electrolytic tin plating lines use soluble anodes. The anodes consist of several rods, which can be adjusted in width to match the strip width. The result is a consistently high surface quality and system efficiency. Furthermore, this method eliminates costs for the restoration of the anode surface. The costs for the tin and the losses from tin sludge formation are also lower. No expense at all is incurred for oxygen.

Electrolytic tin plating lines can also be equipped with insoluble titanium anodes. Here, the electrolyte must be continually enriched with tin ions so that the tin can be deposited on the strip surface. However, this method requires the tin granulate to be dissolved in a system using oxygen. The economic drawback is the higher price of tin granulate, which is 5 to 10 % higher than the price of tin ingots for the production of soluble anodes. What’s more, at least 4 % of the dissolved tin is lost in the form of tin sludge. Extra cost and effort is needed to replenish the special metal coating on the active surfaces of the anodes. Edge masks are necessary for the insoluble anodes in order to adjust the anode width to the width of thinner strips.

PREPARATION CELL

A special process component introduced by SMS Siemag is the preparation cell filled with low-concentration sulfuric acid. The strip runs through this directly before entering the first tin-plating cell. In the preparation cell, the strip is pre-activated and the last particles of iron hydroxide are removed. That ensures the iron content in the electrolyte remains at a constant low level. In contrast, tin-plating lines without preparation cells rely on activation of the strip in the first tin-plating cell. As a result, the iron concentration in the electrolyte can increase to such an extent that it becomes unusable.

TIN-PLATING SECTION

Coating itself takes place in several vertical cells each equipped with four soluble tin anodes. Depending on the strip width, the anode arrays are fitted with up to 18 rods, each 70 mm wide. Because the anode width is chosen to match the strip width, no strip edge masks are necessary.
Because of its higher conductivity, methanesulfonic acid (MSA) is used as the electrolyte. This reduces energy costs, plus the higher current density results in greater flexibility. The electrolyte is largely biodegradable and can be disposed of in an eco-friendly way.

**MONITORING AND REPLACEMENT OF THE TIN ANODES**

A monitoring system continually measures and displays the condition of the anodes. All the rods of an anode array are always replaced simultaneously so that each array contains anodes of the same thickness. This so-called parallel arrangement of the anodes guarantees continuously high-quality and even coating conditions as well as avoiding risks to the strip run from defective anodes. The anodes are produced close to the lines in an anode casting machine.

**REFLOW UNIT**

In the reflow unit, the coating is heated inductively to 250 °C, which is beyond the melting point of the tin. That gives the strip a shiny surface and an alloy layer that improves the corrosion protection and the adhesion of the tin layer to the strip surface. The heat treatment combines the advantages of electrolytic plating (very thin layers) and hot-dip galvanizing (alloy layer). Using high-frequency technology means the thermal processing can be achieved entirely with induction. That in turn removes the need for current rolls on the strip surface, which can cause surface faults. It also prevents the formation of wood grains. Especially noteworthy here is the highly efficient, simple, and exact control of the induction unit. Operators can alter the position of the unit in the strip run to always obtain the required alloy layer.

**EXPANSION OF OUR PRODUCTION IN CHINA**

SMS Siemag received an order from Hubei Jiang-Zhong Machine Manufacturing Co. Ltd. for the complete supply of the plant components for two tinplate annealing lines for Yichang Three Gorges Quantong Co. Ltd. It is usual practice in China when orders are awarded to foreign companies for plants of this kind and dimension that some of the value is added directly in China. While the plants are designed and built abroad, a large proportion of the equipment is manufactured and assembled in China. Local companies in China are carefully selected and supervised for this work. Essential here is quality monitoring to ensure the plant parts meet the necessary standards for on-site installation. Only specific components are imported. With its own locations in China, SMS Siemag can also supply the components that must be manufactured locally.

This means we supply the entire plant in high quality from one source. The two tinplate annealing lines process 350,000 t of ultra-fine plate per year that is subsequently electrolytically plated and used as packaging material.

**ORDER FOR COMPLETE LINE GOES TO SMS SIEMAG STRIP PROCESSING LINES SHANGHAI, CHINA**

A hot-dip galvanizing line for the Shagang Group is the first project for which SMS Siemag Strip Processing Lines Shanghai has taken over complete project planning and responsibility for order processing. The supply scope covers not only design and production of the core machines, but also supervision of assembly and commissioning.

The galvanizing line with an annual capacity of 320,000 t will give the cold strip produced here durable corrosion protection as well as an attractive finish and increased mechanical strength. Either zinc or aluminum/zinc coating are possible. The material will be sold mainly to manufacturers of high-quality household appliances and the automotive industry in the region. Included among the line equipment are an air knife system from Fontaine-Engineering and a vertical radiant-tube furnace from Drever International.
**FURTHER NEW ORDERS FOR COMPONENTS**

This year, several new orders for strip processing line components for Chinese customers went to Strip Processing Lines Shanghai together with our production and assembly location SMS Siemag Metallurgical Equipment in Wujin. These orders demonstrate that our Chinese companies can directly meet the demand from Chinese steel producers for high-quality components. SMS Siemag supplied a tension-leveling machine for a rewinding line to Wisdri Engineering & Research. The plant went into production at the end of 2011. The order covers the design and production of the plant as well as supervision of assembly and commissioning. Another new order we received was for a side trimmer with integrated scrap chopper to be installed in a push-pickling line at Shougang Qian’an. This will be the first side trimmer supplied independently by our Chinese companies.

They will take care of engineering, layout, manufacturing, assembly supervision, and commissioning. An order for another tension leveler came from Ansteel Engineering & Technology. This plant will be installed in a hot-dip galvanizing line at Angang Putian. Furthermore, Ansteel Group International Trade Co. awarded us a contract to supply a post-treatment section including a roll-coater for a hot-dip galvanizing line.

**NEW DEVELOPMENT OF A HIGH-PERFORMANCE LASER WELDING MACHINE**

At the beginning of 2006, SMS Siemag received an order from Salzgitter Flachstahl GmbH, Germany, for a laser welding machine to be integrated into a new pickling line. Completely newly developed by us, the laser welding machine went into operation in the pickling line in 2008. Not only was this an innovative design, we also faced the technological challenge of how to weld extremely hard-to-weld steels such as C67 without additional materials. In 2011, two further laser welding machines went into production, and SMS Siemag received two new orders for laser welding machines. That makes a total of five machines sold.
SECOND PLANT GENERATION SUCCESSFULLY COMMISSIONED

The two laser welding machines in the pickling lines at Tokyo Steel, Japan, and ThyssenKrupp Steel, USA, were successfully commissioned. Among other things, the machines feature a newly developed blade cartridge and hydraulic servo-screwdowns for strip thickness control.

Right from the start, during commissioning of the laser welding machine in the new continuous pickling line at Tokyo Steel, all the contractually specified material combinations were successfully joined. Even strips with thickness differences of up to 1.5 mm were perfectly welded together.

NEW ORDERS FOR LASER WELDING MACHINES

JSW Steel Limited, India, awarded us a contract to supply a pickling/tandem mill including laser welding machine for its Indian location in Toranagallu Vidyanga (Bellary). The pickling/tandem mill will achieve an annual capacity of 2.3 million t of cold strip in widths of up to 1,890 mm. Starting in 2013, JSW will use the new mill to produce strip from high-quality steel grades for the automotive industry.

Similarly, Hyundai Hysco of South Korea ordered a laser welding machine for its new pickling/tandem mill in its Dangjin plant. Due for commissioning in mid-2013, the laser welding machine will be used at the entry side of the mill to weld hard-to-join steel strip into endless strip that can then be fed smoothly into the continuous process.

LARGE NUMBER OF INNOVATIONS

The welding machine features a whole range of innovations that ensure reliable and fast welding, even of difficult material combinations. New here are, for instance:

- Automatic adjustment of welding parameters to new material pairs based on smelting analysis.
- Welding process of difficult material combinations supported by patented inductive heat treatment of the seam.
- Automatic weld seam inspection before, during, and after welding by an integrated weld seam analysis system.
- Automatic laser positioning according to the actual join gap.

ASSEMBLY AND PRE-COMMISSIONING IN HILCHENBACH

Before delivery, the laser welding machine will be fully assembled and pre-commissioned in our Hilchenbach workshop in Germany. This gives us the opportunity to test all the functions. At the same time, we can train the maintenance and operating personnel who will work on the machine in the future while it is fully operational. The result is much simpler commissioning of the machine after installation in the customer’s production line. Included in our scope of supply are the design and manufacturing of the mechanical equipment, as well as the entire electrics and automation.
MAJOR ORDERS

- Gazi Metal Mamülli, Turkey;
  semi-continuous pickling mill
- Hyundai Hysco, South Korea; combined annealing and hot-dip galvanizing line with air knives
- Hyundai Hysco, South Korea; continuous hot-dip galvanizing line with air knives
- Shagang Group, China; tinplate annealing line
- Shagang Group, China; continuous hot-dip galvanizing line with air knives
- Shagang Group, China; electrolytic tin-plating line
- Shougang Jingtang, China; two continuous annealing lines
- Shougang Jingtang, China; two electrolytic tin-plating lines
- Shougang Jingtang United Iron & Steel, China; tinplate annealing line
- Hyundai Hysco, South Korea; laser welding machine for pickling/tandem mill
- JSW, India; pickling/tandem mill including laser welding machine
- Angang Cold Rolling, China; air knives for continuous hot-dip galvanizing line
- Haining Lianxin Strip Science & Technology, China; air knives for continuous hot-dip galvanizing line

COMMISSIONING PROJECTS

- MMK, Russia; pickling/tandem mill
- Tokyo Steel, Japan; continuous pickling mill with laser welding machine
- Severstal Columbus, USA; push-pull pickling line
- JSC Severstal, Russia; continuous color coating line
- Shougang Jingtang, China; continuous annealing line
- ThyssenKrupp Steel, USA; continuous hot-dip galvanizing line No. 1
- ThyssenKrupp Steel, USA; continuous annealing line
- ThyssenKrupp Steel, USA; continuous hot-dip galvanizing line No. 4
- ThyssenKrupp Stainless, USA; stainless steel annealing and pickling line
- MMK, Russia; fluidized bed acid regeneration plant
SHOUGANG JINGTANG AND SHAGANG

Location: China

THREE NEW PLANTS FOR COST-EFFECTIVE PRODUCTION OF HIGH-QUALITY TINPLATE

In 2011, Shougang Jingtang United Iron & Steel placed an order for the supply of two electrolytic tin-plating lines (ETL) for a total annual production of 475,500 t of high-quality tinplate.

Another electrolytic tin-plating line was ordered, this time with an overall annual capacity of 202,500 t. What helped persuade the two companies to choose tin-plating lines from SMS Siemag was their use of soluble tin anodes, with considerable cost advantages for the operator.

Apart from the order for the two electrolytic tin-plating lines, we have already erected and commissioned other plants in the new Shougang Jingtang plant. They are two annealing lines in 2009 and 2010, as well as a pickling/tandem mill in 2007.

Electrolytically tin-plated fine plate (tinplate) is mainly used as packaging material, especially for food and beverage cans. However, tinplate is also used to make chemical and technical products as well as aerosol cans.
Expansion of our competence in thermal processing equipment.

We founded our new Furnace Technology Division in 2011. The reason behind the move is our plan to increase our competence in the thermal processing of flat products. This involves expanding our global know-how in equipment for heating and cooling steel and nonferrous metals. Following the collapse in demand in 2009 and 2010, the first signs of recovery emerged in 2011. By developing new products, we aim to increase our share of the market volume in 2012.

What makes thermal processing so important is that it is the core process in manufacturing modern flat steels. When it comes to flat products, thermal treatment is key to determining the material properties and quality of the final product. Controlled heating and cooling are essential for the production of the high-quality materials today’s market demands. Often, cooling is even more important and simultaneously more complex than heating.

Our new division focuses on thermal processing in the manufacture of hot strip, both in hot strip mills and via the CSP® route. Another factor is that thermal processing is also important for the production of heavy plate. It is followed by cold rolling and strip processing during which recrystallization annealing
is an essential stage. In strip processing or batch annealing plants, thermal processing determines the main mechanical and metallurgical properties of the end products. Next in line is drying after color coating.

Up to now, we bought in process stages at many points along this chain, but in the future we want to supply them ourselves. Our know-how about these processes that are so important to customers will form the basis of our success. The new division will develop, pool, and implement this know-how in order to offer customers excellent solutions for the high-quality and efficient manufacture of their final products.

When it comes to furnaces for strip processing plants, we are already very well positioned on the market through our subsidiary Drever – above all in the segment of lines for the treatment of carbon and stainless steel strip. Now we aim to extend our range of furnaces for electric strip lines and for NF metals such as aluminum.

We have already launched quenching units on the market for defined cooling in hot rolling and heavy plate production. Currently, we are further developing this technology in consideration of new material requirements and cooling strategies. Today, SMS Siemag is in a strong position with CSP® tunnel furnaces. At a length of 250 m, they make up a large part of our CSP® plants. Recent development work has led to useful new roller designs. The water-cooled rollers reduce energy consumption by 30 % compared to conventional designs. We have also developed new dry roller solutions to market maturity. Another innovation is a V-shaped ferry that makes it possible to build a 3-strand CSP® plant with an annual capacity of 4 million t.

**Drever International**

Drever, based in Liège, Belgium, has been a full subsidiary of SMS Siemag since 2006. Additionally, Drever Metallurgical Technology was founded in Shanghai, China, in 2007. Drever is a global leader in the manufacture of continuous annealing furnaces for carbon and stainless steels that are mainly used in continuous annealing and hot-dip galvanizing lines (carbon steel) or annealing and pickling lines (stainless steel). The company also supplies furnaces for processing electric strip (silicon strip). In recent years, reference plants for cooling heavy plates have also been commissioned.
**Ares**
To give it the capacity to supply the Chinese market locally, SMS Siemag acquired shares in Ares, China, in 2010. The focus here is on roller and rotary hearth furnaces as well as furnaces for thermal processing of silicon strip and heavy plate. Currently some 50 employees work at the company’s location in Tianjin, China.

**GATV**
The acquisition of GATV (active in aerodynamic and thermodynamic process technology), currently based in Leverkusen, Germany, means we gained a team of experts from a company that has devoted itself for more than 20 years to drying and cooling strip (with air or water). GATV is a global supplier of process technology in the application fields foil and strip coating, also for the aluminum and steel industry. Included in their range are floater furnaces.

There have been many joint projects involving SMS Siemag and GATV in the past. One example is the floater furnace in the color coating line for aluminum strip that is currently being erected for ASAŞ Alüminyum in Turkey.

