

metals & mining

The magazine for the metals and mining industries

Issue 3|2008

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Metals
in China



Bridging the future:

Next Generation Metals

The door to record steel production is wide open. What is needed is the fast implementation of high-performance plants, based on technological solutions that span a bridge to the future. Siemens VAI has the unique potential to make this reality.

Want to know why?

No other partner combines technological, mechanical, electrical, automation and service know-how in a way that Siemens VAI does – so that you can achieve new benchmarks in productivity and plant performance from a single source. Want to make the “Next Generation Metals” become reality at your plant? Visit us at: www.siemens-vai.com

Metals Technologies

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Marko Tomasic

Dear Readers,

In the past years we witnessed an impressive growth of the Chinese economy. This not only brought benefit to the Chinese nation but also was a driving force for the world economy. The backbone of this growth and great contributors to the Chinese economy are mining and metals industry, delivering raw materials for the downstream production plants. The price for this growth was paid with the continuously rising costs for raw materials and energy, as well as with the rising impact to environment. As we may expect that the rising prices will lead to consolidation in the market, the environmental issue is to be tackled by regulatory measures.

Chinese legislation reacted to this development and now we can say that China has a most comprehensive catalog of environmental laws anywhere in the world. Now it is up to the industry to implement the necessary measures and comply with these excellent laws and regulations.

In this environment, consolidation in the mining and metals industry can be expected with three main challenges:

- concentrate the production to larger enterprises, through M&A and other actions
- idle and dismantle the outdated plants
- implement new technologies for better quality and excellent raw material, energy and environment efficiency.

For this reason, we have decided to take a closer look at China in this issue of metals & mining. By reading this edition and you will realize that Siemens VAI has solutions and new technologies to be a partner for the industry in achieving the new challenging tasks. Corex and Meros are just two examples of the technologies that have been designed to meet the high environmental standards that China, and not only China, needs to maintain going forward.

Advanced solutions and technologies make Siemens VAI the right partner for the Chinese steel industry – now and in the future. Our service centers in China keep us in close contact with the needs and requirements of our customers. Whenever and wherever they arise.

We hope that you enjoy the articles in this issue.

A handwritten signature in black ink, appearing to read 'Marko Tomasic'. The signature is fluid and cursive, written over a light background.

Mr. Marko Tomasic
Head of Metals Technologies
Siemens Ltd., China
Industry Sector, Industry Solutions

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Ultra-Thick Slab Caster with LiquiRob

Siemens VAI received a contract from the Austrian steel producer voestalpine Stahl GmbH, a company of the listed voestalpine Group, for the supply of a new single-strand slab caster. The order value for Siemens VAI is a two-digit-million euro figure. This will be the second slab-caster project to be implemented for the Linz-based steel producer capable of casting slabs in thicknesses of up to 355 millimeters. The upgraded machine was restarted in summer 2007. The new slab caster with a straight mold and a bow radius of ten meters is scheduled for start-up in September 2010. For the first time in a European steel works LiquiRob robot systems will be employed. This will improve the safety of the operating personnel considerably. ■

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Higher Solution and Service in India

The building of new manufacturing capacities in India and the introduction of advanced processes for producing high-grade iron and steel products in India will drive the business of Siemens VAI. "We expect a double digit growth over the market average of 7 to 9 percent thanks to new projects and service solutions," Ashoke Pan said to media at the Press Club of Kolkata. Pan, responsible for the metals technologies business of Siemens VAI in India, implemented an initiative in Kolkata to extend the business portfolio with modernization, upgrades, special equipment and services to support growth. "We want to expand our capacities in India and to develop and train our employees to make a strong team for securing and sustaining our position in this market segment," Pan said. ■

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New Shaft Winding Installations

Siemens International Trading Ltd., Shanghai, has received an order from the Shandong Yuncheng Coal Mine to supply the drives, automation systems and braking systems for three new shaft-winding installations. The project is worth more than ten million euros. The winding installations are scheduled to start production in the spring of 2010. Located in the east Chinese province of Shandong, the mine is set to produce 2.4 million metric tons of coal per year. The mine will have two shafts, one of which will be a production shaft and the other one a service shaft. ■

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Another 400-mm-Thick-Slab Caster

The Chinese steel producer Shougang Group Co. awarded Siemens VAI projects for the supply of three new continuous-casting machines, including a caster capable of casting ultra-thick slabs of up to 400 millimeters. The casters will be installed at the new facility of Tangshan Shougang Baoye Iron and Steel Co. Ltd. (Shougang Baoye) and will be successively started up beginning in September 2009. The orders were received shortly after the order from the Shougang Group for the supply of a 400-millimeter-thick-slab caster at Qinhuangdao ShouQin Metals Material Co. Ltd. The Shougang Group is one of the leading steel manufacturers in China and produced more than 12.4 million tons of finished steel products in 2007. ■

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Plant Start-ups and Acceptance Certificates (April 1 to August 31, 2008)

Company	Country	Project
Arcelor Mittal Bergara	Spain	Start-up of new electrode regulation system on existing 110-ton/90 MVA EAF
Arcelor Laminados Zaragoza	Spain	FAC for revamped DC EAF with new lower shell and Fin-type bottom electrode
Arcelor Mittal Temirtau	Kazakhstan	Start-up of new bar and section mill with an approximate annual capacity of 400,000 t/a
Azovstal Iron & Steel Works	Ukraine	Start-up of new 350-ton twin-station VD-OB (vacuum degassing-oxygen blowing) plant
Baotou Iron and Steel Group	China	Start-up of extended hot-strip mill (E&A supply)
Benxi Iron & Steel Company	China	FAC for modernized 2-strand slab caster (CC 1)
Bhilai Steel Plant	India	Start-up of new 130-ton RH (Ruhrstahl-Heraeus) plant
Chengdu Iron & Steel Co. Ltd.	China	FAC for 70-ton-capacity EAF
Corus	Netherlands	Start-up of new 4-stand 6-high PLTCM
Cosipa	Brazil	Start-up (and PAC) of plant extension to a 170-ton RH-T-COB
Companhia Siderurgica Huachipato	Chile	FAC for installed sublances for BOFs Nr. 1 and Nr. 2
Diacó	Colombia	FAC for two Red-Ring rolling stands installed in the intermediate train of a bar mill
Dingsheng Aluminium Co., Ltd.	China	Start-up foil mill AFC & AGC
Dneprovsky Iron and Steel Works	Ukraine	Start-up of new 7-strand billet caster
Equinox Copper Ventures Ltd.	Zambia	Gearless Drive for SAG (38 ft, 18MW) and Ball (26 ft, 16MW) mill
ISD Dunafer	Hungary	Start-up of new Reversing cold mill
Isdemir Inc.	Turkey	Start-up of new hot-strip mill (E&A supply)
Jieru	China	Start-up of foil mill (automatic flatness control, automatic gauge control)
JSC Severstal	Russia	Start-up of upgraded 6-strand billet caster
Georgsmarienhütte	Germany	Start-up of modernized 6-strand billet caster (new section sizes)
Hadeed	Saudi Arabia	Fulfillment of hot-DRI performance test; start-up/PAC of revamped 6-strand billet caster
Laiwu Steel Group, Ltd.	China	Start-up of new 1-strand slab caster
Lebedinsky GOK	Russia	FAC for new 1.4-million t/a Midrex HBI (hot-briquetted iron) direct-reduction facility
Liuzhou Iron & Steel Co. Ltd.	China	Start-up of refurbished tandem cold mill
Maanshan Iron & Steel Company	China	FAC for expert and neural systems installed in Blast Furnaces No. 1 and No. 2
Magnitogorsk Iron and Steel Works	Russia	FAC for two sinter coolers (No. 2 and No. 3), FAC for new 150-ton ladle furnace
Nanjing Iron & Steel Co., Ltd.	China	Start-up of new 5-strand bloom caster
NASCO (National Steel Company Ltd.)	Saudi Arabia	Start-up of upgraded EAF with new secondary current system and new electrode regulation system for better foaming-slag management
Nizhny Tagil Iron & Steel Works	Russia	Start-up/FAC of replaced 160-ton Converter No. 2 and new offgas treatment system
North American Stainless (NAS)	U.S.A.	FAC for 150-ton ladle furnace for new stainless steel production line
Ovako	Sweden	Start-up of upgraded 110-ton/95 MVA EAF with new hydraulic and electrical equipment
Riva Acciaio	Italy	Start-up of modernized 6-strand billet caster
RPM (Rio Paracatu Mineração)	Brazil	Gearless Drive for SAG mill (38 ft; 20 kW)
Baoshan Iron & Steel Co., Ltd., Medium & Heavy Plate Branch	China	FAC for Corex C-3000 plant; FAC for sublance, bottom-stirring system and wet-type dedusting systems with annular-gap technology for two 150-ton LD (BOF) converters
Shenzhou	China	Start-up of foil mill (AFC & AGC)
Southeast	China	Start-up of foil mill (AFC & AGC)
Tangshan Guofeng Iron & Steel Company	China	Start-up of new Hot Strip Mill No. 2 (E&A supply)
Tangshan Iron & Steel Company	China	FAC for expert and neural systems installed in Blast Furnace No. 1
Tangshan Guofeng Iron & Steel Co.	China	Start-up of new 2-strand slab caster (CC1); FAC for converter dry-type dedusting system
Tiantie Hot Rolling Mill Co. Ltd	China	Start-up of new 2-strand slab caster (CC 2)
Tianjin Tiantie Pipe Corp.	China	Start-up of new PLTCM (E&A supply)
Xiangtan Iron and Steel Group Co.	China	Start-up of 3800 mm plate mill (E&A supply)

The need for flexible production management and green solutions will affect China's steel industry

Leaner and Greener

COVER STORY >



China has achieved an unprecedented growth in its economy and steel production. The global financial crisis will, to a certain extent, also have an impact on the Chinese steel industry and will result in a shift in the focus of investments. Fewer projects to expand primary steelmaking capacity are anticipated, and more projects can be expected in connection with plant modernizations, replacements and service aspects. At the same time, growing pollution awareness will require measures to be implemented in the steel industry on a broad scale to meet increasingly stringent emission values. Siemens Ltd., China, with the full support of the Siemens Business Unit "Metals Technologies," is ideally positioned to meet current and future demands of regional steel manufacturers and to help implement sustainable "green" solutions.

According to the data made available by the National Bureau of Statistics of China on October 28, 2008, the growth rate of the Chinese GDP (Gross Domestic Product) during the first three quarters of 2008 fell to 9.9 percent – the lowest rate during the past five years and down from 11.9 percent in 2007. Due to globalization and the interdependency of commerce and trade, China will not remain immune to this downward business spiral. When considering that an estimated 40 percent of China's exports are sold to the U.S. and Europe, an economic crisis abroad will influence business in China as well. However, the large domestic demand is likely to dampen this impact. The steel industry will also be affected, however, it is difficult to predict to what extent. According to the World Steel Association (formerly the Institute of Iron and Steel/IISI), growth in world steel demand is expected to persist throughout 2008 and 2009, and Chinese crude steel production is still forecast to swell to over 500 million tons in 2008. But a less than expected demand for steel and the resulting production shutdowns and cut-backs may well lead to cash-flow, employment and numerous other downstream problems.

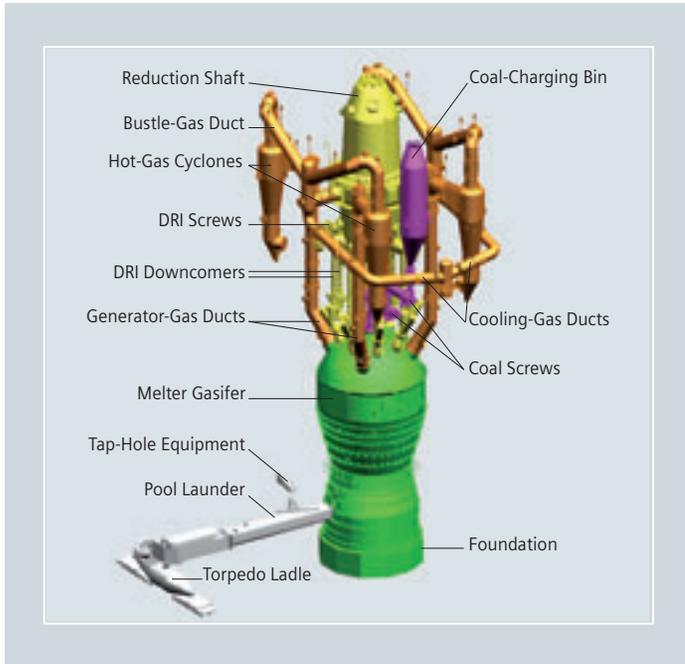
According to an FT.com (Financial Times) article from October 24, Chinese steel producers have already cut overall production by about 20 percent in response to weaker export markets and depressed domestic demand. Recent government efforts to cool down the building industry in combination with a lower demand from Chinese carmakers have not helped the situation

much either. In reality, no one can accurately predict the short-term developments in the steel industry – even the "experts" themselves were not able to see the current crisis coming just a short while ago. Steelmakers have no choice but to flexibly adapt to how things eventually turn out. Most likely a significant reduction in investments in primary iron- and steelmaking capacities will be the short- to mid-term consequence and increased expenditures can be expected for production lines churning out value-added products to maximize profit revenues. Greater emphasis will be placed on improving and modernizing existing facilities that are not capable of meeting today's demands placed on product performance and quality.

Knowing the market and helping producers succeed in changing business climates

Siemens is ideally predestined to help steel producers cope and quickly respond to the fickle business climate prevailing in the metallurgical sector. We have experienced the upturns and downturns of the economy, we know our business partners quite well and we have been able to advise and support them whenever necessary in the past. In China, Siemens Ltd., China (SLC) has commanded a strong presence in this region since decades and has made a substantial contribution to the growth and the predominant position of the Chinese iron and steel industry today. Just to mention a few examples of the most recent Siemens metals projects in China, we may cite the start-up of a gearless dragline at the Zhungeer coal mine, the first tapping of hot metal from the Corex C-3000 plant at Baoshan Iron & Steel Co., Ltd., Medium & Heavy Plate Branch (formerly Shanghai Pudong Iron & Steel Co., Ltd.), start-ups and commissionings of the stainless steel works at Lianzhong Stainless Steel Corporation, the electric arc furnace at Pangang Group Chengdu Iron & Steel Co. Ltd, and the VOD (vacuum oxygen decarburization) plant at Tangshan Iron and Steel Co., Ltd. Numerous caster projects, including the world's widest and thickest slab casters are outlined in a separate article in this issue. Other projects include the supply of the main drive for the hot-rolling mill at Rizhao Steel Co. Ltd, the bar mill start-up at Benxi Iron and Steel Co., the linked pickling lines and tandem cold mills at Shoudu Iron and Steel Co. Ltd. and at Wuhan Iron and Steel Co., Ltd., the electro-tinning line project at Yichang Steel Sheet Co., Ltd. as well as a yearly service contract with Jinxi Iron & Steel Company.

A key reason for our capability to advise and support our customers in a way in which other suppliers often cannot is because of our comprehensive product and supply portfolio, which extends from individual component manufacturing up to turnkey integrated steel >>



Schematic view of main Corex plant sections

Corex C-3000 plant, Baosteel, China



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>> works. This includes engineering, mechanical equipment, individual process as well as integrated process expertise, plant-wide electrical, automation, power, energy management, utility, media supply and environmental solutions, taking advantage of concern-wide Siemens competence and expertise. High-quality plants and equipment combined with well executed projects completed on time for nearly all of the leading Chinese steel producers has been the basis for long-term business relationships and repeat business projects.

In response to ever tighter import restrictions, SLC will place a greater emphasis on increasing the share of local engineering, equipment manufacturing in our own workshops throughout China and extending the range of available services. An increased local project share is the basis for enhanced cooperation and partnerships with our customers built on a foundation of trust and mutual respect. This is also decisive for the prompt addressing of producer requirements and requests. More competitive plants and products will open up additional business opportunities for our customers in support of local and regional growth.

Environmental considerations and the Chinese steel industry

Installation and application of environmental technologies will be increasingly important in the Chinese industry. The steel industry is one of the main sources of pollution in China, particularly with respect to emissions of sulfur dioxide, dust, wastewater and solid waste residues. According to a recent pollution analysis of the China steel industry by Research and Markets, in the year 2007 the quantity of these pollutants were as follows: 1.73 million tons of sulfur dioxide (accounting for 7% of the national total), 1.07 million tons of dust (15% of the national total) and 228.5 million tons of solid wastes (13% of the national total). Wastewater from steel works discharged to the environment amounted to 8% of the national total. Industrial pollution is already the cause of severe health hazards in China and, according to Chinese sources, respiratory infections from pollution is the number one childhood disease.

For these and other reasons, as of January 1, 2009, Chinese laws will be come into effect governing resource-intensive and heavily polluting industries such as steelmaking, non-ferrous metal production, power generation, oil refining, construction and paper/pulp manufacturing. Industries will be required within the foreseeable future to use cleaner sources of energy, employ more environmentally friendly production processes and to adopt water-saving technologies.

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Overview of Meros plant, voestalpine Stahl, Austria

Pioneering role in Corex and Meros

Siemens VAI was one of the first engineering companies to develop and implement new steelmaking technologies that make an active contribution to protecting the environment on an industrial scale. For example, in November 2007, the former Baosteel Pudong Iron and Steel Co. Ltd. commenced with the operation of a new C-3000 Corex plant in Luojing on the western outskirts of Shanghai that has an annual nominal capacity of 1.5 million tons of hot metal. The extremely strict environmental requirements imposed by the local authorities for the operation of this steel works are now being fully complied with, thanks to the unique process features of Corex (see *metals&mining* Issue No. 1/2008, pages 28–29). Corex plant emissions contain only insignificant amounts of sulfur dioxide and other sulfides, nitrogen oxide, phenols and ammonium. Emission values are already far lower than future European standards to be enacted for blast furnaces. Similarly, wastewater discharge is a fraction of that from the conventional blast furnace route, which further reduces the environmental impact of the Corex process. Because coking and sintering plants are not required, substantial cost savings are achieved in the production of hot metal. Although the extent of such savings depends on the local site conditions, they can be as high as 20% under actual operating conditions.

