

# Metals Magazine

Innovation and technology for the metals industry

Fast

Efficient

Professional

The Life-cycle Partner  
For Metals Services

Performance  
is only limited  
by imagination.



**Acceleration from 0 km/h to 100 km/h in 1.7 seconds. 200 km/h in 3.8 seconds flat. Exhaust-gas temperatures in excess of 1,000°C – 50% higher than the melting point of aluminum. Top speeds at 350 km/h, which is more than 50 km/h faster than the takeoff speed of a fully loaded Boeing 747. Formula 1 racing cars count among the most technically awesome machines on the planet. The key word is performance.**



Dr. Lawrence Gould

## Dear Reader,

Performance is the decisive factor for success, irrespective of whether it has to do with the premier event in motor-vehicle racing or with metallurgical plants. There are three components of performance that must always be near the limits of what is possible: the machine, the driver or operator, and the hidden world of services without which any machine will eventually break down and grind to a halt.

State-of-the-art machines are the result of permanent R&D activities performed by hundreds of engineers who work closely together as part of a well-coordinated team. On the basis of operational feedback and new developments, continual improvements with regard to the machine design, material, systems and capability are carried out.

The car driver or plant operator must also be in top condition and in full command of the machine to ensure superior results. A Formula 1 driver requires rigorous training to ensure that he has the superhuman reflexes necessary to drive the car up to the maximum design speed of flying propeller airplanes, which is 350 km/h. As an indication of the stress that a F1 racer must withstand, the average driver loses up to four kilograms of weight during a typical race lasting less than two hours. Operators of metallurgical plants are also subject to immense pressure considering that possible errors may result in equipment damage, production loss and even personnel injury. Expert training, technical assistance and on-site support by a life-cycle partner helps to improve the skills and expertise of plant personnel at every step of the value-added steel-production chain.

Finally, behind every top-of-the-line machine, there is a vast world of service activities that are required to keep everything running at benchmark levels – whether an F1 car or a mill. This includes equipment and system maintenance, repair, upgrades and replacements, installation of the latest innovations, etc. – regularly done on- and off-site by expert personnel to ensure maximum performance.

Performance, however, is only limited by imagination. On the basis of its decades of plant-building experience and the know-how acquired from the completion of thousands of metallurgical and service projects worldwide, Siemens VAI can support producers to stretch their imagination of what a metallurgical plant is capable of doing. This issue of Metals Magazine outlines the range of services offered by a life-cycle partner that contributes to overall team success.

Yours sincerely,

Dr. Lawrence Gould  
Managing Editor  
Siemens VAI Metals Technologies GmbH

# The No. 1 Formula for Success

In the increasingly competitive business climate of today, the support of an experienced and dedicated life-cycle partner has become indispensable for metals producers to remain successful. Expert and reliable service not only helps producers get to the finish line, it supports them to be the winner of the race.



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### Metals Magazine Is Now Available on Your iPad

For selected magazine topics readers can now access additional content with the new iPad magazine application. The app, an interactive alternative to the print version of Metals Magazine, can be downloaded at the Siemens magazine newsstand.



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## Dedication to life-cycle partnerships

# Siemens VAI Meets Its Commitments

In November 2013, Albrecht Neumann took over the helm of Siemens VAI. He shares some details about his first months in office and the company's strategy.

### How have you spent your first months as the new CEO of Siemens VAI?

Until taking on this position, I was responsible for Siemens VAI in the United States. So I've been focusing a lot of attention on getting to know other parts of the business. My first longer trips abroad were to China, India, Russia and Mexico – and to the United States. In each of those countries I met with a number of steel producers. Despite current sluggish growth, China is the world's most significant market for the metals business.

### Were you able to identify any market trends during your travels?

My visits with customers during the last few months have strengthened my conviction that we are on the right track with our life-cycle strategy and that we have set the right priorities. In China and in other markets, for example, there is great interest in our environmental portfolio and in our energy-efficient solutions. This is an area where I see considerable business potential.

### Can you say a bit more about the life-cycle strategy?

Siemens VAI strives to serve its customers within the framework of a life-cycle partnership. This is more than a business model. A life-cycle partnership extends from the initial plant installation and continues throughout the entire lifetime of the plant – often exceeding more than half a century. Siemens VAI will continue to place a strong emphasis on deepening and

extending the range of services offered to customers for optimizing their plants' performance. Enhanced customer support will be achieved with pioneering innovations, plant modernizations, solutions for energy efficiency and environmental care, as well as industrial IT and automation. Through the combination of dedicated services, process optimization, solutions and equipment upgrades, existing production facilities will not only sustain their original design capacity – they will also surpass all performance indicators by far.

### What do you think is the most important message customers everywhere need to understand about Siemens VAI?

That they can trust us. And the best evidence of the trust our customers have in us is the many new orders that we have received in recent weeks and months from around the world. Some examples: two orders in October 2013 for a rolling mill for reinforced steels at Kalika Steel Alloys in India and a flat bar rolling mill for Qingdao Steel in China; the November 2013 orders for five Meros plants in Turkey and Italy; and the February 2014 order from Pangang in China for a continuous galvanizing line. We are also an excellent partner for modernizations, as proven by orders – both signed in February 2014 – for the Cemtas bar rolling mill in Turkey and the slab caster for Hüttenwerke Krupp Mannesmann GmbH (HKM) in Germany. No matter what type of contract, Siemens VAI always meets its commitments.



Albrecht Neumann,  
CEO of Siemens VAI  
Metals Technologies

Albrecht Neumann joined Siemens in 1988 as a commissioning engineer for pulp and paper plants. After that, he served as an applications engineer exercising responsibility in various areas of sales, projects and service. He was later appointed to many leadership roles, including Regional Head of Germany for the former Industry Solutions Division of Siemens. He was also responsible for a number of strategic projects related to the restructuring and realignment of Siemens' businesses. Neumann possesses extensive experience in the food and beverage, cement, water-treatment and metals industries.

## New orders and plant start-ups

# Recent Project Activities



- 1. Chongqing, China
- 2. Qingdao, China
- 3. Wuhan, China
- 4. Taiyuan, China
- 5. Eisenhüttenstadt, Germany
- 6. Duisburg-Huckingen, Germany
- 7. Jalna, India
- 8. Taranto, Italy
- 9. Kostanay, Kazakhstan
- 10. Dangjin, Korea
- 11. Bursa, Turkey
- 12. Karabük, Turkey


### 1. China

## Pangang orders continuous galvanizing line

The Chinese Pangang Group placed an order to a consortium led by Siemens VAI for the supply of a continuous hot-dip galvanizing line for their Chongqing plant. The new facility will process up to 450,000 tons of deep-drawing, high-strength and dual-phase steels per annum for use in the automotive industry. For the first time in a Chinese plant, strips can be galvanized, galvanized or aluminized on a single line.

Siemens VAI will engineer and supply the complete mechanical and electrical equipment as well as the automation system. The galvanizing line will include the entry section, a laser system for welding and cutting, an electrolytic cleaning section, a strip-heating section with an all-radiant tubes (ART) furnace, the galvanizing section, a 4-high temper mill with a roll force of 1,200 tons, a 25-ton tension leveler, loopers and the inspection system.

The project is scheduled to be completed by mid-2015.

The image shows a large-scale industrial steel mill. Several massive vertical rollers are visible, each with a yellow and white striped pattern. A continuous strip of metal is being processed, moving from the bottom left towards the top right. The background is filled with industrial structures, including walkways and railings, under bright, somewhat hazy lighting.

*For the first time in a Chinese plant, strips can be galvanized, galvanized or aluminized on a single line.*

New continuous galvanizing line to be installed at Pangang steelworks in Chongqing, China

## 2. China

### New flat-bar rolling mill for Qingdao Steel

Siemens VAI won an order from Qingdao Special Iron & Steel Co. Ltd. (Qingdao Steel) for the supply of a flat-bar rolling mill with an installed capacity of 600,000 tons of spring, carbon and alloyed steel grades per year. Flat bars with widths ranging between 60 mm and 160 mm and thicknesses from 6 mm to 60 mm will be produced for use in the automotive and construction industries. The project supply scope for Siemens VAI includes a 4-stand finishing train, a cropping shear, sizing train, multi-section thermo-processing equipment, a hot-dividing shear and two abrasive saws for cutting the finished rolled products to length.

The new mill is part of Qingdao Steel's program of relocating and modernizing plants to comply with ever-stricter environmental requirements. Plant commissioning is scheduled for early 2015.



Example of a sizing train from Siemens VAI

## 3. China

### Cooling section of hot-rolling mill to be modernized at Wisco

The cooling section of the No. 2 Hot Rolling Mill of Wuhan Iron & Steel Co. Ltd. (Wisco) will be modernized by Siemens VAI. New Power Cooling headers will be installed, the laminar cooling headers will be partly replaced with turbolaminar cooling headers, and the cooling model will be updated. The accelerated cooling rates will enable Wisco to produce new steel grades, including high-strength and API (American Petroleum Institute) grades (e.g., X100) for the automotive and petroleum industries. At the same time, the use of expensive alloying agents can be reduced thanks to carefully controlled cooling rates that ensure that the strip lies within tight temperature tolerances during cooling. Modernization of the cooling system is due to be completed in February 2015.

## 4. China

### Three slab casters started up at Tisco in three months

In late 2013, Siemens VAI started up three slab casters for Taiyuan Iron and Steel Group Corp. (Tisco) – China's leading producer of stainless steel. Two of the casters are installed at Tisco's carbon and special-steel works, and the third one at the company's stainless steel works. Fast installation and start-up of the casters was made possible applying Siemens VAI Connect & Cast solutions. The latest technological packages and process-automation systems from Siemens VAI are in operation in all three machines to ensure the production of slabs with extraordinarily high quality. Each caster is designed to produce one million tons of slabs per year and will increase Tisco's capacity to manufacture high-quality carbon, silicon and stainless steels.

Advanced technological packages installed in Tisco's slab caster ensure outstanding product quality



*The latest technological packages and process-automation systems from Siemens VAI are in operation in all three machines to ensure the production of slabs with extraordinarily high quality.*





Existing slab caster at HKM to be modernized by Siemens VAI

## 5. Germany

### Eisenhüttenstadt to generate electricity from BF gas

Siemens VAI will install a top-gas pressure-recovery turbine (TRT) and auxiliary systems at Blast Furnace 5A of Arcelor-Mittal in Eisenhüttenstadt, Germany. The equipment will enable the pressure and sensible heat of the top gas to be converted into an average of 7 MW of electrical energy.

The scope of supply from Siemens VAI comprises the top-gas piping system and the supporting structure, process valves, the TRT system, a synchronous generator, the hydraulic and lubricating systems, as well as the associated electrical and automation equipment.

Siemens VAI will also be responsible for the supply of basic and detailed engineering, and will provide advisory services during the installation, start-up and commissioning of the top-gas pressure-recovery system.

The new TRT system is part of a project designed to increase energy efficiency and reduce the environmental impact of iron production at this steelworks. Commissioning is scheduled for mid-2015.

## 6. Germany

### Slab caster modernization at HKM

Hüttenwerke Krupp Mannesmann GmbH (HKM) awarded Siemens VAI an order to modernize Slab Caster No. 3 at its Duisburg-Huckingen plant in Germany. The target of this project is to enhance the quality and product tolerances of the cast slabs, to extend the range of products, and to improve caster availability and personnel safety.

The slab caster, which was delivered by a third-party supplier, has been in operation at HKM in Duisburg since 2000. It will be equipped with new basic automation and process-optimization systems; technology packages that include DynaGap Soft Reduction, LevCon, DynaWidth and DynaFlex; and new safety features. The air-mist secondary cooling system will be outfitted with DynaJet nozzles to optimize the temperature control during the cooling of the slabs. This will enable HKM to further widen the range of high-quality steel grades in its product portfolio.

Modernization is scheduled to take place at the end of 2014 during a temporary plant shutdown.

## 7. India

### Newly designed rebar rolling mill for Kalika Steel

The Indian steel producer Kalika Steel Alloys Pvt. Ltd. (Kalika Steel) placed an order with Siemens VAI for the supply of a new rebar rolling mill. The plant will be erected at the company's Jalna steelworks in the state of Maharashtra. After commissioning, it will be capable of rolling approximately 250,000 tons of rebars with diameters of between 8 mm and 40 mm and with lengths of between 9 m and 15 m. A highlight of this project is that the mill features a new overall design that allows rolling facilities with small to medium-size production capacities to be installed quickly and at low cost.

The project scope for Siemens VAI includes the complete mechanical equipment and the electrical and automation systems. The rolling mill will consist of 18 Red Ring stands, followed by a cooling bed and bar-bundling machines.

Kalika Steel aims to expand its production of long products in order to better serve the growing Indian construction sector. Commissioning of the rolling mill is scheduled for late 2014.



Rebar mill supplied by Siemens VAI

## 8. Italy

### Four Meros plants to clean sinter offgas at Ilva

Ilva S.p.A. awarded Siemens VAI a major turnkey order to supply and install four Meros plants to clean the offgas from two sinter plants at the Italian steel producer's Taranto steelworks. More than 2.6 million m<sup>3</sup>/h of offgas will be treated per sinter plant. Emissions of fine dust, sulfur dioxide, organic compounds, heavy metals and acidic gases will be reduced to levels well below E.U.-specified limits.

The Meros plants will make a substantial contribution toward improving the environmental situation in the Taranto region. The first two plants are scheduled to go on stream in April 2015, and the other two will follow in September 2016.

*The Meros plants will make a substantial contribution toward improving the environmental situation in the Taranto region.*

## 9. Kazakhstan

### Evrast long rolling mill goes into operation

A new long rolling mill installed by Siemens VAI was started up for Evraz Caspian Steel LLC in Kostanay, Kazakhstan. The mill is designed to produce 450,000 tons of rebar per year for use in the domestic construction industry in Kazakhstan and adjoining Central Asian countries. The diameter of the end products ranges from 10 mm to 40 mm.

Siemens VAI supplied a billet-reheating furnace, an 8-stand roughing mill, a 6-stand intermediate mill with Red Ring stands, and a finishing mill with four horizontal Red Ring stands. The supply scope also included a quenching line, shearing systems, a 78-m-long cooling bed; machines for counting, bundling, tying, weighing and label printing; a water-treatment plant; a low-voltage power distribution system; and the basic automation and process-optimization systems.

## 10. Korea

### Continuous bloom caster and long-product rolling mills for Hyundai Steel

Siemens VAI received an order from the Korean steel producer Hyundai Steel for the supply of a continuous bloom caster, a large bar rolling mill, and a small bar and wire rod mill for a new steel plant under construction in Dangjin. Special steel grades will be produced at this site for various high-end applications in the automobile industry.

The four-strand bloom caster will produce 1.1 million tons of blooms per year, which will be hot-charged directly into the bar rolling line to save energy during reheating.

The large bar mill, which will comprise a duo reversing breakdown stand and a finishing train with rolling/sizing stands, will produce billets for further processing in the small bar and wire rod mill. This combination mill – with a rolling capacity of 160 t/h – will include a breakdown and intermediate mill that will feed a sizing block for the production of bars, rod and bar-in-coil. A yearly production of 600,000 tons of straight bar and bar-in-coil, and 400,000 tons of wire rod is planned.

Commissioning of the plants is scheduled for late 2015.



Example of a Morgan high-speed laying head for wire rod



*The mill is designed to produce 450,000 tons of rebar per year for use in the domestic construction industry in Kazakhstan.*

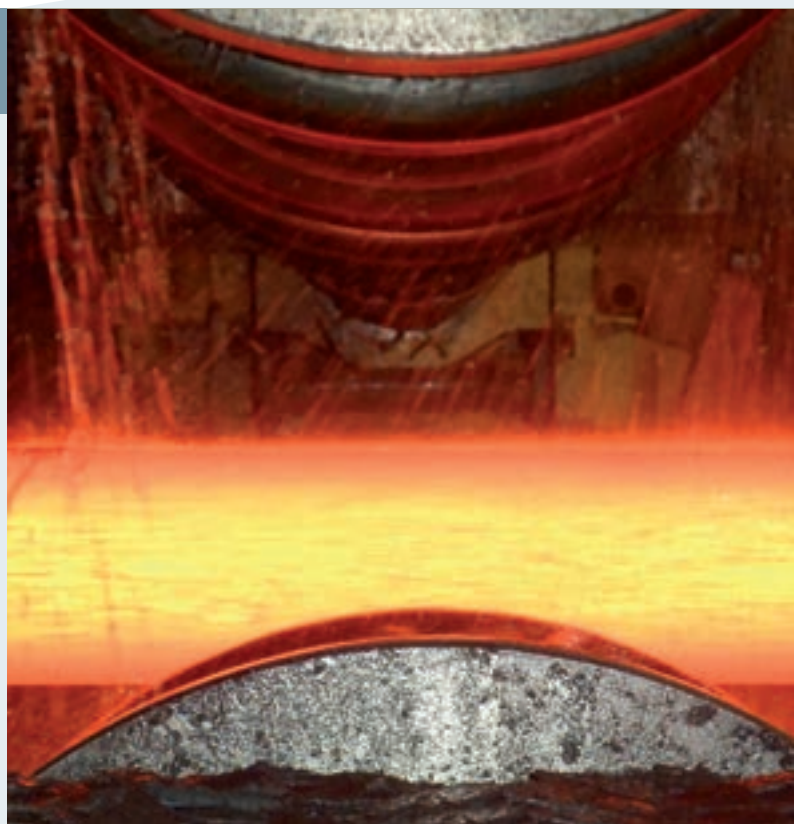
Rebars are now produced in the new Kazakh long rolling mill

### 11. Turkey

## Bar rolling mill to be modernized at Çemtaş

The Turkish steel producer Çelik Makina Sanayi ve Ticaret A.Ş. (Çemtaş) awarded Siemens VAI an order to modernize its bar rolling mill in Bursa, located about 90 km south of Istanbul. The rolling mill will be equipped with a new reversing sliding roughing stand and a new intermediate train. The existing finishing mill will also be upgraded with state-of-the-art technology.

The installed equipment will enable Çemtaş to further improve its product quality, especially with respect to the mechanical properties of the rolled steel, the metallurgical structure, and the surface quality of the rolled bars. Special mechatronic packages and new automation systems that feature advanced built-in process models will provide the bar mill with a plant-wide automation solution to improve productivity and reduce maintenance downtime. The modernized rolling mill is scheduled to come into operation at the beginning of 2015.



Special steel bar for the automotive industry will be rolled in the upgraded long rolling mill at Çemtaş, Turkey



View of the Meros gas-conditioning reactor

### 12. Turkey

## Kardemir to clean sinter plant offgas with Meros technology

Another order was placed for the supply of Meros technology. The Turkish steel producer Karabük Demir Celik Sanayi ve Ticaret A.S. (Kardemir) commissioned Siemens VAI to provide engineering and key components to clean the off-gas emissions from its new Sinter Plant No. 3 located in Karabük, in northern Turkey. The target of this project is to drastically reduce dust and sulfur emissions to values significantly below the statutory limit. The system is being designed so that it can be extended with additional features for the removal of nitrogen oxides, dioxins and volatile organic compounds from the sinter gas. Some 400,000 Nm<sup>3</sup> of offgas will be treated per hour.

The new Meros plant is scheduled to come into operation at the end of 2014.