**TOTAL OF NINE NEW ORDERS FOR HIGH-PERFORMANCE RADIANT-TUBE FURNACES IN COLD STRIP LINES**
Drever International was able to consolidate its standing as the market leader for erecting furnaces in lines for carbon steel cold strip processing. It attracted orders for a total of nine furnaces for hot-dip galvanizing lines, continuous annealing lines, and tinplate annealing lines. Specifically, companies such as Hyundai Hyasco in South Korea, and Shagang, Maanshan, Angang, and Panzhihua in China will start up radiant-tube furnaces from Drever in the next few years. What makes Drever International radiant-tube furnaces stand out are their high efficiency and safe process control. In the furnace, the microstructure created during cold rolling is restructured in a controlled way to obtain the desired mechanical properties. It is vital during this process to ensure the strip is annealed and systematically cooled in line with a special temperature curve. There are precisely defined and automatically controlled sequences with different temperatures, holding times, strip speeds, and cooling rates for every steel grade and strip geometry. The decisive factor for the mechanical properties of the final material — especially in the case of high-strength materials — is controlled, rapid, and even cooling after recrystallization annealing in the vertical radiant-tube furnace under a protective gas atmosphere. The automotive industry increasingly demands high-strength steel grades in order to reduce vehicle weight while maintaining or even improving strength.

**Ultra Fast Cooling system**
Responding to the growing demand for high cooling rates, Drever International has developed an Ultra Fast Cooling (UFC) system that is capable of an even strip cooling performance of 120 K/s/mm. What’s more, it produces an excellent strip shape and very good surfaces. The Drever Ultra Fast Cooling system for the production of high-strength steel grades achieves a convection cooling performance of up to 300 kW/m². Consequently, strip can be cooled in the ultra-fast cooling zone at rates of 100 to 120 K/s/mm from 750 °C to as low as 300 °C within a few seconds. This kind of cooling performance is necessary to produce multiphase steel grades with strengths of up to 1,000 MPA.

The cooling system utilizes the properties of hydrogen (low density and high conductivity) to boost the cooling capacity. The special feature of the Drever Ultra Fast Cooling system is that pure hydrogen is introduced into the cooling chambers to achieve a hydrogen content of 20 to 30 %, and this is responsible for the high cooling performance. Due to the natural diffusion of the gas into other areas, no complex separation of the cooling and the adjacent zones is necessary. As a result, the system requires no more hydrogen than the conventional furnace solution with 5 % hydrogen in the protective gas.
MAJOR ORDERS

- Hyundai Hysco, South Korea;
  furnace for combined annealing and hot-dip galvanizing line
- Hyundai Hysco, South Korea;
  furnace for continuous hot-dip galvanizing line
- Shagang Group, China;
  furnace for tinplate annealing line
- Shagang Group, China;
  furnace for continuous hot-dip galvanizing line
- Panzhihua Iron & Steel, China;
  furnaces for two continuous annealing lines
- ArcelorMittal St-Chély d’Apcher, France;
  furnace for electric strip annealing and coating line
- Guanghan Tiancheng Stainless Steel Products, China;
  furnace for stainless steel annealing and pickling line
- Angang Cold Rolling, China;
  furnace for continuous hot-dip galvanizing line
- Maanshan Iron & Steel, China;
  furnace for continuous annealing line
- Hunan Valin LY Steel, China;
  furnace for continuous annealing line

COMMISSIONING PROJECTS

- ThyssenKrupp Steel, USA;
  furnace for continuous hot-dip galvanizing line No. 1
- ThyssenKrupp Stainless, USA;
  furnace for stainless steel annealing and pickling line
- Shougang Jingtang, China;
  furnaces for two hot-dip galvanizing lines
- Outokumpu, Finland;
  furnace for stainless steel annealing and pickling line
- Wuhan Iron & Steel, China;
  furnace for continuous annealing line
- Handan Iron & Steel, China;
  furnaces for two hot-dip galvanizing lines
- Jiangyin, China;
  quencher for heavy plate thermal processing
ORDER FOR FURNACE FOR ELECTRIC STRIP PRODUCTION

Equipped with a new annealing and coating line, Arce-lorMittal St-Chély d’Apher, France, plans to increase its production of high-quality non-grain-oriented electric strip (NGO). The order for the horizontal furnace for the new line went to Drever International in May. The line is scheduled to go into production in December 2012.

Due to its electrical and magnetic properties, NGO electric strip (also called silicon steel strip) is mainly used in electro-technology to manufacture core parts of electrical machines. Because the orientation of the ferritic grains (texture) is randomly distributed, the material features largely isotropic mechanical and magnetic properties in all directions and is usually used in rotating machines with changing field orientation. The material produced on the new line can be used in hybrid vehicles, for instance.

In the annealing and coating line, the annealing process directs the internal grain structure of the 0.18 to 1.5-mm-thick strip at a speed of up to 240 m/min. Depending on requirements, the material, which is between 800 and 1,350 mm wide, is then covered with an insulation layer. The new line is already the third annealing and coating line in the ArcelorMittal facility in St-Chély d’Apher. In the horizontal annealing furnace, the strip is initially heated to more than 1,000 °C, with the heat introduced by inductors and electric heating elements. The furnace atmosphere consists of a nitrogen/hydrogen mix, and this new furnace is capable of operation with a very high hydrogen concentration. This reducing atmosphere produces an especially oxide-free, clean strip surface, which contributes to high material quality. Equally important for the microstructure is careful, slow cooling of the material. This is why the strip is cooled at a very precise rate, first in a slow cooling section, then in a rapid cooling phase. A standout feature of the plant is the heat recovery system in the cooling section, which enables the surplus heat to be utilized at other places in the steelworks. Moreover, the residual heat can even be used as district heating to heat the local swimming pool.

Demand for electric strip is growing steadily due to its advantageous electromagnetic properties. They lead to substantial increases in energy efficiency in electro-technology applications. However, the highly complex production routes require sophisticated strip processing methods. Our long-standing experience in this field means we supply advanced solutions for the production of excellent qualities.
New developments and improvements ensure our customers’ productivity.

In 2011, our Electrics and Automation Division increased order intake significantly against the previous year. However, sales were down compared to 2010. We expect sales this year to return to the same level as 2010.

INNOVATIONS FOR STABLE PRODUCTION

We launched our SMS Siemag innovation offensive to ensure we develop automation solutions that meet the requirements of improved mechanical equipment and new process technologies.

Naturally, the development fields in our Electrics and Automation Division are just as varied as its range of products. Looking for example at steelmaking plants, we have developed improved process models and controls that reduce furnace throughput times and cut energy consumption. Our specialists have improved the microstructure model applied in hot rolling mills for even more reliable prediction of material properties and microstructures in heavy plate production. One development focus in cold rolling is the reduction of off-gage lengths to achieve higher productivity.

To help our customers cope with the increasingly complex automation of production plants, we develop innovative visualization methods and concepts that put the operator at the center of the system. A crucial factor here is improved ergonomics and user-friendly work place design.
FASTER COMMISSIONING WITH PLUG & WORK

Once again last year, our Electrics and Automation Division performed extensive integration tests according to our Plug & Work system. In our test fields, the automation system is tested and optimized under near-reality conditions long before installation at the customer’s facility, using a simulation model that maps the entire mechanics, drive technology, and process. Additionally, we train the customer’s operating personnel on the original control desks. In virtual production operation, they get to know the plant functions and how to control them in realistic operating situations. As a result, Plug & Work ensures a rapid runup of the plant.

NEW, STATE-OF-THE-ART TEST FIELD

To ensure we always perform our integration tests under the best conditions, we set up a new, fully air-conditioned test field on a floor space of 400 m² at our Hilchenbach location in Germany. Here, up to four plants, e.g., hot or cold rolling mills, can be tested simultaneously.

This is how we carried out the integration test for the upcoming commissioning of the hot and cold rolling mills for Ma’aden-Alcoa in Saudi Arabia. In the future, the customer will use its new aluminum production plant to produce aluminum cold strip for cans.

Apart from the entire electrics and automation, we are setting up a training center for this project with simulation systems similar to those we use in our Plug & Work test fields. After a thorough system test, the customer’s operating personnel can learn how to use the plant in this center. It gives Ma’aden-Alcoa the option of training its personnel on site in regular or intensive training units. Our customer can demonstrate to its employees how the plants work and are operated by simply connecting the plant automation system to the process simulation just as we do during our integration tests. As employees look at the displays of the dummy control station, the original HMI system shows them all the relevant process figures so they feel like they are operating the real plant.

LARGE NUMBER OF COMMISSIONING PROJECTS WITH X-PACT® AUTOMATION

Last year, a large number of plants went into operation with our X-Pact® electrics and automation. That was how MMK in Magnitogorsk, Russia, was able to roll the first strip on the pickling/tandem line we supplied a full six weeks before the contractually agreed date. The Plug & Work solution played a major role in this early commissioning.

Another success was the commissioning of the 5.0-m heavy plate rolling mill at Vyksa Steel, Russia. It is designed for pipe grades up to strength class X120.
We equipped an electric steelworks and a slab continuous caster for Maghreb Steel, Morocco, with separate X-Pact® electrics and automation packages. The plants are designed for an annual production of 1 million t of steel and supply the Steckel rolling mill we also commissioned as well as a heavy plate rolling mill with input stock. They produce low and medium-carbon as well as high-strength, low-alloy steels.

The world’s first 3-strand CSP® plant went into production at Essar Steel, India, also supported by X-Pact® electrics and automation. Commissioning started at the beginning of April 2011 with one casting strand, followed in July 2011 by the second strand. The third casting strand is due to be commissioned shortly. As expected, the plant started up smoothly after Plug & Work testing, assembly, and commissioning. When it is completed, the world’s first 3-strand CSP® plant will have an annual capacity of 3.5 million t of hot strip.

We also used X-Pact® electrics and automation for the heavy shear line we built for Shougang Qian’an, China, once again confirming our capability as a complete supplier for the mechanical equipment as well as electrical and automation systems.

SUBSIDIARY LUX AUTOMATION

Our subsidiary LUX Automation GmbH specializes in service and modernization of plant electrical and automation systems in Germany and its European neighbors. Last year, LUX successfully wrapped up a number of projects. For instance, it installed the electric systems in a ladle furnace and an electric-arc furnace at Peiner Träger, Germany. Currently, LUX is supplying the electrics and automation for the Steckel rolling mill of our customer Salzgitter Flachstahl, Germany. The mill will be used to roll high-manganese strip on the new strip caster.
MAJOR ORDERS

STEELWORKS/CONTINUOUS CASTERS
- ArcelorMittal Kryvyi, Ukraine; electrics and automation for six converter steelworks
- PT. Krakatau Posco, Indonesia; electrics and automation for a BOF steelworks
- Pohang Iron Steel Co. Ltd., South Korea; electrics and automation for two ferro silicon submerged-arc furnaces
- Salzgitter Flachstahl GmbH, Germany; electrics and automation for a ladle turret, continuous caster No. 2, and converter steelworks A
- ArcelorMittal Gent, Belgium; electrics and automation for the modernization of the converter tilting drive
- AG der Dillinger Hütttenwerke, Germany; electrics and automation for vertical continuous caster No. 6
- Acos Laminados do Para S.A., Brazil; electrics and automation for caster No. 1 and a converter steelworks
- Hyundai Steel, Korea; electrics and automation for the modernization of the mold oscillation

HOT ROLLING MILLS
- DanSteel A/S, Denmark; electrics and automation for the modernization of the heavy plate mill
- Salzgitter Mannesmann, Germany; electrics and automation for a cross-cutting shear and further finishing equipment
- Indussteel Belgium S.A. (ArcelorMittal), Belgium; electrics and automation for an existing cold plate straightener
- Nanjing Iron Steel Group, China; part of the electrics and automation for a 4.7-m heavy plate mill

COLD ROLLING MILLS AND ALUMINUM PLANTS
- Gazi Metal Mamülli, Turkey; electrics and automation for a cold rolling mill including pickling and reversing plant
- Guangxi Alinan Aluminium, China; electrics and automation for an aluminum hot strip mill and an aluminum cold rolling mill

STRIP PROCESSING LINES
- Shougang Iron & Steel Co. Ltd., China; electrics and automation for a continuous annealing line and two electrolytic tin-plating lines
COMMISSIONING PROJECTS

STEELWORKS/CONTINUOUS CASTERS
– Peiner Träger GmbH, Germany; electrics and automation for a submerged-arc furnace
– Essar Steel Limited, India; electrics and automation (phase II) for a CONARC®, a Twin-LF (twin ladle furnace) with auxiliary plants and a slab plant
– Essar Steel Limited, India; electrics and automation for a 3-strand CSP® plant
– NA Kayser Lünen, Germany; electrics and automation for a rotary converter
– Jindal Stainless, India; electrics and automation for a single-strand slab caster and a stainless steelworks (AOD, 2 x EAF, LF, and auxiliary plants)
– Anglo American Brasil LTDA, Brazil; electrics and automation for two 114-MVA FeNi submerged-arc furnaces
– Severstal, USA; electrics and automation for a CSP® plant
– Maghreb Steel, Morocco; electrics and automation for an electric steelworks (EAF, LF, and auxiliary plants) and a continuous slab caster
– PNTZ, Russia; electrics and automation for an electric steelworks (EAF, LF, VD, and auxiliary plants)
– Kardemir, Turkey; electrics and automation for a gas recovery plant
– ArcelorMittal Bremen, Germany; electrics and automation for a gas recovery plant
– Essar Steel Ltd., India; electrics and automation of the 3-strand CSP® plant
– Severstal, USA; electrics and automation for coiler No. 2 of the CSP® plant
– Tata Steel, India; electrics and automation for the CSP® plant
– Vyksa Steel Works, Russia; electrics and automation including Level 3 for the heavy plate mill

COLD ROLLING MILLS AND ALUMINUM PLANTS
– Magnitogorsk Iron & Steel Works, Russia; electrics and automation for a coupled pickling/tandem mill
– Northeast Light Alloy Products Co., Harbin, China; part of the electrics and automation for an aluminum hot strip mill

HOT ROLLING MILLS
– SSAB TUNNPLAT, Sweden; electrics and automation for the new laminar cooling section and water supply plant
– Hyundai Steel Company, Korea; electrics and automation for a heavy plate mill
– Industeel Belgium S.A. (ArcelorMittal), Belgium; electrics and automation for a cold plate leveler
– Baotou Steel, China; electrics and automation for a cold plate leveler

STRIP PROCESSING LINES
– Lianyuan Iron & Steel Co., Ltd., China; electrics and automation for cross-cutting shear line
– Shougang Qian’an, China; electrics and automation for annealing and pickling line
– Shougang Iron & Steel Co. Ltd., China; electrics and automation for shear line
MMK PICKLING/TANDEM MILL

The pickling/tandem mill is part of a complete cold strip complex we are currently building for MMK in Magnitogorsk, Russia. With its technological features and an annual capacity of 2.1 million t of cold strip, the pickling/tandem mill is one of the world’s most powerful plants of its kind. From the energy distribution and drive technology to the technological controls in the X-Pact® Level 1 system to the production tracking in the X-Pact® Level 2 system, we supplied the entire electrics and automation for this plant.

Comprising four tanks, each 35 m long, the pickling section is the longest in the world. Integrated in the pickling circuit is a regeneration plant for recycling the hydrochloric acid. It is exceptionally efficient, making 99% of the acid reusable.

The entire pickling process is monitored and controlled by the pickling model of the X-Pact® electrics and automation. To optimize the temperature, the pickling model takes into account not only the temperature of the strip currently in the plant, but also that of the following strips. The result: excellent pickling at low energy consumption. Furthermore, the pickling model provides the target values for the speed-controlled pumps. That makes it possible to exactly regulate the quantity of pickling acid so that the plant can process both easy-to-pickle or hard-to-pickle strip, meeting the highest surface quality requirements.