Another example includes the introduction of Meros (Maximized Emission Reduction Of Sintering) technology which will be implemented at the sinter

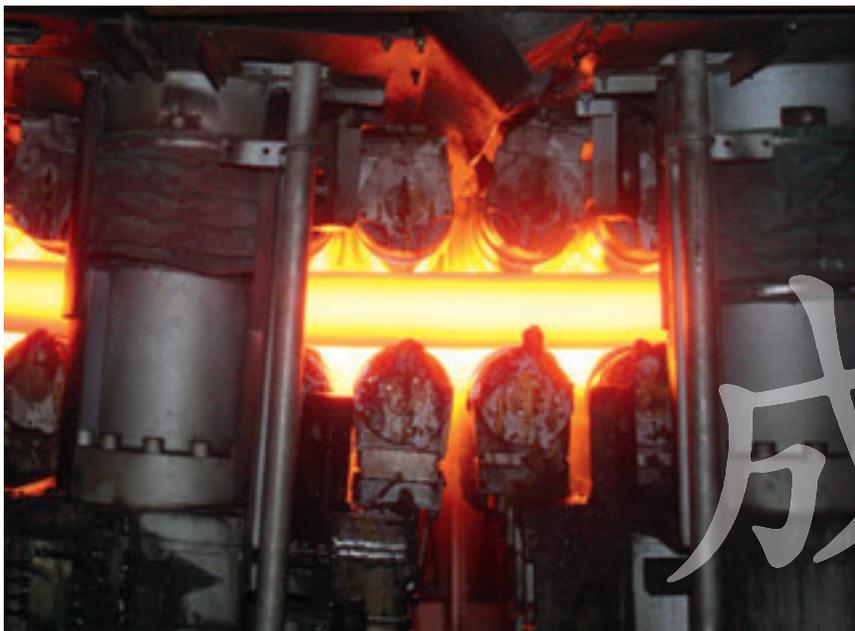
plant of Maanshan Iron & Steel Company Ltd. (see *metals&mining* Issue No. 2/2008, pages 27–31 for a description of this project and the process). Compared to conventional sinter-offgas wet-cleaning systems, Meros reduces emissions of dust, heavy metals, organic compounds and sulfur dioxide by up to 90%.

Crisis and challenge

The present economic downturn may or may not have a lasting impact on developments in world steel industry, in which China plays a key role. In a climate of uncertainty, producers will consider reducing investments in primary steelmaking facilities as well as new production plants, and will implement cost-cutting measures. This will nevertheless be accompanied by a government- and society-imposed, plant-wide application of environmental technologies to reduce health hazards and preserve natural resources. Environmental projects implemented by Siemens VAI, examples of which were briefly outlined above, show that parallel to drastic reductions in environmental emissions, significant improvements in process efficiency are also achieved. Despite the current uncertain situation in the economy, Siemens VAI nevertheless foresees a long-term positive trend and has the background and experience to help steelmakers chart the right course into the future. ■

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COVER STORY >



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Embracement of advanced technology has transformed
China's steel industry

Gold Medal in Steelmaking Too

China's image as a producer of primarily low-to-medium-quality commodity steels has undergone a dramatic makeover in recent years. Today, China is not only the world's largest steel producer, but has also become a manufacturer and exporter of quality steel. Decisive reasons for this remarkable transition have been the unmitigated focus on installing the best technologies available, maximized project involvement and steadily increasing process and production know-how.

In the year 1985, China's crude-steel production was 46.8 million tons of steel, which accounted for only about 6.5 percent of global steel production at that time. Already by the year 2000 this figure grew to nearly 130 million tons. Today, China is the No. 1 steel-maker in the world. 489 million tons of steel manufactured in 2007 in approximately 800 steel mills throughout China adds up to over 37 percent of the entire world steel output. Despite the current financial crisis, China is expected to produce more than 500 million tons of steel in 2008 and this may be in the range of 700–800 million t/a by 2012, according to Chinese sources. This growth has been phenomenal and without parallel in the industry.

Increasing Chinese steel exports

For the first time ever, Chinese steel exports exceeded imports in 2006. In the year 2007 net exports topped 45 million tons – nearly ten percent of their total steel output. It is not only that the quality of the steel grades exported by China today is at least equivalent to the quality of the same steel grades traded on commodity markets, but the respective prices are highly competitive. Even a casual research of the internet and other sources indicates that Chinese steel can often be exported and sold to overseas consumers at lower prices than can be produced by many steel manufac-

turers. And with the relentlessly increasing steel output in China, one does not have to be a seer to predict that the quantity of exported steel will increase as well with the logical intention of recovering the immense investments that have been made in the indigenous steel industry.

It can also be expected that the share of exported high-alloy and stainless steel grades will increase with consideration to the high profit margins for the sale of these types of steels.

Limiting factors for China's steel industry and countermeasures

It can occasionally be heard that China will never be able to be a competitive steel supplier on international markets because the bulk of the iron ores used by the domestic steel industry has to be imported. In fact, Chinese iron ore imports reached 380 million tons in 2007, 83 percent of which came from Australia, India and Brazil. To meet the projected growth in steel output as cited above, China's iron ore imports would have to exceed 625 million tons by the year 2012. Increasingly restricted access to raw materials, tighter electrical and other energy supplies, environmental restraints, financial bottlenecks and inadequate transport capability could indeed hamper the growth of China's steel industry. >>

>> However, China is undertaking important steps in response to these challenges. An increased trend can be noted towards migrating steel production to coastal areas to alleviate internal transport problems and reduce shipment costs. Increasing consolidation of the Chinese steel industry will contribute to improved production efficiency, and the ten largest steel mills in the country may account for about 50% of steel production by 2010. Environmental awareness has never been higher in China than at the present as shown by the relocation of many Chinese steel mills to outside of urban areas and by escalating investments in environmental technologies. Siemens VAI examples of this can be seen by the two Corex projects at Baosteel, the Meros sinter-offgas-treatment plant at Maanshan as well as by a large increase in the number of order intakes for steel mill dedusting plants throughout China.

Long-term contracts have been signed to secure iron ores and to control costs. This is exemplified by investments in the ownership of the Australian Savage River iron ore deposit as well as by major investments in the mining, transportation and port facilities of the huge unexploited Gabonese Belinga iron ore deposit, which has an estimated one billion tons of iron ore with an iron content of 65 percent. Furthermore, other Chinese steel producers are seeking to buy stakes in Brazilian iron ore suppliers to secure long-term iron ore supplies. It can therefore be assumed that China will be able to import iron ores at lower costs, especially as a large-scale bulk importer, in comparison with most other iron-ore-importing steel producers.

China has considerable reserves of many of the most important elements required to produce alloyed steels, including manganese, titanium, tungsten, vanadium, molybdenum and niobium – only nickel and chromium deposits are inadequate to cover domestic needs. Magnesite used to produce high-quality refractories is also abundantly available in the country. China has vast reserves of high-grade coal – however not coking coal – yet is the largest coke-producing country in the world, boasting an output of 328 million tons in 2007 or roughly 60% of the total world production. Access to virtually all of the raw materials necessary for the production of iron and steel – either from domestic reserves or from imports – is thus assured in the foreseeable future for China's steel industry at more favorable prices compared to most other steelmakers.

Emphasis on technology and experience

In addition to labor-cost advantages and the above raw-material cost considerations, another key reason for the quality and price advantages of Chinese steel can be attributed to the strong emphasis placed by steel companies on carefully comparing and then installing

the best solutions and technologies available from international suppliers. Furthermore, the heavy involvement of local Chinese design and manufacturing companies in the implementation of metallurgical projects has been an important factor for reducing total investment costs and for acquiring a vast background of experience. According to Mr. Christoph Moser, Siemens VAI Vice President of Market & Customers, China, "When the Chinese order a metallurgical plant from our company, it typically includes the complete range of technological packages offered in the Siemens VAI portfolio. We have also noted the steadily increasing share of local manufacturing in all of our plant projects in China." Or in the words of Andreas Flick, Senior Vice President of Siemens VAI Continuous Casting Technology: "We continue to be impressed at how quickly Chinese steel companies adopt the most modern caster equipment, much faster than the rest of the world. China has proved to be a fertile ground for Siemens VAI for the introduction of our most advanced casting technologies and the latest technological packages."

The Chinese have taken giant strides in the iron and steel industry through a permanent emphasis on employing the most advanced technologies available. The impressive accumulation of plant-building, metallurgical, process and operational know-how has contributed to decisive production and competition advantages on the global steel market. The consequences of this are quite obvious to the world steel industry. In a free-market environment, only those companies which can reliably supply products and goods which meet the quality requirements at favorable prices will be capable of competing and surviving on a long-term basis. Ongoing technological and process developments allow steel to be produced and rolled more efficiently and economically than at any time in the past. Therefore, an alert awareness of solution possibilities and continual upgrading of production facilities is a logical and necessary course of action. This is where Siemens VAI can help. Advanced solutions and technological packages are available to support steel producers in acquiring a competitive edge and to confront the challenges facing the steel industry today. ■

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Review of the Tenth Continuous Casting Conference of Siemens VAI

From Visions to Solutions

One of those great events in the world of continuous casting took place from May 26–28, 2008 at the Design Center of Linz, Austria. Experts from 46 countries representing 179 companies attended the CCC'08, the tenth continuous casting conference sponsored by Siemens VAI. Under the motto of "From Visions to Solutions," participants were exposed to a world of ideas to consider for implementing at their own plants.

CONFERENCES >

This time, the CCC'08 Continuous Casting Conference coincided with the 40th anniversary of the first caster installed by Siemens VAI in 1968 at the steel works of voestalpine Stahl in Linz, Austria. The motto of the conference underlined the importance of visions and ideas and the role they play in the subsequent implementation of solutions. This is ideally achieved in strong partnerships between steel producers and technology suppliers in which both parties work closely together to make visions become reality.

"The conference visitors came to inform themselves about the latest developments and trends in this dynamic and exciting field," said Andreas Flick, Senior Vice President of Continuous Casting Technology. "All participants had the opportunity to share experience, exchange ideas and actively join in the discussions. A wide range of solutions were presented for improving caster performance, product quality, operational reliability, personnel safety and many other aspects."

A total of 46 lectures were held dealing with all aspects of continuous casting technology. In the keynote speech, Mr. Heyno Smith, Chief Operating Officer of ThyssenKrupp CSA in Brazil, spoke about the strategic development of ThyssenKrupp Stahl and reviewed the company's European and international steel business operations. Reflecting the theme of the conference, his presentation provided an example of how a major worldwide steel producer is responding to the opportunities and challenges facing the steel industry today with visionary ideas.

"The presence of more than 550 specialists at the CCC'08 made Linz the continuous casting capital of the world. This underlines the strong interest in our company's technology."

Dr. Richard Pfeiffer, President and Chairman of the Board of Siemens VAI

In the subsequent lecture sessions the start-up and operation of Siemens VAI-supplied slab and long-product casters were described. Detailed reports were presented which focused on plant and equipment design, process optimization, caster upgrading, safety aspects, maintenance and service. Special sessions were held on the casting of stainless steel, metallurgy and also on life-cycle services for mechanical components and caster automation. At the end of the conference, focused interest groups had the opportunity to visit metallurgical plants at voestalpine Stahl as well as various workshops.



CCC'08 awards ceremony



Scenes from the exhibition

Strong participation at the CCC'08

Andreas Flick, Senior Vice President of Siemens VAI Continuous Casting Technology

Exhibition Highlights

The CCC'08 exhibition was highlighted by a series of demonstrations and displays, including a retrospective "time tunnel" marking 40 years of milestones in Siemens VAI continuous casting technology. Plant components, monitor displays and simulations illustrated the complete range of the company's continuous casting portfolio.

A particular highlight of the exhibition was the caster robot, known as LiquiRob. This full-sized industrial unit demonstrated various tasks that are performed in the dangerous areas of the caster platform and steel converters, allowing operators to monitor >>

"The conference participants seemed to be very satisfied with their relationship to Siemens VAI. This gives us assurance for our future projects."

Conference visitor at the CCC'08

Lecture Highlights

Casting speed record

Mr. B. J. Min, Head of Steel Plant Nr. 2 at Posco Gwangyang Works, reported that a casting-speed world record of 2.7 meters per minute was set with their 250-mm-thick slab caster following the machine start-up in November 2007.

World's thickest slab

In his lecture, Mr. P. Hodnik described the casting of 355-millimeter-thick slabs on the upgraded slab caster CC5 at voestalpine Stahl in Linz – the world's thickest slabs ever cast on a bow-type caster with a straight mold.



Byeoung-Jin Min during his conference presentation

High-speed billet casting

In the paper of S. Zhuravlev, the casting of billets at a record speed of 7.4 meters per minute at Severstal Cherepovets, Russia in July 2007 were outlined.

Bloom soft reduction

During his conference presentation, Mr. Tu Ming Ye spoke about the product quality improvements at WISCO, China since the introduction of DynaGap Soft-Reduction in all five strands of their CCM No. 1 Bloom Caster.



Evening event in the K&K Riding Stable from the time of the Austro-Hungarian empire

LiquiRob demonstration



Casting of 355-mm-thick slabs at voestalpine Stahl, Linz/Austria



CONFERENCES >

- >> casting operations from the safety of the control room. LiquiRob represents a major step for improved operator safety and consistent production quality.

The ESP terminal (Endless Strip Production) was another focal point for the conference visitors. Details of a new visionary strip-production concept were shown for the new plant facility currently under construction at Arvedi Steel in Cremona, Italy. For the first time ever,

"I found the stand with the robot outside to be very interesting and impressive because the safety of the employees working in the casting area is very important."

Conference visitor at the CCC'08

thin-gauge hot-rolled strip will be produced from liquid steel in a continuous, uninterrupted process, thus combining energy savings with significant product benefits.

The ECO-Star rollers on display represented the latest development in Siemens VAI roller design. On the basis of their specific design features, a fully optimized strand support for improved product quality is assured. Thanks to their assembly characteristics, rollers of this type can be supplied on short notice and maintenance requirements are drastically reduced. Internal periph-

eral cooling of the roller barrels is also offered for roller installations where secondary cooling of the strand is no longer required.

A caster simulator, similar to an airline cockpit simulator, featured built-in Level 1 and Level 2 software of a slab caster which is installed in an actual plant. With this tool caster operators can be thoroughly trained under realistic production conditions – from standard caster operations up to critical casting situations. Visitors at the exhibition had the opportunity to "take over the controls" to see how well they could do in running a caster (without the danger of damage occurring).

According to Andreas Jungbauer, Product Manager of Continuous Casting Technology and organizer of the conference, "Siemens VAI is sincerely interested in the welfare and success of its continuous casting family. The CCC'08 is another example of our commitment to better serve our customers with solutions to make their visions become reality." We look forward to welcoming you to our next CCC!

More Information

For additional impressions of the CCC'08, you are invited to enjoy the picture gallery under www.siemens-vai.com/ccc08.

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Second Siemens VAI media summit

A Trip to Cracow

More than 100 journalists and media members covering the metals industry joined executives from around the world to gather at the Siemens 2nd annual media summit held June 4–6 in Cracow, Poland. The international event commemorated some of the most recent technological advancements for the production and processing of steel. In addition to the technical presentations, attendees took part in open discussions with Siemens management and had the opportunity to tour the ArcelorMittal Poland hot rolling mill just outside of Cracow.

COVER STORY >

Opening the summit, Dr. Richard Pfeiffer, CEO Siemens VAI explained the company's evolving strategy as one that is creating new manufacturing and service centres to support its intention to become a local supplier of plants and process solutions, not only for metals but also open cast mining. "We aim to use acquisitions and joint ventures to expand our business network for engineering, plant solutions and maintenance in order to reinforce our local presence and our proximity to the customer," explained Dr. Richard Pfeiffer. Siemens VAI is therefore aiming to increase its added value further, particularly in China, India, Russia and the Ukraine. Chief Financial Officer at Siemens VAI, Werner Auer, anticipates that the 33% increase to EUR 3.5 billion in incoming orders registered in 2007 (September 30) will be followed by further "significant" growth in the current financial year, thanks to new projects and the expansion of the company's service range.

Acquisitions will also contribute to this growth, for instance the recent takeover of the US company Morgan Construction in Worcester, Massachusetts, whereby Siemens VAI acquired one of the leading providers of long products – a company with 500 plants worldwide manufacturing wire, bar and billet rolls. Pfeiffer believes there is potential for huge growth by collaborating with local partners, founding community businesses and, in particular, building up the competency of some 9000 Siemens VAI employees. Another key focus will be the service area, where the replacement parts business will be developed in individual workshops and clearly defined electrical and mechanical package solutions will be combined. The basis for this move will be a systematic standardization of products and processes, which will optimize the operational reliability of the plants and drastically reduce downtime.



Developing expertise

As communicated by Bruno Lindorfer, head of Research & Development at Siemens VAI, Siemens business activities registered 90 inventions and 65 patents in the 2007 financial year. The main focus was on rolling automation, strip processing, ironmaking, steelmaking and continuous casting. In 2008, Siemens VAI is set to invest around EUR 55 million in research and development, while a 10% increase is planned for 2009. With a lifespan of 20 to 30 years, plants and processes are subject to continuous modification. Siemens VAI is unparalleled by any other plant construction company in its broad technological basis, which encompasses everything from automation and electrotechnology to mechanical solutions as well as comprehensive metallurgical procedural knowledge. According to Lindorfer, this foundation can be used "to optimize investment in the steel sector and maintain the company's competitive capacity through new developments." ■

Dr. Richard Pfeiffer, CEO Siemens VAI (left) and Werner Auer, CFO at Siemens VAI

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Siemens installs high-performance conveyor at Germany's Vattenfall

6000 Tons of Coal per Hour

Siemens is currently acting as the general contractor for the installation of a 13.5-kilometer-long belt conveyor system for Vattenfall Europe Mining AG in eastern Germany. As the author notes, plans call for the high-performance conveyor system to begin operation in mid-2010 and to transport up to 6000 t/hour of brown coal from the Reichwalde opencast mine to the Boxberg power-generation station.

Storage area of Boxberg power station

Conveyor system, Welzow

MINING >





Vattenfall Europe Mining AG belongs to Vattenfall Europe AG and is responsible for the opencast mining operations of the company. Vattenfall is the fifth-largest producer of electricity and the leading provider of district heating in Europe.