# News Flashes

## **Armenian Steel Casting Enterprise** **Armenia**

The FAC\* was received for the new Siemens VAI-supplied rolling mill that is designed to produce 125,000 tons of reinforcement bars per year. This mill is the first modern facility for the production of long products in Armenia.

## **Borçelik Çelik Sanayii Ticaret A.Ş** **Turkey**

The customer placed a repeat order with Siemens VAI for the supply of an automatic surface-inspection system (Siroll Sias), which has already been installed in more than 120 inspection lines worldwide. An additional order was received to modernize the laser welder of the inspection line that was supplied by Siemens VAI in 2004.

## **Chongqing Shougang Wuzhong Automotive Component Co., Ltd.** **China**

An order was received for the supply of a new blanking line that includes a feeding line with a cassette-type, multi-roll leveler, a 630-ton press and a double-station magnetic stacker. The line is capable of producing any type of blank shapes for inner and outer automotive parts.

## **Diaco S.A.** **Colombia**

The FAC\* was received for the rolling mill upgrade that Siemens VAI carried out at the Tocancipá steel mill of Diaco S.A., the Colombian branch of the Brazilian Gerdau company. The mill rolling capacity is 140,000 tons of rebars per year.

## **Dost Steel Limited** **Pakistan**

Production at the Siemens VAI-built 350,000 t/a rebar mill will commence in mid-2014.

## **Dragon Steel Corporation** **Taiwan**

On March 6, 2014, Blast Furnace No. 2 achieved its first operational anniversary since the plant start-up, and it has already surpassed its targeted annual production output of 2.5 million tons of hot metal.

## **İskenderun Iron and Steel Co (Isdemir)** **Turkey**

The customer issued the FAC\* for the new process-optimization system that Siemens VAI installed in Blast Furnace No. 4.

## **Jindal South West (JSW) Steel Ltd.** **India**

The new Siemens VAI-supplied single-strand Slab Caster No. 4 entered service at the Toranagallu steelworks of JSW Steel. The caster has an annual production capacity of 1.4 million tons of high-quality slabs that will be processed to steel tubes for use in the petroleum and other industries. Siemens VAI also supplied and started up Slab Caster No. 3 that has been in operation at the same site since 2006. Both casters are equipped with DynaGap Soft Reduction Technology.

## **Jindal Steel & Power Ltd. (JSPL)** **India**

A single-strand slab caster supplied by Siemens VAI recently commenced operation at the Angul plant of JSPL. The caster has a nominal annual casting capacity of 1.5 million tons of slabs and produces a broad range of steel grades that extends from ultra-low-carbon to high-carbon steels in addition to microalloyed and low-alloy grades.

## **Outokumpu Stainless USA, LLC** **U.S.A.**

Siemens VAI received an order for the installation of a new Simetal Condition Monitoring System (CMS) in the existing AOD converter and continuous casting machine. The CMS system will enable continuous equipment monitoring of core equipment components.

## **Pohang Iron & Steel Co, Ltd. (Posco)** **Korea**

The FAC\* was received for two new K-OBM-S converters that are equipped with bottom tuyeres and a top oxygen lance for the production of stainless steel.

## **Qatar Steel Company** **Qatar**

A new process-optimization system installed in a direct-reduction plant was recently started up.

## **Saudi Iron & Steel Co. Ltd. (Hadeed)** **Saudi Arabia**

An order was received for the upgrading of the Level 2 automation system at Hadeed's flat products facility.

## **Shandong Taishan Steel Group Co. Ltd.** **China**

Following the modernization of three 70-ton K-OBM-S converters, Siemens VAI received the FAC\* from the customer. Each converter is capable of producing 800,000 tons of stainless steel per year.

## **Tata Steel Ltd.** **India**

In September 2013, the Simetal Gimbal Top completed four years of successful operation at Tata Steel's Jamshedpur steelworks. The uniquely designed tilting chute was continuously operated for over three years without replacement.

## **ThyssenKrupp Steel Europe AG** **Germany**

Siemens VAI received the FAC\* following completion of the modernization of the 2-strand casting-rolling mill at the Duisburg-Bruckhausen steelworks. The project comprised the installation of advanced technological packages in the slab caster and the replacement of the automation systems.

## **Tonghua Iron & Steel Group Co., Ltd.** **China**

The FAC\* was issued in December 2013 for the modernized bar and bar-in-coil line following the relocation of the entire plant from Beijing to Tonghua (Jilin province).

\*FAC = Final Acceptance Certificate



Fast, efficient and professional service maximizes machine performance

Siemens VAI offers a comprehensive service portfolio for the metals industry

# Service Is Our Business

## Pit stop No. 1

A pit stop of a Formula 1 racing car typically lasts less than three seconds. During this brief period a wide range of service activities, such as replacing the worn tires, are performed at lightning speed. When a metallurgical plant is shut down for maintenance reasons, fast and professional services are vital to ensure that the plant resumes full production as quickly as possible. This is where the services offered by a life-cycle partner can reduce production outages and minimize downtime costs.

**In the increasingly competitive business climate of today, the support of an experienced and dedicated life-cycle partner has become indispensable for metals producers to remain successful. Upgrades to modern technologies, replacement of obsolete plants, and the demand to reduce energy consumption and emissions – this is where the services offered by Siemens VAI can be decisive. Expert and reliable service not only helps producers get to the finish line, it supports them to be the winner of the race.**

**T**he globalization of business has led to a fundamental change in attitudes toward service. Until recently, customers called in service providers only when there was a difficult problem to be resolved or when specialized tasks had to be assigned to external suppliers. Now that same provider may be responsible for integrated plant-wide services as part of a performance-based contract with payment tied to results. Greater worldwide competition is prompting customers to make increased use of outsourcing service packages to further reduce costs. This is also becoming increasingly important in connection with plant modernizations, particularly to meet the continually growing demands placed on energy conservation and environmental protection.

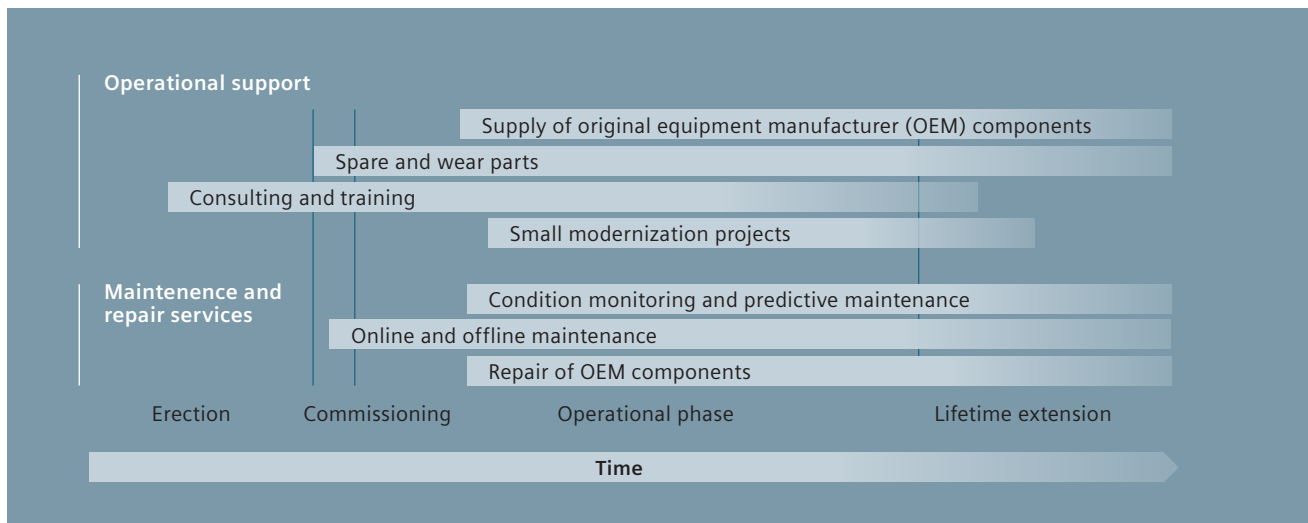
**Comprehensive service portfolio**

As a global partner to the metals industry, Siemens VAI provides solutions and services from a single source for the entire life cycle of plants in the steel and non-ferrous industries. Through the combination of process, mechanical, technological, electrical and automation expertise, comprehen-

sive and tailor-made services are available to maximize plant performance. Flexible service packages and solutions are available on short notice to meet the highest demands placed on product quality, plant reliability and optimized production processes.

Worldwide, Siemens VAI employs thousands of specialists with the experience and background to provide plant service in the most efficient and cost-effective manner. Customized upgrades for plant technology, equipment and systems are accompanied by round-the-clock support. As a leader in plant modernization and maintenance service, Siemens VAI offers a unique and complete range of services that includes:

- Consulting and training
- Technical assistance
- Operational support
- Condition monitoring
- Spare and wear parts supply
- Supply and repair of OEM parts
- On- and offline support

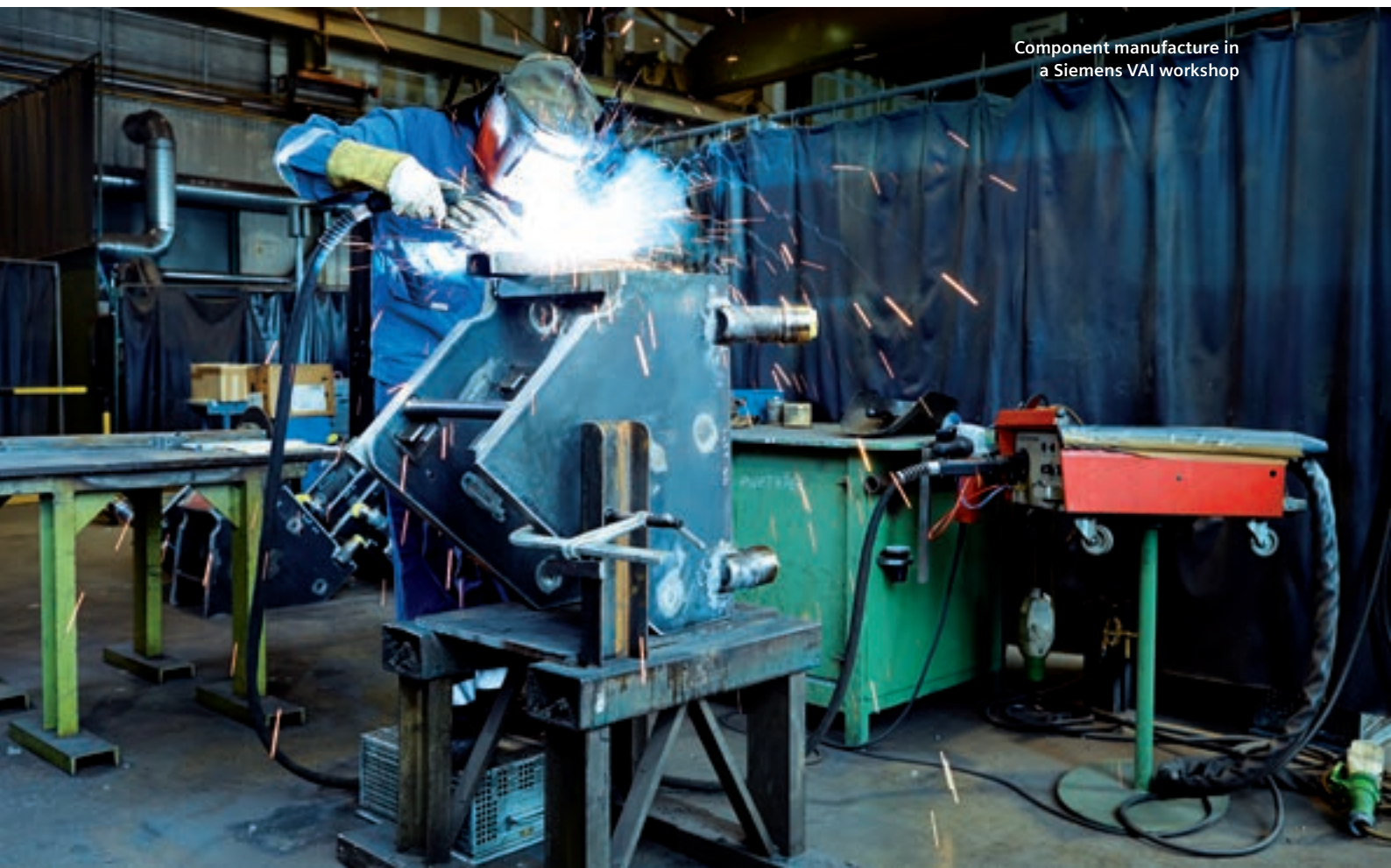


Comprehensive metallurgical services are available for every step of the life cycle of a plant





Professional consulting services



Component manufacture in a Siemens VAI workshop

## Greater worldwide competition is prompting customers to make increased use of outsourcing service packages to further reduce costs.



Service begins with in-depth customer interviews and on-site plant inspections. The customer's maintenance requirements are identified, followed by a customized maintenance strategy that covers processes, systems and overall maintenance organization. Rendered services may include equipment inspections, residual component-lifetime assessments, repair scheduling, modernizations, assembly and testing, spare-parts supply as well as on-site, off-site or on-call field service support. Service agreements can be structured for a specific period of time, or be based on long-term partnership contracts that feature flexible performance-based payment models.

### Consulting and training bring proven results

Changing market requirements and increasing competition are forcing producers to continuously evaluate, maintain and improve their sales position. In order to boost profitability, steelmakers have to elevate their product quality and plant performance as well as expand the scope of their product portfolio. In addition to optimizing operational processes, maintenance practices must be adapted as well. Siemens VAI advises customers on the latest industry standards, best practices and market trends. Consulting services include evaluations of the technological and economic performance of selected production steps and existing maintenance procedures, followed by recommendations for improvements.

### Technical assistance for greater plant efficiency

Whether a customer seeks improved product quality, higher production yields or greater operational flexibility, experts from Siemens VAI provide technical assistance to enhance the efficiency of plant equipment. Technical assistance also covers maintenance improvements to make the best use of a plant's existing capability. Advisory services during equipment and plant installation and start-up is provided for new facilities.

### Operational support to achieve benchmark performance

Siemens VAI advises customers about measures to increase a plant's availability and productivity, points out cost-saving possibilities, and proposes the solution steps required to implement the improvements. Extensive operational support is also offered, which is drawn from the experience gained from the implementation of thousands of plant and service projects covering every step of the iron and steel production chain – from ore beneficiation and agglomeration to the finished steel product. In this way, a plant operator can minimize operational risks and multiply the experience base of its workforce in a life-cycle partnership with Siemens VAI. This partnership offers permanent access to the worldwide expertise available from Siemens VAI with respect to plant maintenance and operational reliability.

Operational support is structured in three hierarchical levels. The first level is troubleshooting via a help desk. The second level is fault elimination through online support provided by remote access to a plant's automation system. The third level of support is the immediate dispatch of experts to the customer's site.

### Pit stop No. 2



The top speed of a Formula 1 racing car is about 350 km/h. However, that would be no match for a Morgan Vee No-Twist wire mill from Siemens VAI that is capable of sustained and reliable speeds of more than 430 km/h. This high rolling speed allows more than 150 tons of wire to be produced per hour. Plant modernization combined with operational support and expert service can push a plant's limits to well beyond its original design capacity.



Manufacture of cooling elements for an electric arc furnace, Siemens VAI workshop in Legelshurst, Germany



Refurbishment of copper-mold plates for a caster mold

**As a leader in plant modernization and maintenance service, Siemens VAI offers a unique and complete range of services.**



Precision assembly  
and repair work

### Condition monitoring puts a finger on a plant's pulse

Condition monitoring is the cornerstone discipline of most predictive maintenance programs and serves as the basis for many proactive maintenance decisions. Process and operation data are permanently monitored and deviations from targeted values are signaled. Siemens VAI works closely with customers to implement a wide range of condition-monitoring systems and solutions that include:

- Vibration-analysis services
- Plant equipment adjustments and alignment
- Machinery diagnostics
- Root-cause analyses
- Motor testing
- Oil analyses
- Infrared thermography
- Bearing failure analyses
- Mechanical lubrication audits

#### Pit stop No. 3



An average Formula 1 car is equipped with 150 sensors that wirelessly transfer data 1,000 times per second during a race to be analyzed by a supercomputer operated by the team engineers. Blast furnaces equipped with the Simetal Blast Furnace Process Optimization System feature the installation of more than 1,000 sensors and probes that constantly measure the burden temperature, pressure and other process parameters. The data is transmitted to an expert system where it is evaluated and, when required, corrective actions are automatically initiated to ensure smooth and consistent operation of the blast furnace.

### Lowering the cost of ownership of spare and wear parts

Having spare and wear parts available is extremely important to plant operators, yet storing a complete inventory of spare parts can be an expensive undertaking for a single plant. Through its global production sites and procurement network, Siemens VAI rapidly and reliably supplies the right parts to any site anywhere in the world. Through this approach, customers achieve notable cost savings by avoiding downtime to source, procure and store spare parts.

#### Pit stop No. 4



A Formula 1 car has an official minimum weight of 691 kg and typically contains 80,000 parts. A single rolling mill can weigh more than 1,000 tons and is comprised of hundreds of thousands of components. In-depth knowledge of the condition of the various parts and how they interact with each other is essential to ensure their timely maintenance, repair and reinstallation to maximize their useful lifetime and minimize plant downtime. Proper servicing of complex metallurgical plants is only possible with the support of highly experienced and dedicated service specialists.

For operators who wish to keep their stock of spares near the plant site, Siemens VAI can provide consignment storage. When new equipment is installed, the equipment supplier usually provides an initial stock of spare parts as part of the original contract. Replacement spares for older equipment can then be contractually supplied according to a defined maintenance schedule, and emergency spare parts can be immediately delivered in the event of equipment breakdown or accidental damage. In all cases, Siemens VAI provides genuine, original and high-quality replacement parts.

### Supply and repair of OEM parts

Key equipment items and specialized components that are crucial for ensuring peak plant performance are manufactured in Siemens VAI-owned workshop facilities. The original equipment manufacturer (OEM) parts are the product of many years of coordinated efforts and experience in engineering, design, manufacturing, plant operation and maintenance activities. The reliability of these parts is ensured by thorough in-house testing and continual improvements. They typically feature "plug-and-play" capability for fast installation, which contributes to increased plant uptime and faster start-ups. As part of a service contract, Siemens VAI can repair and refurbish demanding OEM components, examples of which include continuous casting oscillators, hydraulic automatic gauge control (HAGC) cylinders, chocks and bearings, Morgoil bearings, coiler mandrels and hydraulic blocks. Siemens VAI also has extensive experience in overhauling and upgrading components installed by third-party suppliers.

#### Main benefits

- Improved reliability of critical components through exhaustive in-house testing
- Enhanced product quality with fewer product downgrades
- Higher product yield due to tighter tolerances of production equipment
- Increased uptime, higher productivity
- Reduced maintenance costs due to longer component usage and longer repair intervals
- Extended component lifetime

#### Pit stop No. 5



An indestructible form of carbon fiber is used in Formula 1 brake discs. When the driver hits the brakes, the discs can reach temperatures higher than 1,200°C. (Low-carbon steel already starts to melt at temperatures of just over 1,400°C.) The combination of superb-quality materials and highly specialized manufacturing techniques is a prerequisite for the use of components for critical applications. This is true both for both top-of-the-line racing cars and metallurgical plants.