Next, the pickled hot strip is rolled in the five-stand four-high tandem mill to final thicknesses of from 3.0 to a minimum of 0.28 mm. The powerful, 45-MW drives for the mill stands and coiler make this plant the world’s most powerful twin pickling/tandem mill. All these mill stands feature measuring, control, and adjusting systems including CVC® plus technology from SMS Siemag. The work rolls can be changed fully automatically within just a few minutes. Three loopers – controlled by an automatic load control system – ensure smooth production conditions in both plant parts. An automation system coordinates the number of loops in the loopers with the production plan. For example, the looper in front of the rolling mill is emptied in good time before a planned roll change.

The modular plant design, the preassembly of key components, and the extensive Plug & Work function tests provided ideal conditions for smooth assembly and commissioning six weeks before the contractually agreed date.
Once again in 2011, we significantly increased our order intake in services. Both in spare parts and in technical customer service, we further improved our market position as planned. Regionally, most of our service business is in the USA, China, and Western Europe, followed by Russia and India. The past year included major orders for the repair of core components such as drives, mandrels, and spindles, but also orders for support in servicing work, and for establishing customer-specific spare parts stores.

For 2012, we expect a continued high demand for our customized services tailored to metallurgical plants. Our Service Division is devoted to supporting our customers over the entire life cycle of their plants. That’s why we continually expand our product range and set up new service branches around the world.

We consider the teamwork between our customers’ experts and our SMS Siemag service employees to be a key basis for our joint success over the past few years. Now we aim to intensify this cooperation with the SMS Siemag TECademy, founded to offer our customers tailor-made seminars and training programs.

It’s the ideal opportunity for engineers, plant technicians, plant operators, and other specialists to gain expert support so they can recognize and utilize the full potential of their plants. Customers can choose from modules dealing with Technology, Plant Technology, and Maintenance/Servicing. If required, the SMS Siemag TECademy also offers customized training units either at our German locations in Hilchenbach and Düsseldorf, in SMS Siemag branches around the
world, or directly at our customers’ locations. At the beginning of December 2011, we booked the first order for a training course on the subject “Technologies in Hot and Cold Strip Production”.

**ELECTRIC-ARC FURNACE MAINTENANCE RIGHT ON TIME**

It was down to high flexibility and excellent coordination with the customer that an SMS Siemag service team completed maintenance of a 40-t electric-arc furnace at Gontermann-Peipers GmbH in Siegen, Germany, dead on time. The plant shutdown lasted just 20 days. Originally, the furnace was supplied in 1957/58 by one of our predecessor companies, Mannesmann Demag.

Gontermann-Peipers produces high-quality cast backup and work rolls as well as complex cast products for the mechanical engineering industry. The rolls are used worldwide in heavy plate mills, hot strip mills, and cold rolling mills in the steel and NF metal industry. It took the SMS workshop team a mere four days to carry out the work. The subsequent reassembly of the furnace also went without a hitch so that it could be released for production one day before the agreed date.

**INCREASING PLANT AVAILABILITY – OUR TECHNICAL CUSTOMER SERVICE**

Faced by continued cost pressure in the metallurgical and rolling mill industry, our customers place increasing importance on the availability of their plants. And it’s not just limited to daily maintenance. We also support our customers with repair management and planning, plus spare parts and stock management. One important instrument here is our Integrated Maintenance Management System (IMMS®). This approach of planned maintenance based on RCM (Reliability Centered Maintenance) methods has become well established on the market. We successfully installed IMMS® for the new large tube plant of the ChTPZ group in Russia.

Our Genius Condition Monitoring (CM) system is also becoming increasingly popular with our customers. This computer-aided system monitors and documents the condition of highly critical components and warns in advance of necessary maintenance work. That largely avoids unplanned standstills. We signed contracts for this system for instance with OMK in Russia, as well as TKS Bochum and Hydro Aluminium in Germany.

When it comes to the installation and commissioning of high-tech spare parts in their existing plants, our customers rely on the experience of our experts, who often work to tight time schedules and under difficult space conditions.

Typical for this kind of project is the replacement of roller slewing bearings in continuous caster ladle turrets, exemplified by the job at Krupp Mannesmann in Duisburg, Germany. It required intensive engineering work for the assembly, above all because large, cumbersome, and heavy parts had to be moved. The on-site machining work made high demands on the precision of the mobile machining systems. What’s more, the job had to be completed in the shortest possible time to keep the shutdown time of the production plant to a minimum.
SERVICE CLOSE TO CUSTOMERS – OUR BRANCHES

Last year, we further expanded our service network. Now, more than 30 locations and 1,100 employees around the globe offer services close to our customers. In early 2012, we are opening new service workshops in China, Turkey, Brazil, and India. Also in the pipeline are more locations in the Ukraine, the United Arab Emirates, Southeast Asia, and North and South America.

We registered an increase in repair business for core components in China. Currently, we expect even more growth above all in repairs of mandrels. Following a foundation phase, our service branches in Russia have proved successful. Considering the present project situation, we anticipate a steady expansion of our business in Russia.

Location: North America
- Spare parts
- Warehouse management
- Know-how components repairs
- Zinc pot equipment repairs
- Copper mold plating/segment workshop
- Roll workshop
- Work roll chroming
- Technical customer support

Location: South America
- Spare parts
- Technical customer support
- Know-how components repairs
- Copper mold plating/segment workshop
Burkhard Dahmen (right), President & CEO of SMS Siemag AG, and Marcel Fasswald (left), Managing Director of SMS India Pvt. Ltd., opening the new branch in Gurgaon, India.
Innovation drive for the entire process chain.

Here at SMS Siemag, we have an interdisciplinary approach to technological development, always taking into account the entire process chain: from steelmaking and continuous casting to hot and cold rolling, strip processing, electrics and automation, and service. As part of our innovation drive launched in 2009, we have significantly boosted investment, human resources, and activities in the whole area of development.

SMS Siemag draws on know-how about all process stages – from liquid steel right through to the finished product. This is how we are able to set the required physical parameters in steel production, then design the follow-up and further processing stages to ensure cost-effective, high-quality products. Customers can count on solution packages with plant components that mesh perfectly. This also means our Technological Development department must support and implement inter-departmental, interdisciplinary expertise.

Now, we have created the corresponding organizational structure. Our development work focuses on these customer requirements:

- Reduction of production costs
- Final product quality
- Environment and energy
- Raw and input materials

Engineers, mathematicians, physicists, and IT specialists work together in our Development Central department. Moreover, the department is closely linked to the SMS Siemag Divisions and maintains...
close contacts with cooperation partners among our customers and public research institutes. This guarantees a transfer of information and expertise between all parties involved and between theory and practice. Teaming up with customers in joint projects, we run industrial-scale trials on new developments. In concrete terms, this means we develop new products, such as burner technology for electric-arc furnaces, with a very close orientation toward market demands.

New or improved plant components as well as innovative coolants and lubricants are tested on our own test benches. Even after testing the prototypes, we put complex machine components such as flatness measuring rollers for cold rolling through extensive checks and calibration procedures. All this ensures our customers get ready-to-install components.

Our Plug & Work strategy follows a similar pattern. It involves setting up all the hardware and software components that belong to the electrics and automation of a future plant in our test center. Then we put everything through extensive integration tests using simulation tools.

In our development department, we also simulate all the essential processes using special software tools and programs developed by our own experts. Included here are steelmaking, casting, rolling, or coiling hot strip, as well as the mechanical and hydraulic behavior of plants, for instance when coiling high-strength strip. Yet these simulations are not only useful for providing in-depth insights into processes. They also enable us to test and optimize new developments. That cuts development time and minimizes customer risk during commissioning.

These are the basic principles behind our work on today’s development goals, applied along the entire process chain.
TECHNIKUM TECHNOLOGY CENTER

At our production location in Hilchenbach, Germany, we upgraded our technology center, Technikum. Here, plant components can be developed or basic research carried out using various test benches. There is for instance a strip rolling mill specially built for testing and optimizing high-performance emulsions. Currently our experts are using a strip plant with heating and cooling units for the further development of intensive cooling solutions. We also purchased a modern quenching and deformation dilatometer to enhance our material and process expertise. The dilatometer can be used for systematic material analyses, producing findings we can apply both in the design of our plants and in the development of new technologies. The Technikum facility means we can develop plant components quickly and to specific requirements before they are installed in customer plants. It is equally useful for new plant strategies.

STEELWORKS

New drive system for AOD converters
When process gas is introduced underneath the bath surface in AOD converters, it generates dynamic bath movements in the converter vessel, in turn causing severe oscillations that put considerable strain on the entire drive train. To tackle this problem, we have developed a new mechanical-electronic solution for the connection of the drive train to the foundations. It drastically cuts the dynamic stresses to approx. 20% of the normal figure, enabling smooth operations.

Innovative burner technology for electric-arc furnaces
The SIS burner/injector is a combined system for melting scrap and overheating the heat in the EAF. It consists of a central laval nozzle and a coaxial annular gap nozzle. In a cooperation project with the shock wave lab at RWTH Aachen University, we developed a dynamic gas calculation model that determines the optimum contour of the laval nozzle and calculates the impact of the hot enveloping gas jet on the central oxygen jet. Now we can optimize the flow of the SIS unit to eliminate pressure interference in the central jet so that large flame and jet lengths are achieved. This will make the melting and overheating process in the EAF more efficient.

CONTINUOUS CASTING

HD mold (High Definition mold)
Our newly-developed, low-maintenance mold plates with fiber optics provide reliable temperature measuring with signal quality better than previously possible, giving our customers an even more detailed and precise insight into the continuous casting process.

For the first time, temperature distribution can be represented in the form of a 3-D graphic with integrated displays of heat flow density and strand shell thickness. Also included in the HD mold are early breakout prediction and longitudinal crack detection. In addition to the online options, powerful offline replay functions and long-term evaluation systems are also part of the overall system.

The new sensor system with fiber optics is capable of measuring a large number of temperatures with free selection of the distances between two measuring points. This makes it possible to determine the position of the actual mold level (without casting powder). The sensors can monitor the mold filling process, or in the future even automatically control it.

HOT ROLLING

High-performance Sieflex® spindles
Frequently, it is the drive spindle that limits the maximum transmittable rolling torque and the minimum roll diameter for finishing stands in hot rolling mills. This is where the new generation of Sieflex® spindles makes all the difference, enabling transmission of much higher torques. This increased performance is achieved above all by an improvement in the gearing design. It makes smaller roll diameters and therefore smaller mill stands feasible. The high-performance spindle is also ideal for modernizations because it comes with a longer service life and increases rolling torque at the same work roll diameter.
Cooling section for DQ qualities – mechanical equipment and model

Producing thick DQ (Direct Quench) steel grades on hot strip mills represents a considerable challenge for the design of the cooling section. A new generation of laminar cooling systems achieves the high cooling rates necessary for DQ steels by applying a much higher volume of water – up to three times that of standard cooling sections.

A system of this type has been installed at SSAB in Sweden. Apart from DQ grades, SSAB produces more than 330 different steel grades. The improved cooling model works by calculating the water volume required to achieve a precise coiler temperature on the basis of a pre-defined cooling strategy.

The whole system is based on physical and mathematical calculations that describe the microstructure depending on the chemical composition. As a result, the coiler temperature is maintained within the contractually agreed limits after only a very short start-up time.

Multifunction cold rolling mill

The CVC® 18 HS multifunction cold rolling mill is an innovative rolling mill type for high-strength steels such as stainless steels. What is special here is that these mills feature extremely thin work rolls that are supported at the sides. That makes high thickness reductions possible in just one pass. Because the work rolls come with a large horizontal shifting range, operators can adjust the forces on the support system, reducing the rate of wear. Changing the mill stand from CVC® 18 HS mode to a four-high stand is easy and fast. All it takes is replacing the roll cartridge. For the plant owner, that means low investment costs and increased flexibility. Plants of this type are in operation for instance at Posco (Korea) and Yusco (Taiwan).
Self-cleaning rolling oil filter equipment: Durafine® filter system
Our Supafine® filters are known for super-fine filtration of rolling oils used for instance in cold rolling stainless steel and NF metal strip. More than 200 references worldwide demonstrate its market acceptance.

Now, after the systematic further development of the Supafine® solution, we can present our advanced Durafine® filter system. Even more compact in design, the newly developed Durafine® filter system achieves better cleaning for top strip quality. It requires only 30% of the installation space of a comparable Supafine® filter. This makes the system ideal for revamps. Furthermore, our customers benefit from lower operating costs.

**ENERGY AND THE ENVIRONMENT**

We constantly improve our cost-effective CSP® process, with a particular focus on cutting energy consumption. In the CSP® process, a roller-hearth furnace links the caster to the rolling mill. The thin slab is conveyed through the furnace by furnace rollers installed at regular intervals. According to current best technology, the internal support tube is cooled with water to achieve a viable service life of the furnace roller. However, this removes heat from the furnace, which has to be replaced.

To solve this problem, we have developed a furnace roller that does not require water cooling. Consequently, it reduces the energy consumption of the overall tunnel furnace by up to 50%. The roller is made of a high-temperature-resistant special alloy. It can also be installed in and removed from the roller-hearth furnace at operating temperature. Right now, the first prototype tests are under way.

**ROBOTICS**

We are also developing robotics for application over the entire process chain. New in this field is our assistance robot for maintenance work on ladles, with the maintenance employee and the robot both inside the work space at the same time. Here, the robot performs the ergonomically difficult and strenuous tasks, while the employee takes care of the complex sensory and monitoring tasks. Major priorities in this development work are safety, integration of the work place with robots in the steelworks surroundings, and designing tools suitable for automation. We are cooperating with an industrial partner on this project.

**STRIP PROCESSING LINES**

**Stainless steel pickling model**
We have developed a Level-2 model for stainless steel strip pickling that ensures consistent pickling quality while minimizing acid consumption. Primarily, the model maintains a constant concentration of the nitric acid and hydrofluoric acid mix to suit the material quality, and adjusts the acid temperature to the operating conditions. This process does not require any input from the operating personnel. The same method is used for the upstream sulfuric acid or neutral salt pickling systems. Thepickling model was applied for the first time in the pickling line for stainless steel and special grades at Baoshan Special Steel Branch in Shanghai, China. Another line equipped with the stainless steel pickling model is the new annealing and pickling line for stainless steel strip at ThyssenKrupp Stainless Steel USA in Calvert, Alabama.
Strong growth on the market for wire rod and bar mills

**SIGNS POINT TO GROWTH AGAIN**

After an average business year in 2010, the signs in Business Area SMS Meer again pointed to growth in 2011. Order intake increased to EUR 1,365 million – a growth of 31%. This was the second-highest value in the history of the Business Area. SMS Concast was consolidated into Business Area SMS Meer.

Sales increased by 24% to EUR 1,197 million. Here again, this was the second-highest value ever.

In terms of profit, Business Area SMS Meer improved even on the already good previous year’s result. All the product areas plus service contributed to the overall positive development of the past business year.