Every year, the company extracts approximately 60 million tons of brown coal, which is converted into electricity in the Jänschwalde, Schwarze Pumpe, and Boxberg power stations. The Boxberg power station, in particular, supplies up to 15.6 billion kW-hours of electricity per year. By 2011, Vattenfall plans to connect another generation station with an output of 675 MW to the power grid at Boxberg. To secure the long-term supply of coal to Boxberg power station, coal mining will be restarted in the Reichwalde opencast mine in 2010.

To transport brown coal from the Reichwalde opencast mine to Boxberg power station, Siemens is currently installing a belt conveyor system with a total length of 13.5 km. With a belt width of 2 m and a total

of six conveyor belts, the system will be able to move around 6000 t/hour directly from the Reichwalde mine to the Boxberg power station. According to Vattenfall, some 60 million tpy of the brown coal will be mined from the Lausitz area and used to fire the power plant or be processed for other uses at the Schwarze Pumpe beneficiation facility.

The total drive power is 19,350 kW and is distributed between six drive stations, three of which have an output of 3×1250 kW each, and three other stations, each with an output of 3×900 kW. Four of the conveyor belts are stationary and two are movable.

Uniform technical design from several different partners

A uniform technical design underlies all the drive stations and deflecting stations. Apart from bridge constructions, two water removal stations and a feeder unit that transfers the coal to an existing conveyor belong to the scope of the project. Siemens is responsible for >>

>> engineering the entire system as well as for manufacture, delivery, and installation of the equipment. Proven basic concepts combined with converters from the new Sinamics S120 series will make operation of the belt systems especially efficient and reliable. The drive and automation components being used are part of the Simine^{CIS} CON solution platform from Siemens.

At the request of the customer, variable speed conveyor drives will be installed to take advantage of energy savings and reduced wear on mechanical assemblies and flexible operation. The drives will also allow the conveyor to run at reduced speed with full load.

Additionally, as the general contractor, Siemens will coordinate all machine deliveries and services supplied by a number of suppliers as well as items provided by Vattenfall Europe Mining AG. Even after commissioning of the belt conveyor system, the Siemens service center in the neighboring Nochten opencast mine of Vattenfall will ensure that the equipment is effectively serviced.

Secure supply of coal through 2040

With its 360 million tons of brown coal reserves, the Reichwalde opencast mine will provide a secure supply of coal to the Boxberg power station through the year 2040, without having to resettle any of the local inhabitants or rely on the uncertainties of the international

raw material markets. Throughout the planning stage for this project, Vattenfall has placed emphasis on environmentally-sound and energy-saving technologies in coal extraction. When the project is completed, Reichwalde will count among the most technologically advanced and cost-efficient opencast mines in Germany.

The Reichwalde opencast mine, together with the Nochten coal field, will employ a total of 900 people, according to Vattenfall, of which about 100 will be located in the mine itself and the new block of the Boxberg power station.

The Reichwalde coal field

The Reichwalde coal field, located on the southeast edge of the Lausitz mountains, opened in 1980. The low-sulphur coal (about 1.2%) in the second Lusitz seam is up to 85 m underground. The seam averages 10–12 m thick. ■

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Bucket chain excavator.
Daily output: 35,000 cubic meters of soil

Main Benefits

Benefits due to operating modes:

- Conveyor speed adjustable according to plant requirements
- Creep speed operation
- Noise level reduction
- Avoiding of overflow at transfer chutes
- Simultaneous starting and stop of entire conveying route

Benefits concerning maintenance:

- Less maintenance regarding brushes and fluid couplings

Reduced slip between drive pulleys and belt during starting and stopping

Reduced belt tension

Reduced wear on the mechanical brakes

Smooth starting and stopping

Benefit due to energy saving for variable speed drives:

Matching belt speed to mechanical flow

None rotor resistor

Regenerating operating during stopping or by downhill conveyors

Conveyor bridge spanning 60 meters. Largest movable technical installation in the world

Siemens introduces new generation of shovel drives

Mining the Global Market

Siemens recently introduced a new drive for smaller electric mining shovels with a 20–30 m³ bucket load. In conjunction with Bucyrus International, Inc., Siemens has received orders for several of these new units to be supplied on machines destined for operations in Asia and South America. Additional orders are expected for delivery over the coming year.

MINING ^

The new smaller drives were developed to meet market requirements for smaller, yet efficient mining machines in the developing and fast-growing mining regions of India, Brazil, China and Russia. With over 30 years' shovel AC drive experience, Siemens Mining Technologies has created drives that operate faster and more efficiently than DC drives. The AC induction motors allow higher stall torque, faster acceleration, and higher speeds in field weakening to deliver a larger area under the speed/torque curve and shorter machine cycle times.

Single drive design platform

These latest shovel drives will use the same water-cooled Insulated Gate Bipolar Transistor (IGBT) drive system supplied with haul trucks and Bucyrus' large rope shovels and walking draglines. By creating a single drive design platform for shovels, draglines and trucks, costs associated with operations, training, maintenance and support are substantially reduced. The IGBT technology has been shown to be capable of operating above 98% availability with Mean Time between Failures (MTBF) in the thousands of hours and a Mean Time to Repair (MTTR) of typically less than one hour.

The IGBT inverters, controlled by the updated Siemens SIBAS 32 S control platform, transform DC power at a constant voltage into AC power a variable frequency and voltage to drive the shovel motors. Unlike DC motors, AC motors have no brushes or commutators that must be maintained.

SIBAS 32 S control technology is based on a modular structure and includes control units such as the traction control unit or the central control unit, as well as input and output stations in the driver's cab remote and central machine locations. The control units of the SIBAS 32 system comprise a number of different modules that provide open-loop and closed-loop control, protecting onboard equipment and performing higher-level control and information tasks. In addition to these functions, there are integrated systems for diagnostics, maintenance, and commissioning support.

Coupled with IGBT power inverters, SIBAS 32 S control modules require no routine maintenance. The IGBT inverters feature high overload capacity, which allows electronic protection circuits without fuses to greatly increase reliability.

Move to manufacturing in India

In keeping with its position of producing mining technology for global markets, Siemens has begun manufacturing its IGBT inverter/SIBAS 32 S control components for shovels and trucks at its factory in Nashik, India. The Nashik factory has been selected for inverter/

control manufacturing because of its long history of producing traction inverters for Indian Railways, which use similar equipment and technology as the new shovel drive system. With this in mind, manufacturing in India will accelerate component time-to-market considerably to help satisfy India's growing demand for mining equipment.

The decision to produce inverter and controller components in India is the next step in the Siemens strategy for manufacturing mining products. Although Siemens has been supplying electrical drive systems and automation equipment for bucket wheel excavators and conveyors for more than two decades in India, the production of shovel and truck electrics locally for the world's third largest producer of coal marks a significant step toward becoming much more responsive to the mining needs of the burgeoning Indian market.

Similar to other rapidly developing nations, India has seen an explosion in the demand for raw materials for export and domestic consumption. Siemens new generation of smaller AC drive systems for mining shovels is helping to satisfy this growing demand by improving equipment productivity while reducing maintenance costs.

In addition to the shovel drive system, Siemens offices in Mumbai will procure transformers, medium and low voltage switchgear, cable and installation materials. Siemens will also be providing project management, software and hardware engineering, and commissioning services for equipment used by India's largest coal producers. The first three machines will be delivered in the first quarter of 2009.

By partnering with many of the world's largest equipment manufacturers, Siemens is increasingly able to leverage its global experience and reach. From Chile to China, Siemens powers shovels, trucks of all sizes, and draglines are moving the mining industry on every continent. This latest development in local manufacturing in India further demonstrates Siemens commitment to serving global markets. ■

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Successful start-up of the LISCO Stainless Steelmaking Plant, China

Among the Biggest and the Best

In April 2004, the project starting shot sounded for Siemens VAI for a brand new stainless steel works in Guangdong Province – the first in southern China. A highly flexible meltshop capable of producing 800,000 tons per year of a wide range of stainless steel grades and qualities was built for Lianzhong Stainless Steel Corporation (LISCO). The plant was successfully started up in February 2007.

IRON & STEEL >



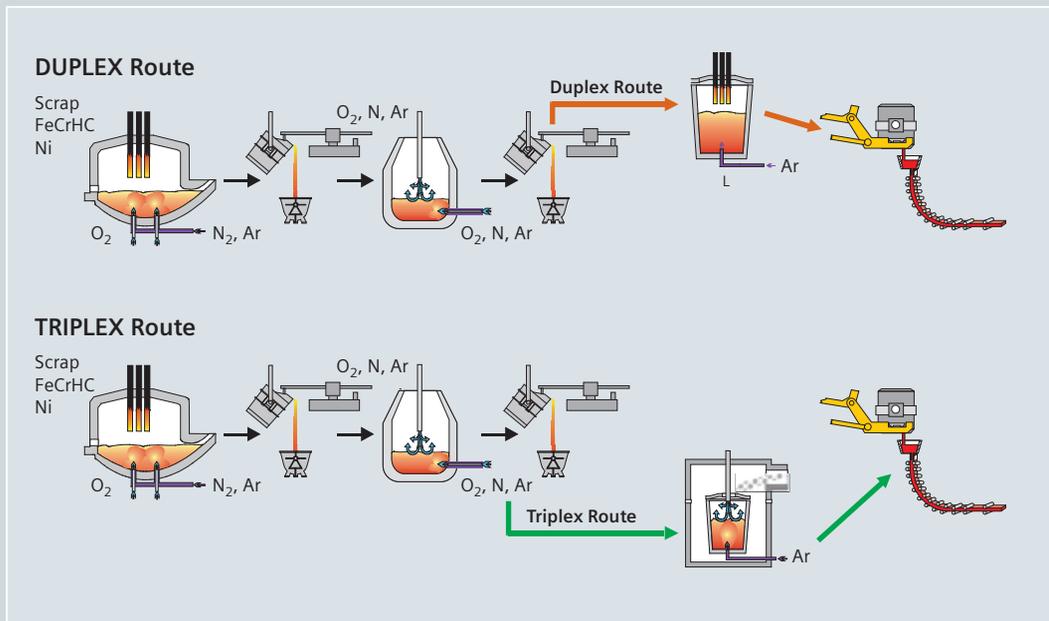
Electric arc furnace

In response to the growing domestic and global market demand for stainless steel, LISCO, a subsidiary of the Taiwanese company Yieh United Steel Corporation (YUSCO), had commissioned Siemens VAI with the design, manufacture, erection and start-up of a new stainless steelmaking plant, including a slab caster, which was built in the Economic Development Zone of Guangzhou, China.

The project scope for Siemens VAI included the supply of the scrap yard facilities, a 160-ton EAF (electric arc furnace), a 170-ton AOD (argon oxygen decarburization) converter, a ladle furnace, a twin 170-ton VOD (vacuum oxygen decarburization) stand, the related primary and secondary dedusting systems, the raw material and alloy-handling system, a single-strand slab caster, the energy and utility-supply systems as well as Level 1 and Level 2 steel plant automation. Stainless steel production is carried out in both the duplex and triplex process routes, allowing a very broad range of steels grades to be manufactured comprising all austenitic steels, including high-manganese-bearing grades of the 200 series, as well as Ferritic 409 and 430 grades.

Process and production overview

The meltshop and associated facilities are comprised of six bays with a building-space area of approximately 70,000 m². Raw materials are received by truck and intermediately stored in the scrap and alloy yards. The scrap is weighed during loading into the scrap baskets and this information together with the steel composition is directly transferred to the Level 2 automation system. The scrap is melted in the EAF and the premelt is tapped into AOD charging ladles followed by deslagging at the slag-skimming stand. After processing of the premelt in the AOD converter, the liquid steel is transported in ladles to the ladle treatment and VOD stations for temperature and compositional adjustments after which it is cast in the slab caster. >>



Stainless steel production routes at LISCO

Key Data of the Main Process Units

EAF plant

Taping weight	140/160 tons
Furnace diameter	8 m
Vessel type	Exchangeable, split shell, with spout
Electrode diameter	700 mm
Transformer rating	155 MVA
O ₂ and C lances (consumable type)	3

AOD plant

Tapping weight	170 tons
Number of side tuyeres	8
Tilting drive	4 pinion drive

Ladle furnace and ladle treatment plant

Treatment capacity	170 tons
Transformer capacity	26 MVA
Stands for ladle treatment	2
Additional equipment	2-strand wire feeder

VOD plant

Treatment capacity	170 tons
Number of vessels	2
Outer diameter of tanks	6.7 m
Oxygen flow rate	3000 m ³ /h
Treatment cycle time	110 min

Slab caster

Metallurgical length	27 m
Bow radius	9 m
Slab thicknesses	200 mm
Slab widths	800–1600 mm
Max. casting speed	1.5 m/min for austenitic grades, 1.3 m/min for ferritic grades

>> EAF plant

The EAF is designed for an annual production output of approximately 770,000 tons of liquid premelt. The nominal heat size is between 140 and 160 tons and an average output of 18 heats per day is achieved. With its eight-meter diameter and installed transformer capacity of 155 MVA, the LISCO EAF counts among the biggest and most powerful EAFs employed in stainless steelmaking in the world. The furnace is equipped with consumable lances to allow both oxygen to be injected into the vessel for scrap cutting and decarburization, as well carbon and FeSi fines during the refining phase. A Level 2 automation system with powerful process models optimizes the melting practice and the set points for the flux and alloy additions. The EAF is completely enclosed by a doghouse to minimize noise and dust emissions within the building.

AOD plant

The AOD converter with a tapping weight of 170 tons is one of the largest stainless steel converters in operation worldwide. It is characterized by a round design with a short lower cone to enable a lower metal-bath

height. This results in a number of advantages such as faster decarburization times due to the lower CO partial pressure in the bath, an up to 20% lower silicon consumption – especially for extra-low carbon (ELC) grades – and easier bricklaying work. Oxygen, nitrogen and argon are blown into the heat by means of eight under-bath tuyeres installed in the side-walls. Outer annular shroud tuyeres protect the inner pipes from excess wear. Application of a top-lance accelerates decarburization in the initial blowing stages. A Level 2 automation system, which includes a predictive process model, allows automatic blowing sequences to be carried out and specifies the precise quantities of materials to be charged into the AOD to produce the required steel grade. The AOD vessel is mounted in the VAI-CON® Quick suspension system which enables the vessel to be exchanged within less than 85 minutes for maintenance purposes.

Ladle furnace/ladle-treatment station

For those stainless steel grades produced at LISCO where very low contents of certain elements are not required, the steel is produced according to the duplex



AOD converter charging

route. Following tapping from the AOD converter, the heat is deslagged in the slag-skimming station and then transported by crane to either the ladle furnace or the ladle-treatment station. Here, stirring as well as compositional and temperature adjustments are carried out in accordance with the steel-grade and casting requirements. The ladle furnace also serves as an important steel buffer should irregularities in production scheduling occur.

VOD plant

For the production of stainless steel grades requiring extremely low contents of carbon, nitrogen, sulfur or hydrogen, steel from the AOD is subsequently treated in a vacuum oxygen decarburization (VOD) station. At LISCO this is designed as a twin-stand unit with two 170-ton-vessels. The ladle is placed inside one of the vacuum chambers which is covered by a moveable cover equipped with a connection to the vacuum system. The tank pressure is controlled according to the process demands. Bath circulation is carried out by means of inert gas bubbling through porous plugs installed at the ladle bottom. During vacuum treatment of one ladle, the temperature and alloy composition of the second ladle can be finally adjusted.

Slab caster

The single-strand bow-type slab caster with a straight mold is capable of casting more than 800,000 tons of slabs per year in thicknesses of 800 millimeters and in widths ranging from 800–1,600 millimeters. It is equipped with an electromagnetic stirrer (EMS) placed at the caster outer bow at the end of the bender to homogenize the steel composition. A host of technological packages are also installed to ensure highest caster performance and product quality. These include the LevCon automatic mold-level control system, Mold-Expert automatic breakout prediction, SmartMold enabling the fast exchange of worn copper plates, DynaWidth for flexible and online slab-width adjustments, DynaFlex hydraulic oscillation for the online adjustment of the mold-oscillation parameters and also Dynacs dynamic secondary cooling. A slab yard management system was also supplied.

Dedusting systems

In the steel bay five independent primary suction units are installed at the EAF, the AOD converter and ladle furnace, the VOD plant, the material-handling system and the slab torch-cutting machine. Several additional suction points are located at the ladle-treatment station and refractory maintenance areas. Secondary dedusting systems are installed in the EAF and AOD doghouses to ensure a clean environment inside and

outside of the plant. The applied technology (bag filter with pulse-jet cleaning) fully meets the imposed environmental regulations.

Operational results and concluding remarks

Civil works for the plant commenced in November 2005 and erection and cold commissioning were completed in accordance with the contract schedule after only 14 months. The plant was successfully started up on February 15, 2007. This was possible thanks to the excellent cooperation with LISCO personnel and the local construction company MCC. The production ramp-up curve was comparable to other similar installations. Two weeks after the first heat two-shift operations were introduced, and 24-hour operation could already begin six weeks following the plant start-up. The excellent project implementation and results achieved since the plant start-up are a consequence of the streamlined management approach of LISCO and YUSCO, the reliable and state-of-the-art equipment installed as well as efficient and market-oriented plant operations. ■

Slab Caster



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Interview with Walter Rainer Kastner: Corex plant start-up at Baosteel, China

A Proud Accomplishment

IRON & STEEL >



“All of China was watching ...”

Walter Rainer Kastner (center),
Project Manager for the Corex plant installation,
Baosteel, China

Walter Rainer Kastner was the project manager for the world’s largest and first Corex plant ever built in China. With this technology, liquid hot metal can be produced using mainly non-coking coal as the energy source and reductant, at lower unit costs and also at a much lower environmental impact compared to the conventional coke-oven, sinter-plant and blast-furnace production route. Closely watched by the Chinese metallurgical world, the Corex plant was started up at Baosteel on November 8, 2007, following two and a half years of intensive engineering and construction activities. In this interview W. R. Kastner spoke about the project background, implementation and operational results following nearly one year of commercial production.