### Online and offline maintenance

All moving parts in a metallurgical plant have a limited lifetime due to wear, corrosion and fatigue. The plant operator can minimize the occurrence of breakdowns and unplanned stoppages with proper maintenance. Taking a plant out of ser-



Equipment replacement work – the harsh reality of getting the job done



Vibration analysis as part of condition-monitoring services

vice to exchange parts more frequently than necessary is wasteful. Waiting too long before exchanging parts incurs a greater risk of a component breakdown that may lead to unscheduled plant shutdowns. Running a maintenance program effectively thus requires careful planning, experience and in-depth maintenance know-how.

On the basis of its plant-building experience, operational know-how and spare-parts supply capability, Siemens VAI provides complete online and offline maintenance programs for any given plant at the lowest possible cost to the customer. A key factor for success is working according to a documented unit-exchange practice such as CMMS (computerized maintenance management system). A broad spectrum of activities is performed that covers routine unit changes, turnaround and repair programs, specialized component repair, and professional refurbishment of reusable parts. Furthermore, Siemens VAI improves components subject to excessive maintenance through functional enhancements and increased serviceability. All activities benefit from a global supply chain and logistics management system.

#### Main benefits

- Shifting of fixed maintenance costs to variable maintenance costs
- Optimized service intervals
- Reduced inventory and assets
- Global access to spares and components

#### On your mark, get set, go for service

As a longstanding partner to the metals industry for more than 100 years, Siemens VAI has at its disposal a vast treasure of know-how acquired from the engineering, supply, start-up and commissioning of every type of metallurgical plant. This also includes 35 years of experience in executing service contracts, also under performance-based long-term partnership agreements. With some 250 locations in 190 countries, Siemens VAI has the global reach to provide logistical and technological services whenever and wherever required to maximize equipment availability, plant productivity and customer success.

Ludwig Reiter, Vice President of Metallurgical Services – Maintenance and Repair  
Dr. Lawrence Gould, Metals Magazine Editor

## Finish line

### Siemens PLM software used to design winning Formula 1 racing car

The use of Siemens PLM software by more than 100 engineers of the Infiniti Red Bull Racing team has been decisive for the new design of the 2013 world champion racing car driven by Sebastian Vettel. This is his fourth Formula 1 world title won in a row since 2010, which has set a historic record.

The cooperation between Infiniti Red Bull Racing and Siemens was established in 2005, and it has been a success story ever since. The Siemens software allows Infiniti Red Bull Racing engineers to design new car components, test them in the virtual domain, and initiate their production and installation with a mouse click in record time.

"The Siemens partnership is critical for us because it's an integral part of our design process. Through our relationship with Siemens we've come to rely on their critical tools to generate creative design solutions, thus ensuring that we field the best grand prix cars we possibly can. In no small part Siemens has been a key contributor to our success in recent years and to the eight world championships we have achieved," states Christian Horner, Team Principal, Infiniti Red Bull Racing.

Helping Infiniti Red Bull Racing win the fourth consecutive title in a truly impressive fashion has once again demonstrated the high quality, consistency and reliability of Siemens PLM software technologies. Watch the webisode on the background behind this amazing accomplishment.





Customer satisfaction  
guaranteed

Make your plant a winner –  
with life-cycle service from Siemens VAI

**A world-class  
machine, combined  
with superb opera-  
tional expertise,  
and backed by a  
top-notch service  
team is the No. 1  
Formula for success.**





# Demonstrated Capabilities of a Service Life-cycle Partner

Whether for a maintenance contract, modernization, training or the supply of spare parts, the service portfolio at Siemens VAI includes everything needed to keep a plant running at optimum performance levels over its entire life cycle. The following examples from across the world demonstrate the range and capabilities of service from Siemens VAI. In each case, the customer benefits from decades of expertise and metallurgical know-how.



Expert maintenance services extend the lifetime of plant components





*Decades of experience combined with customized services and proven maintenance solutions reduce costs, increase a plant's productivity and service life, and improve product quality and operational safety.*

**ArcelorMittal Esch-Belval, Luxembourg**  
**Major EAF modernization leads to a host of benefits**

In the autumn of 2012, Siemens VAI supplied a new EAF bottom shell equipped with a fin-type anode system, a lifting table for fast anode changes, and a new electric arc furnace (EAF) tilting platform to the ArcelorMittal Esch-Belval steelworks in Luxembourg. The optimized geometry of the furnace allowed the tapping weight to be increased from 157 tons to 162 tons. The modernization shortened tap-to-tap times, extended the service life of the anode, increased availability and lowered maintenance costs. Overall production capacity was increased by more than 10% and conversion costs were lowered. Siemens VAI also dismantled the old equipment and installed and commissioned the new components. The upgraded EAF successfully resumed operation in 2013. (Figure 1)

**Tata Steel Ltd., India**  
**Automatic gas-coupling system revamp**

In response to the request for a quick, safe and maintenance-friendly connection device for the stirring-gas supply to the steel ladle, Siemens VAI engineers installed an automatic gas-coupling system at Tata's LD1 steel mill in 2012 and 2013. The system is working perfectly and fully meets the customer's high demands placed on personnel safety.

**Novolipetsk Steel OJSC (NLMK), Russia**  
**Major spare-parts contracts for dedusting facilities**

In 2010, NLMK signed a contract with Siemens VAI for the supply of a 1,250-piece spares package for the primary and secondary dedusting systems of the LD1 plant that had been originally supplied by Siemens VAI. This was followed one year later with a second contract for a 2,000-piece spares package for the LD2 plant dedusting facilities. Both spares packages are for a period of two operation years. (Figure 2)

**Gerdau Açominas Ouro Branco, Brazil**  
**Maintenance of continuous casting machines**

Under a five-year contract, Siemens VAI is responsible for the overall maintenance of one 2-strand slab caster, one 4-strand bloom caster and one 6-strand billet caster. The contract scope of supply embraces disassembly and assembly of molds and caster segments, refurbishment of rollers, renewal and nickel plating of mold-copper plates as well as delivery and stocking of spare parts. Compensation is according to a cost-per-ton payment model.

**Hyundai Steel Company, South Korea**  
**Training for slab caster maintenance**

In 2006, Hyundai Steel Company had placed an order with Siemens VAI for the supply of a continuous slab caster. The



Fig. 1: Reduced EAF conversion costs and 10% capacity increase at the ArcelorMittal Esch-Belval electric steelworks, Luxembourg

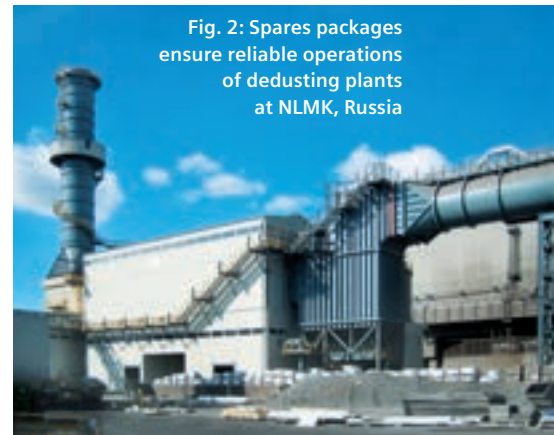


Fig. 2: Spares packages ensure reliable operations of dedusting plants at NLMK, Russia



Fig. 3: Expert maintenance services performed at Nucor Steel during the past 24 years

## ***A contractual partnership for maintenance that has lasted for 24 years is proof of the outstanding services performed by Siemens VAI.***



Fig. 4: Supply of mechanical, electrical and automation spare parts for the Arvedi ESP plant of Acciaieria Arvedi, Italy

agreement also included training of Hyundai's maintenance personnel. Theoretical and practical training was performed at a Siemens VAI workshop at Companhia Siderúrgica Nacional (CSN) and at production sites in Brazil belonging to CSN and Usiminas.

### **Nucor Steel Ltd., U.S.A.**

#### **Total caster maintenance since 1990**

A contractual partnership for the maintenance of Nucor Steel's continuous slab casting machine that has lasted for 24 years is proof of the outstanding services performed by the Siemens VAI maintenance facility in Blytheville, Arkansas. Since 1990, around 140 employees have reliably serviced Nucor's caster segments, rolls and molds. (Figure 3)

### **Acciaieria Arvedi SpA, Italy**

#### **Supply of 1,750 spares within 15 months**

The reliable supply of spare parts is essential for the smooth operation of a steel plant. In March 2010, Siemens VAI signed a contract for the supply of mechanical, electrical and automation spare parts for the Arvedi ESP (endless strip production) plant of Acciaieria Arvedi (Figure 4). Following the conclusion of the successful service agreement with Arvedi, a number of subsequent service contracts were signed to continue this mutually beneficial life-cycle partnership.

### **Flat-steel producer, China**

#### **Morgoil KLX bearings chosen for new Arvedi ESP plants**

Morgoil KLX bearings will be installed in the hot-strip mills of two Arvedi ESP lines currently under construction at the steelworks of a Chinese steel producer. These mill types were chosen by the customer because of their industry-recognized capabilities, reliability, accuracy and high level of service support available worldwide. Metallurgical Services Vice President Gabriel Royo commented "The KLX bearings were specially designed for this groundbreaking flat-rolling facility. We have re-engineered the lubrication systems to increase the already impressive dependability of Morgoil

bearings. The choice of Morgoil bearings will further reduce the manpower and maintenance requirements of the new ESP mills compared to other roller bearings for the same application, meaning additional operational cost savings for these mills."

All Morgoil bearings are engineered, designed and built by the Morgoil Bearing Division of the Metallurgical Services Group of Siemens VAI.

### **ArcelorMittal Temirtau, Kazakhstan**

#### **Service support improves mill performance**

In January 2013, Siemens VAI Service, Italy (MSS ITA) received a service contract from ArcelorMittal Temirtau (AMT) in Kazakhstan with the target to increase the output of a Siemens VAI long rolling mill supplied in 2009 to its nominal capacity, and to expand the product mix to meet the local market needs. Electric and automation services were also provided as part of a separate service agreement concluded with Siemens Yekaterinburg (Russia). Thanks to the expertise, support and maintenance services provided by MSS ITA and Siemens Yekaterinburg, the mill is now capable of rolling 330,000 tons of small profiles (angles and flats) and rebars per month. Equipment lifetime could also be extended considerably.

MSS ITA additionally received contracts for the supply of original manufacturer parts (OMP), spare parts and tungsten carbide rolls that will allow AMT to produce tri-slit rebars with diameters of 10 mm, considerably reducing production stoppages for groove changes.

#### **Proven maintenance solutions backed by experience**

Siemens VAI Metallurgical Services is dedicated to the success of its customers. Decades of experience combined with customized services and proven maintenance solutions reduce costs, increase a plant's productivity and service life, and improve product quality and operational safety.

Tanja Dobesberger, Global Marketing Manager for Metallurgical Services  
Dr. Lawrence Gould, Managing Editor of Metals Magazine

**Plant performance and competitiveness improves dramatically with expert services**

# Service Makes the Difference

Mikael Leksell is the new head of the Business Segment Metallurgical Services at Siemens VAI. In an interview with Metals Magazine editor Dr. Lawrence Gould, he outlined his understanding of service and the approach that he intends to apply to enhance the quality of services for metals producers.



Mikael Leksell (right) discusses how customers can profit from the services offered by a life-cycle partner

**What does service stand for at Siemens VAI?**

**Mikael Leksell:** Service is an integral part of our business model and it is in our DNA. Without a service mindset and a comprehensive service portfolio, Siemens VAI would not have acquired the recognition it has today in the metals market. In end effect, it boils down to increasing the competitiveness of our customers. At first by providing leading technology, and then during the life cycle of metallurgical plants to ensure maximum availability, productivity and product quality while meeting ever-increasing environmental regulations.

**How do you intend to further expand and enrich the scope of services offered to customers?**

**Leksell:** First of all, we will continue to be the leading partner for our customers during the entire lifetime of their plants, providing a complete service portfolio and tailor-made services oriented to their specific needs and requirements. Our global footprint combined with a network of service experts makes us the service partner of choice. Additionally, we will continue to increase our condition monitoring and predictive maintenance services. Here, Siemens VAI is in a unique position in that we can combine our process know-how, engineering and plant-building capabilities with our maintenance expertise and technology platforms. We are able to offer the right services at the right time, thereby avoiding unnecessary downtime, premature replacement of parts, unscheduled shutdowns and additional costs.

**What do you see as the main benefits for producers?**

**Leksell:** First of all, we are a global company acting in local markets close to our customers. This makes us faster and more cost efficient. At the end of the day, the service business is predominantly a local business. Furthermore, we at Siemens VAI are able to supply the complete process chain from iron- and steelmaking to rolling and processing, as we continue to evolve in the direction of a life-cycle partner for operations and maintenance services.

We offer a comprehensive service portfolio tailored to customer needs that ranges from the initial supply and manufacturing of spares, repairs, modernization and upgrades to on- and offline maintenance. Know-how and technology allow us to provide services in areas such as condition monitoring and mechatronics, making it possible to do predictive maintenance and optimize the total cost of ownership for our customers.

**How important is service for winning plant contracts?**

**Leksell:** Very important! Our customers want maximum output from their investment. This can only be achieved by providing the basis for reliable operations where the equipment generates maximum performance. The key is managing the whole chain, from knowledge transfer during start-up, supplying the critical spare parts, and offering a tailored service solution for the life cycle of a plant already during the project negotiation phase. A supplier's capability to support the customer throughout the life cycle of a plant is a decisive factor for winning plant contracts.

**What do metals customers expect today in terms of total service support?**

**Leksell:** In general, our customers are highly competent in what they do, and they expect the same from their partners. They want a proactive approach where we must foresee and meet their demands anywhere in the world, which is what top-of-the-line expert services are all about.

**How do you see the future development of the service business in the metals industry?**

**Leksell:** In such a well-established market, service and maintenance will become increasingly important for our customers and also for us. How producers maintain and continuously improve their plants is decisive to remain competitive. And this is where the experience of Siemens VAI makes a big difference.

*Our customers are highly competent in what they do, and they expect the same from their partners.*



## Strategically located maintenance facilities optimize customer service in North America

# On Site and On Demand

Siemens VAI has been providing maintenance services to metals customers in North America for nearly 30 years covering the entire spectrum of services designed to optimize plant utilization. Eleven maintenance and manufacturing facilities are strategically located in key metal-producing regions in North America – ten in the U.S. and one in Mexico – ensuring that Siemens VAI specialists are near to the customer where they can best meet their specific needs (Figure 1).

**W**ith workshops on or near its customers' plants, Siemens VAI can provide full support from the moment a mill is commissioned. In Columbus, Mississippi, for example, Siemens VAI has a mechanical maintenance facility based within the Severstal Columbus plant (Figure 2). As Severstal's production and equipment maintenance needs grow, the services offered by Siemens VAI can expand accordingly.

### Immediate response with specialized services

These strategic locations not only support operations at nearby customer facilities, but also reduce most material-handling costs and eliminate transit times typical of many offline maintenance approaches. In addition, on-site locations allow an immediate response to operating emergencies, enable more frequent preventive maintenance tasks, and create an effective exchange of critical information that helps to optimize overall maintenance services.

Each Siemens VAI facility focuses on its own core value-added services, which may include mold copper coatings, roll manufacturing and reconditioning; top zone, bender and segment refurbishment; EAF water-cooled components; and

material-handling equipment. Currently, Siemens VAI is the No. 1 market shareholder for high-hardness copper coatings in North America, and it is a leader in the caster roll reconditioning market.

### Tougher rolls last longer

Siemens VAI is dedicated to making improvements that will enhance the life cycle of mill equipment. In 2005, for example, the idler rolls in the strand-guide system of a third-party-supplied, 4-strand beam-blank caster were experiencing excessive wear at Steel Dynamics Inc. (SDI) in Columbia City. Siemens VAI professionals initiated roll trials and began with the conversion of the carbon-steel base material of all caster rolls to the more durable 17-4PH stainless steel material. Before conversion, the average service life of the rolls was 125,000 tons. Trial analyses found that the maximum recordable wear at this tonnage was approximately 0.006 inches (0.15 mm) – this was the determining factor to convert the rolls. The conversion to 17-4PH resulted in the extension of the lifespan of the rolls by a factor of three to four. Currently, there are rolls in the caster that are still usable after the casting of nearly 340,000 tons of steel.

**Fig. 1: North American maintenance centers and sites of Siemens VAI**

- Headquarters of Siemens USA
- Siemens VAI service headquarters
- Maintenance center and/or workshop hub catering to numerous customers
- Maintenance site located at or near customer plants



***Siemens VAI is the No. 1 market shareholder for high-hardness copper coatings in North America, and it is a leader in the caster roll reconditioning market.***

**Fig. 2: Siemens VAI Columbus employees set roll heights on a caster segment**



*The Hiper Coat process reduced wear and stock loss during machining, which equaled a **600%** increase in the total service life of the copper mold.*

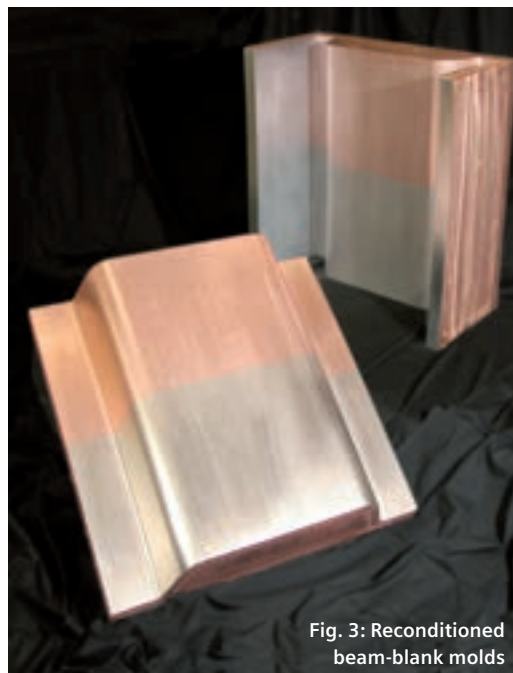


Fig. 3: Reconditioned beam-blank molds

The service program is still in place and skim machining of used 17-4PH rolls is performed – which was never possible with the original equipment manufacturer (OEM) components. As a result of the success of the stainless steel rolls on the beam-blank caster, the customer is now considering using 17-4PH rolls on its billet/bloom caster.

#### Increased mold campaign life

Siemens VAI experts also successfully assisted SDI in Columbia City to increase the mold campaign life of the beam-blank caster by switching from standard nickel sulfamate plating to Siemens VAI Hiper Coat plating. Prior to the conversion, the average mold life was approximately 80,000 tons of cast steel. With Hiper Coat plating the average mold life now exceeds 135,000 tons. More importantly, the product quality is much higher due to fewer defects that arise with the use of Hiper Coat plating. The plating also reduced mold wear and stock loss during machining, which equaled a 600% increase in the total service life of the copper mold (Figure 3).