**GROWTH IN LONG PRODUCTS**

Apart from its traditionally strong position on the markets for tube and forging plants, SMS Meer also achieved a high market penetration in long product rolling mills in 2011. What paid off here were our investments in the highly competitive market for wire rod and bar mills, where we achieved above-average growth rates. The new location in Shanghai contributed to the success of SMS Meer in China as a plant supplier also to medium-sized wire producers.

Simultaneously, the Business Area boosted its market leadership in section and billet mills. Business with bright steel processing lines also increased significantly.

**ON COURSE FOR INCREASED INTERNATIONALIZATION**

New recruitment of staff in the Asian growth regions continued in 2011. In India, we built up a strong service unit alongside our existing Indian company. We are on course with our expansion of manufacturing capacities.

Since 2011, SMS Meer has also been represented in Japan with its own company. SMS Meer K.K. in Tokyo ensures our Japanese customers receive on-site support more quickly.
The Managing Board of SMS Meer GmbH

At SMS Meer, service means providing our customers with higher productivity and plant availability. Our business partners profit from higher product quality and lower operating costs. After continually expanding our service activities over recent years, we restructured our service range. MEERcare pools all services to do with machines and plants – from spare parts to maintenance and revamps, to on-site support. MEERcoach offers customers training and support services such as startup support, production monitoring, and training courses. MEERconsult covers consulting and implementation services, maintenance strategies, feasibility studies, and process and technical advice.

However, SMS Meer is not only expanding its international branches and services. It is also investing in its production areas. In 2010, the Business Area opened a modern workshop in Shanghai, and last year we started extensive construction work on the modernization of the production plants in Mönchengladbach and Aachen. The investment package totals EUR 60 million – for new production shops, but also for modernizing the machining equipment. “This is how we are boosting productivity and cutting delivery times,” says Dr. Joachim Schönbeck, President and CEO of SMS Meer.

These measures will significantly shorten lead times and reduce manufacturing costs. Simultaneously, improved production planning and control systems will create extra flexibility for short-term spare part and repair jobs. All this means we can supply customers faster. It ensures we can respond to their needs more flexibly.

While other companies move their production to Asia, SMS Meer underlines its clear commitment to Germany as a production location. This gives customers big advantages, especially because of our motivated and well-trained employees.
Demand for SMS Concast plants increases significantly.

Compared to 2010, the demand for electric-arc furnaces, continuous casting technology, and secondary metallurgy for long products increased strongly once again. SMS Concast was consolidated completely into Business Area SMS Meer.

ALL-INCLUSIVE PLANTS: FURTHER IMPROVEMENT IN ORDER INTAKE

SMS Concast received two more orders from the Chinese Shagang Group. One steelmaking plant with an annual capacity of 1.1 million t is going to the Zhangjiagang Renzhong Steel Company. It comprises an electric furnace, ladle furnace, VD vacuum degasser, and a billet caster with six strands. The billets will be used as input stock for the production of tire cord. The plant is equipped with modern green technology. Also included in the scope of supply are the electrical and automation systems.

The six-strand billet caster is destined for the Zhangjiagang Hongfa works. This plant also features modern environmental equipment. Here again, electrics and automation are part of the package.

The Vigil Group awarded us an order for an electric steelworks to be erected in Brazil. We are supplying the electric-arc furnace, ladle furnace, and a three-strand billet caster, as well as the necessary auxiliary plants for dust extraction and additive substances. Another Vigil Group works is currently under construction in Mexico, and here again SMS Concast is supplying the key plants.
ELECTRIC-ARC FURNACES, SECONDARY METALLURGY, AND CONTINUOUS CASTING TECHNOLOGY ALSO SUCCESSFUL

The South Korean SPP Yulchon Energy Company awarded SMS Concast a contract to build and supply a combined jumbo continuous caster for blooms. The new caster will process 600,000 t of liquid steel per year. This material will go into 250,000 to 350,000 t of round blooms (with a diameter of 800 mm) and 200,000 to 300,000 t of blooms in various rectangular formats. When the plant is built with this combination of casting cross-sections, SPP Yulchon will operate the world’s largest combined caster.

Warren Steel produces alloyed and non-alloyed quality steels for the forging, oil, and gas industries. To improve the quality of its products, the company in Ohio, USA, is modernizing its three-strand bloom caster. The order comprises a revamp of the secondary cooling and the strand guidance systems. Furthermore, SMS Concast is supplying marking machines and the components for plant automation.

Jiangsu Liangfeng Energy Equipment plans to produce 1.1 million t of steel per year in the near future. That is why the Chinese company has awarded a contract to SMS Concast for a 110-t electric-arc furnace for a new steelmaking plant. The furnace is encased in a housing and meets the highest safety requirements. Project Manager Giovanni Cairoli of SMS Concast says: “Our solution is not just highly energy efficient and super-effective. Jiangsu Liangfeng will also benefit from the plant’s special flexibility.” The furnace can be charged with either 100 % scrap, or 65 % scrap and 35 % pig iron.

Another order for SMS Concast came from the Turkish steel producer Kardemir Iron Steel in Karabük. It comprises a combined continuous caster for billets, blooms, and beam blanks. The plant features five casting strands and is equipped for the production of a broad range of cross-sections. A specially shaped and dimensioned tundish channel optimizes the steel flow.

In 2010, the United Steel Company (Sulb), in Bahrain, awarded SMS Meer an order for a minimill. One year later, Sulb followed this up with an order for a fourth casting strand for the plant. On signing the original contract, both partners had agreed on this option. However, the fact that Sulb decided on the extension just six months after the first order shows how satisfied our customer is with the project so far. Commissioning is scheduled for the second half of 2012.

The Riva Group, headquartered in Milan, Italy, confirmed its long-standing trust in SMS Concast with orders for the revamp of the continuous caster in its facility in Lesegno, and of the electric-arc furnace at its Caronno location. Although both orders were issued at the beginning of 2011, the plants were already back on stream in the summer, including the electrics and automation equipment. More than that, they were producing at full capacity within just a few days. Including dismounting, assembly, and commissioning, the delivery time was under eight months.
MAJOR ORDERS

ALL-INCLUSIVE PLANTS
- Zhangjiagang Renzhong Wire Rod Co. Ltd., China; 110-t electric-arc furnace, vacuum degasser, and six-strand billet plant
- Vigil Group, Brazil; 65-t electric-arc furnace, three-strand billet plant with auxiliary plants

ELECTRIC-ARC FURNACES
- Yonggang, China; 130-t electric-arc furnace
- Riva Group, Caronno, Italy; extension of 85-t electric-arc furnace

SECONDARY METALLURGY
- Rathi Super Steel, India; 50-t vacuum degasser
- ÖZKAN Demir Celik Sanayi A.S., Turkey; 85-t vacuum degasser

CONTINUOUS CASTING TECHNOLOGY
- Spp Yulchon Energy Co., South Korea; two-strand bloom plant for 800-mm round formats
- United Steel Company (Sulb), Bahrain; fourth casting strand
- Henan Jiyuan Iron & Steel (Group), China; three-strand bloom plant for 600-mm round formats
- Zhangjiagang Hongfa Steel Making, China; six-strand billet plant
- Zhasan Youfa Iron & Steel, China; six-strand billet plant
- Kardemir A.S. Karabük Demir Celik Sanayi ve Ticaret, Turkey; four-strand combination plant for billets, blooms, and beam blank formats
- Gerdau Aços Especiais Brasil – Pinda, Brazil; four-strand billet plant
- Warren Steel Holding, USA; alteration of three-strand bloom plant
- Feng Hsin Iron & Steel, Taiwan; addition of fifth strand
- Riva Group, Lesegno, Italy; alteration of billet plant
- CIAL, India; two three-strand billet plants

COMMISSIONING PROJECTS

ALL-INCLUSIVE PLANTS
- Slovakia Steel Mills, Slovakia; steelworks with 70-t electric-arc furnace, ladle furnace, and three-strand billet plant (minimill)
- Vallourec & Sumitomo Tubos do Brasil Ltd., Brazil; steelworks with ladle furnace and 140-t vacuum degasser, five-strand caster for 150–400 mm round formats

ELECTRIC-ARC FURNACES
- Riva Group, Caronno, Italy; extension of 85-t electric-arc furnace
- Maanshan Iron & Steel Co., China; 110-t electric-arc furnace

CONTINUOUS CASTING TECHNOLOGY
- pNTZ – JSC Pervouralisk New Tube Mill, Russia; five-strand caster for 150–200 mm round formats
- JSPL Raigarh, India; six-strand billet plant, 130, 150 sq
- POSCO Pohang, South Korea; eight-strand 400 x 500 mm bloom plant
- Dongbei Special Steel Group, China; three-strand 380 x 490 bloom plant
- Liangfeng Steel, Yongang, China; eight-strand billet plant, 150, 180 sq
- Riva Group, Lesegno, Italy; alteration of billet plant
NEW MINIMILL FOR SLOVAKIA

Today, the benefits of minimills pay off more than ever. Their high flexibility and low costs give customers a number of advantages on their markets. Slovakia Steel Mills (SSM) started up a minimill in Strážske that is designed to produce 600,000 t of long products per year. Supplied by SMS Concast, the steelworks consists of an electric-arc furnace, a ladle furnace with all the auxiliary plants, and the three-strand continuous caster. The final processing lines were designed and supplied by SMS Meer. Included here are a VCC line for compact and fast coil winding, a cooling bed with a high-performance exit section, and a wire line with a speed of up to 105 m/s. This gives SSM the capacity to manufacture a large range of products. It also opens up the option of making SBQ (Special Bar Quality) steels in the future. That means SSM will also be able to supply the automotive and mechanical engineering industries.
Tube welding plants in demand.

Demand on the various partial markets was very varied in 2011. While business development in the seamless tube sector was slow, SMS Meer noted high demand for plants for welded tubes.

SEAMLESS TUBE PLANTS: LEADING POSITION DEFENDED

Following several years of increasing order intake, the demand for seamless tube plants has cooled down. However, thanks to its good products and committed workforce, SMS Meer still managed to defend its leading position.

Tenaris Silcotub, Romania placed an order with SMS Meer for a tube threading machine for seamless oilfield pipes. A new tube-end chamfering machine will work upstream of the threading machine. Both machines are part of a new finishing train. With these plants, Tenaris Silcotub will meet the tough international standards for oilfield pipes in just one work stage.

Bohai Steel Group of China contracted SMS Meer to supply a 5 ½” PQF seamless tube plant. The annual production capacity of the machine is some 320,000 t. A newly developed stretch-reducing mill will slash operating costs. Apart from assembly and commissioning, the order includes training of the operating personnel.

It was high time for Spanish company Tubos Reunidos Industrial to revamp its CPE (Cross-roll Piercing and Elongation) plant. Although the CPE itself was modern, it contained an old detaching mill that had been in use for 50 years. SMS Meer was responsible for the entire engineering, installation of the new detaching mill including electrics and automation, assembly supervision, and recommissioning.

At Chinese tube manufacturer Jiangsu Valin Xigang Special Steel, a new 10 ¾” PQF seamless tube plant
In 2011, the German automotive industry supplier Mubea successfully commissioned an HF precision tube welding line from SMS Meer. The company uses it to produce precision tubes for the automotive industry with a roundness tolerance of one 400th of a millimeter. Working with SMS Meer technology, Mubea succeeds in making chassis stabilizers that are up to 40% lighter than previously used products made of solid material. That is a huge advantage and simultaneously a major contribution to fuel saving.

Hengyang Valin Steel Tube has put its new 7" POF plant from SMS Meer into production. For this project, the teams from SMS Meer in Mönchengladbach and China cooperated closely on the engineering and manufacturing. Full production capacity will be achieved by mid-2012.

PWS attracted an order from Zhejiang Kingland pipe Industry in Huzhou City, China for a modern, two-stage spiral pipe plant. The plant produces high-quality spiral pipes for oil and gas pipelines. The production capacity of the first construction stage is 180,000 t per year, with the option of an increase to 240,000 t per year at a later date. What impressed Kingland about the PWS product was the technically future-oriented machine design with low energy consumption.

Right on time for the Chinese national holiday on October 1, 2011, Shandong Shengli Steel pipe produced the first pipe on its two-stage plant supplied by PWS. Now the company can produce 240,000 t of high-quality spiral pipes per year. “In terms of energy yield, our welding technology is record-breaking,” says Michael Stark, Managing Director of PWS.

Despite a difficult market situation, business with welded tube plants and large pipes developed positively.

China’s largest seamless tube manufacturer, Tianjin Pipe International Economic & Trading (TPCO), now also produces welded tubes – thanks to its new 14" ERW tube welding machine from SMS Meer. The plant guarantees TPCO high productivity and flexibility. Liu Zhiyong, the Project Manager at TPCO, is happy: “We already have several plants from SMS Meer in operation and appreciate this successful partnership.” Currently, a 26" ERW tube welding plant from SMS Meer is being assembled at the same production location and will go online in mid-2012.

POSITIVE DEVELOPMENT IN WELDED TUBE PLANTS

FUTURE-ORIENTED TECHNOLOGY IN SPIRAL PIPE WELDING PLANTS

Despite a difficult market situation, business with welded tube plants and large pipes developed positively.

Berg Steel Pipe Corporation (BSPC), USA, placed an order with SMS Meer for a tube testing press for longitudinal welded seam large pipes to replace their existing press. Entirely pre-manufactured component groups ensure that BSPC will be able to produce after a short alteration time. The testing press is designed to fit into the existing foundations. Despite this, it achieves a higher rate of throughput than its predecessor.

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POSITIVE DEVELOPMENT IN WELDED TUBE PLANTS

FUTURE-ORIENTED TECHNOLOGY IN SPIRAL PIPE WELDING PLANTS

Despite a difficult market situation, business with welded tube plants and large pipes developed positively.

Berg Steel Pipe Corporation (BSPC), USA, placed an order with SMS Meer for a tube testing press for longitudinal welded seam large pipes to replace their existing press. Entirely pre-manufactured component groups ensure that BSPC will be able to produce after a short alteration time. The testing press is designed to fit into the existing foundations. Despite this, it achieves a higher rate of throughput than its predecessor.

In 2011, the German automotive industry supplier Mubea successfully commissioned an HF precision tube welding line from SMS Meer. The company uses it to produce precision tubes for the automotive industry with a roundness tolerance of one 400th of a millimeter. Working with SMS Meer technology, Mubea succeeds in making chassis stabilizers that are up to 40% lighter than previously used products made of solid material. That is a huge advantage and simultaneously a major contribution to fuel saving.

Hengyang Valin Steel Tube has put its new 7" POF plant from SMS Meer into production. For this project, the teams from SMS Meer in Mönchengladbach and China cooperated closely on the engineering and manufacturing. Full production capacity will be achieved by mid-2012.

PWS attracted an order from Zhejiang Kingland Pipe Industry in Huzhou City, China for a modern, two-stage spiral pipe plant. The plant produces high-quality spiral pipes for oil and gas pipelines. The production capacity of the first construction stage is 180,000 t per year, with the option of an increase to 240,000 t per year at a later date. What impressed Kingland about the PWS product was the technically future-oriented machine design with low energy consumption.