What were the main challenges to be overcome in the implementation of the largest Corex plant ever built to date? Were you worried that the plant would function as designed?

W. R. Kastner: This Corex plant, a so-called C-3000 module, was designed with a 100 percent higher production capacity compared to the existing C-2000 mod-

ules in operation in Korea, India and South Africa. Were we worried? Yes we were. But what assured me personally was the fact that I was a member of the project teams in previous Corex-plant upscalings when we went from six tons to 40 tons per hour, and then from there up to 100 tons of hot metal per hour with the C-2000 modules. With this experience background,

I was convinced that we would once again be able overcome any difficulties in the upscaling to 180 tons per hour with the new plant.

In your opinion, what were key factors that contributed to the success of this project?

W. R. Kastner: First of all, I would like to emphasize that we really had an excellent team for this project. I knew most of the people from previous Corex installations, knew their strengths, their capabilities – people who I could rely on and who could motivate and inspire the customer’s project team in such a way that everybody fully identified with the project. With such a group, success could be the only outcome. I cannot put into words the feeling and sense of accomplishment that we all had when hot metal was tapped from the Corex plant for the first time! This success was the product of teamwork.

How did the start-up go? Were there any major problems that had to be overcome?

W. R. Kastner: The start-up itself proceeded according to plan. Despite the fact that up until now we didn’t have any experience in operating such a big Corex plant, production could be quickly ramped up to the planned 160 tons per hour. When we reached that figure, we saw that a few modifications had to be made in order to further increase the melting rate to design capacity. But then again, in a joint effort together with Baosteel, the limiting factors could be overcome according to an agreed action plan. We were then able to carry out the performance test run in May 2008.

What were the main performance figures that had to be met?

W. R. Kastner: First of all, we had to demonstrate a melting rate of 180 tons of hot metal per hour. The chemical composition of the hot metal had to fulfill a strict set of criteria for it to be used in the steel shop. Secondly, the guaranteed coal- and oxygen-consumption rates per ton of hot metal had to be demonstrated. These figures were easily met during the performance test.

Where do the raw materials used at Baosteel come from?

W. R. Kastner: The iron ores come mostly from Australia, South Africa and Brazil. The coal, additives and other consumables are all from China.

What does Baosteel do with the Corex export gas?

W. R. Kastner: The export gas is used in the company’s combined-cycle power plant for the efficient generation of electrical energy, in the steel works itself, and for heating purposes at the adjacent main steel works

Corex plant start-up (Nov. 8, 2007)



of Baosteel. Due to its relative purity, burning behavior and its heating value, this gas, especially considering the recent dramatic increases in worldwide energy prices, has become quite a valuable by-product of the Corex plant. This is another factor in favor of the Corex process, not only at Baosteel, but also at the other Corex plants in operation in South Africa, India and Korea.

What optimization potential do you see with Baosteel’s Corex plant?

W. R. Kastner: There is still room for improvement. We are very optimistic that a melting rate of even 200 tons per hour will be possible with further optimization work. That’s about 10 percent higher than the plant’s nominal capacity.

What’s the outlook for additional Corex installations in China?

W. R. Kastner: All of China was watching to see what would happen during the start-up of the plant. The successful results generated a lot of interest in this technology. The second Corex plant at Baosteel is already under construction, underlining Baosteel’s satisfaction with the process. We are now looking forward to the next Corex projects in China.

On June 21, 2008, Siemens VAI received the Final Acceptance Certificate from Baoshan Iron & Steel Co., Ltd., Medium & Heavy Plate Branch for the Corex C-3000 plant, marking the successful conclusion of this project. ■

Interview with
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Start-up of the electric arc furnace
at Chengdu Iron & Steel, China

The Future Is Electric

On March 1, 2008, a new electric arc furnace (EAF) supplied by Siemens VAI was successfully started up at Pangang Group Chengdu Iron & Steel Co. Ltd (PG CSST), Sichuan Province, China. This project was characterized by the close cooperation between a steel producer and an engineering/plant-building company to implement advanced electric steelmaking technology at a new plant site constructed outside of Chengdu.

Charging of the 70-ton-capacity EAF at PG CSST, Chengdu, China



To supply a new plant means total commitment. “The start-up of any electric arc furnace is an exciting and dramatic event,” said Joachim Wallich, Project Manager of Siemens VAI for the Chengdu EAF installation. “Deafening noise, blinding light and the characteristic smell of metal and dust are typical for an EAF meltshop environment. Even experienced operators are awed by the power of pure electrical energy when thousands of kilowatts are funneled into the confined space of a furnace to melt rusting scrap to liquid steel. Anyone who had ever witnessed an EAF in operation for the first time will never forget that event. This is now the seventh EAF project that I have been involved with, and it’s always a thrilling experience.”

In November 2006, Siemens VAI received a contract from Pangang Group Chengdu Iron & Steel Co. Ltd (PGG CSST) for the supply a 70-ton-capacity EAF which would be capable of producing more than 560,000 tons of liquid steel per year. This plant installation was part of an overall project to relocate the liquid-metal production facilities of a steel works in Chengdu, the cap-

ital of Sichuan province in south-central China, to about 30 kilometers outside of the city. One of the main reasons for this relocation was to improve the air quality of Chengdu City with its four million inhabitants, reflecting the continuing efforts by the local municipal authorities to improve the local environment. The new EAF steel mill would not only feature reduced environmental emissions, but would also be capable of producing steel at higher outputs, in better quality and at lower costs.

Scope of supply

The Siemens VAI supply scope for the EAF included mechanical key components, the EAF transformer, the programmable logic controller (PLC), human machine interface (HMI) as well as Level 2 hardware and software. A fully optimized automation package, highlighted by the Simelt electrode-control system, is the basis for assuring high product quality, production output and cost efficiency. The hydraulic plant was supplied by Siemens Limited China.



Energy comparison with lightning

The guaranteed electrical energy consumption to produce a ton of steel at the Chengdu plant was 315 kWh/t (20 percent of the charge is hot metal). This means that to tap seventy tons of steel, roughly 22,000 kWh are required for each furnace heat. An interesting comparison can be made with lightning. Most people tend to overestimate the power of lightning. The electrical energy contained in a typical bolt of lightning is about 250 kWh. For even the relatively small EAF that Siemens VAI supplied to Chengdu, the energy of roughly 88 flashes of lightning would be necessary to melt a typical furnace charge to liquid steel. However, the energy consumed in even the largest EAFs in operation in the world today is no comparison with the energy released in an average-size thunderstorm, which is about 10×10^6 kWh. This figure is equivalent to the average electrical energy required for 455 Chengdu furnace heats, or more than 17 days of continuous operation. (L. Gould)

The customer

Pangang Group Chengdu Iron & Steel Co. Ltd is one of the largest Chinese producers of seamless steel tubes and the main manufacturer of construction steel products such as steel bars and wire rods in the western region of China. Company commodities are widely used in the petroleum, coal-mining, chemical, power-generation, aviation, shipbuilding, transportation, construction and national-defense industries and are exported to more than 30 countries worldwide. Previous Siemens VAI projects with PG CSST include the installation of a 4-strand billet caster in 1992 followed by the supply of a 3-strand billet caster in 1996.

The installed AC EAF has a volume of about 100 cubic meters and a tapping weight of 70 tons. Up to 20% hot metal is charged into the furnace through the slag door by means of a hot-metal launder, or directly into the open top of the furnace with a crane-supported hot-metal ladle. Three refining combined burners (RCBs) were also supplied to enhance production performance. This allows supersonic oxygen lancing to be carried out at the end of the heat to refine the steel as well as to enable postcombustion to accelerate melting and reduce electrical energy costs.

Start-up

The EAF was tapped for the first time on March 1, 2008. The performance figures that had to be fulfilled at a steel output of 70 tons per heat were as follows:

- Tap-to-tap time: 55 minutes
- Electrical energy consumption: 315 kWh/t
- Oxygen consumption: 41 Nm³/t
- Natural gas consumption: 6 Nm³/t

Two weeks after the EAF start-up, the contractual performance guarantees were already met during normal furnace operation. This meant that a separate performance test could be dispensed with altogether. With the receipt of the Final Acceptance Certificate, the project came to a successful conclusion for Siemens VAI. Said Wallisch: “The customer and Siemens VAI worked closely and efficiently together right from the start of the project. This was an extremely solution-focused project execution in which all concerns were dealt with in a pragmatic manner. The result was the successful EAF start-up and completion of this project to the satisfaction of all.” ■

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Continuous casting success story in China

Solutions for Best Performance

Siemens VAI is the No. 1 supplier of slab casters and an important supplier of long-product casters in China. Long-term customer relationships and repeat business activities characterize the overall relationship between Chinese steel producers and Siemens VAI. High-performance machines incorporating the latest equipment design and technological packages have been decisive for China's leading position today in terms of caster performance and product quality.

The success story of Siemens VAI continuous casting technology in China commenced in the year 1986 with the supply of a new billet caster at Lanzhou Iron & Steel Group Co. (Gansu Province). This was followed by new slab caster installations in 1988 at both Taiyuan Iron and Steel (Group) Co., Ltd. (Shanxi Province) and at Shanghai China Steel Group Co., Ltd. in Shanghai. Since that time up until June 2008, Siemens VAI has sold 63 slab casters comprising 86 strands in addition to 15 long-product casters with 66 strands to a total of 36 Chinese steel producers to date. Furthermore, during this time period a total of 14 slab casters with 24 strands were modernized. The majority of these machines are still in operation today. Figure 1 shows locations of new slab caster installations and major upgrades carried out in China. More than 60 percent of all slab caster projects awarded in China from January 2004 up to June 2008 were received by Siemens VAI (Figure 2).

"Chinese caster installations typically incorporate the latest design features and a full range of technological packages to ensure the highest possible quality of the cast product," said Dr. Karl Mörwald, Head of the Siemens VAI Research & Development Department. "The growth in the Chinese market for slab casting machines, especially during the past ten years, has been phenomenal! Starting with the supply of very basic equipment for the first caster orders back in the 1980s, our customers have rapidly advanced to become technology-oriented investors and producers." This

viewpoint was resonated by Josef Fuchshuber, Head of the Siemens VAI Business Subsegment Continuous Casting Long: "Since the introduction of high-speed billet casting in 1996 at Hangzhou, the Chinese long-product market has fully accepted the technological solutions from our company. These also include hydraulic oscillation, round-casting technology, dynamic soft reduction up to near-net-shape beam-blank casting which gives us a leading edge and an excellent basis for continuing the continuous casting success story in China."

In addition to the emphasis on employing the latest technological solutions to produce the best product quality, China is also leading the way with a number of caster superlatives recently implemented in both the flat and long-product casting sectors:

World's widest slabs

In June 2004 Siemens VAI started up the world's widest slab caster at Nanjing Iron & Steel Co., Ltd. in Nanjing, Jiangsu Province. Slabs are cast in widths of up to 3,250 millimeters at thicknesses of 150 millimeters which are rolled to plates and coils in a plate-Steckel mill which Siemens VAI also supplied.

World's largest beam blanks

In the field of long-product casting, Siemens VAI implemented beam-blank casters capable of casting the world's largest beam blanks. At Laiwu Iron and Steel Group Co., Ltd. in Laiwu, Shandong Province, a 3-strand >>



Slab Casting at Jiangsu Shagang Group Co., Ltd, Zhangjiagang City, Jiangsu Province

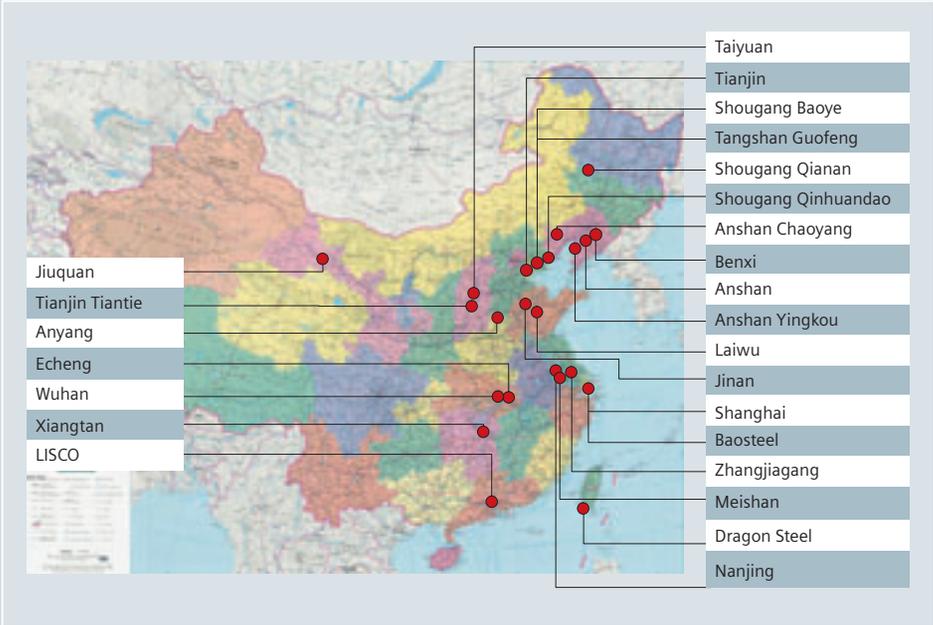


Figure 1: New slab caster installations and major upgrades

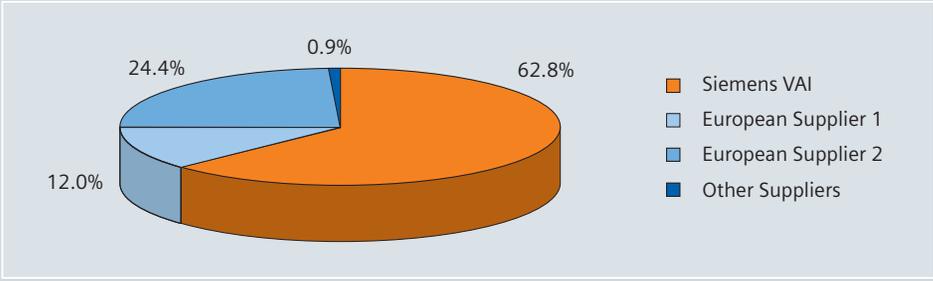


Figure 2: Percentage of Siemens VAI slab caster orders (2004 to June 2008)



3-Strand Beam-Blank Caster
at Laiwu Steel Group Limited,
Shandong Province

Examples of Siemens VAI technological packages for improved casting performance

LevCon; automatic mold-level-control system with "autostart" casting functions

Mold Expert; on-line automatic breakout prediction and strand-shell friction monitoring

Smart Mold; specially designed cassette-type mold allowing the quick exchange of worn Cu-plates

DiaMold; high-speed casting molds for billet casters, characterized by tapered mold tubes and open bottom-mold corners to reduce strand friction

DynaWidth; an online mold-width adjustment system for flexible and fast slab-width changes

DynaFlex; a hydraulic oscillator for the online and flexible adjustment of the mold-oscillation parameters for an improved strand-surface quality

DriveCon; pre-configured strand-withdrawal drive control incorporating event-tracking features and top-and bottom dummy bar insertion control

Smart Bender; a fully remotely adjustable first casting section for fast strand-thickness adjustments

Smart Segment; a specially designed strand-guide segment which allows online and remote roll-gap adjustments to be carried out for slab-thickness changes as well as to enable dynamic soft reduction

DynaGap Soft Reduction; a fully automatic roll-gap control system allowing dynamic soft reduction to minimize centerline segregation for improved internal strand quality

Dynacs; secondary-cooling model capable of calculating the strand-temperature profile at any position along the strand for the optimum adjustment of the secondary-cooling setpoints and the determination of the point of final strand solidification

3D Spray System; optimum and uniform cooling of variable slab widths achieved through the raising or lowering of the nozzle arrangement above the strand surface resulting in a considerable reduction in the frequency and severity of corner cracks

DynaJet Nozzles; air-mist nozzles with optimized spray pattern and long nozzle tube for reduced segment piping

Star Roller Family; intermediately supported and interchangeable roller types featuring minimum bending, narrow bearing-block widths and superior load distribution for optimum strand support – available also in dry-type design for special casting requirements

LiquiRob Caster Robot; carries out numerous tasks on the caster platform and in other areas of a steel mill where liquid metal is manipulated, allowing operators to monitor activities from the safety of the control room

VAIQ Quality Control; online quality-tracking and -control system contributing to the continuous improvement of product quality and increased metallurgical know-how

Connect & Cast Solutions; fully optimized and integrated project execution covering design, manufacturing, testing and installation as the basis for fast and trouble-free plant start-ups

YieldExpert; optimization of strand speed for multi-strand casters and the cut-slab lengths

LubriCon & HydraulCon; support fast caster start-up times through immediate availability of hydraulic power and lubrication, and feature configurable controls for caster lubrication and hydraulic-power systems immediately when turned on.

>> beam-blank caster was supplied which is capable of casting beam blanks in formats from 555×440×90 millimeters up to 1024×390×90 millimeters. At the time of the plant start-up in August 2005, this was largest beam-blank cross section in the world. This was followed by the start-up of another 3-strand beam-blank caster at Jinxi Iron & Steel Company Ltd., Hebei Province, in 2006, in which beam blanks with a similar record cross section are cast. Finally, a third ultra-large 3-strand beam-blank caster with beam-blank formats of up to 1024×390×90 millimeters will be installed at Jiexiu Xintai Iron & Steel Co., Ltd., Shanxi Province. This plant is scheduled to commence production in 2009.

World's thickest slabs

"Today, Chinese steel manufacturers command highly competitive positions by anticipating new trends at an early stage, such as the growing market for ultra-thick slabs," said Dr. Mörwald further. This is shown by the following two examples:

The world's thickest slabs will be cast at Tangshan Shougang Baoye Iron and Steel Co. Ltd. (Shougang Group Co.) in Tangshan City in Hebei Province, approximately 150 kilometers to the east of Beijing. Siemens VAI is currently supplying a total of three slab casters for this new steel works, one of which is capable of casting slabs in thicknesses from 250 to 400 millimeters and at widths from 1,600 to 2,400 millimeters. The casters, which include a full range of technological packages, will be successively started up beginning September 2010.