#### Reducing customer costs

Siemens VAI employees are not only professionals for their own equipment, they are also trusted specialists and experts for competitor equipment. Enhancing equipment longevity and performance remains the goal of every service job, whether equipment was supplied by Siemens VAI or by third parties. The Siemens VAI domestic manufacturing capability significantly reduces customer costs, particularly for electric arc

furnace components and material-handling equipment. What also distinguishes Siemens VAI from the competition is the lower transportation costs and faster customer-response times.

#### On-call support worldwide

With a global supply chain, Siemens VAI is able to maintain supplier relationships and partnerships that allow for global sourcing in addition to domestic supply. This global approach ensures that purchases are timely and efficient, and it provides the flexibility to meet the cost budgets of customers. With strong ties to the Siemens centers of competence for leading-edge engineering and metals technology development, Siemens VAI service operations also have the capacity to provide problem solving, technology enhancement and plant modernizations.

The Siemens VAI maintenance support model combines facilities specializing in specific component refurbishment, which are strategically located at site-specific facilities, with global procurement resources. This simplifies a contract that addresses customer needs and allows service demands to be better forecast. Whether the customer wants to align its service contract with the production output or with investments related to a specific menu of equipment units – or a combination of both – the Siemens VAI service model offers considerable flexibility.

Joe Didwall, Director of Operations



Services are now even closer to customers

# Speed and Location Drive Success

When critical rolling mill equipment no longer performs at acceptable levels, or fails altogether, operators want the problem resolved immediately. Speed and location are critical success factors in the service business. Thanks to the recent acquisition of Service Guide, Inc. in Cortland, Ohio, service is now even closer for customers.



From a customer's perspective, the closer the better. Any downtime costs money, and servicing rolling mill equipment requires special expertise. Service Guide, Inc. (SGI) has been a leading industrial maintenance service shop for steel and aluminum mills and mines since 1964. With a portfolio that complements existing Siemens VAI capabilities, SGI manufactures and repairs a wide variety of spare parts and components, including back-up and work-roll chocks, roller bearings, spindles, couplings, roll-force cylinders, bearings, mill rolls, copper rolls, guides and liners.

"We saw an opportunity to locate in our customers' backyard by acquiring a company with the reputation of the highest-quality products and services," explains Gabriel Royo, Vice President of Metallurgical Services at Siemens Industry in the United States. "Combining the portfolios of SGI and Siemens VAI allows us to provide a more complete spectrum of service products for steel and aluminum mill customers, and to offer a single source for components and equipment services."

Close proximity to the customers means faster turnaround and lower overall costs. SGI has three facilities that are ten kilometers (six miles) apart in Cortland and Warren in northeast Ohio – a region where many Siemens VAI customers are concentrated. Altogether, the acquisition brings manufacturing capacity covering an area of more than five soccer fields, a large storage facility for critical spare parts, a dedicated fleet of trucks, and more than 100 experienced employees. "Now we have the technology and expertise to

help our local customers with much more of their mill than we could before," says Steven Bedard, General Manager at the Ohio location.

## Joining a global network

The new facilities in Cortland and Warren serve as a Siemens hub for combined chock and roller bearing maintenance programs for both flat and long rolling mills in North America. In addition, the hub offers repairs and refurbishing for rolling mill spindles and couplings. Operations in Worcester, Massachusetts, continue to focus on Morgoil oil film bearings and hydraulic automated gauge control (HAGC) components for hot-strip and cold-rolling mills. Steelmaking and EAF furnaces are covered by further locations in Mexico and the United States. Seven U.S. service facilities focus on caster maintenance activities covering the country's northern and southern regions. The Service Guide addition to Siemens VAI brings the total number of U.S. service locations to ten, all strategically located close to the customer base.

These expanded North American facilities join a global network to serve customers on several continents, including locations in Austria, Brazil, China, France, India, Italy and the United Kingdom. "The SGI acquisition strengthens the expansion of Siemens VAI's global mechanical service portfolio so that we can meet the needs of customers wherever they are," concludes Royo.

Allison Chisolm, Metals Magazine editor



Hot-strip mill, ArcelorMittal Poland, Kraków

Life-cycle service for the world's leading oil film bearing

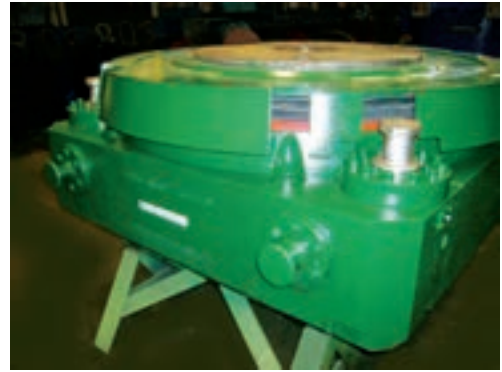
# Premier Service for Premier Morgoil Bearings

Since the early 1930s, the Morgoil bearing has been the premier oil film bearing used in rolling mills. Today, there are 1,700 hot and cold mills operating around the world that use Morgoil bearings. These extend from old bar mills up to new mills being started up in the United States and China, for both ferrous and non-ferrous mills of all sizes. Most of these mills are serviced by Siemens VAI with its multiple service locations and experts worldwide.

***“Restoring a mill’s bearings to their original tolerances can generate enormous savings.”***



HAGC cylinder: before ...



... and after reconditioning services

Since it first entered the market, Morgoil has been developing new technology and finding better solutions for customers worldwide. The last 30 years alone have seen a number of innovations to improve performance. In the 1980s, for example, Morgoil developed KL (keyless) sleeve technology to improve bearing performance in rolling precision products and DF (dry mill) sealing technology to reduce oil leakage. In the late 1990s, Morgoil invested in the world’s only backup oil film bearing testing facility. Through the use of this facility and the design data generated, Morgoil then developed the KLX bearing, which notably increased the bearing load capacity by 25% to 30% when compared with similar-size older-generation bearings. KLX bearings of the latest generation installed in a mid-sized rolling mill must withstand rolling forces of 3,000 tons to 4,000 tons. A large plate mill could exert even 12,000 tons of rolling force. By comparison, a Boeing 747 exerts just 200 tons of thrusting force before takeoff.

#### Fast and efficient response

Because Morgoil bearings operate in such extreme conditions, full-service, on-demand support is provided for all Morgoil products through a global team of field-service personnel stationed around the world. Siemens VAI field-service engineers are expertly trained to provide fast and efficient response to resolve customer problems, and always keep in mind the global mission to maximize mill utilization. The use of original spare parts, proven technology and dedicated service engineers ensures the lowest cost of ownership for any rolling mill customer.

Morgoil service personnel perform routine inspection of bearings and related equipment, in addition to mill-equipment monitoring for preventive maintenance. These inspections can help to identify any issue that could have an impact on mill performance. Bearings can reveal the effects of other faulty mill equipment, so regular bearing inspections can improve mill uptime. Additionally, service representatives conduct regular training to keep mill personnel abreast of proper maintenance and operation practices, as well as of the latest improvements in techniques and equipment that can help improve mill efficiency. Service representatives can also audit all mill equipment, not just the

bearings, to assist mill operators in maximizing uptime and minimizing equipment failure.

#### Extension of service life

Once it has been determined that mill equipment has worn past acceptable limits, reconditioning services can be provided to breathe new life into used Morgoil equipment. These services can range from simple disassembly and inspection to total rebuild of chocks or other equipment.

Bearings and mill equipment in need of repair can be sent to Morgoil manufacturing service centers around the world. No matter when the bearings were manufactured, experts in each of those locations can look up reference drawings that go all the way back to the original designs. Restoring a mill’s bearings to their original tolerances can generate enormous savings compared to outright replacement of equipment, and mill life can be extended for another decade or more.

Morgoil also reconditions other flat-mill equipment, including hydraulic automatic gauge control (HAGC) cylinders, work-roll chocks, back-up chocks, shifting blocks, bending blocks, downcoiler mandrels and high-capacity universal drives. HAGC service centers are located in North America, China and India. These facilities feature sophisticated test stands that can measure friction in a cylinder to within 1% of original equipment tolerances.

#### Proven technology, expert support, outstanding reputation

Comprehensive service support can be provided quickly and efficiently for all Morgoil products, whether for the initial installation of Morgoil equipment, routine inspections and troubleshooting, personnel training, equipment reconditioning, spare-parts supply, or preventive and predictive maintenance, condition monitoring, mill up-grades and more. Service specialists are stationed around the world to provide a fast and efficient response to all customer requirements. The proven reliability and reputation of Morgoil bearings and the accompanying services is the reason why this bearing continues as the solution of choice for rolling mills of all types.

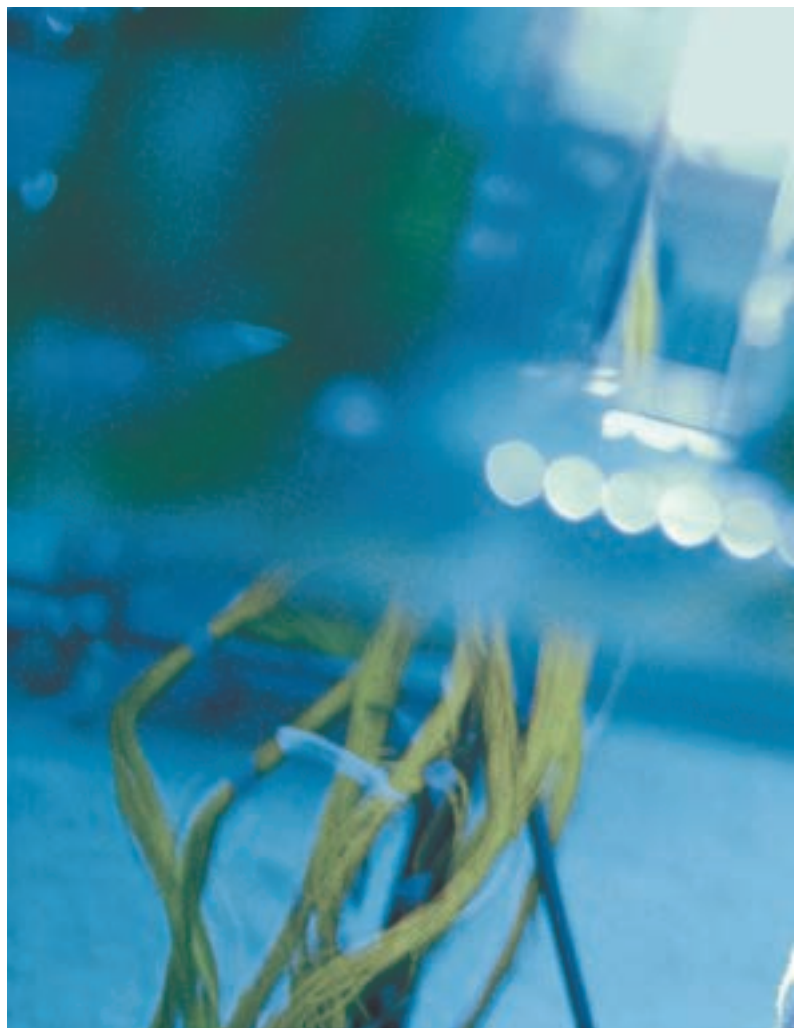
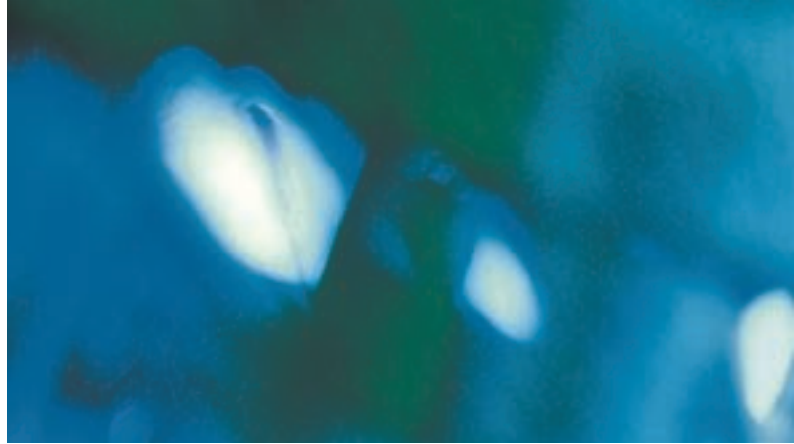
Gabriel Royo, Vice President Metallurgical Services

Electrics and automation expertise helps keep plants running at peak performance

# Fit for E&A Life-cycle Services in Metals

Over the course of a plant's lifetime, life-cycle costs can be many times higher than the initial investment. When so much money is at stake, it's worth going with a trusted partner. With their extensive knowledge of the metals manufacturing route, Siemens VAI engineers have the background and experience to keep plants running smoothly and reliably.

**W**hen drive systems, process-automation systems or technological closed-loop controls fail, operators are forced to shut a plant down. Depending on what is being manufactured, the costs for unplanned shutdowns like this can quickly cost several hundred thousand euros – and even up to sums that can total in the millions. So when the drive system stopped functioning properly at an aluminum rolling mill in Germany, the atmosphere was understandably tense.





*Unplanned shutdowns can quickly cost several hundred thousand euros – and even up to sums that can total in the millions.*

## Technical Support

- Metals Service & Support Center (MSC)
- Standardized tracking system
- Service manager with metals knowledge
- Remote support
- Emergency assistance



## Field Services

- On-site fault elimination for all kinds of metals products and solutions
- Support for regional projects (engineering, commissioning)
- Preventive maintenance packages (health checks)



## Integral Maintenance Solutions

- Analysis of customer maintenance processes
- Implementation maintenance and management systematic
- Computerized maintenance management system (CMMS) implementation
- Maintenance outsourcing



## Migrations and Modernizations

- Retrofits for drive systems
- Automation upgrades (S5→S7)
- Migration of Siroll and SiiX Level 2 systems to a virtualized environment
- Concepts, engineering, commissioning



## Training

- Classroom training and on-the-job training according to customer needs
- Technical and technology knowledge management



# Core elements of the Siemens VAI service portfolio

## Spares and Components

- Spare parts
- Initial spares
- Emergency spares
- Replacements and substitutions
- Asset optimization service



## Service Contracts

- Help-desk support
- Remote diagnosis
- On-site fault elimination
- 24/7 service lines
- Preventive maintenance packages (health checks) for different plant products and solutions



## Repair Services

- Inspection of damper bars
- Rotor check with special tools
- Converter on-site repair
- Bearing wear control



## Consulting/Engineering

- Feasibility studies
- Application engineering
- Tailored solutions for service/maintenance
- Investigation of potential for optimization



Fortunately, the customer had a contract with Siemens VAI for technical support, and the engineer on duty called the Metals Service & Support Center (MSC) right away. Thanks to assistance from the company engineers, the plant was back up and running within an hour and a half.

The Siemens VAI team was able to quickly identify and repair the problem, since life-cycle services is more than troubleshooting and emergency repairs. Siemens VAI combines corrective and preventive elements to assess the current status of the installed system, solution or even the entire plant at any time. Professional life-cycle service is about doing everything possible to avoid unplanned shut-downs. The focus is on the entire plant life cycle.

### Partner from the beginning

In an ideal case, after the Final Acceptance Certificate (FAC) is issued by the customer and the product or solution goes into regular service, Siemens VAI commences with life-cycle support in the framework of a service contract. A wide spectrum of services are available, ranging from corrective service with guaranteed response times, to planned services with on-site health checks, and all the way to taking over the plant maintenance for technological plant units. Further support options include remote service, remote data analysis with off-site health checks, changes, add-ons and modernizations, as well as support for software updates and upgrades, plus additional training. The goal of all contracts is to work in close cooperation with customers, helping them to achieve a competitive edge. Operators always want to get more out of their plants – to go higher and faster, and to simply be better. The Siemens VAI global service network provides the right answers to achieve these goals.

An important element of life-cycle support is the Metals Service & Support Center (MSC), which serves as a clearly defined access point for customers. It can be reached via e-mail and fax, and also by using a 24/7 on-call service line that is open exclusively for customers with service agreements. The help desk is staffed by experienced personnel from the engineering and commissioning departments. The specialists make sure that all queries are understood correctly, and that solutions are found without delay. In the example mentioned above, the help desk was the first

point of contact when the drive system failed – and the staff on duty quickly found a solution.

The Product Lifecycle Services organization is only as strong as the regional service engineers – the most important element within the global service network. Local Siemens VAI staff members have excellent knowledge of the different installed systems, solutions and components, which they use to provide extensive support for customer installations on location. To ensure that their know-how is always up to date, training sessions are held regularly in the different regions.

***Within the last three years, Siemens VAI has migrated more than thirty computers and servers worldwide.***

### Access from afar

Another core strength of the Product Lifecycle Services organization at Siemens VAI is remote access. The evolution of the Internet with assured transmission bandwidths and reliable security precautions offers new possibilities with remote service, which has become an indispensable tool for many service applications. Remote service helps to quickly establish contact with the customer's plant, wherever it may be in the world. Using the gathered information, the engineers in the back office can determine the further course of action, and even solve problems remotely. The remote support session can only be initiated by the customer. Thus, the customer can be sure that Siemens VAI personnel cannot "visit" the installation without permission. The customer has complete control over the remote service session at all

## Training with the customer in mind

A global life-cycle service training program is in place to prepare employees to even better meet service demands. So far, the training has been held in almost a dozen countries, including India, the Netherlands, Saudi Arabia, Spain and the United Arab Emirates. A whole range of topics are covered in the training, for example achieving cost control through tailor-made services, or developing specific system upgrades, modernization and migration solutions for automation and drive systems.

In particular, the life-cycle training takes a deep dive into the service portfolio and the approach adapted for the region in question. Attention is also put on establishing the right infrastructure and seamlessly integrating the local Product Lifecycle Services organization in capital projects from the beginning. The classroom sessions are complemented by customer visits to put the newly acquired knowledge into practice. This involves inspecting plants, discussing specific service requirements with the customer, and developing dedicated service solutions.

All the employees who have participated so far have rated the training very positively. The participants greatly appreciate the opportunity to gain detailed insights into a number of service solutions, thus allowing them to offer service solutions that are tailored even more closely to customer requirements.

times; not just because only the customer alone can initiate such a session, but because all activities are logged.

A further mark of quality is a dedicated service manager for all capital projects. Right from the beginning, service managers are part of every capital investment project. They gain knowledge of the project content, realize service pre-conditions, and take up contact with the customer regarding life-cycle solutions of their plant. Furthermore, the service managers take on the following duties for customers with service agreements: they hold responsibility for meeting all contractual obligations and the associated underlying conditions; they ensure the quality of the services provided; they serve as direct contacts for service agreement customers in the case of an escalation; and they continuously keep their customers informed about new service solutions to further optimize plant performance.

### Planning the future

An additional life-cycle issue is the availability of solutions, systems as well as single components. Industrial plants contain heterogeneous electrical and automation environments with a virtually incalculable number of individual systems. This is why customers are often unaware how difficult it is to obtain a replacement assembly – if at all – until it fails. The result can be

serious plant availability problems or deteriorations in product quality. To prevent such situations, Siemens VAI is in a position to provide obsolescence management. To start with, an analysis is carried out to establish which systems and components are to be monitored. Using this analysis, the life cycles of these assemblies, systems, components or key software products are subject to regular appraisals. Depending on a system's proximity to its end-of-lifetime date, the situation is discussed with the customer at an early stage, offering an opportunity to decide whether to acquire remaining stocks, or to initiate a migration or even a modernization to successor assemblies right away.