Right on time for the Chinese national holiday on October 1, 2011, Shandong Shengli Steel pipe produced the first pipe on its two-stage plant supplied by PWS. Now the company can produce 240,000 t of high-quality spiral pipes per year. “In terms of energy yield, our welding technology is record-breaking,” says Michael Stark, Managing Director of PWS.
MAJOR ORDERS

SEAMLESS TUBE PLANTS
- Tenaris Silcotub, Romania;
  thread cutting machine/tube chamfering machine
- Tagmet, Russia; 10 ⅜” PQF redressing machine
- Bohai, China; 5 ½” PQF plant
- Jiangsu Tianhuai, China; 20” PQF plant
- Changbao, China; stretch-reducing mill

WELDED TUBE PLANTS
- Berg Steel, USA; testing press
- Vyksa Steel Works, Russia;
  additional expander and finishing press

SPIRAL PIPE WELDING PLANTS
- Zhejiang Kingland Pipe Industry, China;
  two-stage spiral pipe plant

COMMISSIONING PROJECTS

SEAMLESS TUBE PLANTS
- VSB, Brazil; 16 ½” PQF plant
- Tubos Reunidos, Spain; detaching mill
- Jiangsu Valin-Xigang (Wuxi), China;
  10 ¾” PQF rolling mill
- Baotou Iron & Steel, China; 6 ¼” PQF tube plant
- Yantai Baosteel, China; 18 ¼” PQF tube plant
- Chelyabinsk, Russia; feeder for the pilger rolling mill
- Baotou, China; KR III CNC
- Hengyang Valin, China; 7 ¾” PQF plant
- Tenaris Tamsa, Mexico;
  thread cutting machines/tube chamfering machines
- Productos Tubolares, Spain;
  feeder for the pilger rolling mill

WELDED TUBE PLANTS
- Mubea, Germany; RD 40
- TPCO, China; 14” ERW tube welding plants

SPIRAL PIPE WELDING PLANTS
- Shandong Shengli, China;
  two-stage spiral pipe shaping and welding plant
BRAZILIAN PRESIDENT SWITCHES ON VSB SEAMLESS TUBE PLANT

Vallourec & Sumitomo Tubos do Brasil (VSB) has built a new facility in the Brazilian state of Minas Gerais. SMS Concast supplied the secondary metallurgy plants and the continuous caster, while the PQF seamless tube rolling mill comes from SMS Meer. Recently, the plant was inaugurated by the Brazilian President Dilma Rousseff.

A total of 1 million t of steel is produced here, with the tube plant designed for an annual production volume of 600,000 t. The OCTG tubes feature high-quality premium tube connections with precision threads that guarantee gas-tight joins. SMS Meer supplied all the core components for the rolling mill equipment, including the media systems and automation. The heart of the plant, the PQF® rolling mill, is equipped with individual roll drives and fully hydraulic screwdowns.

Cristiano Caldeira, Production Manager at VSB: “The companies in the SMS group are very reliable partners. We found the best-possible supplier for our quality requirements. SMS staff also worked side by side with us during the construction phase of the plant. That’s exactly what I expect from a good business partner.”

[1] The new works produces one million t of steel and 600,000 t of tubes. [2] Christian Caldeira (left) and Ralf Büttgen are proud of the new plant.
Growing market – SMS Meer profits overproportionally.

There was good news in 2011 as the market for section mills continued to grow. Even better, due to its technologically and economically superior plant solutions, SMS Meer profited overproportionally from this development.

**CONTINUED SUCCESS FOR SECTION AND BILLET MILLS**

Inner Mongolia Baotou Steel Union, China, awarded SMS Meer an order for a heavy section mill with an annual capacity of 1.2 million t. With this plant, Baotou can produce beams, rails, and sheet piles. It takes only 20 minutes to change sections – thanks to the modern CCS (Compact Cartridge Stand) mill stands and a 9-roller CRS (Compact Roller Straightener).

Furthermore, Baotou will produce beams more cost-effectively in the future. That is because the XH rolling process guarantees higher productivity and lower roll wear despite the more compact plant layout.

Our Chinese customer Xining Special Steel ordered a new semi-continuous billet mill for large round and rectangular formats from SMS Meer. The core components of the plant are compact stands with hydraulic control in HCS (Hydraulic Compact Stand) design. Our automated roll gap control and HSC (Hydraulic Sizing Control) sizing technology ensure close rolling tolerances and efficient production.

Premiere at Jindal Steel & Power in India: Now equipped with a new CRS roll straightener with an adjustable ninth roll, Jindal can straighten not only beams but also rails in its plant in Raigarh. This means the company manufactures beams and rails of better straightness and lower internal stress – a real boost to product quality.
In its section mill in Unterwellenborn, German company Stahlwerk Thüringen successfully commissioned a rougher supplied by SMS Meer. The new duo-reversing stand replaces a mill stand from 1984 and allows for much faster roll changing and altogether more cost-effective production.

Another successful commissioning project took place at Jiexiu Xintai Iron & Steel in China. The company put a heavy rolling mill for steel beams with an annual capacity of 1.2 million t into operation. On this section mill, our customer rolls beams in the size range of 200 to 1,000 mm. The plant is already the ninth rolling mill for heavy sections SMS Meer has delivered to China.

**STABLE DEMAND FOR LIGHT SECTION MILLS**

South Steel Company, Saudi Arabia, placed an order with SMS Meer for the design and supply of a combined wire rod and bar mill. The complex, with an annual capacity of 500,000 t, is under construction in Jizan Economic City in the south of Saudi Arabia. SMS Concast and SMS Meer have already supplied a complete minimill for this complex. Central to the new plant is our MEERdrive® finishing block with its modern single drive technology.

SMS Meer commissioned a complete mini steelworks with a combined bar and wire rod mill for Slovakia Steel Mill in Slovakia. The steelmaking plant was supplied by SMS Concast. It comes with a rolling mill designed to produce 400,000 t per year.

SMS Meer completed the revamp of the 40-year-old light section mill at Ascometal in France ahead of schedule. The project was wrapped up with the successful test and final approval of the new roughing train only 18 months after the order was placed. Ascometal uses this plant to produce wire for ball bearings, steel springs, nuts, and screws.

**STRONG GROWTH IN WIRE ROD AND BAR MILLS**

In 2011, SMS Meer was able to attract a large number of orders for wire rod mills – above all from the Chinese market. It is above all privately owned Chinese companies that are generating stable demand, which we can meet together with our Chinese subsidiary SMS Meer Engineering China (SMEC).

Xinjiang Gaoyi Smelting in China awarded an order to SMS Meer for the supply of a wire rod outlet for its wire mill consisting of a wire block, a loop laying head, and a horizontal coil press. The company can use this plant to manufacture high-quality products, for instance for China’s booming construction industry.

Also in China, Jiangsu ShenYuan Special Steel ordered a wire rod line for stainless steel from SMS Meer. The rolling mill can produce more than 180,000 t per year and rolls high-quality stainless steels as well as complex valve steels. Due to the overall technology and logistics concept developed by SMS Meer, the plant saves considerable costs for post-treatment.
FuJian WuHang Stainless Steel (Baosteel Group), China, is currently building one of the most modern stainless steel rolling mills for the production of wire rod and bar coils.

Capable of an annual production capacity of more than 300,000 t, the rolling mill will mainly roll stainless steels. Included in the core technology supplied by SMS Meer are a 3-roll PSM (Precision Sizing Mill) block and a wire rod finishing block featuring MEERdrive®. This order represents the first time SMS Meer has introduced these new technologies to China.

SMS Meer is extending the existing bar mill of German company DEW. This involves installing a new laser measuring device downline of the 3-roll PSM block and integrating an online cross-section control system. That will reduce dimension fluctuations during the rolling process to a minimum.

Xining Special Steel in China placed an order with SMS Meer for a bar mill for quality and stainless steels (SBQ grades). The plant features a 3-roll PSM block. Using the hydraulic screwdowns under rolling load, Xining can produce any dimensions from a single caliber series – to close tolerances and in small batch sizes. The plant is also equipped for thermo-mechanical rolling.

**UPTURN ON MARKET FOR DRAWN STEEL PLANTS**

On the market for bright steel machines, the upward trend that started in the fourth quarter of 2010 continued. There was a clear revival of this market throughout 2011.

Ziehwerk Plettenberg, Germany, contracted SMS Meer to supply a new bright steel center. Consisting of the core components peeling machine and straightener, the plant is designed for a diameter range of from 10 to 54 mm. The company has for many years counted on plants of the “Schumag” type to meet top precision requirements – especially when it comes to shape tolerances.

Flanschenwerk Bebitz, Germany, ordered a BC 120 bright steel plant from SMS Meer. The machine achieves a peeling rate of up to 40 m/min., making it some 30 % more productive than conventional plants. Furthermore, short changeover times will make it possible for the company to respond more flexibly to special customer requirements in the future.

At its facility in Cheylas, French company Ascometal commissioned a bright steel plant to expand its production of spring steel. The heart of the ring-bar line is a peeling machine from our PM series. Also part of the order was a new sizing unit, a two-roll straightener, and the entire finishing train.
MAJOR ORDERS

SECTION AND BILLET MILLS
- Inner Mongolia Baotou Steel Union, China; heavy section rolling mill for beams, rails, and sheet piles
- Xining Special Steel, China; semi-continuous billet rolling mill
- Kardemir, Turkey; upgrade of automation and Level 2

LIGHT SECTION MILLS
- South Steel Co., Saudi Arabia; bar and wire rod mill plant with MEERdrive® technology, annual capacity 500,000 t
- GV do Brasil Industria e Comercio de Aco, Brazil; rebar and wire rod mill plant
- Simec International 6, Tlaxcala Plant, Mexico; modernization of the bar rolling mill for the production of 40 t/h of SBQ
- Sanan Iron & Steel Co., China; HSD system
- ESI, United Arab Emirates; revamp of bar mill
- M-Metal, Thailand; overhaul of bar and wire rod mill automation
- Ferrosider, Italy; modernization of finishing train

WIRE ROD AND BAR MILLS
- Xinjiang Gaoyi Smelting, China; wire rod outlet for wire mill
- Jiangsu ShenYuan Special Steel, China; wire rod outlet for stainless steel
- FuJian WuHang Stainless Steel, China; stainless steel rolling mill for wire rod and bar, plus coil handling machine
- Saarstahl AG, Germany; five crank shears for the wire mill

- Deutsche Edelstahlwerke, Germany; expansion of the PSM with a closed loop control system
- Xining Special Steel, China; bar mill for quality and stainless steels
- Yugang Jiujiang, China; two wire mills including electrics and automation
- Xining Special Steel, China; bar mill with PSM
- Xilin Steel, China; two wire rod outlets

BRIGHT STEEL PLANTS
- Ziehwerk Plettenberg, Germany; BC 50 bright steel center
- Flanschenwerk Bebitz, Germany; BC 120 bright steel plant
- Villares, Brazil; KZ-RP-1B/8 drawing machine and BC 35 bright steel center
- Ogiso, Japan; two Schleipo N1 grinding and polishing machines
- POSCO, Korea; PMS 250 peeling machine
- Geissler, Germany; WRP 250 B straightener
COMMISSIONING PROJECTS

SECTION AND BILLET MILLS
- Jindal Steel & Power, India; roller straightener for rails and heavy beams
- Stahlwerk Thüringen, Germany; new rougher
- Jiexiu Xintai Iron & Steel, China; section rolling mill for heavy beams
- Acominas, Brazil; finishing train for a heavy beam mill

LIGHT SECTION MILLS
- Ascometal, France; revamp of roughing train, descaling unit, rougher, induction furnace, and cutoff shear
- Daehan Steel Co. Ltd., South Korea; VCC rolling mill plant, annual capacity 450,000 t
- SSM Slovakia Steel Mills, Slovakia; rebar steel and wire mill plant & VCC system (minimill)
- NUCOR Steel Marion, USA; lug and scrapping shear as well as overhaul of finishing train
- Gerdau Açominas, Brazil; bundling machine
- Sinobras, Brazil; pinch roll and two bundling machines
- Qatar Steel, Qatar; cutoff shear and thermal processing line
- Visa Steel, India; bar, section, and wire mill, annual capacity 500,000 t
- Steelco, Syria; rebar and light section mill, annual capacity 300,000 t

WIRE ROD AND BAR MILLS
- Xin Jiang Yi Li Iron & Steel, China; wire rod mill
- VISA Steel, India; bar and wire rod mill
- Slovakia Steel Mill, Slovakia; minimill with bar and wire rod mill

BRIGHT STEEL PLANTS
- Ascometal, France; BC 20
- SEAH Special Steel, South Korea; BC 125
- Boxholm, Sweden; KZ-RP-2B
FROM 0 TO 111 M/S IN RECORD TIME

Formula 1 world champion Sebastian Vettel races around the circuit at 300 km/h – or 83 m/s.

Yet the new wire rod outlet in the rolling mill of Xin Jiang Yi Li Iron & Steel is even faster. It rolls wire at a rate of 111 m/s. What’s special here is that it reached maximum performance just shortly after commissioning. In fact, in record time.

Xin Jiang Yi Li Iron & Steel is headquartered in Xinjiang Uyghur in northwestern China. The plant went into production at the end of 2011. All the core components come from SMS Meer. Project Manager William Li von Xin Jiang Yi Li is highly satisfied with the problem-free assembly and prompt commissioning: “The SMS Meer components worked perfectly straight away. Immediately after commissioning we achieved rolling speeds of more than 110 m/s.”

[1] The LCC – open here – achieves defined cooling. [2] In the finishing block, the rolled wire is accelerated to up to 111 m/s – faster than a Formula 1 racing car. [3] The coil press winds the cooled wire into coils for further transport.
Positive market development in hydraulic presses, extrusion presses, and closed-die forging machines.

There was a positive market development in the forging technology segment in 2011. Especially in China, demand for innovative plant technology from SMS Meer remains strong.

**RECORD SUCCESS WITH HYDRAULIC PRESSES**

In North America, demand for hydraulic radial forging machines has soared. That’s reflected, for instance, in an order for SMS Meer from Carpenter Technology Corporation, USA, for an SMX 1100/22 MN. Once it is built, this plant will be the world’s most powerful machine of its kind.

Patriot Special Metals, USA, started production on an SMX 650 forging machine.

A newly developed horizontal forging machine went to Japan Aeroforge. Primarily, this SMI 430/8 MN produces input products for the aeronautics industry.

Two HPM 1600E5 powder presses went into operation at GTP Global Tungsten & Powders, USA.

**STABLE DEMAND FOR EXTRUSION PRESSES**

What continues to drive growth on the extrusion press market is the demand for large presses for the railroad industry. However, companies in the automotive industry are also investing in new plant — both in Europe and in China.
An extrusion force of 150 MN is a powerful argument. It certainly convinced Shandong Yankuang Light Alloy Company in Jining, China. That was why the company ordered the world’s largest front-loader light alloy press from SMS Meer. In May 2011, SMS Meer presented the giant plant to 300 trade visitors at its Mönchengladbach production location. The Business Area is supplying a total of four extrusion presses for aluminum profiles to Shandong Yankuang. The plants feature extrusion forces of 36, 55, 82, and 150 MN. Commissioning is scheduled for the beginning of 2012.