Simultaneously, another ultra-thick slab caster is being supplied by Siemens VAI to Qinhuangdao ShouQin Metals Material Co. Ltd. (Shougang Group Co.) located in the coastal city of Qinhuangdao in Hebei Province. Slab thicknesses will range from 250 millimeters up to 400 millimeters for subsequent rolling to plates for use in the shipbuilding and petroleum industries. Plant start-up is scheduled for June 2010. Again, the caster will be outfitted with nearly the complete range of technological packages offered in the Siemens VAI portfolio.

Long-term partnerships and repeat business

The continuous casting activities of Siemens VAI in China are characterized by long-term partnerships and by "repeat business" with leading Chinese steel producers. For example, beginning with the first slab caster supplied to Taiyuan Iron & Steel (Group) Co. Ltd. (TISCO) in 1988, eight slab caster projects involving nine new or upgraded strands were carried out to date. At Wuhan Iron and Steel Co., Ltd. (WISCO), Siemens VAI implemented a total of ten slab and long-product caster projects in 1999 comprising a total of 29 strands



for this company. Since the year 2000 altogether eleven projects were received by Siemens VAI from the Angang Group for the supply of new or modernization of existing slab casters with a total of 15 strands. At Shougang Group Co. the respective figures were eight slab casters with 12 strands, and at Shagang Group Co. this was for seven slab casters with 12 strands. The series of projects carried out for the same customer over extended periods of time is a clear indication of the excellent project cooperation and satisfaction with the installed casting equipment and technology. It goes without saying that in addition to continually improving operational practices and know-how, the successes of these companies is also largely attributable to application of advanced technologies.

Ultra-wide slab casting at Nanjing Iron & Steel Co., Ltd.

Concluding remarks

On the basis of permanent research and development, Siemens VAI offers a complete range of advanced solutions and technological packages to ensure producers a competitive edge in continuous casting. These solutions are typically developed and implemented in close cooperation with steel producers so that they address the actual needs and meet the performance and quality targets of continuous casting. "We are proud that our casting machines are recognized as a state-of-the-art, and this commits us to continuing our reputation as being the leading supplier of casting solutions in China" – Andreas Flick, Senior Vice President, Continuous Casting Technology. ■

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Interview with Ulf Arnusch:
Senior Project Manager for caster projects in China

Where the Dragon Roars



PEOPLE >

Since 1995, Ulf Arnusch has served as the technical project and commissioning leader for a total of 15 slab caster projects comprising 24 strand installations at Chinese steel works in Bengang, Angang, Wugang, Shougang and Lisco. He is currently executing projects for Shougang which also involve a slab caster capable of casting 400-millimeter-thick slabs – the thickest slabs to be cast in China. In this interview Ulf Arnusch spoke about his experience, background and the highlights of his work in China.

How did you first become involved in Chinese projects and why have you stayed in this region for so long?

Ulf Arnusch: Before 1995, I was involved with caster projects at Bethlehem Steel in the U.S.A., at voestalpine Stahl in Austria and in a caster project at Erdemir in Turkey. In the mid-1990s, the market for continuous casting machines suddenly opened up in China. On the basis of my previous project experience, I was asked to go to China. My first project was at Bengang which went very well. And this was noted by the Chinese steel

industry which led to numerous visits to the plant. This marked the starting point for us of a long and continuous series of caster projects in China which have continued until this day.

Was there a caster project which particularly stood out in your mind?

Arnusch: Yes, this was at Bengang, my first caster installation in China. The project was especially challenging because it was the customer's first caster and operator experience was limited. Also, the plant com-

“... no end in sight for caster projects.”

Ulf Arnusch, Senior Project Manager, Siemens VAI

missioning took place at a time when the temperatures went down to minus 30 degrees Celsius, which froze up the entire media-supply system. We solved this problem by feeding hot slabs from the ingot line in the reverse direction up the roller tables to thaw things out. The project was brought to a successful conclusion with the result that shortly afterwards, the customer ordered a second caster from us without even requesting a bid from another supplier!

Is there such a thing as a project without problems, and are the problems which do arise typically more of a technical, logistical or human-personnel nature?

Arnusch: With any project there are always unexpected situations and problems that arise which require creative solutions and approaches. The problems that I frequently encounter have to do with a lack sufficient coordination and communication between the customer personnel and local subcontractors to assure that the right parts and components arrive at the construction site on time. There always seems to be this problem. So we now make sure that a detailed personnel and action plan for all site activities are defined in advance so that everybody knows what has to be done, by whom and by when. This improves the overall transparency of a project and helps us to see and react to potential bottlenecks in time.

In your opinion, what are the decisive factors for successful caster projects?

Arnusch: First and foremost, a well-proven caster concept with advanced and reliable equipment, technologies and systems is the basis for the success of any project. Secondly, it is very important that the same persons with long-term experience be part of the project team to ensure an optimum internal coordination and high motivational level. Other factors obviously include the close coordination and communication with the customer and knowledge of the local customs and business environment.



Has it been a major challenge for you to work together with people with different mentalities, backgrounds and ways of doing things?

Arnusch: Actually, I honestly enjoy working together with the Chinese. Yes, they have a totally different mentality and ways of doing things than we do, but this is what makes the projects and working in China so interesting. At the beginning it was difficult, but because I have been in China for so long now, I better understand the mentality differences and we are always able to find ways of solving any problems which might occur.

Do you expect the current boom for caster projects in China to continue or is the end in sight?

Arnusch: Two years ago, I expected that caster investments in China would begin to decline in the short-term future. But I was wrong. Today, there is no end in sight for caster projects. I'm not sure if anybody knows how long this trend is going to last.

What are your plans for the future? Will you stay in China, or do you intend to go elsewhere?

Arnusch: Because of the numerous Chinese projects going on at the time, it looks like I'll be in China for some time to come. I made a tacit agreement with one of the directors of a major steel producer in China that the last caster project I'll do before I retire will be for his company.

And now a final question – how good is your Chinese?

Arnusch: Well, let me put it this way “马马虎虎”. ■

Interview with
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Siemens VAI modernizes group of coilers for Severstal in Russia

New Power Coilers

Siemens VAI has received an order from Russian steel producer OAO Severstal to modernize the coilers of hot rolling mill 2 at the company's Tscherepovez location. The existing coilers 4 and 5 are to be replaced with Power Coilers. This will enable coiling of high strength steel, up to and including X100 pipe grades. According to customers requirements, the installation will take place in 2010.



Power Coiler at ArcelorMittal, Poland

Severstal is the second largest producer of flat steel in Russia. In the company's hot rolling mill 2 in Tscherepovez in the Wologda district, around six million metric tons of strip steel are produced every year. Modernizing the group of coilers is aimed at expanding the product range, enhancing product quality and, at the same time, increasing both productivity and the availability of the plant. The central feature of the project is the installation of two Siemens VAI Power Coilers to replace coilers 4 and 5. Thanks to the use of

four wrapper rolls, of which the first is a twin-type unit, the Power Coiler technology will enable coiling of thick and high strength steels up to X100 pipe grades. Moreover, Siemens will renew the lateral guides of coiler number 4, install a new roller table, including lateral guides, ahead of coilers 5 and 6, and equip coilers 4 and 5 with fully hydraulic drivers and new coil removal carriages. The associated electrical equipment and the automation system are also part of the project. After modernization of the group of coilers and installation of the two new Power Coilers, the Tscherepovez hot rolling mill will be able to produce strips up to a maximum width of 1,850 mm and thicknesses of between 1.2 mm and 25.4 mm. After the two successful start-ups of Power Coilers at the ArcelorMittal facilities in Fos sur Mer, France, and in Cracow, Poland, this is the third order for this reliable and efficient coiler solution from Siemens VAI. One important reason why the contract was awarded to Siemens VAI was the close cooperation that has existed between Siemens VAI and Severstal since 20 years. Due to this intense cooperation and the long-term successful realization of projects, MT (Metals Technologies) has now been honored by Severstal. MT was selected as the winner in the framework of a competition for a "long-lasting partnership" and received the award from the Commercial Director, Igor Nechaev recently. ■

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Implementation and further development of the Microstructure Monitor

Improving Steel's Microstructure

A decisive criterion for the quality of hot-rolled strip involves its lying within the tolerance range specified by the customer for tensile and yield strength. To document this quality, the rolling mill operator has traditionally been forced to subject samples taken from ongoing production to an extensive – and expensive – series of tests. This testing not only slows down production speed, but can also provide unreliable results depending on the intervals between the samples. To overcome these shortcomings, the Microstructure Monitor from Siemens determines quality parameters and optimizes process parameters online, during the production process, reducing the need for costly laboratory measurements and the time needed to conclude those tests.

The microstructure is an important outcome from the hot rolling process of steel strip. The influences of process parameters on microstructure and how to control the rolling operation in a hot strip mill to achieve certain mechanical properties have been investigated thoroughly by mill operators. These investigations, in turn, have led to rolling prescriptions that were more or less based on the experience and expertise of the respective companies.

Traditionally, determination of the microstructure has been either the result of offline investigations that had to be transferred to industrial use, or it has come

from trial and error. Either way, the safe production of a desired microstructure has been filled with uncertainties, most arising from the influencing effects of the process itself. The Microstructure Monitor from Siemens VAI integrated microstructure aspects to rolling mill automation.

Key developments in the Microstructure Monitor

As computing power has increased, offline modeling of the microstructure formation during the thermal process has become more refined, enabling real-time determination and, with it, use in industrial processes. >>

ROLLING & PROCESSING >

Customer Plant	Country	Plant/Project Description	Year of start-up
P.T. Krakatau Steel	Indonesia	Hot Strip Mill modernization	2010
Acc. Arvedi	Italy	New Endless Strip Production (ESP) plant	2009
Bhushan Steel	India	New Hot Strip Mill	2009
Shougang Iron and Steel	China	New Hot Strip Mill	2007
Jiangsu Shagang Group	China	Relocated and revamped Hot Strip Mill	2006
Wuhan Iron and Steel	China	New Hot Strip Mill No.2	2003
ThyssenKrupp Steel	Germany	Hot Strip Mill WBW2 (Beckerwerth)	2001
voestalpine Stahl	Austria	Hot Strip Mill	2000
Hoesch Hohenlimburg	Germany	Hot Strip Mill for narrow strip (25–685 mm)	1998

Siemens VAI reference installations of the Microstructure Monitor

>> Both Siemens and VAI have pursued related R&D projects since the mid 1990s.

Siemens has concentrated mainly on R&D associated with the strip cooling section, where the microstructure is determined by applying defined cooling rates on the strip. The model that computes the mechanical properties is based on a neural network. The approach averages the results of different types of neural networks (in our case a multilayer perceptron and a “local global” map). The training procedure is performed offline, i.e. a number of tensile test results are collected together with the respective input parameters of the neural network, allowing the network to be retained. The neural network is capable of performing input selection, outlier detection, and consideration of constraints. Using cross-validation of the results prevents overfitting of the network. A combination of a physical model and a neural network facilitates double-checking the results of the neural network, especially in the extrapolation domain.

Online, real-time supply of application data

The Microstructure Monitor is supplied with the chemical composition of the strip and with the process data from the hot rolling mill. A schematic overview of the interface is shown in Figure 1.

The application is also supplied online with data directly from process automation. Based on the microstructure model, even an in-line (during running pro-

More accurate quality parameters lead to higher strip quality

duction) modification of the coiling temperature can be undertaken. For example by optimizing the coiling temperature of micro-alloyed steels the strip will meet the target mechanical properties more accurately.

Computing mechanical properties of the strip over the entire strip length is another feature of the online system. This improves conventional quality control, where only values from head end and tail end are usually available.

Making the model productive

The first Siemens pilot system was installed at the medium strip hot rolling mill of Hoesch Hohenlimburg, a producer of specialized steel grades in small lots. Piloting moved from low carbon manganese steels to micro-alloyed HSLA grades. Several other installations on different mills worldwide followed, as shown in the references table and Figure 2.

At the same time, VAI piloted its VAI Q-Strip system at the HSM of Voestalpine Stahl in Linz, Austria, which had a slightly different product spectrum. For both Siemens and VAI, other installations followed and showed the reliability of each system. Today, the ideas of the two solutions have been joined to make the best use of both in a combined Microstructure Monitor system. Experience has shown that focusing on the core part of the phase transformation – the cooling section – provides the greatest benefit in day-to-day mill operations.

Over the years, the model has been refined continuously, resulting in higher prediction accuracy and



Fig. 1: Schematic view of a conventional hot rolling mill and the Microstructure Monitor with its input and output parameters. In the optimization mode, process parameters like the coiling temperature can be altered/optimized to reach the target mechanical product properties.

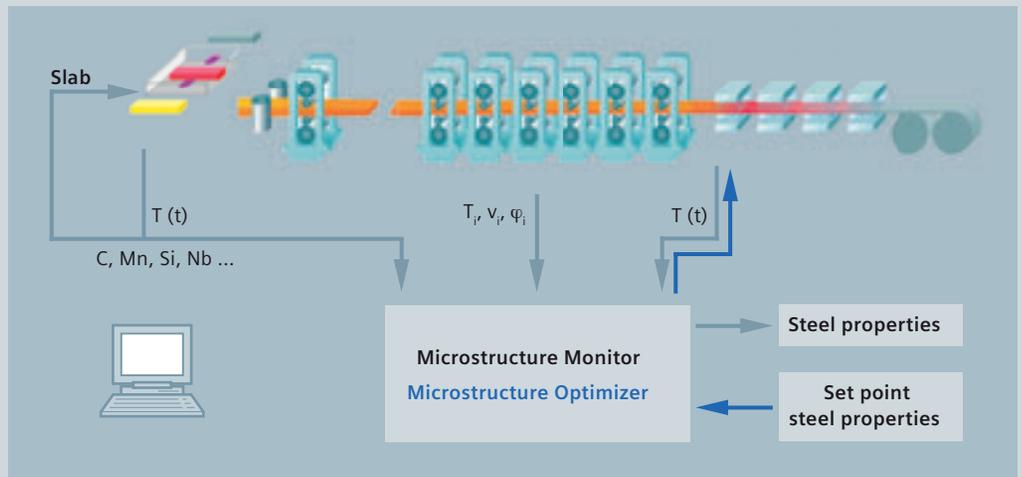
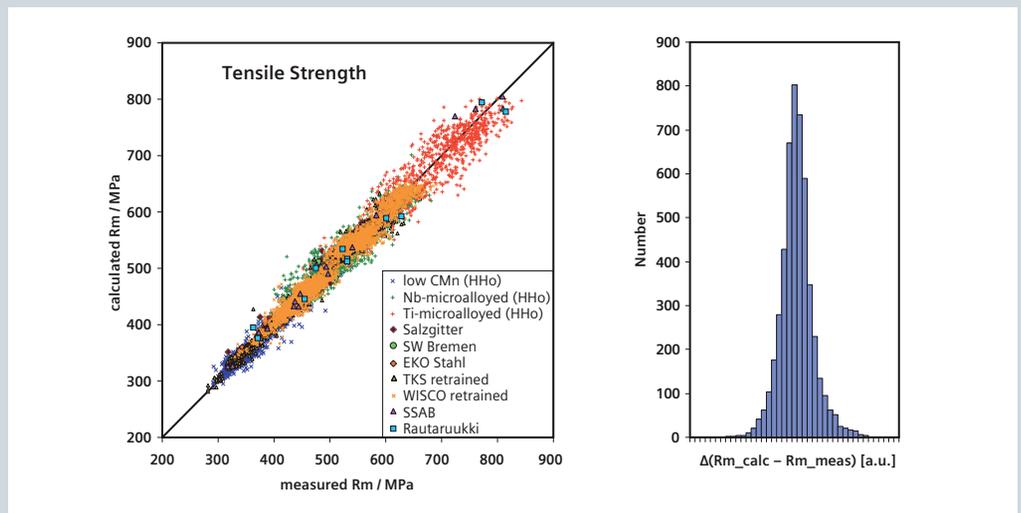


Fig. 2: Reliability of the Microstructure Monitor in test trials. The deviation between calculated and measured values falls within the scope of the measuring accuracy. The evaluation included strip products from the medium-strip hot rolling mill of Hoesch Hohenlimburg (HHo), the wide-strip hot rolling mill of ThyssenKrupp Steel Beeckerwerth as well as test strips from several other hot rolling mills (large symbols). The yellow points indicate strips from WISCO, China, where the system has been online since 2003. The system calculates also the microstructure of the steel (grain size and phase fractions), which must otherwise be measured in the laboratory.



wider range of steel grades accommodated by the monitor. One advantage over the traditional offline physical test method lies in the fact that the microstructure is determined for any point of the strip over the entire length. Thus a continuous quality control is possible, and potentially substandard strip sections can be easily identified and cut off or investigated separately. Another advantage is obvious: once the system is installed, the sampling costs can be significantly reduced, because calculated results are available immediately after coiling. Real physical tensile tests are needed only for validation and maintenance of the system.

From Microstructure Monitor to microstructure control

Besides generating data automatically to certify strip quality, the Microstructure Monitor is now an important tool to monitor the performance of the mill, especially in the cooling section. The development of the Microstructure Monitor has had a major impact on the development of microstructure target cooling, which is today the standard cooling section control system of Siemens VAI. Microstructure target cooling keeps the final microstructure and phase fractions constant over

the strip length. This means that one Microstructure Monitor aspect (the phase transformation) has been already integrated into cooling section control and has been even improved using the physical approach based on Gibbs' free enthalpy.

Other aspects like Microstructure Monitor information from the roughing and finishing mill and the prediction of mechanical properties are currently being integrated in the cooling section control and will be available for future applications. With these new features, not only changes in final rolling temperature or strip speed can be considered in the cooling section, but also changes in the incoming microstructure like austenite grain size or partly transformed microstructure. Ongoing development of the Microstructure Monitor will enable more precise calculation of the mechanical properties of each strip point and, ultimately, even better control of these properties over the strip length. ■

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Completely integrated solutions for cold rolling in India

Setting SAIL for Better Steel

Bokaro Steel (BSL), a unit of Steel Authority of India (SAIL), is one of the country's largest producers of cold rolled products. Recently, BSL decided to enlarge its production and product ranges by investing in a new CRM complex in the state of Jharkand capable of producing 1.3 million tpy. The new CRM will furnish a wide range of high-end CR products for the automotive body and household appliance industries.