Migrations and modernizations like these are part of life-cycle services for the metals industry that the service organization is increasingly concentrating on. An example of where this type of support is particularly useful is with computer systems. While a plant is designed to operate for 15 years and longer, it isn't sensible or even possible to run originally installed computer technology that long – especially taking the fast development cycles in computing into consideration. In particular with the migration of existing process-automation systems (Level 2 systems) to virtualized environments, a familiar system can be operated on a modern hardware platform. Within the last three years, Siemens VAI has migrated more than 30 computers and servers worldwide.

### The right combination

To successfully provide services, three things that are very important for the customer, namely the time zone, that the service personnel speaks the local language and an understanding for the local culture. Thanks to a global service network combined with remote access and strong back office support, Siemens VAI fulfills these three areas.

This setup that blends the best of the global and the local capabilities convinced companies like Turkish steel-maker İskenderun Iron & Steel Works Co. to conclude a service contract with Siemens VAI. Operators of a plant in Spain were also won over by the collaboration between the Siemens VAI Product Lifecycle Services colleagues at headquarters and their counterparts on location in Spain. And then there are customers like Dillinger Hütte (see pages 58–59) and Lisco (see pages 60–61) who have a dedicated Siemens VAI service base set up at their works. This worldwide network – consisting of local service centers in more than 30 countries all over the world – is indispensable in finding solutions for really complex queries.

### Quality and savings

With its service concept centered on the Product Lifecycle Services organization, remote access and service managers, Siemens VAI is in an excellent position to help metals customers operate under continuously stable conditions. And through expert training and uniform standards, a high level of quality is ensured. More than anything, services from Siemens VAI help customers avoid unplanned downtimes – as well as cut both operating and maintenance costs, and thereby improve their competitive edge.

Sven-Michael Böhm, Global Head of Lifecycle Services for Metals



# Three Questions for Dirk Hoke

CEO Customer Services Division, Siemens Industry

1

## **Mr. Hoke, what makes Siemens VAI the life-cycle service partner of choice for customers within the metals industry?**

Excellent service is performed by people. And as part of the global Siemens network covering 190 countries, service people are never far from our customers' sites. Experience and expertise gained in thousands of projects worldwide are at the heart of our tailored service portfolio for integrated steel and metallurgical facilities. Our technology-based service portfolio and proven processes enable us to not only focus on a steel plant's entire life cycle but to continuously help customers improve their competitiveness.

have interesting solutions in place: whether Drive Train Condition Monitoring, Energy Analytics, Asset Analytics or Industrial Security Services – the continuous acquisition and analysis of process and production data in real time allows us to help our customers make the right decisions for production.

***“With our technology-based services, we help our customers to continuously improve their competitiveness.”***

Dirk Hoke

2

## **What's the extent of the portfolio for metals producers?**

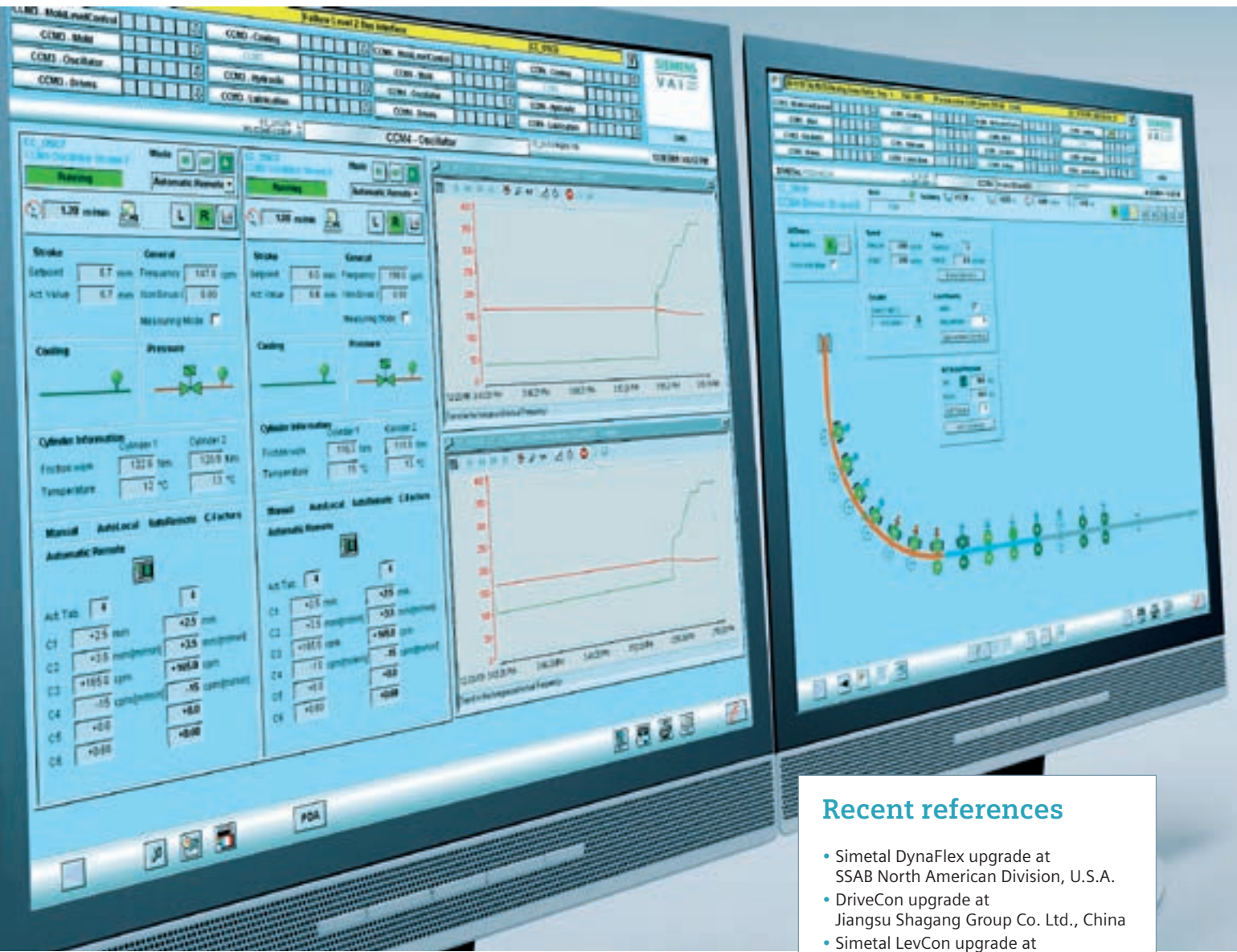
Our vertically integrated service portfolio covers mechanical and mechatronic equipment, drives, motors, automation, electrics and electronics as well as utility supply and environmental technologies in the areas of ironmaking, steelmaking, rolling and processing. We consider the specific characteristics of this industry. For example, in the framework of new construction projects we offer our services early on, such as during the project-planning phase. Our technology-based services help metals customers reduce their operating costs and at the same time improve production processes and plant availability.

3

## **What do you see as some of the future trends in the service business?**

As production processes become more and more complex, and different plant areas are increasingly networked through IT, the amount of available data is growing. At the same time, remote maintenance solutions and cloud-based services are on the rise. A goal is to turn this “big data” into “smart data.” Already today we





- ### Recent references
- Simetal DynaFlex upgrade at SSAB North American Division, U.S.A.
  - DriveCon upgrade at Jiangsu Shagang Group Co. Ltd., China
  - Simetal LevCon upgrade at Anshan Iron & Steel Group Corp., China
  - Simetal DynaFlex upgrade at JSW Steel Ltd., India

Automation upgrades extend caster life and improve product quality



Simatic C7

UPGRADE



Simatic Touch Panel

+



Simatic IM 151 CPU

Rapid installation of  
tailor-made upgrades  
for caster automation

# Clever Caster Control

Siemens VAI offers an array of advanced technological packages to improve productivity and the output quality of continuous casting machines. The latest upgrades, characterized by their modularity and standardization, profit from vast knowledge acquired during the last 40 years.

## Main benefits

- Customized packages enable future expansion of automation or add new capabilities
- The proven and reliable system is based on knowledge accumulated over the years
- Standardized and tested interfaces ensure fast and trouble-free integration into existing installations
- High availability of spare parts
- Implementation of state-of-the-art technology extends the life of automation systems

Siemens' standard Simatic C7 CPU automation package has been a well-proven product for over 15 years. Installed in several hundred technological packages for Siemens VAI casters, Simatic C7 CPU is now nearing the end of its life. It will become increasingly difficult to source spare parts, which could jeopardize caster production.

The successor to the outdated Simatic C7 CPU is the Simatic IM 151-8 PN/DP controller, coupled with a Simatic Touch Panel. The controller can be used in stand-alone mode or for distributed automation solutions. Beside a reduction in the response times to critical local signals, it offers easier troubleshooting for the maintenance crew. The solution comes with an on-board Industrial Ethernet interface, which is fully compatible with ET 200S interface modules Profibus and Profinet. By programming, downloading updates and making diagnostics through Profinet or Industrial Ethernet ports, maintenance is made more accessible and remote support can be offered by the Siemens VAI service team.

Furthermore, with the Simatic IM 151-8 PN/DP controller steelmakers can take advantage of continuous developments and improvements that have been gained through experience in numerous installations. The automation system can thus be kept at a state-of-the-art level at a minimum investment cost.

## Short return on investment

The main focus of the upgrade from Simatic C7 CPU to Simatic IM 151-8 PN/DP lies in migration and upgrading solutions that provide a short return on investment. To ensure the shortest possible downtimes, Siemens VAI has developed standardized software and hardware solutions using well-proven and established Siemens products. For technological packages that include operator displays, diagnostics via a Web browser are available. Optimized I/O configuration designed for the specific requirements of the caster ensure a cost-efficient and tailor-made upgrade package.

Areas of application for the upgrade to the Simatic IM 151-8 PN/DP controller are found throughout the entire casting machine. This starts at the caster head applying Simetal LevCon mold-level control and Simetal DynaFlex mold oscillator, and continues down the caster with DriveCon for strand guidance and auxiliary systems such as Hydraulicon and LubriCon. It can also be used for upgrades of the maintenance tools WamBoy and OsciBoy. Taking advantage of these cost-effective upgrading solutions extends the life of the existing automation systems installed on the caster.

Highly skilled Siemens VAI experts provide an efficient and smooth completion of an upgrade to meet the specific demands of the particular plant. This is a key factor for an optimum upgrade strategy and project success.

Stefan Burger, Product Owner, Electrics and Automation for Continuous Casting  
Brigitte Laimer, Head of Sales, Electrics and Automation Lifecycle Services

Expert consultation services from a world-leading supplier of continuous casting technology

# Professional Advice Is Worth the Price

In the current market environment, producers must quickly respond and adapt in order to remain competitive. Casting Technology Consulting (CTC) from Siemens VAI supports customers to achieve their goals. The three focal areas of CTC are quality, simulation and component design.



Stainless steel slab caster, ArcelorMittal, Belgium (Carinox)

**T**oday, quality and flexibility in production are more important than ever. Rapidly changing market demands call for flexible plants that can be adjusted quickly – with a minimum of production downtime. Yet two challenges in particular come up again and again for steel producers. The first is quality. In many cases, quality problems can result in downgraded and even rejected products, which incurs additional costs. The second is the growing market demand for special steel grades, which calls for an enhancement of the product portfolio. In both cases, Siemens VAI with its CTC expertise is the right partner. The underlining objective is to ensure permanent production excellence on a cost-effective basis. The pillars of quality, simulation and component design are the principal focal areas of CTC.

### Quality – the basis for business success

The investigation for quality-related improvements begins with a comprehensive evaluation of all factors that have a potential impact on product and process quality. The entire heat is examined, from the takeover point in the secondary metallurgical treatment area all the way through the entire continuous casting process. Statistical evaluations of process and quality data as well as detailed metallographic quality analyses help to ensure that the quality demands of the cast products are met. Additional support is provided by partnerships with external laboratories and universities with their high-end research facilities. Drawing on process and production experience acquired from more than 400 casters worldwide, recommendations for improvements are given with respect to, for example, optimization of the casting process; use of alternative consumables (casting powder, refractories); modification of the automation system; and the related training services for operators and metallurgists.

### Simulation – to see inside the strand

State-of-the-art numerical simulation techniques were developed by Siemens VAI in the late 1970s. The goal of simulation is to optimize the casting process and to achieve a high level of product quality within the shortest possible development times. Thanks to enormously expanded computer capacity and improved software algorithms, Siemens VAI technology experts can simulate complex processes and conditions even in real time. Using advanced simulation models, it is possible to acquire deeper insight into the steel-solidification process as the basis for superior equipment design and casting operations. Applied simulation techniques include:

- Thermomechanical investigations for advanced component design mainly based on FEM (finite-element method)
- CFD (computational fluid dynamics) analyses for simulating the multiphase steel flow in the tundish and mold.
- Thermodynamic models to incorporate phase transformation simulations

Expert support in the selection of advanced technological packages and process models for the slab caster mold area



The latest spray nozzle designs are optimized in testing stands to meet the increasing requirements placed on secondary strand cooling

### Component design – smart design saves money

The highest machine performance, flexibility and reliability can only be ensured when the installed equipment, components and systems are thoroughly designed and fully integrated with each other. While this is the case with new casters, it does not necessarily apply to older machines that have been in operation for years or even decades.

Special components and packages are available or can be developed to enhance machine availability and to meet the increasing market demands with respect to new steel grades, product dimensions and quality. With the installation of long-lasting components, maintenance expenditures are also significantly reduced. Examples of smart component designs that help steel producers save money in the casting process include, among others, advanced tapered molds for flat and long products; latest-generation strand-guide rollers for longer lifetime and reduced maintenance costs; and improved spray nozzles for a more uniform spray-water distribution.

### Superior results with expert consultation

Technological support and professional after-sales services is decisive to select the right machine equipment, to cast top-quality products, to ensure cost-effective production and to remain successful on the market. During the past four years, more than 100 CTC orders have been executed by Siemens VAI experts for steel producers around the globe. On the basis of this wealth of experience, Casting Technology Consulting services are available for any casting machine, including those that were installed by other suppliers.

Steffen Tiede, Continuous Casting, Head of Special Products

Mulpic interrupted cooling provides unique advantages for plate mills

# Survival of the Fittest

As global economic conditions start to improve, the demand for plate is expected to increase as well. However, production overcapacity in this sector remains high. Many plate producers are therefore focusing on achieving better quality and making higher added-value products to survive in this competitive market. The Mulpic (multi-purpose interrupted cooling) system is a proven solution for existing plate mills to extend the product range of producers as well as to reduce alloying costs and improve weldability.

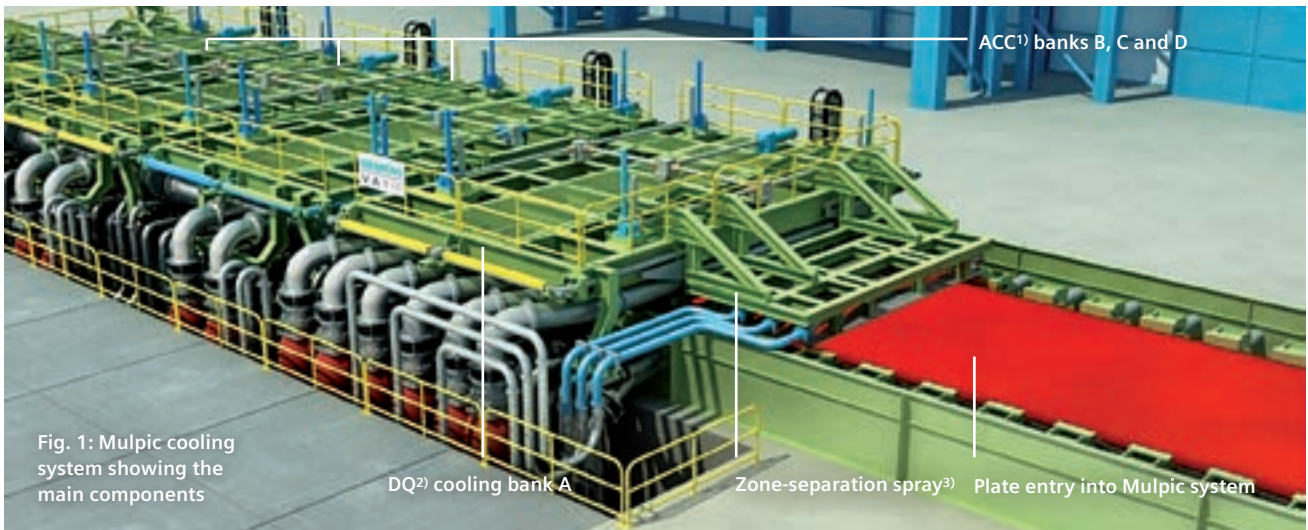
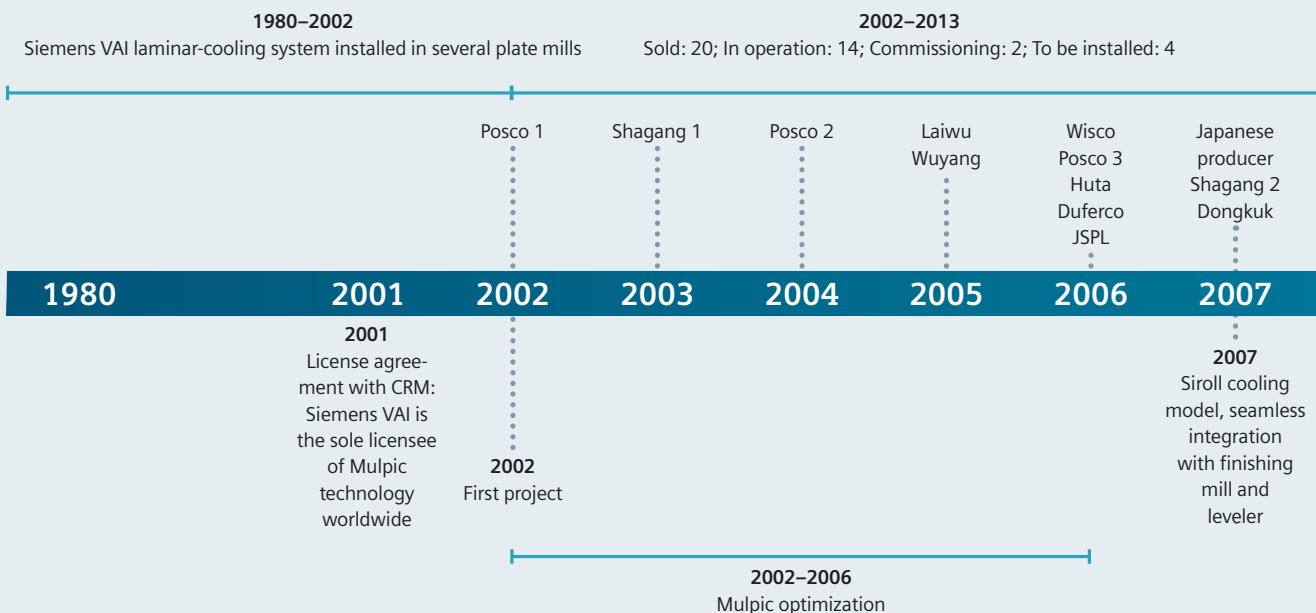


Fig. 1: Mulpic cooling system showing the main components

¹ ACC = Accelerated cooling control; ² DQ = Direct quench;

³ Comprises two sets of water-spray nozzles that retain the cooling water within a particular Mulpic cooling zone



**M**ore and more, end users of steel plate require improved and more consistent mechanical properties with regard to strength, toughness and hardness. Users are also demanding better flatness, weldability and traceability. To meet these market demands and to remain competitive, plate-mill operators can no longer rely on their existing assets. Procedures must therefore be modified and technology updated and automated to have a chance of future success.