Just one year after placing the order, Shandong Nan-shan in China commissioned six extrusion presses from SMS Meer – four with an extrusion force of 11 MN, and the other two with 18 MN of extrusion force each.

UPWARD TREND IN CLOSED-DIE FORGING MACHINES

In 2011, the market for closed-die forging machines also benefited from the upswing in the automotive industry. Once again, China was the growth engine for the industry and its suppliers.


There is a growing demand for powder-forged auto parts in China. That was reflected in the order from newly founded company Shandong Xinyi Powder Metallurgy for a robot automated SPPE 6.3 screw press for forging powder con rods.

We supplied a heated tool holder system for the screw press at Böhler Schmiedetechnik in Austria. It means the customer can now produce a much wider product range with the machine.
## MAJOR ORDERS

### HYDRAULIC PRESSES
- Carpenter Technology, USA; hydraulic radial forging machine SMX 1100/22 MN
- Japan Aeroforge, Japan; hydraulic horizontal forging machine SMI 430/8 MN
- SPP Yulchon Energy, Korea; 100/120 MN forging press

### EXTRUSION PRESSES
- China Aluminium North West, China; 36 MN extrusion press
- Ulusan, Turkey; 25/27 MN extrusion press
- Nanshan America, USA; 82/55 MN extrusion press
- Constellium Singen, Germany; 40/44 MN extrusion press
- Aluar Argentino, Argentina; 22/24 MN extrusion press

### CLOSED-DIE FORGING MACHINES
- Donfeng Nissan Passenger Vehicle Company, China; wedge press with forging roll
- Actemium, France; mod. APU 2000
- Shandong Xinyi Powder Metallurgy, China; SPPE 6.3

## COMMISSIONING PROJECTS

### HYDRAULIC PRESSES
- Fomas, Italy; 1200/3500 forging manipulator
- GTP Global Tungsten & Powders, USA; 2 CNC powder presses HPM 1600E5
- Patriot Special Metals, USA; SMX 650 forging machine

### EXTRUSION PRESSES
- Shandong Nanshan, China; six extrusion presses with pressing forces of 11 to 18 MN
- Alupco, Saudi Arabia; 25/27 MN extrusion press
- Gutmann, Germany; 32/35 MN short-stroke extrusion press
- Steelmet, Bulgaria; 25/27 MN extrusion press
- Otto Fuchs, Germany; 50/55 MN extrusion press
- Chepetzky, Russia; 35/55 MN extrusion press

### CLOSED-DIE FORGING MACHINES
- Wuxi Turbine Blade, China; clutch-operated screw press
- Böhler Schmiedetechnik, Austria; heated tool holding system for screw press
COMMISSIONING IN RECORD TIME

The new clutch-operated screw press at Wuxi Turbine Blade (WTB), China, went into operation three months ahead of schedule. It has an impact force of 35,500 t. Apart from the press, a rotary hearth furnace, manipulators, and the infrastructure necessary for the plants are being newly built. In the future, WTB will be able to manufacture high-performance components from special steel such as titanium and nickel-based alloys for power station turbines.

The new plant combines the advantages of forging hammers and hydraulic presses. It requires just 500 kW of frequency-controlled drive power. That is 87 % less than conventional screw presses. Only a few impacts are required for each forging.

The press table weighs 305 t and is made from a single block. The heaviest component, at 340 t, is the lifting beam. Furthermore, 24 kilometers of electric cable and 500 meters of pipes were installed. It took 110 truckloads of concrete just for casting the base for the foundation blocks.

[1] After nine months' assembly time, the clutch-operated screw press went into operation. [2] The flywheel has a diameter of 7,500 mm. [3] The new screw press is used to manufacture turbine blades for the power generation and aeronautics industries.

WTB Managing Director Yan Qi and Product Area Head Norbert Gober after the successful commissioning.
Significantly higher project activities with aluminum and copper plants.

The market for NF plants grew vigorously in 2011. There was a significantly higher project activity involving both aluminum and copper plants following a weak year in 2010.

**STRONG DEMAND FOR ALUMINUM PLANTS**

Hertwich Engineering strengthened its global leadership on the market for aluminum plants.

The company attracted an order from SAPA RC Profiles, Belgium’s largest manufacturer of aluminum profiles, for a modern continuous homogenizing plant. With the new plant, SAPA can increase its production and expand its product range.

Hertwich Engineering also completed a large project for Emirates Aluminium (EMAL) near Abu Dhabi. The order comprised two integrated homogenizing and sawing plants. These machines are part of the world’s largest aluminum smelting plant and have an annual capacity of 165,000 t each.

Two Ecomelt furnaces from Hertwich Engineering come with reduced energy consumption, emissions, and — crucially — costs at Otto Fuchs in Germany. The two-chamber melting furnaces replace outdated induction furnaces. Not only designed to ensure minimal metal loss, they also use regenerative heating systems.

Weseralu, Germany, has put a billet saw from Hertwich Engineering into operation. It was important for the company to be able to cut raw material for the production of aluminum profiles to the desired formats directly in its own extrusion press shop. This is how Weseralu has improved material flow and reduced its costs. Because Hertwich Engineering
pre-commissioned the plant in its own workshop, the round billet saw was assembled and commissioned at Weseralu in just three weeks.

Another growth driver in 2011 was the nascent Chinese aeronautics industry, which generated a strong demand above all for plate stretchers.

SMS Meer attracted orders for four plants in a market segment where new investment has been rare in the past.

COPPER PLANTS IN DEMAND IN CHINA

There was positive development on the market for copper plants last year.

In China, Contirod plants were particularly in demand. SMS Meer booked three orders for integrated casting and rolling plants for copper wire. These plants are among the world’s most modern and efficient of their type. Two of the wire lines are designed for an annual capacity of 320,000 t: Ningbo Shimao Copper (35 t per hour), and Shandong Xiangrui Copper (48 t per hour). Jiangxi Copper, China’s largest manufacturer of copper cathodes, will receive a Contirod plant with a performance of 60 t per hour. Metallo Chimique of Belgium has ordered a casting wheel for copper anodes from SMS Meer. The casting wheel is equipped with a newly developed caster for minimum weight tolerances.

As a result, our customer can slash costs and increase productivity. Thomas Schatz, a sales engineer at SMS Meer says: “Our new system for minimizing the thermal load on the casting molds increases the mold service life by up to 20%. What’s more, they need less servicing.”
### MAJOR ORDERS

#### ALUMINUM PLANTS
- Ma’aden, Saudi Arabia;
  - continuous homogenization plant, saws
- Dubal, United Arab Emirates;
  - chamber homogenizing plant
- Aleris Deizisau, Germany;
  - two-chamber melting furnace (Ecomelt)
- Guangxi Alnan, China;
  - 100 MN plate stretcher and 30 MN plate stretcher
- Aleris Dingsheng Aluminum, China;
  - 60 MN plate stretcher
- Zouping Qixing Industrial Aluminium, China;
  - 72 MN plate stretcher

#### COPPER PLANTS
- Jiangxi Copper, China; Contirod plant, 60 t/h
- Shandong Xiangrui Copper, China;
  - Contirod plant, 48 t/h
- Ningbo Shimao Copper, China; Contirod plant, 35 t/h
- Metallo Chimique, Belgium;
  - casting wheel for copper anodes
- Taewoo Metal, Korea; vertical continuous caster

### COMMISSIONING PROJECTS

#### ALUMINUM PLANTS
- Otto Fuchs, Germany;
  - two two-chamber melting furnaces (Ecomelt)
- Weseralu, Germany; round billet saw, briquetting press
- Impol, Slovenia; helical UT
- Alumetal, Poland; belt-type ingot caster
- Alumetal, Poland; URTF 14
- Sapa, Belgium; continuous homogenization plant, saw
- Novelis, China; ingot scalper
- Chinalco Ruimin, China; ingot scalper

#### COPPER PLANTS
- Shandong Jinsheng Copper, China;
  - Contirod plant, 48 t/h
- Xing Xing, China; Contirod CR 3500
Chinese company Shandong Jinsheng commissioned the second complete continuous caster and rolling mill for copper wire in the new copper complex in Linyi. Our customer will use the wire mill to manufacture 320,000 t per year of high-quality copper wire from copper cathodes. The Contirod line is designed for a production rate of 48 t per hour.

This is one of the world’s most modern and efficient copper wire plants of its kind.

To achieve this technological lead, we redesigned the gas control system of the shaft furnace for melting the copper cathodes. The Hazelett modular double-strip caster comes with the largest casting format in China. What’s more, the highly flexible fourteen-stand rolling mill is equipped with frequency-controlled AC drives and integrated coil pressing machines followed by a packing station.
HEAT TREATMENT TECHNOLOGY

The large number of orders from international customers in the thermal processing industry underlines the increasing importance of inductive heating.

There was a welcome recovery last year on the market for thermal technology. Due to the continued boom in the automotive industry, global demand for induction solutions from SMS Elotherm was healthy. Simultaneously, the market for conventional reheating furnaces grew.

INDUCTION HARDENING PLANTS FOR THE AUTOMOTIVE INDUSTRY

In 2011, SMS Elotherm booked ten orders from around the world for its EloCrank crankshaft hardening machine. What makes these machines special is their compact design and reduced energy consumption. Their flexibility means engine manufacturers can quickly react to changed crankshaft geometries.

Shanghai GKN Drive Shaft (SDS) is expanding its production capacity. In 2011, the Chinese company ordered nine more EloFlex-type hardening machines. SDS uses these machines to harden its entire range of synchronous joint and shaft products. Meanwhile, the company operates more than 30 machines from SMS Elotherm.

NEW ORDERS FOR INDUCTION HEATING PLANTS

Promco, a Russian manufacturer of forged balls for milling machines, awarded SMS Elotherm an order for an inductive billet heating plant complete with feed equipment. This is the start of an extensive modernization and expansion campaign by the company in its ball production operations.
ArcelorMittal Romania ordered an induction system from SMS Elotherm for reheating and temperature equalizing seamless tubes. The induction technology applied here leads to improved quality and reproducible results in the sizing mill. The main advantage of the system is its high energy density in a comparatively small space. At ArcelorMittal, the 8.7 MW are being installed on a process length of less than 10 meters.

Shanghai GKN Drive Shaft (SDS) put its third induction heating plant from SMS Elotherm into production. Now SDS can benefit from the advantages of warm forming: minimal scale formation, lower pressing forces during forging leading to lower wear, and close dimensional tolerances. SDS ordered the warm reheating plant with an additional graphitization device.

FURTHER GROWTH FOR REHEATING FURNACES

As in previous years, SMS Meer once again in 2011 improved its position on the market for reheating furnaces.

Simec International, Mexico, ordered a walking-beam furnace with a capacity of 40 t/h. GV do Brasil placed an order for a pusher-type furnace with a performance of 100 t/h. For South Steel in Saudi Arabia, SMS Meer is building a walking-hearth furnace with a performance of 100 t/h. We also signed a contract with Tenaris Siderca in Argentina for austenitizing and tempering furnaces for seamless tubes.

INDUCTION TEMPERING PLANTS FOR THE MIDDLE EAST

Last year, ArcelorMittal in Jubail, Saudi Arabia, chose an inductive quench and temper line from SMS Elotherm. While conventional induction plants usually only process tubes of the same diameter, the quench and temper solution ordered here can also temper tubes sized at the ends – and in high quality. Specially developed by SMS Elotherm, a preheating system ensures homogeneous mechanical properties both at the sized tube ends and in the rest of the tube.
MAJOR ORDERS

INDUCTION HARDENING PLANTS
– Shanghai GKN Drive Shaft (SDS), China; nine EloFlex machines for axle parts
– FAW Jiefang, China; EloCrank machine for crankshafts
– VW group, China; five EloCrank machines for various crankshaft models for Volkswagen and Audi
– BMW Hams Hall, UK; hardening and tempering system consisting of two EloCrank machines
– MAG IAS (BMW), Germany; EloCrank machine for crankshafts for BMW location in Shenyang, China
– Ellwood National Crankshaft, USA; EloCrank XL for large crankshafts
– Daimler, Germany; EloFlex machine for hardening axle parts

INDUCTION HEATING PLANTS
– promco, Russia; inductive billet heating plant
– WHB, Brazil; EloForge forge heating plant
– Volkswagen Kassel, Germany; EloForge forge heating plant
– Arvedi, Italy; EloSeam machine for tube seam annealing
– Husteel, Korea; EloSeam machine for tube seam annealing
– Berco, Italy; EloForge forge heating plant
– Bifrangi, Italy; EloForge forge heating plant
– Omnia, Slovakia; two EloBar forge heating plants
– EIE for Peugeot, France; EloForge forge heating plant, EloBar forge heating plant
– ArcelorMittal, USA; EloBar forge heating plant
– ArcelorMittal, Romania;
  EloTube machine for tube heating

INDUCTION TEMPERING PLANTS
– ArcelorMittal Jubail, Saudi Arabia;
  TemperLine for tempering tubes
– ArcelorMittal, Romania;
  TemperLine for tempering tubes
– Dongbu Steel, Korea; TemperLine for bar steel

COMMISSIONING PROJECTS

INDUCTION HARDENING PLANTS
– SDS Shanghai GKN, China; five EloFlex machines for axle parts
– PSM Dalian, China; EloRing machine for large rings
– WHB, Brazil; EloCrank machine for crankshafts
– Gebrüder Heller (FAW), China;
  EloCrank machine for crankshafts
– Jiangsu World, China; EloCrank L for truck crankshafts
– GM Powertrain, Hungary;
  EloCrank machine for crankshafts
– Daimler, India; hardening system for cylinder running surfaces

INDUCTION HEATING PLANTS
– SMS Meer (Ascometal), France;
  EloBar machine for long products
– GKN Driveline, Germany; EloBar forge heating plant
– Hirschvogel Germany; EloForge forge heating plant
– Shanghai GKN Drive Shaft (SDS), China;
  EloForge forge heating plant
– Productos Tubulares S.A.U., Spain;
  EloTube tube heating plant

REHEATING FURNACES
– SSM Slovakia Steel Mills, Slovakia;
  walking-hearth furnace, 60 t/h
– Steelco, Syria; pusher-type furnace, 60 t/h
– KSIEMP, Kaluga, Russia;
  walking-hearth furnace, 160 t/h

REHEATING FURNACES
– Tenaris Siderca, Argentina; two walking-beam furnaces for the thermal processing line, 51.6 and 60.7 t/h
– Simec International 6, Tlaxcala Plant, Mexico;
  walking-beam furnace, 40 t/hour
– GV do Brasil Industria e Comercio de Aco, Brazil;
  pusher-type furnace, 100 t/h
– South Steel Co., Saudi Arabia;
  walking-hearth furnace, 100 t/h
GKN DRIvELINE CHOOSES INDUCTIVE HEATING

GKN Driveline is the world’s leading supplier of power transmission elements for the automotive industry. In Trier, Germany, last summer, the company opened a new production line for precision parts for synchronous joints.