India's leading steel producer, SAIL, recently decided to expand its capacity from 14.5 to 22.5 million tpy by 2012. The Bokaro Steel Plant, which is SAIL's flagship for flat products and is located in the state of Jharkand, will see its cold strip capacity more than double by 2011. Following intense competition among major suppliers, Siemens VAI was awarded the contract for the core lines of the new cold mill, including design, engineering, delivery, installation, and commissioning of a coupled tandem pickling line, a hot-dip galvanizing line, and an electrolytic strip cleaning line.

Completely Integrated Solutions (CIS) ...

Among the features of the successful Siemens VAI bid for the major portion of the Bokaro project are the Siroll^{CIS} CM & PL product lines, which embed all process experience and expertise that Siemens VAI has accumulated over decades of activity in cold rolling and strip processing. At Bokaro, the first link of the production chain will be the tandem cold mill, coupled to a pickling line. For these products, all core equipment, critical for the lines performances, are fully engineered, manufactured and tested in Siemens VAI European plant, located in Montbrison, France. The state-of-the-art PLTCM (1.3 million tpy capacity) will be the first of its kind in India equipped with heavy gauge laser welder (LW 21H); pickling section, horizontal loopers and side trimmer; 5-Stand 6-High cold mill; and a carousel coiler.

What is more, this new mill will meet the highest quality standards in terms of strip flatness, strip surface, strip cleanliness and dimensional tolerances. It has been designed to produce special high-strength

and automotive, including IF, HSLA, HSS, and DP, in addition to low carbon steel.

... for welding, pickling, rolling, and galvanizing

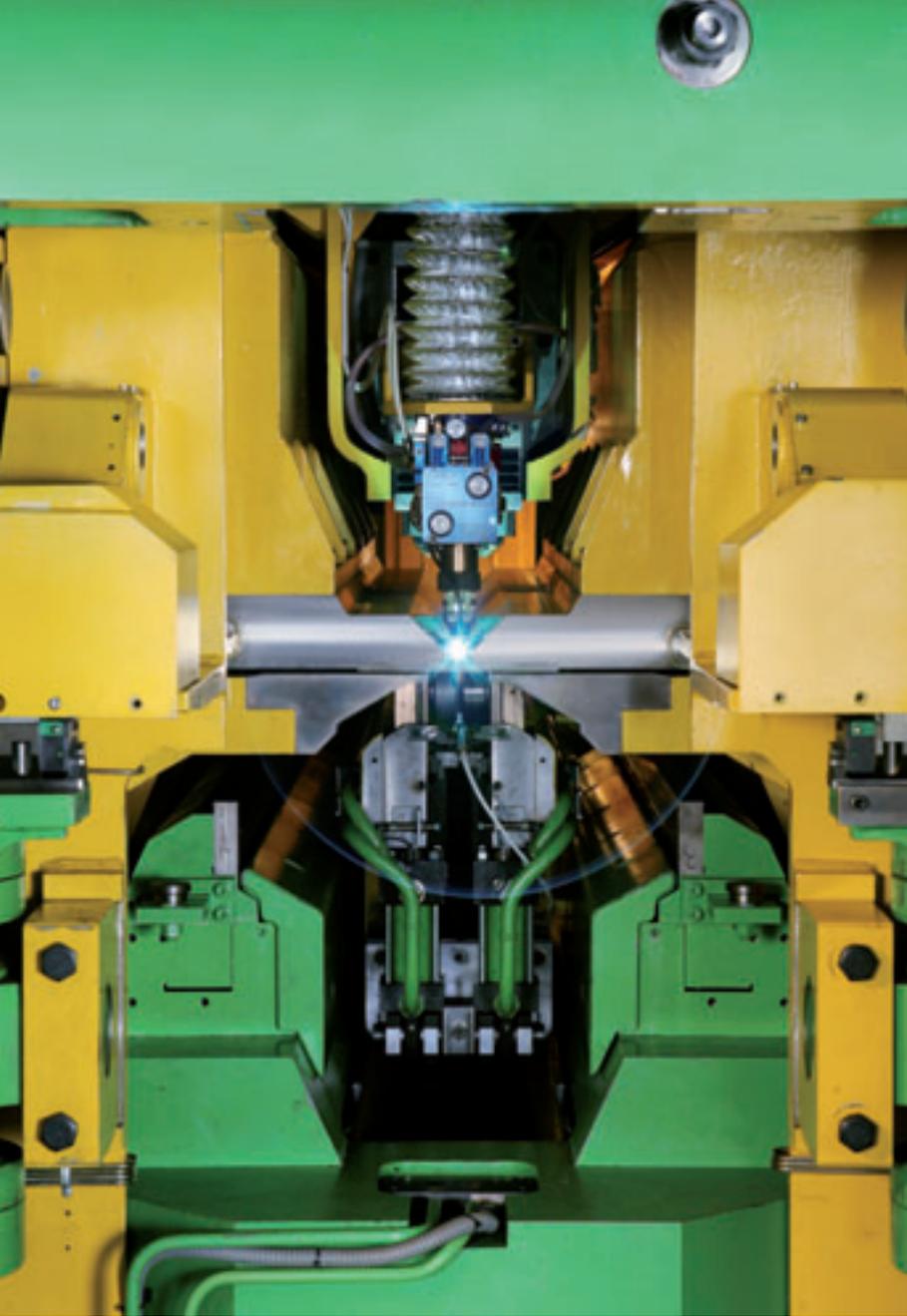
In a continuous process such as on the PLTCM, the welder plays an essential role in maintaining line throughput and availability. The Bokaro PLTCM includes a new LW21H welder, which has been specially designed by Siemens VAI to handle next generation steel grades. With capability spanning the thickness range from 1.5 to 6 mm and all steel grades, it welds without trimming operation or over-thickness, ensuring rollable welds for flawless downstream production.

Line Data

Line Type	High-Turbulent Pickling 5-Stand 6-High TCM
Roll Force per Stand	24,000 kN
Mill Exit Type	Carousel Coiler
Tandem exit Mill Speed	1200 mpm
Installed Power	34,000 kW
Annual Capacity	1,300,000 tpy

Product Data

Material	IF, CQ, DQ, HSS
Max. Width	1560 mm
Thickness	Entry 1.6 to 5.0 mm Exit 0.25 to 2.0 mm
Coil Weight	31 t
Coil Diameter	2,000 mm



**The new
laser welder LW21H**

Coil pickling quality is assured by using polypropylene tanks with high-turbulent flow design and controlled by Siroll Faplac (Fully Automatic Pickle Liquor Analysis and Control), which regulates pickling, rinsing, and fume exhaust modules in order to produce a final steel strip without any scale and stains. This high quality is achieved with the highest productivity and lowest operating costs, thanks to the fresh acid addition optimization, the pickling speed management as well as the online controls that suppress the need for sampling and laboratory analysis.

In the tandem mill area, the strip thickness is reduced by means of five 6-high mill stands equipped with high speed hydraulic gap controlled cylinders; the main motors are controlled by Sinamics SM150 converters. Based on IGCT (Integrated Gate Commutated Thyristor) technology, these medium-voltage source converters provide excellent dynamic response and quiet operation.

The automation solution of Siroll^{CIS} CM achieves tight strip thickness performance. It relies on the proven Siemens VAI thickness control concept, which uses the advanced mass-flow technique to deliver solid performance under all operational conditions. In addition, specific setpoints are calculated for the strip weld rolling (flying gauge change), so as to minimize the off-gauge length and tension variations. The flatness control system behind Stand 5 uses a Siroll^{CIS} Siflat contactless shape sensor and controls flatness with a multivariable control algorithm that uses all flatness actuators available: work roll and intermediate roll (IR) bending, IR shifting with SmartCrown profile, tilting, and selective cooling.

Downstream of the Bokaro PLTCM, SAIL has also invested in an electrolytic cleaning line (ECL) to remove the remaining iron fines and oil residues from the tandem mill. Advanced ECL technology provides outstanding coil cleanliness before the coils reach the downstream batch annealing furnace.

The Hot Dip Galvanizing Line (HDGL) is sized to produce 380,000 tpy of galvanized and galvanized coils mainly dedicated to the non-exposed automotive and household appliance applications. The line includes all the latest Siemens VAI state technology and will be the first line in India capable of producing advance steel grades to include HSS, DP, and TRIP. Aided by Siemens VAI technology, SAIL is now on a steady course toward profitable production of better steel. ■



**Model of a new Siemens VAI
Tandem cold mill housing**

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Implementation of an advanced continuous annealing line in China

MaSteel Means Business

ROLLING & PROCESSING >



First among its Chinese competitors, MaSteel, located in Ma'anshan, around 60 km south of Nanjing in Anhui Province, is currently showcasing the integration of the Siroll^{CIS} PL control system into a continuous annealing line for the production of automotive-grade steel strip.

The new MaSteel annealing line has been designed for a product mix that includes conventional drawable grades and advanced multiphase HSS grades: DP (Dual Phase); LYR (Low Yield Ratio); and TRIP (Transformation Induced Plasticity) in strip thicknesses of 0.25 to 2.5 mm and strip widths up to 2000 mm at an annual capacity of 938,000 tonnes. A description of the line has already been given in the Issue 3/2007 of the metals & mining magazine.

The mechanical-technological steel properties are primarily adjusted by heat treatment and chemical

alloying elements. This influences the steel grain and phase structure. Due to the non-linear steel properties physical experiments are essential. Under these experiments direct investigations predict the influence of a single parameter on the material behavior using a simulator. The specific optimum parameters for the plant are decisive for the optimization of processes and a faster development of steel materials. Siemens VAI used Vatron's physical simulators as an efficient tool for optimizing the processes and developing new steel grades in the project. The thermal treatment is performed by a multi-purpose annealing furnace, consisting of 9 chambers or sections with a total heating power of 73,300kW and cooling power of 30,040kW. The supplier for the furnace was Fives Stein.

Four-high temper mill with flatness control and tension leveler

Skin passing and tension leveling are essential for the production of exposed automotive strip and other high-quality applications. The skin-pass mill and tension leveler equipment serves to meet the very strict specifications for surface roughness, mechanical properties, yield point suppression and flatness of the final product. Two types of works roll can be used according to the strip hardness and the roughness transfer targeted. Small rolls (dia 450 mm) are applied for processing hard material and bigger WR (600 mm) are used for soft steel. The in-line skin-pass mill operates with the Siemens flatness control system to produce excellent flatness for all strips. The use of the contactless Siroll^{CIS} SIFLAT flatness measurement device underlines the request for a minimized risk of surface damage.

Siroll^{CIS} PL basic automation solution

The efficient and cost-effective operation of a high-quality continuous annealing line requires a sophisticated automation and process control system: Siroll^{CIS} PL. An important feature of the Siroll^{CIS} PL solution is the reduction of the number of engineering and commissioning resources who need to be experts in processing line technology and have knowledge of different automation platforms. Instead, with Siroll^{CIS} PL, processing line technology is focused on basic automation, which eliminates the need for technology boards in drive automation. This has the advantage that the large number of processing line drives can be engineered and commissioned as standard drives by drive specialists without processing line knowledge. Siemens Simatic S7 automation system is the core of the Siroll^{CIS} PL solution.

The basic automation is divided into five parts: the entry, process and exit units, together with a material

tracking unit for the complete line, and the SPM unit. The first three units each contain sequence and support functions for the control of media and auxiliary devices in the entry, line and exit sections, a master ramp generator for synchronous drive operation, strip tension and looper control, and a line coordinator which acts as section master and interface to the material tracking unit. The material tracking unit handles set-point data for all coils in the line, tracks the coils up to the unwinder and after the rewinder, as well as the strips in the line. It ensures timely application of set points to the subordinate functions and generates specific actions dependent on weld seams or strip defects. Finally, it acts as the interface to the HMI system for visual display and to the process computer for the receipt of primary data and the transmission of product coil information. The skin-pass mill units handle the technological controls for the SPM, such as elongation control, hydraulic gap control and bending control. It also handles the auxiliary functions of the SPM and the roll change.

Automatic quality control

Strip surface quality is determined by the SIAS automatic surface inspection system. This unit detects and classifies surface defects and issues strip-related reports that enable the customer to grade and sort their products in accordance with their customers' requirements. The SIAS surface inspection system used at MaSteel features a new width measurement function with pixel accuracy (0.5 mm), which detects holes and edge cracks and measures the product width in order to optimize edge trimming.

18 months of consistently high quality

The continuous annealing line at MaSteel has been in industrial operation for 18 months, during which it has consistently delivered the high-quality product to the market. Building on its success with the MaSteel continuous annealing project, Siemens VAI is currently preparing new CALs for Wisco's CRM3 plant and for Tianjin Tiantie, both located in the Hubei province, among other processing lines in China. The concept of these plants is also focused on the production of new steels required by the automotive industries, especially for the processing of ultra-high-strength steel, further evidence of the viability and durability of the Siroll^{CIS} PL solution in China. ■

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Choosing and controlling the right aluminum millstand actuator

Creative Cold Rolling



Alusix mill window

Mill throughput, product quality requirements, and alloy mix are all key parts of any decision on the type of aluminum mill configuration best-suited to a particular application. Mill users must also be acutely aware that any decision on mill actuator needs to produce material that is focused on improved quality at a high output with lower overall conversion costs.

With well over three decades of experience, Siemens VAI is ideally placed to serve the demanding market for rolled aluminum with its Siroll^{CIS} ALU family of high performance cold rolling mills and process control systems. Mill designs from Siemens VAI are specifically focused on the future high speed and performance requirements of the aluminum cold rolling market.

The mill range comprises a standard four-high mill, a four-high mill with Variable Crown (VC) back-up roll, Alusix high mill, and the Dynamic Shaperoll (DSR) mill. Built into the mill stack designs are several common high-performance features that include hydraulic push-up cylinders to undertake automatic gauge control functions and roll-gap setting; positive and negative roll bending (plus \pm intermediate roll bending for the Alusix mill); roll cooling and hot edge sprays for the work roll; and roll stack offset cylinders.

Most must operate with a high level of flexibility so that they can change operating parameters to accommodate market conditions. This often means that the addition of an advanced actuator is essential to achieve the desired performance. The higher the level of technology brings with it improved gauge and flatness performance improvements over a longer length of the coil that results in an improvement in coil yield.

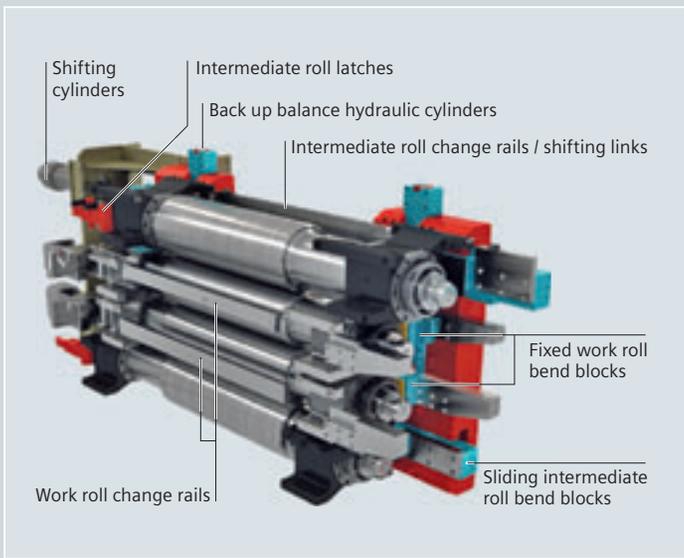
Four-high and VC back-up roll

The VC roll is a hydraulically inflatable dynamic back-up roll supplied by Sumitomo Corporation. It can be used in wide cold and foil rolling applications to improve flatness performance, particularly following a roll change or prolonged delays. It also helps reduce the requirement for different roll cambers – and thus roll inventory – as well as providing improvement in body of coil flatness performance, particularly in closed gap rolling, where roll bend influence is less effective. The VC roll has a simple control characteristic and is easily retrofitted.

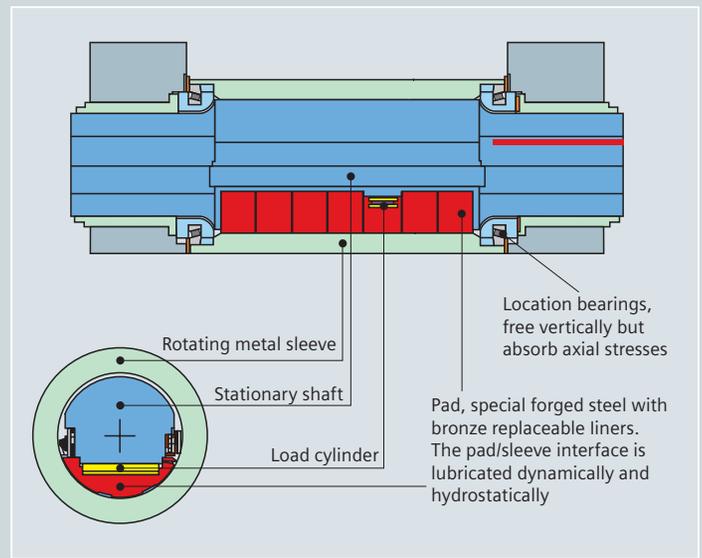
Siemens VAI has successfully supplied VC rolls to two high-speed cold mills at Novelis in South Korea and to three 2-meter wide, 2000 meter/minute foil mills at the Shanghai Shenhua Aluminium Foil Company in China and Huta Konin, Poland.

Alusix mill

The introduction of a range of six-high mills completes and complements the Siemens VAI Siroll^{CIS} ALU family of high-performance cold rolling mills.



Siroll^{GIS} Alusix work and intermediate roll bend arrangement



DSR assembly

The Siroll Alusix mill design utilizes a Fully Active Long Stroke principle to position the intermediate rolls adjacent to the edge of the strip in-process and includes the Siemens VAI fully dynamic roll bend system. The roll bend design is a dynamic positive and negative roll bending system applied to the work and intermediate rolls. The design employs an evolution of the “E” block principles used in Siemens VAI four-high cold mills with its known advantages of separate positive and negative bending cylinders that provide a smooth transition when transferring from positive to negative roll bending operation (no dead band). Another feature is the elimination of all high pressure flexible connections to the roll chocks to simplify the roll change procedure as well as removal of any hydraulic leakage at the connection points. Both Siemens VAI’s roll bend system and fully active shifting technology are fully integrated into Siemens VAI’s automatic flatness control system to provide unequalled flatness performance from a six-high aluminum rolling mill.