One way to produce high-end plate is through thermo-mechanical rolling. The downside to this method is that it requires significant microalloying. A leaner steel chemistry can be applied if accelerated cooling following thermo-mechanical rolling is employed. Reducing the amount of microalloying in the steel not only saves money but also improves the weldability of the final product. Indeed, some microstructures can only be produced by accelerated cooling after rolling, and in these cases precise, repeatable control of the cooling path is absolutely necessary for success.

### Mulpic – well proven in the market

In 2001, Siemens VAI identified Mulpic as a niche product for plate mills that offered considerable advantages with respect to the production of high-quality steel grades and for the development of new steel products. Mulpic was originally developed in Belgium by CRM (Center for Research in Metallurgy) in the 1980s, and at that time it was installed in European mills at Dillinger Hütte, SSAB and Duferco Clabecq. This technology remained confined to those three plants for the next 20 years.

In 2002, after obtaining an exclusive license from CRM to use the Mulpic interrupted cooling system, Siemens VAI supplied the first line outside Europe to Posco in South Korea. In the years since, 20 Mulpic systems have been sold worldwide, the most recent to the Japanese steel producer Kobe Steel in 2013.

### Highest flexibility

The layout of existing mills varies widely from one plant to the next and requires considerable flexibility when modernizing these plants. Thanks to its modular design, Mulpic can be installed in any existing mill configuration. The system offers maximum flexibility with respect to the number of cooling units that can be used. Each water header can be controlled individually to provide an optimum cooling rate according to the respective steel grade under production. (Figure 1).

Complex piping is a challenge due to the large volumes of water involved. However, the adaptability of the design means the piping can be installed above or below floor level using telescopic pipes or flexible hoses. A quick-drain function has been added to ensure no production delay when switching between cooled and non-cooled plates.

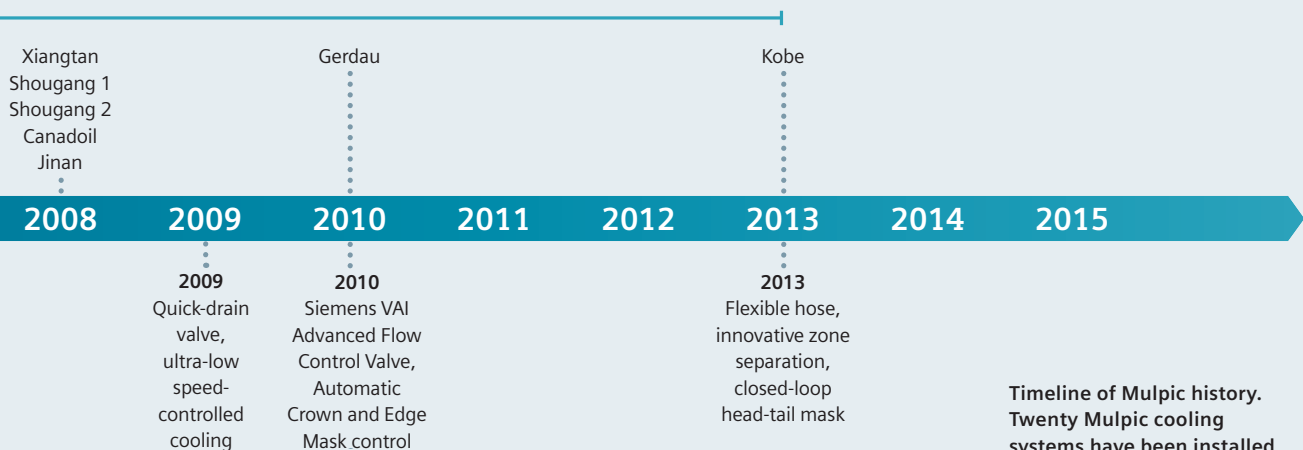
### Continuous development

While the mechanical design used today remains similar to the first Mulpic lines, the actuators, instrumentation and control system have undergone major improvements over the years. Experience gained from the previously commissioned Mulpic installations is included in development efforts. This has resulted in the most sophisticated and proven cooling solution for plate mills in the world.

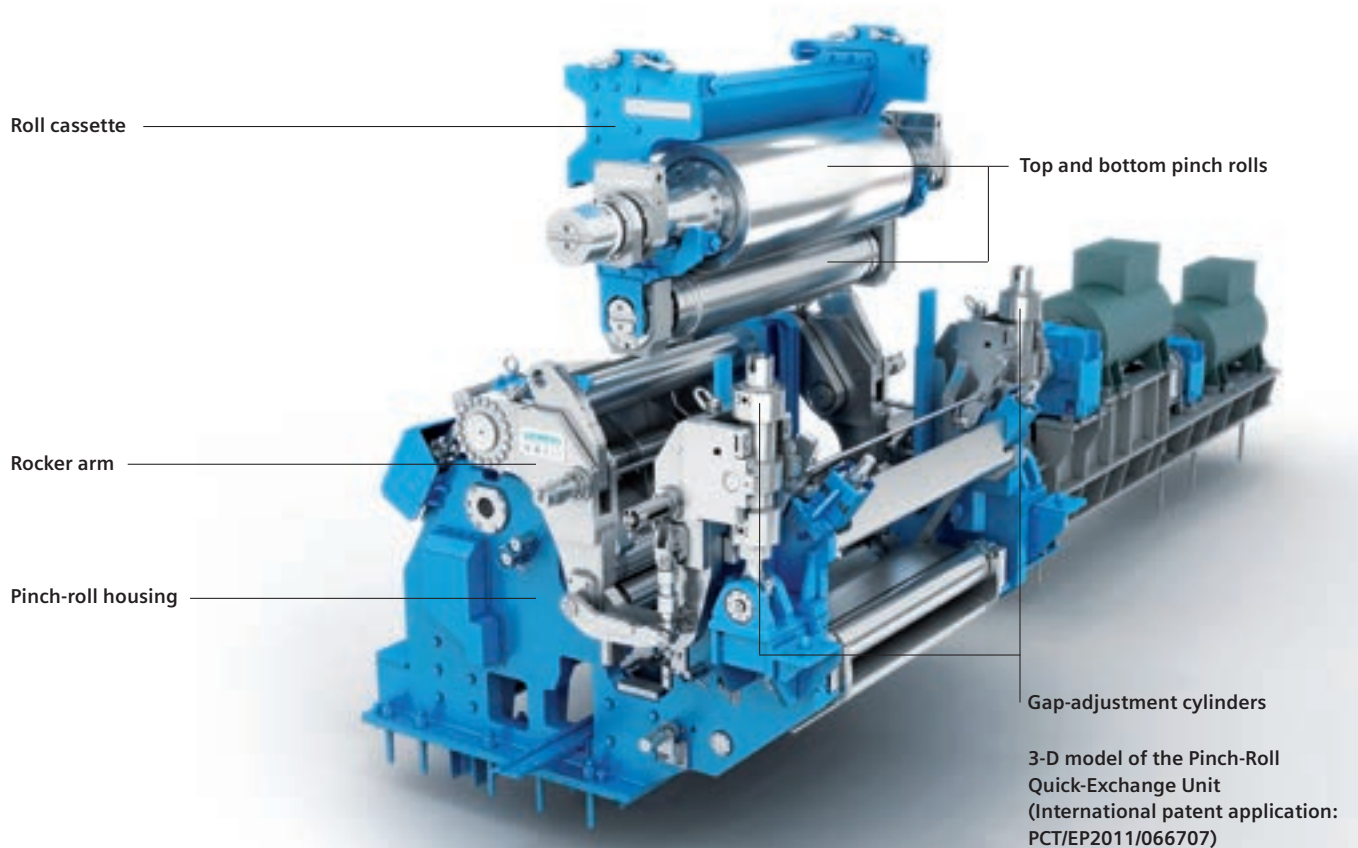
Customer feedback also plays an important role. In one case, a producer reported that valve actuators required significant maintenance. The answer was to design a new advanced flow control valve, which today is delivered preinstalled and has an automated calibration sequence. What's more, it also improves flow accuracy to better than 0.5%.

Further improvements to the cooling model and human-machine interface (HMI) ensure that the fully automated Mulpic cooling system is easy to operate and maintain. Enhancements like these provide customers with a solution that will help them continue to meet the demands of end users for the production of advanced steel grades.

Sandip Samanta, Product Life-cycle Manager, Plate Mills  
Mark Chalmers, Product Manager, Mulpic



**Timeline of Mulpic history.** Twenty Mulpic cooling systems have been installed by Siemens VAI in plate mills since 2002



The new Pinch-Roll Quick-Exchange Unit from Siemens VAI improves the performance of hot-strip mills

# World's Fastest Pinch-Roll Exchange

Siemens VAI has developed a new pinch-roll unit that is designed as a quick-exchange cassette. Instead of up to eight hours, the pinch rolls can now be replaced within just ten minutes at any time – even during production. This capability to quickly exchange the pinch rolls leads to a host of convincing benefits for producers. After exhaustive testing in the workshop, the world's first Pinch-Roll Quick-Exchange Units were installed and recently started up in a new hot-strip mill of a renowned U.S. steel producer.





Workshop demonstration of easy insertion of the Pinch-Roll Quick-Exchange Unit into the unit housing

**T**he pinch-roll unit is an indispensable equipment section in all hot-strip mills. It serves the function of advancing the hot-rolled strip that exits the finishing mill and the laminar cooling section into the downcoiler. Material deposits accumulating on the pinch-roll surfaces (so-called “pick-ups”) must be removed quickly in order to prevent damage to the strip surface.

Up until now, pinch rolls have been cleaned inline during stoppages of rolling operations. Manual inline refurbishment of the roll surfaces, however, poses a major safety risk for maintenance personnel, who are required to work in a hot and dangerous environment. The pinch rolls also have to be exchanged and grinded offline in the workshop in regular intervals, depending on the steel grades rolled. In order to avoid production standstills of up to eight hours, the pinch-roll exchange procedure is normally carried out during a scheduled maintenance shutdown. If an unscheduled pinch-roll exchange is required, this results in a major production loss. This leads to numerous disadvantages for producers related to mill productivity, flexibility, operational costs and the capability to satisfy the product-mix requirements.

## *The Pinch-Roll Quick-Exchange Unit can pay for itself within one to two years.*

In response to this situation, Siemens VAI redesigned the pinch-roll set as a quick-exchange cassette. It can be removed from the unit housing and replaced at any time within only ten minutes, for example, during a routine work-roll change in the mill. All related refurbishment and maintenance work can now be ideally performed offline in a safe working environment. The complete exchange is performed semi-automatically – only the crane has to be manually operated during the removal and insertion of the pinch-roll cassette into the unit housing.

### Main benefits

#### Improved strip surface quality

- Installation of perfectly refurbished pinch rolls at any time

#### Increased mill output

- Shorter unscheduled pinch-roll exchange times
- Elimination of time-consuming, inline roll-surface cleaning

#### Increased flexibility

- To meet the quality demands of automotive steels, etc.
- To enable checker-plate rolling at any time – and not just at the end of the service lifetime of the pinch rolls
- To select the right pinch rolls for the steel grade to be rolled

#### Highest safety standards

- Due to elimination of dangerous inline roll-surface cleaning

#### Increased lifetime of pinch rolls

- Thanks to optimized roll-grinding intervals

#### Reduced operational costs

- Due to elimination of manual inline grinding and shorter, unscheduled pinch-roll changes
- Increased availability of personnel and crane during scheduled mill shutdown periods

To put it in a nutshell, with a small investment it is possible to achieve major improvements in hot-strip mill performance. In fact, with consideration to all of the advantages offered by the Quick-Exchange Pinch-Roll Unit, this solution can pay for itself within one to two years.

Walter Grabner, Engineer for Flat Rolling, Metallurgical Services  
Friedrich Moser, Head of Technology for Flat Rolling,  
Metallurgical Services



To watch a film showing the complete pinch-roll replacement sequence in record time, go to:

<http://www.siemens.com/metals-service-pinch-roll>

Morgan Vee No-Twist Mill rebuilt in 4½ days

# Achieving the Impossible

To meet its quality and production targets, Saarstahl Burbach modernized its 4-strand wire rod mill. Working on a four-year cycle, Siemens VAI engineers have rebuilt all four strands. In 2012, Strand No. 2 was on the line. The challenge: to complete the rebuild in less than five days with a five-member team.

The 4-strand long rolling mill of Saarstahl Burbach in Germany produces one million tons of rods per year



**L**ike most mill owners, Saarstahl places great value on mill utilization, and its maintenance and offline spares programs have allowed it to uphold critical production goals. Since 2010, Saarstahl has purchased 18 new bevel gear drive boxes from Siemens VAI, which has provided the flexibility to recondition and rebuild spare bevel boxes throughout the year in preparation for the next strand rebuild.

Operators at Saarstahl would never have attempted such a short downtime if they did not have faith in the Siemens VAI team's expertise and experience to undertake the task. Over the years, U.S.- and U.K.-based teams had developed solid relationships with the customer. "Without the equipment exchange and repair strategy developed together with the customer, the 4½-day plan would never have worked," said Trevor Oldham, Senior Service Engineer. Siemens VAI engineers also provided technical supervision for the strip-down, rebuild and repair of the bevel gear drive boxes as they were removed.

## Forward planning and trust

Long before the scheduled shutdown, the customer and the Siemens VAI service team worked together to formulate a plan to meet the demanding schedule. Both sides understood their specific roles and responsibilities. The project also pulled in seasoned field engineers from Sheffield, U.K., and Siemens VAI operations in the United States. The level of

trust between the team and the client ensured a smooth execution. Meeting this tight timetable required a thorough understanding of the project, the correct equipment, an effective parts-exchange strategy that included new or rebuilt replacement bevel boxes, an experienced site engineer to run the project, and a sound plan to achieve the shutdown program.

Undertaking a typical Morgan Vee No-Twist Mill (NTM) rebuild involves many steps, including completion of a vibration analysis and a full alignment survey prior to shutdown and rebuild. Once on site, the team of five had to strip out the ten existing bevel gear drive boxes, strip out and renew the five lower stand supports for the bevel gear drive boxes, install the ten rebuilt bevel gear drive boxes, and install and align new couplings on each stand. After

*The level of trust between the team and the client ensured a smooth execution.*



installation, the engineers tested and adjusted the NTM to achieve precise drive and pass-line mill positions.

“Never has so much been achieved by so few, but it demonstrates both the level of expertise that exists in our service teams and the power of developing a partnership approach with our customers,” said David Titus, Director, Long Rolling Services. The collaboration proved even more effective in August 2013 when the long rolling service team broke the record again. The same scope of work was completed in just 3½ days with only four site engineers.

#### **The right equipment in the right place**

Several years ago, Siemens VAI engineers recognized that in order to offer this kind of service, they would need to create their own special rebuild tool kit. Housed in two large wheeled tool chests, the NTM tool kit can be moved easily to the rebuild site. The tool kits are shipped to the mill two weeks prior to the shutdown so that they are certain to be available. In 2013, the tool kit was expanded to include a new laser tool to help verify coupling alignments in less time. Further investments are under consideration to improve the team’s capability to validate the production pass line. This high level of mill servicing is not just available for Saarstahl but for any owner of rod and wire mill equipment.

Patrick Hogan, General Manager, Long Rolling Services

#### **Technical maintenance training seminars**

Between shutdowns, the day-to-day responsibility for mill maintenance remains with rolling mill personnel. To assist with the common maintenance practice of rebuilding and repairing high-speed roll housings every six months, Siemens VAI hosts technical maintenance training seminars.

One held in June 2013 specifically focused on the rebuilding and maintenance of roll-housing modules used in Morgan Vee No-Twist Mills (NTM). The seminar combined a comprehensive study of roll-housing maintenance with hands-on practice of mechanical methods used to rebuild NTM roll housings. Participants learned how to properly rebuild and inspect the roll-housing assembly as well as to effectively use Siemens VAI rebuild tooling and its application in proper equipment disassembly and reassembly. Engineering staff from the spares, contract engineering and fluids groups shared their knowledge in the classroom and participated in open-forum discussions with customers from around the globe. Field service engineers conducted the seminar’s hands-on portion.



Laser-based plant surveys can make a substantial contribution to properly aligned and machined equipment for improved mill performance

A simple service step for a major plant improvement



Laser measuring-head unit

# Laser Surveys for Metallurgical Plants

In today's competitive markets, even small improvements can make a significant difference to profitability. The Siemens VAI Metallurgical Services team is committed to providing cost-effective solutions to help clients maximize plant utilization, save money and improve product quality. A recent service project for Tata Steel's Dalzell steelworks in the U.K. shows what is possible.

**F**or optimum rolling and product quality, it is essential that all equipment is kept within original design tolerances. Siemens VAI has the expertise to ensure that this is the case with its portfolio of services ranging from one-off surveys to fully outsourced maintenance contracts.

With regard to mill stands, typical issues that require service attention include misalignment and out-of-tolerance conditions. When this is the case, the following often arises:

- Quality problems, especially when rolling high-strength, thin-gauge products
- Excessive wear on housing/chock-wear plates that leads to a shorter service life
- Difficulty in achieving optimum working clearances within the mill housing

Laser surveys can help determine where problems lie. By combining the latest laser 3-D measuring technology with Siemens VAI plant-building and process knowledge, customers gain access to a one-stop expert house for all troubleshooting and plant-optimization requirements. Laser surveys performed using the latest laser-survey-tracker technology can cover a wide range of mechanical assemblies that include mill housings, drive systems and gearboxes, strip-coiling devices, cooling beds and shears.

### Back to standard

Operators from Tata Steel's Dalzell steelworks recently contacted the Siemens VAI services team in the U.K. regarding concerns over excessive wear on the lower section of their rolling-mill housing. Excessive wear is related to operating clearances and alignment issues, which can have a direct impact on end-product quality. The customer was in urgent need to restore the housing to its original design clearances and asked Siemens VAI to conduct a precision laser survey of the housing.

The survey itself was completed within one working day, and the targeted mill window alignment and mill centerline settings were defined. The survey revealed the necessity to conduct a significant in-situ machining program to restore the operating clearances to the design specifications and to reset the mill window furniture back to being square, parallel and equidistant from the centerline of the mill.

For these steps, Siemens VAI engineers calculated the machining requirements of the mill window to achieve the necessary operating clearances and specified the mill alignment setup. The new wear plate dimensions were also calculated. The work to restore the mill stand to an acceptable condition was carried out during the scheduled 14-day annual production shutdown period. The customer now has a fingerprint of the mill housing with which to compare future preventive surveys.

"We were highly satisfied with the level of technical expertise and competence provided by the Siemens VAI Metallurgical Services team throughout the process," says Colin Timmins, Works Manager at Tata's Dalzell site.