These parts are installed in vehicles made by all renowned automotive manufacturers. GKN uses an induction plant from SMS Elotherm to heat the raw material to forging temperature. The EloBar™ system can operate without interruption for two hours. That is because it is equipped with a high-capacity bar cartridge. Another special feature is the innovative iZone™ technology. It means the still-hot bars can be reheated before cooling down to room temperature.

MEERcare, MEERcoach, and MEERconsult structure our service range.

Once again in 2011, the demand for services was higher than in the previous year. That is why SMS Meer continues to expand the range in this area. We have organized our services into three lines: MEERcare, MEERcoach, and MEERconsult. They guarantee comprehensive support even after commissioning of our machines and plants.

**MEERcare for Services on the Plant**

MEERcare brings together all services that support reliable and long service life of machines and plants. Included in its scope are spare parts, maintenance work, and also modernizations and quick repairs.

Here is one example from France: Forges de Bologne contracted SMS Meer to revamp its 34-year-old forging press. Now the press that was originally sold to a Russian customer is back up to date with a new screw set, new mechanical components, and a new hydraulic and electrical control system. The plant has been producing premium-quality turbine blades since October 2011.

**The MEERcoach Training Program**

MEERcoach covers all aspects of training and support. Whether customers want to train their staff, or require support in production and maintenance, SMS Meer experts help make sure every customer employee understands and can handle the production and machine processes.
Keen to benefit from our expertise, APT Kurvers of the Netherlands engaged SMS Meer to optimize its extrusion press. Our service technicians analyzed the current state of the hydraulics and electrics, adjusted the control and drive components, and documented the new settings in an in-depth service report.

Finally, they instructed the customer’s maintenance and repair personnel thoroughly on the new control parameters. The result: reduced idle times and even higher productivity.

MEERCONSULT: SOLIDLY BASED DECISIONS

MEERconsult pools all the consulting services of SMS Meer. They range from feasibility studies to customized maintenance and repair strategies – services that provide our customers with real advantages on their markets.

Tube manufacturer Tagmet is the first Russian company to rely on our advanced PQF technology for seamless tubes. SMS Meer supported the company in commissioning its PQF mill stands. Maintenance is also part of the service package.
INTERNATIONALIZATION INCREASES: GLOBAL SERVICE BRANCHES FOR MORE CLOSENESS TO CUSTOMERS

Last year, SMS Meer further expanded the global service network with highly qualified employees.

In India, the existing national company now includes an effective service unit. Since 2011, SMS Meer has also been represented in Japan with its own company, SMS Meer K.K. in Tokyo ensures our Japanese customers receive on-site support more quickly.

At SMS Meer, service means providing our customers with higher productivity and plant availability. Our business partners profit from higher product quality and lower operating costs. This gives them clear and sustained competitive advantages. It’s an offer more and more customers appreciate.
Ecoplants: The name for sustainable solutions.

ECOPLANTS UNITE ECOLOGY AND ECONOMY – FOR EXTRA CUSTOMER BENEFIT

Combining sustainability with economic growth is a challenge almost all markets face worldwide. Especially in the metal industry with its high energy-saving potential, the issue is gaining in importance. SMS Meer has long recognized this and offers its customers solutions that address both aspects equally.

Ecoplants is our new brand for sustainable solutions. It acknowledges that sustainability has become a crucial factor in growth – for reasons of economy as well as ecology. In terms of economy because saving energy and resources saves money, and ecologically because protecting resources is ever-more vital. Both aspects define our Ecoplants solutions.

Ecoplant criteria impact in four dimensions:

- Significant reduction of raw material input
- Significant reduction of energy and operating materials
- Significant reduction of emissions
- Significant increase in recycling

These requirements are tested and measured in a reference plant. If they are met, the product and the reference plant receive the Ecoplant designation. Equally important is that customers gain economic value from the new solution. Various Ecoplant solutions are already in use at our customers’ facilities.

- CMT (Continuous Mill Technology) is an advancement of the basic idea behind the minimill: short paths due to direct connection of the rolling mill to the steelmaking plant. Unlike previous plants, CMT does not need a reheating furnace because the steel is rolled directly while still at casting...
heat. The first reference plant is the minimill owned by Tung Ho Steel in Taoyan/Taiwan. It saves emissions to the tune of 72,000 t of CO₂, 410 t of SO₂, and 225 t of NOₓ per year. That translates into cost savings for the customer totaling EUR 11 per ton.

- What makes POF technology (Premium Quality Finishing) so special is the extremely high quality of the thin-walled precision tubes it produces. The core of the technology is a 3-roll design, a single roll drive, and fully hydraulic screwdowns. All these elements lead to precise setting and adjustment of the roll gap within fragments of a second. The result is a significant reduction in material and energy input, accompanied by lower production costs. Compared to previous technology, efficiency is 5 % higher, and energy consumption 10 % lower. Costs are cut by 26 EUR/t.

- The principle behind MEERdrive® is replacing the heavy transmission of a wire rolling block with intelligent single drives for each stand. An innovative rapid regulation system perfectly coordinates the individual motors with each other so that the rolling speeds required for the process are achieved with extreme precision. The MEERdrive® solution simplifies spare parts management, creates flexibility in pass schedule planning, and minimizes maintenance. Furthermore, the precise control over the process means producers can exactly determine the metallurgical properties of the end product. Roll wear as well as energy consumption decrease substantially because the individual motors work much more efficiently than a common drive. The new wire mill at ArcelorMittal in Duisburg-Ruhrort, Germany, relies totally on MEERdrive® – a major reason why it will be one of the fastest, most energy-efficient, and also quietest in the world. Its energy consumption will be 1,800 MWh per year less than conventional solutions. And it will require 60 % fewer rolling rings.

Other key focuses in our technological development work were product quality and product range.
THICK WALLS, SMALL DIAMETERS

With its innovative ideas, SMS Meer makes it possible, to produce precise, longitudinal-seam-welded tubes with high wall thicknesses and smaller diameters for offshore pipelines even more cost-effectively than before. We have for instance developed a finishing press that shapes blank tubes from the JCO® process into tubes with a minimized slit for longitudinal seam welding. While tubes are being welded, unwanted bending can occur. The SMS Meer-developed active straightening unit corrects this during the expanding process without any additional work stage.

NEW LASUS MULTI-SCAN

New in the LASUS system is our LASUS Multi-Scan model. It uses two to four laser measurements in parallel. They measure seamless tube wall thicknesses directly during production. LASUS Multi-Scan comes with specially developed processes for tube wall thickness analysis. In “rotary mode”, it measures wall thicknesses multiple times around the tube circumference in high resolution. The system identifies eccentricity, polygonal properties, as well as local and mean wall thicknesses. In “nodding mode”, the pattern of the wall thickness at positions on the weld gap is measured, also in high resolution. Unlike conventional technology, this does not require any radioactive substances.

INVEX MOLDS FOR BEAM BLANKS

The INVEX molds newly developed by SMS Concast simultaneously improve product properties and reduce operating costs. Recently, this technology was expanded to include beam blanks. Now INVEX technology can be applied to the entire range of molds used in steelmaking plants.

IMPROVED STRAND PROPERTIES WITH CONCOR

CONCOR is a new continuous casting roller SMS Concast has launched on the market. The extremely compact roller enables internal cooling of all critical components. It means that internally cooled rollers can be used for the first time in the web area of beam blank segments. No spray water is needed for roller cooling.

ZERO-WASTE CONCEPT FOR ALUMINUM DROSS

During aluminum smelting and refining, waste products containing metal – so called aluminum dross – are generated. Normally, recycling the dross leaves over salt slag that must be disposed of as hazardous waste. The alternative is expensive chemical post-treatment. Processes for salt-free recycling of dross are already available, but until recently none of them were economically viable because of the low metal yield. Now Hertwich Engineering has developed an industrially feasible pilot plant that recovers more metal from the slag and additionally produces pure aluminum oxide or calcium aluminate. Instead of waste, the process produces valuable material that can be used in the ceramic industry, for instance.
ELEXIS AG

“Vision for automation” – the motto that drives us.

The elexis group with its subsidiaries is the technology leader in production automation, drive technology, and quality assurance. For years, our company has followed its motto “Vision for automation”. It is what drives us – always with the aim of generating profitable growth.

We demand the best of our products, our employees, and of course ourselves. High standards are our yardstick. Only then can we continually develop technologically advanced solutions for our customers. We are always motivated by traditional values such as reliability and responsibility. They form the solid foundation for the healthy dynamism and future-orientation of our company.

WORLD LEADER DUE TO TOP TECHNOLOGY AND GLOBAL PRESENCE

The leadership of elexis AG on niche markets is based on the technological edge and global presence of the company.

elexis AG is renowned as an efficient and future-oriented technology leader for production automation, drive technology, and quality assurance. With locations in more than 90 countries and close contacts with more than 7,500 customers, the elexis group is a truly global enterprise.

The wide-ranging technological expertise within the elexis group covers existing basic drive technology, key technologies (control technology and high-precision automation), and pioneering solutions in quality assurance systems.
Typical of elexis group brands and products is their orientation toward today’s mega-trends: mobility, health, packaging, and consumption, as well as environment and raw materials. These fields give the company excellent growth and development prospects. However, the mega-trend at the forefront of the elexis strategy is without a doubt industrial manufacturing. A crucial requirement of tomorrow’s industry is “efficiency plus sustainability”. This is where elexis products come in, with technology that boosts efficiency. Customers benefit from these products for automating manufacturing processes, reducing waste, and increasing profitability.

**STRONG DESPITE MARKET FLUCTUATIONS**

Diversification secures order intake and sales stability. There is a continued shift of growth to the emerging economies, and the international presence of the elexis group takes an active role in this.

More than 3,000 companies are represented in the German Engineering Federation (VDMA). They operate in different branches of industry and are subject to different economic cycles. Therefore, order development within the VDMA provides a representative picture of the entire engineering industry. The elexis AG product range covers a similar structure, with products equally distributed around the economic cycle. Moreover, products and components from elexis AG can be used in various industries.

Order intake by the group increased on the previous year by 15.5% to EUR 174.0 million. This shows that, as in previous years, the business development of elexis AG matched the economic development of the German engineering industry. At the end of 2011, the VDMA reported a 10% increase in order intake in the German engineering industry.

elexis AG attracted sales some 22% higher than the previous year, totaling EUR 167.4 million (2010: EUR 136.7 million). Once again in 2011, the foreign locations and the strength of elexis AG in exports contributed substantially to these sales increases. Specifically, in 2011 the elexis group generated some 61% (2010: 58%) of its direct sales revenues outside Germany. Adding indirect exports to this figure reveals the foreign share of sales to be more than 80%.

**HIGH QUALITY AUTOMATION DIVISION BENEFITS FROM CATCH-UP EFFECTS**

The High Quality Automation Division accounted for more than 80% of the elexis group’s sales revenue, making it the main pillar of elexis AG. All product units and companies in this segment registered above-average demand in the 2011 business year. Especially the first half of 2011 was characterized by catch-up effects as a result of the last recession.
The High Quality Automation Division specializes in all aspects of flat material strips and webs. The elexis AG range comprises control technology, quality assurance systems, and drive technology. Market success for elexis products is generated by their ability to deliver sustainable profitability in industrial production. This is where they enable customers to achieve significant efficiency increases while also improving quality. These were unbeatable arguments that convinced customers last year as they emerged from the recession. That is why they reactivated shelved investments and initiated new projects to boost production efficiency.

**HIGH PRECISION AUTOMATION DIVISION SETS NEW SIGNALS IN INTERNATIONAL SALES**

With the introduction of modular systems and ever higher requirements of hygiene, efficiency, and automation, markets are also successively opening up in the Asian countries. Previously, customers were mainly located in the industrialized world.

During a large number of international business trips, employees from the division presented the entire range of handling automation products for injection molding processes. The target groups here were Chinese injection molding machine manufacturers as well as end customers in the medicine and automotive industries.

**EXPANSION IN CHINA**

Asia, and above all China, will in the future remain the engines of economic growth and continue to be a core market for the products of the elexis group. The production and assembly capacities already in place in Shanghai and Beijing were expanded in 2011, significantly increasing the depth of added value. Furthermore, since the opening of the elexis Business Center in Shanghai in the fourth quarter of 2011, Chinese customers have had the opportunity to take a look at elexis automation solutions in their own country.

**COST-EFFICIENCY SECURES PROFITABLE GROWTH**

Profitable growth is the core of our growth strategy. Apart from innovation, technology leadership, and global market presence, profitability also stands for tight cost management. Only with clear-cut and efficient processes and costs can we achieve sustained profit.

At all its German locations, elexis AG further implemented its continuous improvement process throughout the value-added chain. The transfer of process optimization to our foreign production locations also resulted in the first successes. For instance, we were able to reduce the space required for brake assembly at our Brazilian location by 25%. Following an initial current status analysis of the production and process sequences in Japan, we developed and implemented a new manufacturing layout for assembly and repairs.

**SUSTAINABLE OPERATIONS**

Achieving sustainable business operations will remain the challenge of the future. In times of climate change and dwindling resources, sustainable utilization of energy and raw materials is urgently necessary. What we need here are new strategies and innovative ideas just as much as continuous optimization of existing production processes.

**PRODUCTION OPTIMIZATION IN THE STEEL INDUSTRY**

With the IMPOCpro online measuring system for tensile strength and yield strength, elexis supplies a system that improves production processes in hot-dip galvanizing lines, continuous annealing lines, pickling lines, cutting lines, and tin-plating lines. The measured values are available online. That minimizes faulty production as well as expensive, time-consuming sample taking. The data measured with IMPOCpro can be applied to permanently optimize processes. This is often the only way new, higher-quality products can be viably produced.
Especially energy-intensive industries such as steel manufacturing face immense challenges. One of the main tasks here is reducing energy consumption, emissions, and raw materials consumption along the value-added chain. One answer is IMPOCpro from elexis.

With IMPOCpro, elexis offers its customers a convincing solution that enables them to improve their products, lastingly increase production efficiency, and minimize production costs. Building on the experience from 14 years of utilization of IMPOCpro and a total of 26 systems sold in eight countries, elexis continued to improve IMPOCpro in 2011. This will ensure the company can meet all customer demands for higher product quality also in the future.

**WASTE AVOIDANCE AND ENERGY EFFICIENCY IN THE PACKAGING INDUSTRY**

Cost-effective printing requires short changeover times, high printing speeds, and a more efficient use of the raw materials paper, foil, and ink. Each printing error generates extra rejects. Reducing printing speed increases both production costs and production time. What is necessary here is continuous quality control of the printed image and the printing quality at constant high speeds. Quality control that avoids rejects makes production more efficient and eco-friendly.

elexis AG supplies a product range of semi and fully automated web monitoring systems geared to the requirements of the packaging and converting industry. Yet not only detecting printing errors is important. There is also an increasing focus on ink management to save costs and improve production times. In 2011, elexis started work on developing an inline ink spectral measuring system together with a partner. This system will be unveiled at drupa, the world’s largest printing trade show, in May 2012.