The Siroll Alusix mill features an excellent control range and can achieve an extended form correction characteristic due to the independent control capability of the work and intermediate roll bending.

Moreover, compared to a standard four-high mill, the Alusix mill provides a number of operational benefits to include reduced roll inventory, since the extended control range eliminates the requirement for multiple work roll camber sets; uncomplicated grinding techniques, as all rolls are ground parallel; and performance benefits in operations where there are

frequent width and product changes (so common in aluminum specific rolling operations). Alusix also supports schedule-free rolling.

Dynamic Shaperoll (DSR) mill

The DSR has been applied to all types of aluminum rolling mills. It is an advanced actuator that replaces the back-up roll in the mill stack. A rotating sleeve is supported by hydrostatic/hydrodynamic oil film bearings loaded in zones by servo controlled hydraulic roll load cylinders located in a static central beam as shown above.

The pressure in each zone can be varied independently to control the roll force distribution across the strip. By driving all zones together, sleeve position and gauge can be controlled.

In addition to its high level of performance capability, DSR is the only truly dynamic actuator that is able to undertake symmetric and asymmetric changes to the roll gap profile. It is easily retrofitted, which helps to minimize initial capital investment.

The latest Siemens VAI wide cold mill projects at CBA in Brazil, Chinalco South West Aluminium, in China, and Chinalco Henan in China have all been supplied as DSR mills. ■

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Siemens acquired Morgan Construction Company

New Long Rolling Business Rolls in



ROLLING & PROCESSING >

When Siemens acquired Morgan Construction Company last April, it gained 1,100 employees, but more significantly, it gained worldwide recognition for an expertise in long rolling that has been developed over 120 years. Based in Worcester, Massachusetts, USA, Morgan is now world headquarters for the strengthened long rolling business segment of Siemens VAI Metals Technologies (MT), which also includes the existing Siemens MT company, Siemens VAI Italy.

The long rolling business segment is responsible for the design, manufacture and installation of equipment that produces both steel and non-ferrous rods, bars and sections. More than 500 rod, bar, and billet mills in over 40 countries around the world are Morgan mills. Siemens VAI Italy holds an equally impressive record of installations worldwide, with more than 7,000 rolling stands commissioned. Together, these mills have set worldwide benchmarks for technological leadership, reliability and performance, and have captured the greatest market share in long rolling equipment.

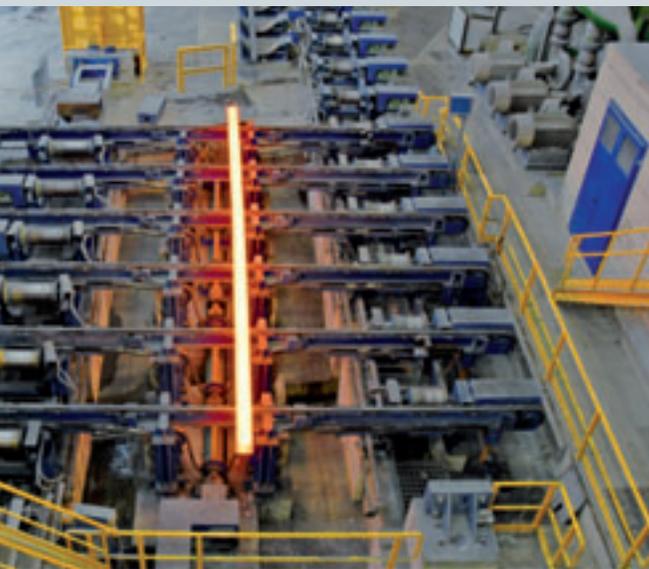
This new business segment is key to meeting long-range goals for MT, as the market opportunity continues to grow. About 45 percent of the world's steel production is long products, representing close to 600 million tons per year. Those rods or bars may be used

for a wide variety of applications, to reinforce concrete and roads, in automotive parts, drawn down to wire for fasteners or nails, or for such high-end uses as aircraft components, orthopedic appliances and surgical implants. Along with a wealth of technical expertise, Siemens improved its competitive position with new manufacturing facilities in Worcester and Shanghai, People's Republic of China. Taking manufacturing in-house promises more direct quality control, ensures that the company's innovative designs remain proprietary, and enables the testing and refinement of new processes across the entire MT product portfolio.

Together with long rolling equipment manufacturing, the business segment includes a healthy spare parts and guides business, MORGOIL bearings and specialized services for the metals industry. Thus, the Siemens VAI long rolling portfolio includes the full spectrum of plant solutions, equipment and processes for all shapes and all grades of carbon, alloy and special steels and super alloys.

The expanded long rolling business segment also brings together two mechanical leaders to offer more cost-effective automation and mechanical combination packages, known as "mechatronic" options for both new mills and upgrades.

The long rolling business is one of the focus areas for Siemens MT, now the market's only in-house full-line supplier capable of meeting the demands of all phases of the production cycle for customers, from ore mining and steel production all the way through to manufacturing complex, high-quality products.



Billet transfer at Ferreria Valsabbia in Valsabbia, Italy



Coil handling and compacting system at ArcelorMittal Brasil in João Monlevade, Brazil

A global structure

Since April, a global structure has emerged to capitalize on the historic strengths of the combined companies. Heading the Siemens VAI long rolling business segment are CEO Philip R. Morgan and Head of Business Administration Andreas Stöcker.

Within long rolling are: Morgan Construction Company (MCCo), responsible for rod and high-speed bar mills; Siemens VAI Italy (SVAI IT), in Marnate, responsible for bar and section mills; MORGOIL, which engineers and produces high-speed, high load bearings for rolling mills Manufacturing, in Worcester and Shanghai; and Spares, Services and Guides, which includes system audits, mill troubleshooting, commissioning services, engineering and technical support, on-site training, as well as parts reconditioning and spares supply.

In addition, there are sector companies incorporating former subsidiaries in China, India, Brazil and the United Kingdom.

“The long rolling market is very competitive,” notes Morgan, “but our technological leadership will help us maintain a competitive cost position.” The best way to meet customers’ needs, he says, is to innovate and develop new technologies that anticipate expanding demands in their markets.

Innovation is part of the culture of a company that has obtained more than 650 patents from the U.S. Patent Office and thousands more worldwide since its founding by inventor and businessman Charles Hill Morgan in 1888. That steady stream of ideas has fueled

its ability to continuously develop significant competitive advantages for customers. Siemens VAI Italy was established in 2005, following Siemens’ takeover of Voestalpine Industrieanlagenbau (VAI). Its origins date back to 1886, when it was founded in Italy by the Pomini family. “Customers now have the best of both worlds,” continues Morgan. “We offer an integrated package with the highest technology available, which should reduce both costs and start-up time.”

A depth of knowledge

As an acknowledged world leader in rolling mill technology, companies in the Siemens VAI long rolling business segment build trust with customers by providing quality products and services that conform to their unique requirements. Employees’ on-site experiences bring a depth of knowledge to each new challenge.

“We work to consistently meet our performance claims for production speeds, mechanical and metallurgical properties of the end product, for effectiveness of our process control systems, and for our level of commitment to classroom and on-site customer training and operations support,” says Morgan.

A new customer recently told him that they chose to build a Morgan mill because they wanted “the best mill from the best people.” ■

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The Beijing National Stadium

A Nest Made of Steel

Anyone looking at the new Olympic Stadium in Beijing would be hard pressed not to think of a bird's nest. The stadium, which was inaugurated shortly before the start of the 2008 Olympic Games, was designed by the renowned Swiss architects Jacques Herzog and Pierre de Meuron, who were the winners of an international contest to design the structure in 2002.

PANORAMA >

This is not the first stadium built by the pair of architects: Herzog and de Meuron also designed the Allianz Arena in Munich and the St. Jakob Stadium in Basel, one of the venues for the recent European Football Championship.

The stadium in Beijing measures 330 meters from north to south and 220 meters from east to west. It is 70 meters high and is designed to hold 91,000 people. Architectural critics talk about lattice structures, wickerwork, mesh patterns, interweaving and steel struts resembling a haystack or bird's nest in their attempts to describe the building. It has the appearance of a gigantic sculpture and stands out in complete contrast to conventional notions of architecture with load-bearing and non-load-bearing structural components to surround and protect. Despite being made from 42,000 metric tons of steel, the immense stadium looks like a natural structure with its undulating struts criss-crossing like branches and seemingly random lines curving up its sides. Instead of covering the stadium framework





as is the norm, the architects chose to use the framework itself as the cladding. 500 translucent membrane panels cover the spaces between the supporting struts.

A nesting site without bolts or rivets

The Beijing Olympic stadium's nickname, the "Bird's Nest," is infinitely more imaginative than "Project 226," the name assigned to it by Jacques Herzog and Pierre de Meuron, but in fact, the project could only be realized once the Swiss architects had managed to reduce the originally estimated construction costs of approximately EUR 325 million by around 40 percent, by abandoning their plans for a retractable roof.

The "Bird's Nest" consists of two separate parts: a reinforced concrete bowl with seating for spectators, and a colossal steel framework that both encloses and covers the seating area. The unusual thing about this design is that the concrete and steel structures do not meet at any point. The steel framework resembles a gigantic three-dimensional jigsaw puzzle made from thousands of prefabricated girders. Many of these weigh up to 350 metric tons and are generally contorted into bizarre shapes. The tangle of steel is a unique sculpture that does not contain a single bolt or rivet, as all the components are welded together.

An urban forum

The Beijing Olympic Games have given rise to an architectural masterpiece and the architects also have their own vision for the future. They would like to see the stadium evolve into a social place no longer famous simply for its original purpose, such as the Eiffel Tower in Paris which was built for an international exhibition. The Olympic stadium and surrounding area should ideally become a bustling urban forum in the future.

The National Stadium is the most prominent building in the "Olympic Green" park, the focal point of the Beijing Olympics. The Olympic Park site covers 1,135 hectares and also houses the National Aquatics Center known as the "Water Cube."

Award-winning design

The new stadium in Beijing was named one of last year's most innovative and progressive designs, winning the 2008 Brit Insurance Design Award for architecture. Brit Insurance Designs of the Year is an annual design competition featuring awards for several categories, presented by the British Design Museum and Brit Insurance.

Beijing's residents take pride in their national stadium, which brought the olympic spirit to Beijing. The "Bird's Nest" is a prestige structure not only for Beijing but also for all of China. ■

Jungler, Julia/istockimages

Siemens VAI launches its new member of the global Metals and Mining Service & Support Center (MSC) in Beijing

MSC Made in China

SERVICES >



Current forecasts see worldwide demand for steel growing by 25% by the year 2015. Driven mainly by heavily-populated Asian nations, this increase in demand must be met with expanded capacity and higher plant productivity. The new Siemens VAI MSC in Beijing can help local companies achieve both objectives.

Regardless of where they are located, the principle for all businesses is the same: Continuous growth requires continuous optimization of processes to stay globally competitive. To help steel customers reach this target, Siemens VAI has established a Metals and Mining Service & Support Center in Beijing as part of the global MSC network to handle inquiries related to plant operations. The MSC network combines the advantages of customer proximity with the global resources of Siemens VAI to provide the best solutions available anywhere.

Within the global MSC network, the most important element is still the local Siemens unit. Local Siemens personnel have an excellent knowledge of the basic system techniques and automation components, which they use to provide extensive support with respect to customer installations. They also offer other benefits that should always be used to best advantage. These include speaking the customer's language and being on site; knowing the customer's management and maintenance personnel; being familiar with the national legislation; being able to handle minor service issues themselves; and, in some cases, having their own spare part logistics system.

All this applies, of course, to the new MSC in China, which can be contacted by all Siemens VAI customers in the region via dedicated communication channels, including e-mail and fax. There is a separate telephone number for customers with service agreements, and they can call the MSC at any time, day or night.

Tracking & Tracing in the global network

The Tracking & Tracing tool serves as a link between the Siemens units spread across the globe. Users of this tool see immediately what service activities are being performed on the premises of which customer by whom and the measures that have already been implemented. This transparency is not only helpful in terms

of finding solutions most efficiently, it prevents multiple processing of the same issue in the event that a customer has sent the same inquiry to more than one Siemens unit.

The service managers at the MSC in China deal with incoming calls during normal office hours. Their objective is to ensure that clarification and coordination of assignments that concern Service Level 1 should be carried out independently and with local resources. In addition, standby teams manned by personnel from the development and commissioning departments have therefore been set up to deal with inquiries outside normal office hours. Relying on their specialist knowledge, the members of these teams can return customer calls and carry out more detailed fault analyses.

Speed and competence

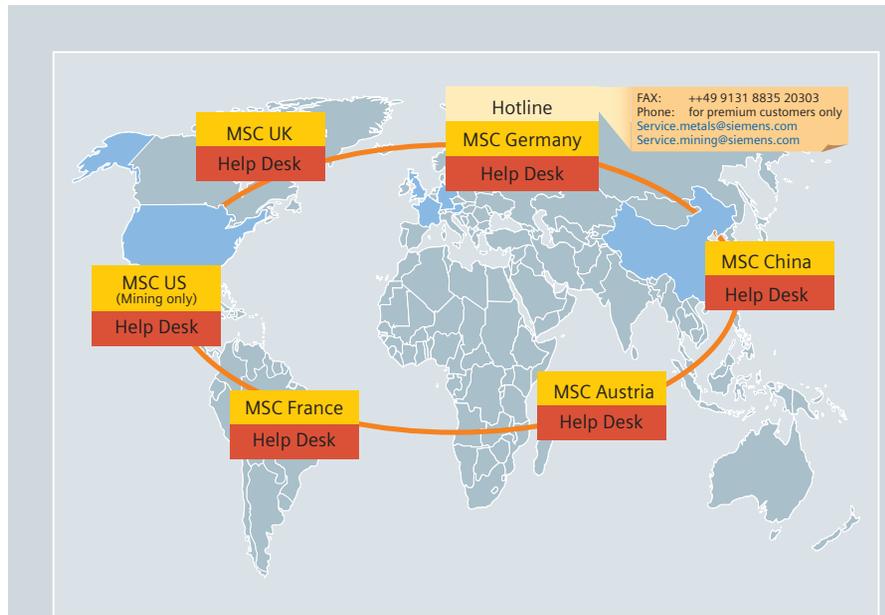
The watchwords of the Siemens VAI MSC network are speed and competence in the improvement of essential service quality parameters. This claim is underscored by the fact that the local MSC staff use a web-based service portal, which documents the most important information on projects, including how project requirements and customer expectations are being met.

Augmenting the range of MSC services are service contracts, remote support, planned and unplanned onsite services, as well as corrective maintenance. In this context, the service contract for Nanjing Iron & Steel Co. Ltd. (NISCO) serves as a good example of established cooperation between Siemens Germany and the regional service organization. The Metals and Mining Service & Support Center coordinates five different on-call services for NISCO, with some of the planned (as well as unplanned) onsite activities carried out by the local service organization in China.

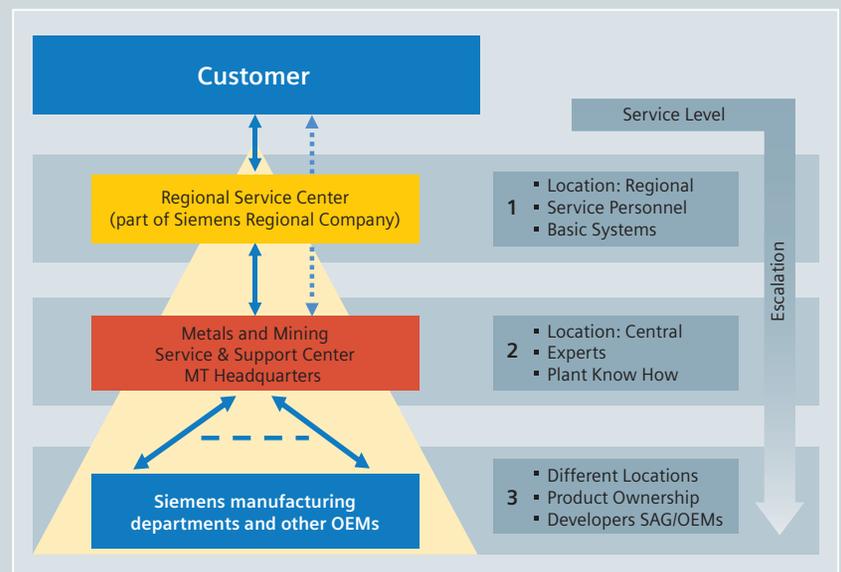
With this the expanded service portfolio, the local service organization in China is in a good position to raise spare parts management to a new level of quality. Thanks to onsite services performed by MSC China, it is now possible to identify customer demand more directly and to provide solid support to the local life cycle business team charged with developing individual solutions.

Uniform quality standard drives business

The establishment of MSC China with uniform structures, tools, and processes is just one way of increasing local life cycle business of the medium and long term. Equally important has been the creation of a uniform quality standard for the service managers who drive this business. It is through the efforts of these service managers and the full implementation of the



Global MSC network of Siemens VAI



Siemens service network

standards that Siemens VAI will be able to enhance its competitiveness in the service business and its acceptance as a service provider, both in China and worldwide. ■

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Flying saw with state-of-the-art control technology and drives

Clean-Cut Tubes

VAI Seuthe GmbH has developed a flying saw with state-of-the-art control technology and drives for a user in Austria. It can be flexibly adapted to the customer's requirements thanks to its open programmability, and it is efficient, safe, and quiet.

VAI Seuthe's new flying saw is gentle on material and optimized for saw-blade lifetime. "We try to give the cutting as much time as possible," explains Jürgen Drossel, designer at VAI Seuthe. The saw doesn't need to wait after cutting, allowing a continuous process. This not only relieves the stress on the mechanics and the motor but also uses less energy.

This optimization requires an open and flexible automation technology. VAI Seuthe has found such an optimum control solution in the Simotion motion control system, which controls axis positioning.