### Faster and less intrusive

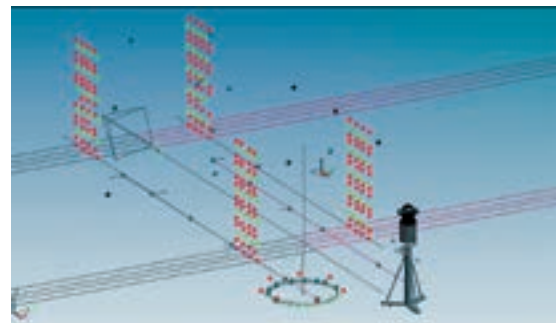
Today's laser surveys are much faster and less intrusive than traditional techniques. When a line of sight to every feature is not required, the tracker can use a technique called "leap-frog" to achieve the same surveying results with minimum plant disassembly. What's more, the equipment is very flexible in its application, and it can be used to conduct surveys over the full range of plant equipment and sizes. These technological advances mean that clients can get back to business as usual with minimum downtime and disruption.

Surveys can be complemented by a range of services that include process consultancy, operation and maintenance best-practice support, electrical and automation troubleshooting, plant upgrades and modernizations, lubrication audits, vibration analyses, energy efficiency and environmental studies.

Scott L. Bellamy, General Manager, Flat Rolling and Iron & Steelmaking Services

### Features of the laser survey tracker system

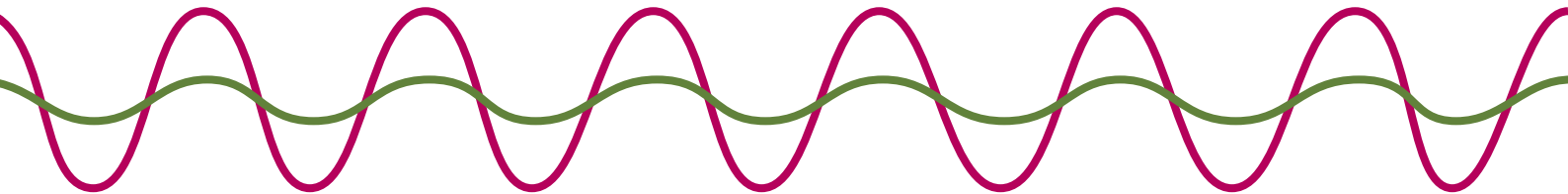
- 110-m-diameter working area
- Accuracy of 0.05 mm at 10 m
- 360° horizontal working envelope
- Self-aligning using gravitational pull
- Ability to translate measured results to 3-D CAD software



Example of a typical 3-D image result of a rolling mill laser survey

## Taming the vibration behavior of rolling mills

# For Good Vibrations



**Unwanted vibrations are a major concern in rolling mills. The constant demand for higher productivity leads to ever-higher rolling speeds, and this results in increased vibrations and the associated problems. The Siroll ChatterBlock family of tools and solutions from Siemens VAI helps to get mill vibrations under control.**

**R**olling mills are complex mechanical assemblies. Thousands of structural components interact with each other through various interfaces such as hydraulic fluids or friction. Some components move in rotation (rolls, spindles, shafts) or in various directions (chocks, strip), some are large ( housings) and others are extremely small (springs and screws). Rolling mill eigenmodes thus cover a wide range of frequencies – typically from a few Hertz up to over a few thousand Hertz. It is therefore inevitable that some resonant modes are excited during strip accelerations and decelerations, causing large vibrations in the system. Vibrations typically become more critical with increasing rolling speed and may lead to unwanted strip thickness variations and, in the worst case, to strip and equipment damage (Figures 1 and 2). Consequently, for certain products some mills must run at a significantly lower speed than the mill design would allow.

Mill chatter is a self-exciting vibration phenomenon that occurs in hot- and cold-rolling mills – and especially in tandem cold-rolling mills. It is characterized by a divergent in-phase vertical vibration of the work and backup rolls with a frequency of about 90–150 Hz for third-octave chatter, and 600–800 Hz for fifth-octave chatter. Mill chatter can be physically understood as intrinsic system instability (parameter-excited vibration) caused by both the equipment and the strip.

Vibrations create numerous problems in rolling mill operation, which can be divided into three categories: productivity, safety and efficiency. Vibrations may be detrimental to productivity because they increase the difficulty to con-

trol strip thickness, which therefore lowers the quality of the output material. If strip quality is below standard, it is a net loss for the producer since the metal must be re-melted or at least downgraded. Vibrations may also lead to significant safety risks: excessive oscillations commonly result in strip breakage with potentially dire consequences for the operators and the mill itself. Attempts to control vibrations place a heavy burden on automation, requiring better and more sophisticated systems. Finally, component wear is accelerated, for example on seals or bearings, and overall energy consumption is increased. This lowers the efficiency of the mill in terms of both investment and energy per ton of steel produced.

It is thus highly important to control vibrations in the mill either actively with tailored automation solutions, or with sophisticated mechanical design solutions – or a combination of both. The Siemens VAI ChatterBlock family of tools and solutions address the problems associated with vibrations.

### **The Siroll ChatterBlock family of solutions**

Over the last decades, Siemens VAI has proven to be a reliable partner for assessing rolling mill dynamics. The services provided to customers are illustrated in the Siroll ChatterBlock family of solutions (Figure 3). The name ChatterBlock is derived from the need to deal with or “block” mill chatter and it also refers to the mechatronic equipment “block” that actively suppresses mill chatter (Figure 4). Siemens VAI addresses all kinds of vibrations that occur in a steel or aluminum rolling facility.

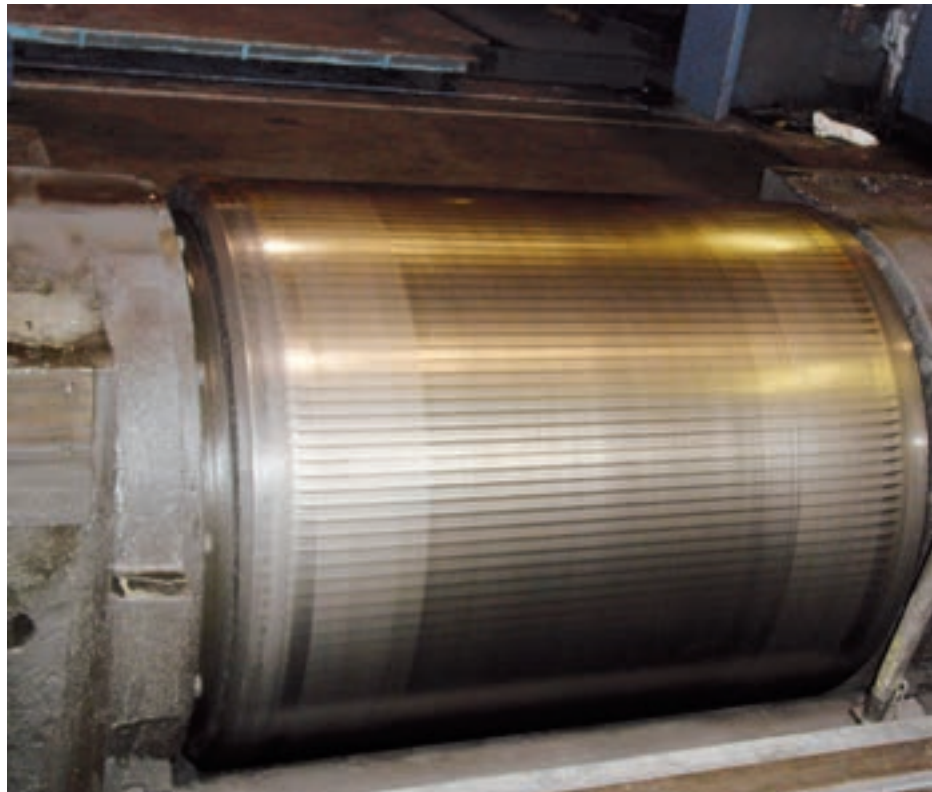


*The Siroll ChatterBlock family of tools and solutions from Siemens VAI helps to get mill vibrations under control.*

Fig. 1:  
Example of strip damage due to third-octave chatter

**Mill chatter is a self-exciting vibration phenomenon that occurs in practically all rolling mills.**

Fig. 2: Backup roll with fifth-octave chatter marks (horizontal line defects on roll surface)



**Problem-solving approach**

After a customer contacts Siemens VAI to provide assistance in connection with mill-vibration matters, the first step is to complete a problem-description questionnaire about the vibration behavior. All related mechanical and process data is taken into consideration to obtain a general picture of the existing situation. The acquired information is analyzed, open questions are clarified and the phase of problem-solving activities is started. The correct and full understanding of the problem generally requires an on-site inspection of the facility, which allows a clear picture of the dynamic behavior of the mill to be obtained. Wear parts, mechanical components, the roll shop, process-data recording and more are inspected by Siemens VAI specialists. Possible causes of the vibratory problems are discussed in detail with the maintenance personnel, operators and production management.

Measurements are usually performed to detect the source of vibrations. Either data from the already-installed measuring systems or data gathered from additional sensors mounted on suspicious components are recorded. A thorough data analysis of the relevant time and frequency domains is carried out. In addition, customized, in-house simulations tools, such as the Siemens VAI Virtual Mill Stand, are applied in order to evaluate and better understand the prevailing conditions. A detailed report that includes an explanation of the root cause of vibration and proposed solution measures is then presented to the customer. With the results of these investigations, an offer is

submitted by Siemens VAI that contains one or more of the following: upgrades of mechanical components or the installation of vibration-control tools such as ChatterBlock Control and ChatterBlock Monitoring, which are described below.

**ChatterBlock Control**

Mill chatter vibrations can be clearly distinguished from other vibration phenomena in the rolling process by their vibration frequency and the fact that mill chatter vibrations quickly diverge. A new mechatronic system, the so-called active chatter damper, was developed in order to actively suppress and cancel third-octave chatter. This system uses new, exclusive servo valves developed in a cooperation between Siemens VAI and Moog Industrial. The first pilot installation at a tandem cold mill in Russia shows satisfying results and confirms the correct approach of this technological solution.

**ChatterBlock Monitoring**

This ChatterBlock tool, which was previously referred to as Siroll ChatterMon, has already been implemented in numerous plants. Vibration signals from sensors installed at each mill stand are transferred together with the rotational velocity data of the spindles to a central processing unit. The vibration levels for third-octave or fifth-octave chatter for each stand are derived from analyses of this real-time data. When critical vibration levels are exceeded, the mill is slowed



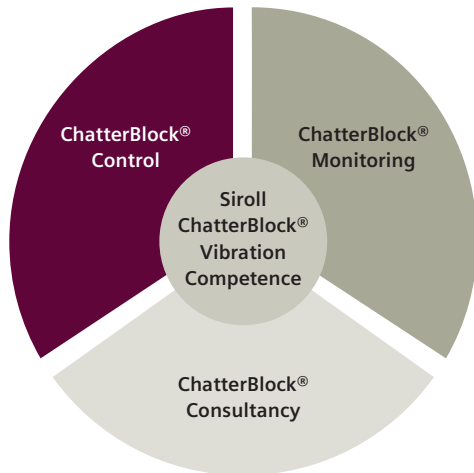


Fig. 3:  
The Siroll ChatterBlock family of solutions to cope with vibration problems in rolling mills

## ***Siemens VAI addresses all kinds of vibrations that occur in a steel or aluminum rolling facility.***

down to sub-critical speeds. The underlying monitoring system can, for instance, reliably detect third-octave chatter of cold-rolling mill stands and consequently diminish and avoid these vibrations by reducing the rolling speed. Furthermore, the system algorithms can detect fifth-octave chatter or defects of work, intermediate and backup rolls, such as roll eccentricity and flat spots. The online customer software provides bar-graph indicators for every vibration level as well as online trending.

### **ChatterBlock Consultancy**

ChatterBlock Consultancy services reflect Siemens VAI's competence to assess and analyze all types of dynamical effects and vibration problems of rolling mills. This comprises detailed modeling of the dynamic system, consideration of linear or non-linear phenomena, and the performance of static and dynamic calculations. Vibration consultancy services also include run-up simulations of the coupled mill stand and drive train in addition to the calculations of structural modes, instabil-

Fig. 4: The Siroll ChatterBlock active-vibration-damping system for third-octave chatter suppression



ity regions, friction and more. In summarizing, any type of problem associated with or originating from vibration can be fully dealt with.

### **Keeping vibrations under control**

Siemens VAI offers a whole range of solutions and know-how when severe vibration problems occur in rolling mills. Through vibration consultancy, Siemens VAI provides the customer with a thorough analysis and the required solutions to tame detrimental vibrations. Immediate and evident benefits are, for example, higher yield rates and improved strip quality. One clear advantage is the possibility to carry out realistic dynamic offline rolling simulations when planning to introduce new steel grades and niche products. Such products are likely to place restrictions on pass scheduling resulting in limited rolling loads and reduced rolling speeds. In such cases, it is crucial to know beforehand if mill chatter or other vibrations can be expected. Also, for new mill designs, simulation tools are applied for improved dimensioning of the mill equipment in order to achieve optimal dynamic mill behavior during rolling operations.

Georg Keintzel, Project Leader, ChatterBlock Control  
Dr. Konrad Krimpelstätter, Head of Hot and Cold Rolling Technology  
Dr. Karl Mayrhofer, Senior Expert, Scientific Calculations  
Dr. Lukas Pichler, Project Leader, ChatterBlock Consultancy

The Siemens service base at Dillinger Hütte

# Compelling Benefits

In 1980, a Siemens service base was established as an equipment installation point at the sprawling Dillinger Hütte steelmaking and processing complex in Dillingen, Germany. Requirements have changed over time, and the service base has evolved from a pure installation facility into a combined service, engineering and project support base, which now offers Dillinger Hütte a host of technical benefits.



Overview of Dillinger Hütte in Dillingen, Germany



Siemens and Dillinger Hütte employees at the Dillinger Hütte service base

## General plant data (2012)

Employees: approximately 5,300  
Crude steel production: >2,300,000 t/a  
Plate production: >1,800,000 t/a



For the last 327 years, Dillinger Hütte has been manufacturing top-quality steel products in line with customer needs. To keep operations running smoothly at the Dillingen site, which comprises a coking plant, blast furnaces, steel plants, continuous casters and a plate mill, Siemens experts are close at hand thanks to the service base. Operators benefit from the close proximity as well as a fast response time when repairs or clarification are needed, as the following examples show.

At the end of November 2010, a fire damaged the third sinter plant at the Dillingen site. The service base took an emergency call from the customer, who requested that a team be activated immediately to conduct an initial damage assessment. In the shortest possible time the team identified cable routes and installed new cable, and built a new substation. In another instance, a computer running a PCS 7 control system for the No. 4 Continuous Caster failed. Again, the team got the system back up in record time. In both cases, excellent knowledge of the plant location combined with technological know-how was the key, especially in regard to the short response times.

### Outstanding cooperation

As these two examples show, having an expert team on site can make a big difference for customers like Dillinger Hütte. To hand over projects on time and in adherence with high quality standards, the local team can draw on engineering resources at headquarters in Erlangen and Linz. The service base also conducts a wide variety of preventive services and local assessments, and provides support with new projects. The focus is generally on the modernization and the expansion of existing facilities.

To institutionalize and perpetuate this story of outstanding cooperation, Siemens VAI is implementing this successful service concept with key customers in several countries. Once implemented, the Siemens VAI service organization will find itself closer to the customer than ever before.

Hermann Kratochwill, Senior Service Manager



New converter control station

Comprehensive maintenance of Lisco's steel and rolling mills

# A Boost for Competitiveness



90-ton electric arc furnace



Electric steel mill



Hot-rolling mill

Libyan Iron and Steel Company (Lisco) is one of Libya's largest industrial complexes. The planned output of Lisco's steelworks in the coastal town of Misurata, approximately 210 km east of Tripoli, is roughly 1.5 million tons per year. Since 1997, Siemens VAI has been the dedicated partner for plant maintenance, helping operators meet the challenges of maximum availability and high quality.

For about a decade, Lisco has met most of Libya's domestic requirements for rolled steel. Its products have also found their way to export markets in Africa, the Middle East, Europe and Southeast Asia. For Lisco, quality is paramount – reflected by, among other things, the ISO 9001 certification of its systems and the numerous European quality awards it has received. An integral part of Lisco's rigorous quality policy is the company's service contract with Siemens VAI.

#### An impressive plant complex

The steelworks in Misurata features a whole range of plants: three direct-reduction plants, six electric arc furnaces, two bar mills, two wire rod mills, one hot- and cold-rolling mill, a galvanizing line, several processing lines, and a continuous coating line. The plant also uses various types of auxiliary units, including a power plant with six steam turbines and a seawater desalination plant with a daily capacity of about 10,500 m<sup>3</sup>, which is used to supply the plant with industrial water. Since it was commissioned in 1989, the plant has been continuously expanded. The maintenance of its many systems is a major challenge in view of the size and diversity of the technological units involved.

As a result of its plant complexity, Lisco decided early on to engage outside companies for plant maintenance. Siemens VAI has been Lisco's dedicated partner for plant maintenance since 1997. A framework agreement was originally concluded to this effect, and it has been repeatedly extended over the years. The agreement symbolizes the fact that both contractual parties profit from their relationship, which has evolved over many years.

#### Dedicated on-site service team

From the outset, Siemens VAI established a service team in Libya that is responsible for all local service-related issues. Following the end of the Libyan Revolution in 2012, Lisco decided to continue its successful collaboration with Siemens VAI on the maintenance and service of the plant. To this end, the service base was reopened and integrated into Lisco's maintenance organization. The advantages are clear: in view of

**The Siemens VAI maintenance contract** covers all Lisco plants and auxiliary facilities that extend from the harbor cranes and power plant, through the Steel Melt Shop No. 1 and No. 2 that comprise six 90-ton EAFs, and up to all long- and flat-rolling mills and processing lines. Expert services support maintenance activities by identifying faults and developing new technical solutions to replace old equipment.

its proximity to the customer, all service issues can be addressed quickly and reliably. The permanent on-site presence of the Siemens VAI service team also creates a certain sense of security. That's because – thanks to the team's outstanding knowledge of the plant and their close cooperation – the customer's requirements and wishes can be much better fulfilled. When service is required, the Siemens VAI service staff functions as a rapid-response team to quickly resolve any problems that may arise in the plant. At the same time Siemens VAI employees also work closely with the Lisco maintenance department to perform scheduled service and maintenance actions efficiently and effectively. An additional benefit of the team's on-site presence is the on-the-job training provided to Lisco's employees by the Siemens VAI service engineers to keep their knowledge of the systems at a high level.

An excellent example of successful collaboration with Lisco is the replacement of the older Simatic S5 150 furnace control system with the modern Simatic S7 400 controller, accompanied by the replacement of analog display systems with modern display systems (WinCC).

#### Increased competitiveness

The service agreement includes consulting services for potential renovation and modernization and for defining replacement and migration strategies to ensure the plant's viability in the future. Committed service engineers ensure that the technical requirements for such measures can be met at all times. Both Lisco and Siemens VAI intend to expand their successful plant maintenance partnership. Both parties agree on the increasing importance of service and maintenance, which will be key for boosting Lisco's competitiveness in the future.