For the first time, both the inline spectral measuring system and stationary handhelds will deliver comparable results on color quality. The new system will set a fresh industry standard for color quality control, and considerably simplify work processes. That is because in the future it will be possible to monitor color quality online during the entire production process.
PRODUCTION OPTIMIZATION IN THE RAW MATERIALS INDUSTRY

Environmental conditions in the mining industry are as tough as ever. Even today, this still results in high maintenance costs and stoppages of conveying equipment. These delays cost time and money. It seems clear that the only way to optimize processes is through further automation.

That prompted elexis in 2011 to develop a solution that applies its existing HKA linear drive technology to conveyor belt control systems in the raw materials industry. This elexis technology controls the conveyor belt in such a way that it prevents damage to the belt and spilling of the material conveyed. The result is lower maintenance and reduced costs. Once again, we have proven that even in established industries, automation continually leads to increases in efficiency.

SAFETY IN CONVEYING TECHNOLOGY

Eldro® and Elhy® brake ventilators have been well established on the market for decades. Over a 66-year product history, more than 1.9 million units have been sold. Today, due to constant further development, these brake ventilators used in industrial brakes still set standards for the safety and efficiency of this technology in mining and the port industry.

RECORD PRODUCTION TIMES IN MEDICAL TECHNOLOGY

Glass petri dishes were invented in 1887 by the German bacteriologist Julius Richard Petri. Almost at the same time, in 1885, a patent application for the first motor car was submitted. Today, petri dishes are manufactured in many sizes and types. Apart from reusable versions in glass that can be sterilized, single-use petri dishes made of clear polystyrene have been around for about 50 years. They belong to the category of mass-produced injection molded parts that are produced on high-performance machines with extremely short cycle times.

To preserve the hygienic and technical product quality, the molded parts are automatically removed, assembled, stacked, and hermetically sealed in packages by linear robots in clean rooms. Plant technology from elexis achieves top production speeds and product quality in this segment. In concrete terms, our solutions operate with a cycle time of 3.6 to 4.2 seconds for one 90-mm petri dish from an 8+8-units machine (depending on the weight of the petri dish and the flatness requirement of the base). That is an improvement in efficiency of about 20% compared to the predecessor versions that took 4.5 to 5.5 seconds per processing stage.

The next-largest plant in this performance class went into production in 2011. Twice the previous size, it produces 16 instead of eight petri dishes per processing stage. Because the cycle time remains almost the same, the performance of one production cell increases by nearly 100%. In keeping with this, the handling equipment can handle 100% more parts per cycle than the previous version.
Corporate culture of high performance and responsibility.

The SMS group is a tradition-rich enterprise run by the fourth generation of its owner family. It is defined by its strong market position as well as a culture of responsibility and high performance geared to meeting individual customer requirements. The group combines the flexibility of medium-sized company units with the resources of a global group – for the benefit of its customers. This non-centralized corporate culture encourages the individual units, and also their employees, to think and act in an entrepreneurial way.

The results of our 2011 employee satisfaction survey confirm this. The employees in the SMS group identify with their company and are motivated to work hard. Crucial to this are the widely appreciated good working conditions. Compared with companies of a similar size and business volume, our group stands out for the high commitment of its workforce. Especially striking is the above-average employee loyalty that gives us the experience-based expertise so vital in the plant and machine construction industry.

**PROFIT SHARING FOR EMPLOYEES**

For some years, employees have been able to participate in the success of the company through a profit-sharing option.

**NUMBER OF JOBS INCREASES**

The number of employees in the SMS group increased due to the takeover of more than 90% of the shares in elexis AG, Germany, as well as new recruitment in China and India. The average figure for the year
was 10,477 employees (2010: 9,209) – 40% of them working abroad.

On average over 2011, the number of employees in Business Area SMS Siemag was 6,828 (2010: 6,551), broken down into 4,082 in Germany and 2,746 abroad.

Despite the transfer of Concast AG with its 346 employees from Business Area SMS Siemag to Business Area SMS Meer, the employee total in Business Area SMS Siemag increased. This was due in particular to the consolidation of various companies such as SMS Siemag Metallurgical Services Magnitogorsk LLC, Russia, SMS Siemag Strip Processing Lines Shanghai Ltd., China, Metix (Pty) Ltd., South Africa, as well as new jobs at SMS India and SMS Millcraft, USA.

New recruitment at SMS Siemag AG focused on the specialist areas energy and environment technology as well as project management, engineering/design, and development.

On average over 2011, the number of employees in Business Area SMS Meer was 3,194 (2010: 2,599), broken down into 2,043 in Germany and 1,151 abroad.

Primarily responsible for the increase was the incorporation of Concast AG and personnel recruitment in Germany – here especially in the service field, and in China at SMS Meer as well as SMS Meer Engineering Ltd., Shanghai.

ENTHUSIASING AND SUPPORTING TOMORROW’S EMPLOYEES

Once again in 2011, we expanded our employer branding activities to systematically attract qualified youngsters to our company.

Included here are close contacts with universities. We take part in student careers events, recruitment shows, and university information days. A special event in May 2011 was a student visitors’ day in our Mönchengladbach workshop, where we displayed the world’s largest extrusion press built by SMS Meer.
Just as attractive are our scholarship program, study and work scheme, internships in Germany and abroad, as well as support for Bachelor and Master dissertations. This is how we offer students a whole range of opportunities to get to know us even before they qualify.

We are also a partner in the SACHEN MACHER (GET TECHNICAL) initiative of the VDI (Association of German Engineers). Among our activities here in 2011 was our participation in a national university promotional tour to inform students about career opportunities in our companies.

We also regularly produce reports on the fascinating world of machine and plant construction for TecTV, a web-based TV magazine show for technically interested young people, plus we support VDI elevate, a support program for students and graduates of engineering courses.

However, despite the huge amount of information available electronically (Internet, Web 2.0...) some 70% of youngsters decide where they want to work on the basis of personal recommendations from family, friends, and acquaintances. Some of our employees represent the third or even fourth generation of their family to work for us. That is why we regularly invite employees and their families to information events in our companies.

An additional attraction was METEC in Düsseldorf in June 2011. We invited our employees and their families to come to our stand at the global trade show for metallurgical plants and machinery and find out for themselves about the latest technology developments and our training and apprenticeship opportunities. Some 1,500 of them took up the offer. Regular family or training days at our locations round off our information program.

To effectively boost the careers of young people, we need to reach them even before they start an apprenticeship or university course.

Dedicated to inspiring future technology specialists, the school-business network we helped set up starts its work in kindergartens and primary schools, continuing through all types of secondary schools. In cooperation with our partners in the network, we offer youngsters opportunities tailored to their age groups to explore technical and scientific subjects for themselves.

**HIGH TRAINING QUALITY**

We are committed to top-quality, practice-driven, and process-oriented training, and our apprentices prove its effectiveness by regularly achieving above-average exam results. Once again, in 2011 SMS group apprentices were awarded distinctions as the state’s best graduates in their professions.

Participation in the German Foreign Languages Competition is one way we boost foreign language skills and teamwork among our apprentices. A team from the SMS group won second place in the contest.

Irrespective of economic cycles, for years we have pursued a policy of above-average apprentice quotas in trade, engineering, and commercial professions.

In 2011 there was a year’s average of 451 apprentices in our companies.

**INTERNATIONAL OUTLOOK**

To support the strong international outlook of our business, our employees must offer special intercultural skills, a high willingness to cooperate, and a focus on reliability. That is why we constantly invest in on-the-job training and standardization of work processes around the world. We are making particular efforts in this direction in China and India, where the number of employees will grow even more in the coming years. This underlines our closeness to our customers on their markets. Already more than
40 % of our employees work outside Germany. Additionally, more than 500 of our German employees are in action for our customers abroad.

**FOCUS ON QUALIFICATION**

Qualified, motivated employees are a crucial factor in maintaining our competitiveness. For this reason, further training and knowledge management are vitally important. That was why we implemented a tailored program of on-the-job training measures with a total of 7,825 participants in 2011.

Here, we made the most of innovative types of learning using modern media, summed up under the name “Webucation”. Included were web-based training, podcasts, video clips, cyber-teachers, telephone training, and audiobooks. These methods enable our employees to learn under their own initiative, whenever and wherever they want. With 33 modules and 1,283 participants, Webucation is firmly established within our educational mix.

**SMS ACADEMY**

Then there is the SMS Academy with its wide-ranging educational program. In their free time, employees attend the academy to boost their personal knowledge and development in areas that interest them.

They can choose, for instance, courses to improve intercultural or rhetorical skills, but also technically oriented information presentations about plants or machinery developed by us.
Last year, more than 4,300 employees took part in SMS Academy events. It’s an impressive figure that underlines the commitment of our employees and their identification with the company.

“WERT” PROGRAM

With our WERT program, the SMS group has created an instrument for know-how transfer. Now, when employees retire, a structured process ensures they pass on their expertise to their successors.

Yet the already established WERT “senior” program is not all. There are also other options for knowledge transfer. Take for instance WERT “professional”, dedicated to systematically passing on special know-how from one employee to others.

IDEAS MANAGEMENT

Our ideas management scheme came up with improvements that saved us EUR 1,591,000 in 2011. Employees submitted 1,881 suggestions that led to prizes totaling EUR 436,000.

TECADEMY

The SMS Siemag technology academy TECademy is the international seminar and training academy for the global metallurgical and rolling mill industry. Launched in 2011, the TECademy cooperates closely with our Service Division to offer steel producers and rolling mill operators efficient training packages featuring SMS Siemag expert know-how.

PERSONNEL DEVELOPMENT

Embracing progressive globalization, we are making even stronger efforts in the integration of our employees around the world with our talent management processes.

In 2011, we increased training in project management, above all for our locations in India, China, and the USA, and simultaneously integrated the feedback from our foreign companies on processes and work routines.

At the same time, we support our human resources staff in the implementation of our global personnel development standards, especially when it comes to performance assessment, talent promotion, and gaining the loyalty of high-potential employees.

In Germany, management conferences were held in all divisions and central departments to prepare for the annual employee assessment talks and to identify our best talents.

At the end of 2011, we started to expand our manager development activities in the form of advice, training, and coaching in order to more effectively support our management staff. This ensures that all managers with human resources responsibility not only stay up to date in their specialist fields, but also regularly gain current know-how about management and leadership.

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# CONSOLIDATED FINANCIAL STATEMENTS

FOR THE YEAR ENDED DECEMBER 31, 2011

## BALANCE SHEET

(IN EUR THOUSANDS)

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Intangible assets</td>
<td>400,315</td>
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<tr>
<td>Property, plant, and equipment</td>
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<tr>
<td>Shares in unconsolidated, affiliated companies</td>
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<td>Inventories</td>
<td>692,410</td>
<td>581,758</td>
</tr>
<tr>
<td>Trade receivables</td>
<td>554,841</td>
<td>570,751</td>
</tr>
<tr>
<td>Receivables from income taxes</td>
<td>20,848</td>
<td>15,313</td>
</tr>
<tr>
<td>Other current assets</td>
<td>153,130</td>
<td>132,036</td>
</tr>
<tr>
<td>Securities</td>
<td>766,290</td>
<td>825,909</td>
</tr>
<tr>
<td>Cash and cash equivalents</td>
<td>1,804,996</td>
<td>1,756,631</td>
</tr>
<tr>
<td><strong>Current assets</strong></td>
<td><strong>3,992,515</strong></td>
<td><strong>3,882,398</strong></td>
</tr>
<tr>
<td><strong>Total assets</strong></td>
<td><strong>4,972,433</strong></td>
<td><strong>4,720,562</strong></td>
</tr>
<tr>
<td>-------------------------------------------------</td>
<td>---------------</td>
<td>---------------</td>
</tr>
<tr>
<td>Shareholders’ equity</td>
<td>871,800</td>
<td>740,142</td>
</tr>
<tr>
<td>Non-current financial liabilities</td>
<td>11,287</td>
<td>128</td>
</tr>
<tr>
<td>Accruals for pensions and similar obligations</td>
<td>474,075</td>
<td>472,140</td>
</tr>
<tr>
<td>Deferred tax liabilities</td>
<td>336,321</td>
<td>377,372</td>
</tr>
<tr>
<td>Other non-current accruals</td>
<td>33,880</td>
<td>33,285</td>
</tr>
<tr>
<td>Other non-current liabilities</td>
<td>54</td>
<td>0</td>
</tr>
<tr>
<td>Non-current liabilities and accruals</td>
<td>855,617</td>
<td>882,925</td>
</tr>
<tr>
<td>Current financial liabilities</td>
<td>93,774</td>
<td>78,810</td>
</tr>
<tr>
<td>Trade payables</td>
<td>331,085</td>
<td>323,282</td>
</tr>
<tr>
<td>Liabilities from income taxes</td>
<td>133,450</td>
<td>76,613</td>
</tr>
<tr>
<td>Advance payments received</td>
<td>1,075,954</td>
<td>1,079,547</td>
</tr>
<tr>
<td>Other current accruals</td>
<td>1,347,916</td>
<td>1,325,370</td>
</tr>
<tr>
<td>Other current liabilities</td>
<td>262,837</td>
<td>213,873</td>
</tr>
<tr>
<td>Current liabilities and accruals</td>
<td>3,245,016</td>
<td>3,097,495</td>
</tr>
<tr>
<td>Total liabilities</td>
<td>4,972,433</td>
<td>4,720,562</td>
</tr>
<tr>
<td></td>
<td>2011</td>
<td>2010</td>
</tr>
<tr>
<td>------------------------------</td>
<td>--------</td>
<td>--------</td>
</tr>
<tr>
<td><strong>Revenue</strong></td>
<td>3,069,722</td>
<td>3,035,743</td>
</tr>
<tr>
<td><strong>Cost of sales</strong></td>
<td>-2,268,284</td>
<td>-2,342,777</td>
</tr>
<tr>
<td><strong>Gross profit</strong></td>
<td>801,438</td>
<td>692,966</td>
</tr>
<tr>
<td><strong>Selling costs</strong></td>
<td>-250,932</td>
<td>-206,335</td>
</tr>
<tr>
<td><strong>General administrative costs</strong></td>
<td>-126,888</td>
<td>-100,706</td>
</tr>
<tr>
<td><strong>Other operating income</strong></td>
<td>14,428</td>
<td>17,057</td>
</tr>
<tr>
<td><strong>Other operating expenses</strong></td>
<td>-200,327</td>
<td>-139,136</td>
</tr>
<tr>
<td><strong>Net investment income</strong></td>
<td>-641</td>
<td>2,107</td>
</tr>
<tr>
<td><strong>Net interest income</strong></td>
<td>28,110</td>
<td>-3,509</td>
</tr>
<tr>
<td><strong>Pre-tax profit</strong></td>
<td>265,188</td>
<td>262,444</td>
</tr>
<tr>
<td><strong>Income taxes</strong></td>
<td>-89,404</td>
<td>-76,904</td>
</tr>
<tr>
<td><strong>Net profit for the year</strong></td>
<td>175,784</td>
<td>185,540</td>
</tr>
<tr>
<td><strong>Minority interests</strong></td>
<td>-9,822</td>
<td>2,174</td>
</tr>
<tr>
<td><strong>Net profit for the year after minority interests</strong></td>
<td>185,606</td>
<td>183,366</td>
</tr>
</tbody>
</table>
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