Flexible production by modularity

The modular Simotion system is optimal for customers, who get a basic controller covering all their functions and can order all other elements as needed. The motion control technology can control 10 to 12 axes. In addition to the saw carriage with four axes (measuring wheel, carriage, saw blade advance, and saw blade), a tube driver can be installed behind the saw carriage to pick up the tube after sawing feeds it to the saw aisle. This also enables the sawing of short tubes with a length between 800 and 3,500 mm.

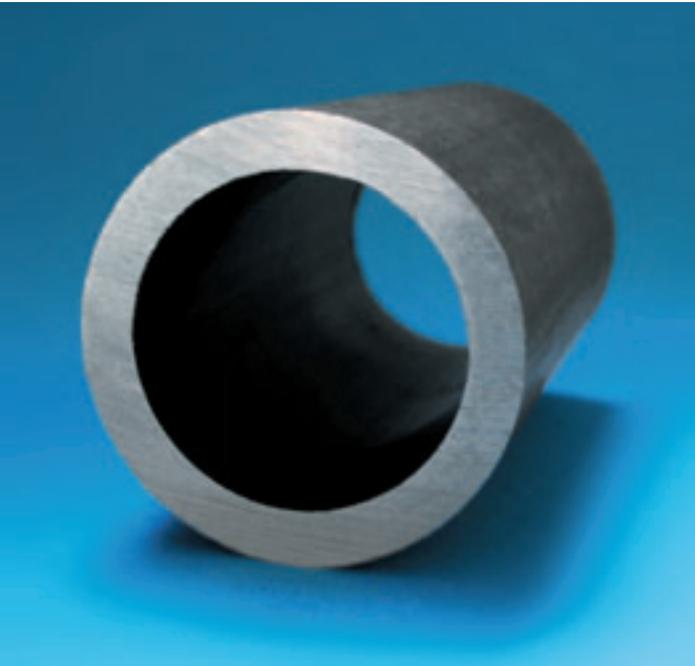
VAI Seuthe has always relied on a modular design in its systems. Mobile interchangeable boards are mounted on a fixed base so that customers can change the chopper, cold saw, or hot saw as required. The aggregates are also easy to change according to the tube size. Thanks to Simotion, the module changes are no problem for the controller either. Parameter sets for the individual modules are already saved in the controller, which the operator has to select to get the

elements ready for operation. The tooling time therefore lasts one hour at the most until the machine is ready for operation again.

Quiet and efficient driving

In order for the saw to cut hard steel, such as manganese steel (40MnB5), with high precision, both high-quality saw blades and efficient drives are necessary. The more accurately the saw blade is positioned, the higher the cutting quality. With the 1PH4 asynchronous spindle motor from Siemens, the saw blade can be advanced some 1/100 mm per tooth. All the drives, including the flying saw carriage motor and the 1FT6 feed drive, have been chosen according to the state-of-the-art in water cooling. The drives are fully encapsulated and therefore protected against dust and soiling. Installed in soundproofed cabins, the motors are also better protected against overheating and are lighter and quieter than air-cooled variants. "A maximum noise emission of 80 dB(A) is prescribed by law for future motors," Drossel explains. "We can completely satisfy these requirements with the water-cooled motors."

VAI Seuthe has also used the Siemens Sinamics S120 drive system for the first time. It is suitable for multi-axis application and is connected to Simotion C via the Drive-Cliq interface. Especially in modular systems like the flying saw, the wiring of the components via Drive-Cliq is a big step forward because the components are detected automatically by integrated electronic rating plates. There is no need for manual data entry during commissioning and exchange. Temperature monitor



VAI Seuthe GmbH

VAI Seuthe GmbH is headquartered in Hemer, Germany, and joined Siemens in 2005. The company has specialized in the engineering, construction, and automation – as well as servicing and modernization – of tube welding machines. The machines are produced in modules at the company headquarters and assembled into machines at the customer's site. Approximately 70 percent of the products are exported – to customers in Eastern and Western Europe as well as Australia, South Africa, Russia, China, India, and Iran.

Flying saw factsheet

Tube diameter: 25 to 115 mm
Profile dimensions of 25 x 25 mm to 130 x 130 mm
Wall thicknesses of 1 to 4 mm
Maximum line speed of 150 m/min
Return stroke speed of 300 m/min

and sensor are polled by a single Ethernet cable, which saves wiring and makes maintenance easier.

Intelligent safety in all elements

A failsafe Simatic S7-317F controller with Profisafe profile takes over the control of the entire sawing process. The emergency stop function of the saw can be accessed directly in the PLC and covers every single element, such as the soundproofed cabin, all doors, the saw safety hood, and the travel of the drives. The machine is stopped safely as soon as the saw passes a certain switch. "We try to stop the drive safely to avoid destroying the saw blade," Jürgen Drossel explains. "That means that the drive is taken out of the cutting, the tension on the tube relieved, and the saw carriage stopped. The high speeds alone prevent us from simply switching off all the drives."

A modern Simatic MP 277 Multi Panel is used for the visualization. This allows saving of parameters appropriate to the tube, which lets customers run the sawing process identically even after a long break. It also makes it easier for the VAI Seuthe technicians to see what is happening and to intervene in good time.



Simple commissioning

The reduced wiring expense of the "flying saw" that was recently delivered to a client in Austria is clearly evident. The modules are assembled into a machine and prewired at VAI Seuthe, and only the bus and control cables need to be connected to the switch cabinet at the customer's premises so that the installation and commissioning can be done much faster. ■

Because of its high feeding speeds and long travel distances, the "flying saw" from Seuthe requires a sophisticated drive and control technology

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More Information
www.siemens-seuthe.com



Completion of the new workshop of SVMC

The Siemens VAI Manufacturing Company in Taicang, China

Dedicated to Excellence

MANUFACTURING CENTERS >

In Taicang, 40 kilometers northwest of Shanghai, China, the hum and bustle of work continues uninterrupted at Siemens VAI Manufacturing (Taicang) Co., Ltd. (SVMC). Since its inception, SVMC has acquired a reputation for the supply of highest quality products for the metals industry, both for export markets and regional Chinese producers.

Founded in 2004, SVMC was the first wholly owned foreign enterprise in the Shanghai region which manufactures a wide range of first-rate equipment for the metals industry. The company supports its sister companies within the Siemens group by supplying equipment for metallurgical plant projects. Exported items have been installed in steel and rolling mills throughout Europe, India, the Middle East, Russia and the U.S.A. Chinese domestic customers include up until now Beijing Shougang Group, Benxi Iron and Steel Group, Baotou Steel, Hangzhou Iron & Steel Group Co. and Shijiazhuang Iron and Steel Co.

A considerable share of the manufactured products of SVMC has been for the iron- and steelmaking industry. In the company's brief history, this comprises a range of items for the blast furnace such as tuyere

stocks, and also for the slag-granulation site which includes dewatering screws and mesh roll filters. Equipment for the meltshop area, for example transfer cars and ladles, are also manufactured. Components and plant sections have been supplied for billets casters and long-products mills (e.g., gear reducers, mill guides and cooling beds). Company expertise and equipment supply extends from the blast furnace up to cold rolling, processing and finishing lines. All products are manufactured in accordance with the highest international standards.

As part of the planned development of the company, a new workshop was opened at the start of June 2008. An even broader range of equipment can now be supplied to better serve the regional and international metals producers. The future capabilities of the company will be enhanced with an increased crane-lifting capacity of up to 100 tons.

Siemens VAI Manufacturing (Taicang) Co., Ltd. is committed to the excellence of its products and to customer service. It will further expand its capabilities in support of metals producers across the globe. ■

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NTMK Honors Siemens VAI

On July 17, 2008, in representation of the Siemens VAI project teams, Mr. Joachim Schnalzger, Product Manager of Siemens VAILD (BOF) Steelmaking Technology, received a "Certificate of Gratitude" from Mr. A. V. Kushnarev, Executive Director of the Nizhny Tagil Iron & Steel Works (NTMK), for the successful project activities implemented by Siemens VAI at this integrated iron and steel works in Russia. The award was presented on the annual "Metallurgists Day" in the nearly filled stadium of the city of Nizhny Tagil. The text on the award reads as follows;

*"Dear Sirs,
On behalf of OJSC Metallurgical Combine of Nizhny Tagil, I would like to express my thanks for the fruitful cooperation. The Siemens VAI company has taken part in the implementation of many successful projects at the metallurgical combine of Nizhny Tagil. The continuous casting machines, lime kilns and secondary metallurgical equipment delivered by your company made it possible to dramatically increase the level of steelmaking technologies and to achieve high technical and economic*



Members of the Siemens VAI converter project team during the start-up celebration of Converter No. 1 at NTMK, Russia (November 8, 2007)

parameters. In 2007 and 2008, in the framework of a joint cooperation, the reconstruction of Converters No. 1 and No. 2 was performed in a short period of time. The automatic process control system that you developed is being successfully operated at the Blast Furnaces No. 5 and No. 6. We wish Siemens VAI continued success and the best of luck in all future undertakings." ■

Long-Lasting Partnership Award from Severstal



Mr. Werner Auer (CFO) and Dr. Alfons Schilcher (International Account Manager for Severstal) of Siemens VAI with the Severstal Award

The Commercial Director of Severstal, Mr. Igor Nechaev, presented Siemens VAI with the "Long-Lasting Partnership Award" for 2008 in recognition of the intensive cooperation and long-term successful implementation of numerous metallurgical projects at the integrated iron and steel works in Cherepovets.

With a crude steel production of 17.5 million tons in 2007, Severstal is the biggest steelmaking company in Russia and one of the largest in the world. The company produces a wide range of flat steel and long products comprising hot- and cold-rolled flat steels (also coated steel), hot-rolled sections, roll-formed shapes, rebars, wire rod and pipes. ■

Plate Leveling Day

On May 13, 2008, Siemens VAI took the opportunity to welcome the members of the European Heavy Plate Committee (EHPC) who were holding their semi-annual meeting on following day at the Industeel Loire plant in Châteauneuf, France. Siemens VAI France thus combined this EHPC event to an “open day” in Montbrison to communicate on its plate leveler capability during a visit of the workshop. Since 2002, Plate leveler business is major activity of Siemens VAI which is a global and leading key player in the field of plate mill equipment. Participants visited the various areas dedicated to machining, assembly and testing. For some

of the attendees, mostly involved in heavy plate production, this was also the opportunity to see technologies from other fields : DAK, DSR, a flash-butt welding, PLANICIM dedicated to strip processing, as well as the new nickel-plating shop. In the field of steel rolling, various equipment under manufacturing could be seen: hydraulic capsules, bending blocks, mandrels. Dedicated tools such as the pilot rolling mill (for R&D) and the 5000-ton testing station were subject to great interest. Many leveler equipment such as roll cassettes, gauge control cylinders could be seen at various stages of manufacturing. ■



Visitors in the Siemens VAI workshop in Montbrison in front of complete plate leveler under erection

Mining Technology Seminar

On August 27th and 28th Siemens Energy & Automation Metals and Mining Division (MTD) along with the South Western U.S. Industrial sales team, conducted a two day Mining Technology Seminar in Phoenix, Arizona. Mining company customers such as Freeport – McMoRan, BHP Billiton, OEM’s, and Engineering Consultants from the region participated in the event. The seminar was tailored to deliver valuable information to the audience regarding productivity improvements through the use of innovative technologies and solutions with a goal of helping mining customers achieve some of their business objectives, such as cost optimization and environmental legislation.

Special Guest Speakers from SE&A MT-MI were Frank Gerdts, Director, Global Mining Technology, and Todd Kennedy, Business Development/Engineered Solutions also with MT-Mining. Frank Gerdts delivered a well

received presentation focused on trends in the mining industry highlighting alternate mining technologies that are expected to become prevalent due to rising fuel prices and stringent environmental legislation. Topics of interest were the Siemens Trolley Assist truck solution, water discharge treatment solutions and Manufacturing Execution Systems (MES). Todd Kennedy presented and discussed with the attendees Siemens Mine Winder Control and Conveyor Systems Technologies.

This event contributed in increasing awareness of Siemens solutions and capabilities in the mining community. It gave Siemens the opportunity to learn from the participating customers and consultants, what projects are on the planning stage in the southwest U.S. mining sites. Individual follow up meetings are being scheduled to assist customers with information on pre-feasibility studies. ■

More information

You can find further information and more press releases over our online portal at www.siemens-vai.com

Events: Upcoming Conferences and Fairs

- NOV** AUSTRALIAN IRON ORE, Metal Bulletin, Perth;
<http://www.metalbulletin.com/events>
- NOV** 12th MIDDLE EAST IRON & STEEL CONFERENCE, Metal Bulletin, Dubai;
<http://www.metalbulletin.com/events/MEIS>
- NOV 02-04** SCRAP SUBSTITUTES & ALTERNATIVE IRONMAKING V, AIST, Baltimore, Marriott Renaissance Hotel; <http://www.aist.org>
- NOV 02-05** INT. STEEL TECHNOLOGIES SYMPOSIUM 2008, China Steel, Kaohsiung;
- NOV 03-05** 4th ANNUAL SCRAP METAL CONGRESS 2008, Terrapinn, Shanghai, InterContinental Pudong Shanghai; <http://www.terrapinn.com/2008/scrap>
- NOV 04-06** VALVE WORLD 2008 CONFERENCE & EXPO, KCI, Maastricht, MECC Conf. & Exhibition Center; <http://www.valve-world.net>
- NOV 04-06** 24th INT. FERRO-ALLOYS CONFERENCE, Metal Bulletin, Athens, Hilton Hotel; <http://www.metalbulletin.com/>
- NOV 04-07** 4th INTERNATIONAL CONFERENCE ON CONTINUOUS CASTING OF STEEL IN DEVELOPING COUNTRIES (CCC'08), CSM, Beijing; <http://www.csm.org.cn/ccc08/index.htm>
- NOV 05-07** SteelChina 2008, IBC, Shanghai; <http://www.ibc-asia.com>
- NOV 05-07** MANTEMIN 2008 – 3rd Mine Equipment Maintenance Meeting, Gecamin, Santiago, Hotel Sheraton; <http://www.mantemin.cl>
- NOV 05-08** IMME 2008, Confederation of Indian Industry (CII), Kolkatta, Salt Lake Stadium Grounds;
- NOV 10** SE AISI ENVIRONMENTAL & SAFETY SEMINAR, SE AISI, Yogyakarta, Indonesia; <http://www.seaisi.org>
- NOV 10-12** 7th INT. STAINLESS AND SPECIAL STEELS SUMMIT, Metal Bulletin, Marbella, Los Monteros; <http://www.metalbulletin.com/events/iss>
- NOV 10-13** 17th IAS ROLLING CONFERENCE & 4th IAS CONFERENCE ON USES OF STEEL, Instituto Argentino de Siderurgia, Rosario, Argentina, Metropolitano Convention Center; <http://www.siderurgia.org.ar>
- NOV 11-13** 7th INT. EXHIBITION ON MINERALS, METALS, METALLURGY & MATERIALS, Delhi
- NOV 11-14** 14th INT. INDUSTRIAL EXHIBITION – METAL-EXPO 2008, Moscow, Crocus Expo Int. Exhibition Centre; <http://www.metal-expo.com>
- NOV 12-14** 16th INT. RECYCLED ALUMINIUM CONFERENCE, Metall Bulletin, Vienna, Le Meridien; <http://www.metalbulletin.com/events/RecAl>
- NOV 13-14** STAHL 2008 – “Performance for tomorrow,” VDEh, Düsseldorf
- NOV 13-16** IIM's 46th INT. METALLURGISTS' DAY & MMMM 2008: 7th International Exhibition on Minerals, Metals, Metallurgy and Materials, Expomedia Events, New Delhi, India Expo Centre, Expo – XXI; <http://www.metal-mineral.com/>
- NOV 17-18** BAR & ROD ROLLING – FULFILLING CUSTOMER NEEDS, Inst. Of Materials, Minerals & Mining, Sheffield; <http://www.iom3.org/events/bar-rod>
- NOV 18-21** 14th INTERNATIONAL INDUSTRIAL EXHIBITION METAL-EXPO 2008, Moscow, The All-Russia Exhibition Center; <http://www.metal-expo.com>
- NOV 19-21** Mining Exhibition – Balikpapan Industrial Expo 2008, Indonesia, <http://www.balikipanexpo.com>
- NOV 27-29** ICSOBA-2008 – BAUXITE, ALUMINA & ALUMINIUM INDUSTRY OF AUSTRAL-ASIA AND NEW TECHNOLOGICAL ADVANCES, Mineral Information & Development Centre, Bhubaneswar; icsoba-2008@mineralinfo.net
- DEC 01-03** 6th STEEL SUCCESS STRATEGIES EUROPE, Metal Bulletin, Paris, Le Meridien Etoile; <http://www.metalbulletin.com/events/ssse>
- DEC 01-05** GEOSTATS 2008 – Eighth International Geostatistics Congress, Universidad de Chile, Santiago, Hotel Sheraton; <http://www.geostats2008.com>
- DEC 04** MAXIMISING MILL PERFORMANCE, IoM³, London; <https://www.eventsforce.net/iom3/frontend/reg/thome.csp?pageID=10965&CSPCHDx=000000000000&eventID=41&eventID=41>
- DEC 09-11** THERMOMECHANICAL SIMULATIONS AND PROCESSING OF STEELS, RDCIS & SAIL, Ranchi, India, RDCIS; <http://www.simpro-ranchi.com>
- DEC 11-12** ATS – International Steelmaking Conference, Claudine Chalier, Paris, France; <http://www.ats-ffa.org>
- DEC 14-16** 12th MIDDLE EAST IRON & STEEL CONFERENCE, Metal Bulletin, Dubai, Grand Hyatt; <http://www.metalbulletin.com/events/meis>
- DEC 15-17** 3rd SHANGHAI INT. EXHIBITION FOR ALUMINIUM INDUSTRY IN 2008, Shanghai Yinghui Exhibition Services Co., Ltd, Shanghai, Shanghai Everbright Convention & Exhibition Center; <http://www.cnal.com>
- YEAR 2009** STEEL FAB 2008, Expo Centre Sharjah, Sharjah, UAE, Expo Centre Sharjah; <http://www.steelfabme.com/>
- JAN 19-22**
- FEB 02-04** STEELRISE 2009, Tata Steel & New Wave Display Services, Bhubaneswar