Hermann Kratochwill, Senior Service Manager

**Customer:** Libyan Iron and Steel Company (Lisco)

**Location:** Misurata, Libya

#### Specific projects in 2013:

- Reopening of service base
- Recommissioning of various plant units and support during production ramp-up
- Modernization of cranes
- Major revision of HV/MV switchgear, including conversion from analog to digital protection
- Conversion of control systems in the reheating furnaces from Simatic S5 to Simatic S7

The new pure.hmi for  
an optimized process overview  
and maximum usability of software  
applications in the metals industry

# Seeing Is

Classic HMI (human-machine interface) solutions often do not provide a clear overview of ongoing plant operations. An intuitive response by operators to optimize process efficiency is thereby hindered. The result is that negative effects can occur with respect to product quality, output, yield and equipment lifetime. Siemens VAI has therefore implemented a new HMI approach, which is marketed under the name pure.hmi.

**A**fter listening to customers and taking a survey of the main requirements for ideal plant control in steel-making, Siemens VAI introduced pure.hmi. The solution was designed to address three key features in HMI applications: integrated design, individual viewing preferences and context-sensitive operator guidance. pure.hmi ensures that operators always interact with the same preferred images and that the system provides instant access to up-to-date information online. Immediate and fact-based decisions can be made from anywhere – all that is needed is access to the Web. A clear and easily understandable control interface reduces training time, decreases plant downtime and lowers maintenance requirements. Because various operator tasks can be performed more quickly and efficiently, operator trust and joy in process control is considerably enhanced. Furthermore, the consistent look and feel of pure.hmi across the entire production chain maximizes the flexibility of operators to work in different areas of a steelworks.

# Believing ▶

## Smart tiles

A user's favorite apps can be pinned as smart tiles in a customized workspace or home screen. The smart tiles can be positioned wherever the user wishes, and they can be grouped together according to related functions or tasks. The appearance, color and form of the tiles can also be adjusted according to personal preferences.

Smart tiles serve as so-called glazed doors to automatically display live information from a user's favorite app, even if the application is not running. For example, should there be a significant deviation from normal process parameters, related information comes alive on the home screen. This enables the operator to make an informed decision to resolve a particular situation.

## Where reality meets virtuality

Information technology in the industry is increasingly shifting in the direction of mobile information access as opposed to desktop-based information access. In accordance with this trend, pure.hmi can be operated using desktop, tablet, hybrid and smartphone devices, and it features multimodal interaction. Moreover, this capability is a prerequisite for participating in the Industry 4.0 revolution, or The Internet of Things and Services. pure.hmi solutions help producers take their business to the next industrial era so they can better meet unique challenges and opportunities in the steel industry.

Ilona Müller, Lead Engineer for Level 2  
Automation and Technology

Barbara Angermayr, Global Marketing  
Manager for Electrics & Automation

*“Less is more”  
is a design  
philosophy  
of the new  
pure.hmi.*

## Benefits of pure.hmi

- Multiuse in all types of devices: smartphones, tablets and desktop PCs
- Highly customizable operator interface
- Consistent look and feel across all automation levels
- Use of clear and intuitive symbols
- Improved efficiency and ergonomics
- Fast and easy integration into existing system environments
- Increased user confidence for plant operation



## References

Recent pure.hmi installations confirm improved process control and operator guidance in a steelworks environment:

- Dragon Steel Corporation, Taiwan: Sinter Plant No. 2
- Qatar Steel Co., Qatar: Midrex plant
- Visakhapatnam Steel Plant (Vizag Steel), India: Blast Furnace No. 1
- Ereğli Iron & Steel Works Co. (Erdemir), Turkey: converter steel plant
- Tangshan Stainless Steel Co., Ltd., China: 1-strand stainless steel slab caster (to be installed in August 2014)





Use of pure.hmi on different devices for a converter process-optimization system

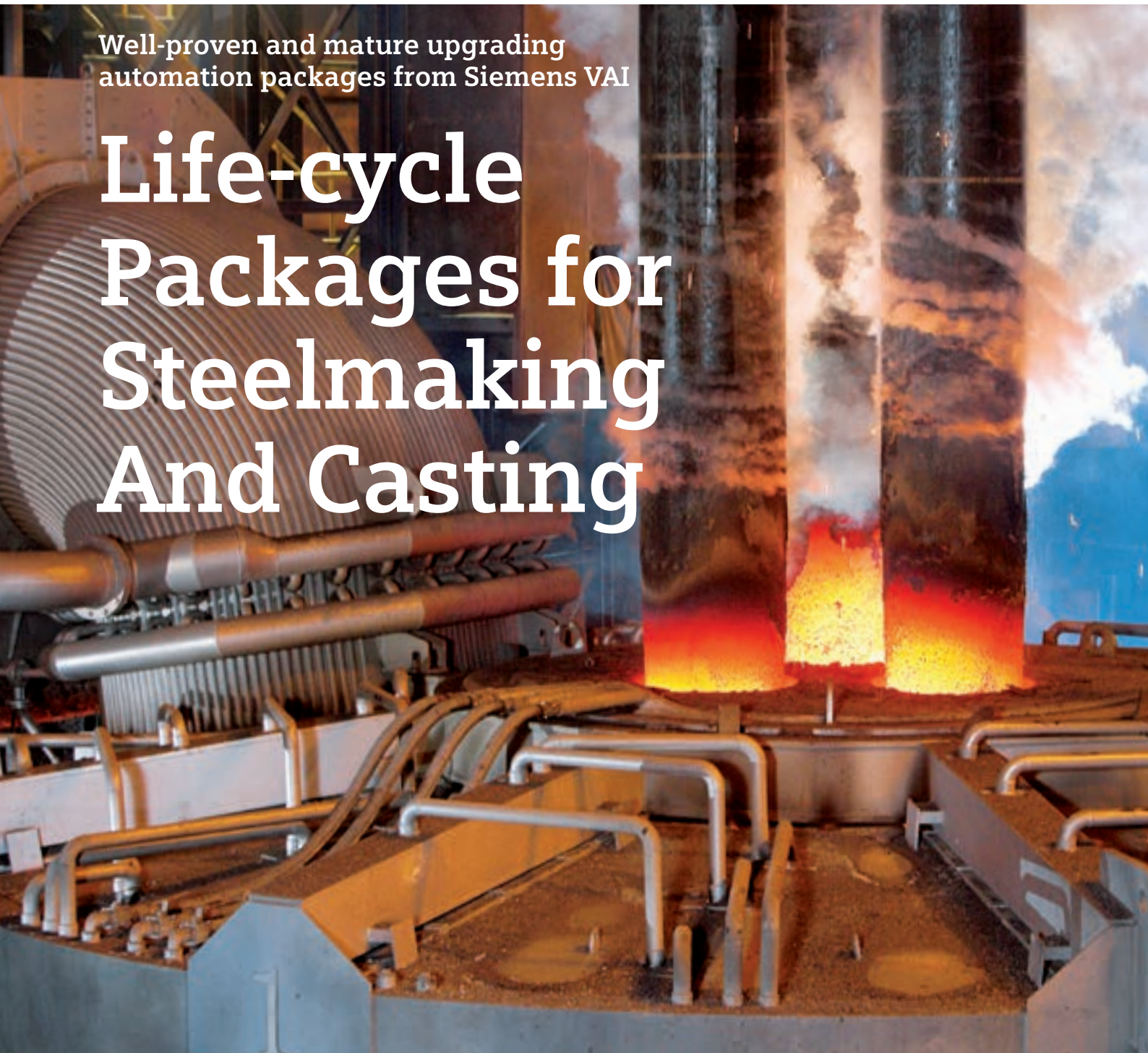


*pure.hmi solutions help producers take their business to the next industrial era.*



Well-proven and mature upgrading automation packages from Siemens VAI

# Life-cycle Packages for Steelmaking And Casting



Automation upgrade packages that interface mechanical systems with sensors and microcomputers help to continuously improve existing plants. These systems are built on the innovation and experience gained in partnerships with customers. The scope of available solutions for steel-makers also extends to plant condition monitoring for improved system maintenance in order to provide early warning of performance loss.



Fig. 1: High-performance electric steelmaking with the most advanced electrode control system

Customers today require more than just the installation of state-of-the-art automation – they also desire a long-term partnership with the system provider to maintain plant performance at a consistently high level. One way to reach this target is to regularly upgrade the installed automation systems. Siemens VAI offers mature upgrading packages that have proven their value at customer sites all over the world. These packages are continuously being further developed to ensure substantial improvements in plant performance. This article provides examples of some of these upgrading solutions available as mechatronic packages.

Mechatronics is an interdisciplinary approach that unites mechanical systems with sensors and microcomputers to optimize performance. These packages can be installed in plants supplied from Siemens VAI or from any third-party supplier. Along with these upgrading packages, annual service contracts, plant health checks, training, on-site assistance and spare-parts management are offered worldwide. Such projects are carried out jointly by Siemens VAI and its local experts to ensure fast response times and enhanced service quality.

#### Perfect electrode control with Simetal Arcos

Optimal quality and plant efficiency is always a driving force. In plants where electric arc furnaces (EAF) are installed, better electrode regulation is at the heart of improving efficiency and steel quality (Figure 1). Siemens VAI solutions for electrode control show excellent results in the world's largest furnaces. Aside from providing the highest reliability and the most advanced technology, improved control strategies and additional modules help save energy and reduce material costs while simultaneously increasing production. As a consequence, a modern electrode control system is now much more than a simple tool for moving the electrode arms.

Recently, a set of additional features was implemented in Simetal Arcos to support steelmakers to increase their process effectiveness. This system offers a high degree of user friendliness and adjustment options. For accurate control of the arc length, a dynamic adaptation to the conventional melting process is now included in Simetal Arcos. It significantly improves process regulation and maximizes energy input. Simultaneously, precise control of the process makes it possible to improve energy efficiency by means of a detailed melting program. Automatic monitoring and testing is performed for mechanical, hydraulic and electrical system components, including correct functioning of measuring circuits, regulation valves and electrode masts. Creeping malfunctions can thus be detected at a very early stage. Defects or failure in the hydraulic system and malfunction or reduced function due to mechanical wear of the guide rail of an electrode-lifting column are common reasons for unexpected breakdowns, poor performance and increased energy consumption of an EAF or ladle furnace.

A newly developed measuring tool can counteract such problems by performing specific test runs on each lifting column. Compact and easy-to-read reports are generated from the control signal from Simetal Arcos, enabling the actual electrode speed and the hydraulic pressure to be

## Simetal Arcos

### Benefits

- Optimized melting performance for reduced production costs
- Less downtime through the implementation of preventive maintenance tools
- Transparent operation processes thanks to comprehensive analyzing tools

### Recent references

- Marienhütte, Graz, Austria
- Outokumpu Stainless, Tornio, Finland
- MMK Magnitogorsk, Russia
- Nasco Al Tuwariqi Group, Saudi Arabia

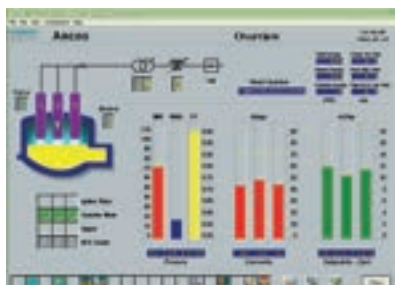


Fig. 2:  
Example of  
HMI screen  
for Arcos  
electrode  
control



compared over time. On-site staff can immediately spot defects or conspicuous abnormalities in the data graphic display and respond accordingly. Furthermore, long-term trends can be reviewed by comparing present profiles with those from the past (Figure 2).

Ongoing developments have led to a mature product that reliably and properly functions in the tough environment of the EAF without any maintenance. However, regular system adjustments may be necessary to ensure the best results from the electrode control systems. Additionally, an annual health check is the basis for trouble-free production and an increased lifetime of the electrode control system.

The Simetal Arcos electrode control system has been well established in the market for over fifteen years, and it has been installed in around 230 electric arc and ladle furnaces worldwide.

### Continuous online offgas analyses with Simetal Lomas

State-of-the-art operation of converter plants requires supervision, control and optimization of the steelmaking process in the converter during oxygen blowing. An advanced process model such as Simetal Dynacon provides this. However, in order to successfully apply the model, it is necessary to continuously and accurately know the relevant parameters of the current converter heat. Process data can be efficiently collected by means of offgas analyses. Already well proven for LD (BOF) converters (Fig. 3), the Simetal Lomas offgas-measurement system has been adopted for the EAF to improve steelmaking efficiency, safety and environmental protection. It is also applicable to the blast furnace and dedusting plants.

The gas-sample probes are available more than 99% of the time. This high rate of availability is ensured by keeping the probe temperature above the acid dew point in the probe's suction area. This allows continuous process gas analyses and avoids sampling-probe blockages. The inactive probe is automatically cleaned during gas analyses of the active probe. Some of the dried and cleaned converter gas from the active probe is backwashed through the inactive probe to regenerate its filter medium. The special filter material and ceramic lining of the gas sampling probes serve to ensure reliable operation. During stages of the converter process where no offgas measurements are performed (e.g., charging and tapping), the probes can be kept clean by purging them with high-pressure nitrogen. The patented solution prevents blockages in the probe-suction area.

Siemens VAI offers a yearly routine check of the Simetal Lomas system to ensure maximum availability and measuring accuracy. During the inspection, specialists check sample gas preparation, media supply, automatic cleaning routines and the condition of the gas coolers. Re-calibration and function tests of the mass spectrometer, which performs the gas analyses, are also a major part of the maintenance service. To round off the package, on-the-job training and a final report with a detailed review of the condition of the system are included.

### Seeing inside the caster mold with Mold Expert

Developed over the years, the Siemens VAI Simetal Mold Expert breakout prevention system is a comprehensive mold-monitoring system that provides in-depth knowledge of pre-

## Simetal Lomas

### Benefits

- Robust and durable gas-analysis system featuring a patented sampling probe
- Fast and precise gas analyses
- Steel quality improvement and energy cost savings

### Recent references

- Steel Dynamics Inc. Roanoke, VA, U.S.A.
- Ilyich Iron and Steel Works, Mariupol, Ukraine
- SSAB Lulea, Sweden
- NLMK Steel, Lipetsk, Russia
- Taiyuan Iron & Steel Group, China
- Shougang Qiangang Iron & Steel, China
- Posco Gwangyang Steelworks, Korea

**Fig. 3:**  
Simetal Lomas  
gas-sampling probe for  
harsh environments

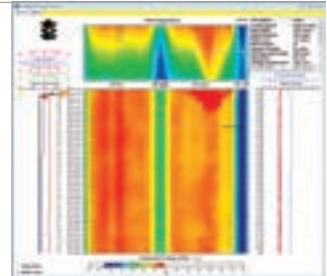
## Mold Expert

### Benefits

- Higher efficiency of breakout prevention
- Improved product quality through a better understanding of the solidification process in the mold
- Reduced downtime during production

### Recent references

- Outokumpu Stainless, Avesta, Sweden
- SSAB Mobile, AL, U.S.A.
- JSW Steel Ltd. Vijayanagar Works, Toranagallu, India
- Taiyuan Iron & Steel Group, China
- Hyundai Steel Co., Ltd., Dangjin, Korea
- ThyssenKrupp Steel Europe AG, Duisburg Bruckhausen, Germany



**Fig. 4:**  
Example of Mold  
Expert HMI display

vailing conditions in the mold down into the strand. Versions of Mold Expert have recently been introduced for bloom casters and also for thin-slab casters for high casting speeds. For customers with Mold Expert already in use, Siemens VAI offers cost-efficient upgrades as well as maintenance packages.

The most recent version of Mold Expert features a number of updates. New algorithms, for example, provide an improved sticker-detection rate with a minimum number of false alarms. Additional new features detect strand shell depressions and mold hot spots to support the operator to react quickly to critical situations. Three rows of thermocouples comprise Siemens VAI's standard system, but any number of rows can be supplied depending on a customer's wishes.

Level Expert, a module of the Mold Expert system, gives an early indication of dynamic bulging, bent rolls and nozzle clogging. Further online checks of stopper characteristics are possible to calculate the degree of clogging and erosion, and to provide breakoff warnings. Continuous recording of mold-level statistics provides maintenance staff with the opportunity to trace back quality problems.

Data handling and visualization has been enhanced by a state-of-the-art human-machine interface (HMI) with data archiving to support easy data inspection of casting sequences going back several months (Figure 4). Oscillation Expert, a further development, tracks the accuracy of the mold-oscillation parameters. It is also a highly supportive tool for condition-based maintenance.

Finally, an auto-adaptive parameter-setting function monitors the mold to provide process guidance to the operator

on the basis of key casting parameters. It suggests an acceptable range of optimum values related to heat flux and friction. Setpoint values are automatically generated through learning from data from previous casting situations.

Aside from the upgrading possibilities, cost-efficient system services are also available. Once a year, a specialist analyzes the Mold Expert data to tune the parameters for improved performance. Additionally, the status of the Mold Expert server PC, HMIs and back-up PC is checked. This service can be provided on site or via a remote connection, and it also includes a detailed report.

### Achieving consistently high plant performance

Whether for converter plants, slab casters or electric arc furnaces, Siemens VAI offers upgrades for steelmaking to keep operations running at peak performance levels. Collaboration between Siemens VAI and experts on location mean that assistance is never far away. An added bonus is that the solutions described above can be installed not only in existing Siemens VAI casters but also in those supplied by third parties.

Christian Kranawetter, Technical Sales, Mechatronics

Brigitte Laimer, Head of Sales for Electrics and Automation Lifecycle Services

Martin Schuster, Product Owner, Mechatronics

Christoph Sedivy, Technical Sales/Product Manager, Mechatronics (principal author)



Dr. Alexander Fleischanderl (center) at the 2013 Siemens' Inventor of the Year ceremony (left: Beat Weibel, Siemens' Head of Corporate Intellectual Property; right: CTO Klaus Helmrich, Siemens' Managing Board member responsible for Human Resources)

Interview with Dr. Alexander Fleischanderl, Siemens' Inventor of the Year

# A Fountain of Innovation

Twelve Siemens R&D specialists were honored during the annual Inventors of the Year award ceremony in Munich on December 4, 2013. Dr. Alexander Fleischanderl, a top Siemens VAI inventor, received the prestigious award for his contributions to sustainable steelmaking, especially in connection with the development of the Simetal Meros process. The immense significance of this process for the treatment of sinter plant offgas has already won Fleischanderl the Austrian Future Award and the Siemens Environmental Award.

## Personal background

Dr. Alexander Fleischanderl first studied technical chemistry and business management at a technical university in Linz, Austria. He then went on to complete his doctoral studies at Graz University of Technology. He is now employed at Siemens VAI where he serves as Head of Technology and Innovation for the areas of Steelmaking and Long Rolling as well as Eco Solutions. In this capacity he is in charge of all “green” business solutions such as gas cleaning, recycling and energy efficiency. About two-thirds of his 91 individual patents are related to environmental protection in the steel industry. “My professional focus is on forging ahead with the development of environmentally friendly solutions,” says Fleischanderl.

### Considering all of your technological innovations, do you feel that Meros was your crowning achievement up until now?

**Dr. Fleischanderl:** Meros has certainly been the most important innovation that I personally have driven from the idea to its implementation, and to date the most successful one from an economic point of view.

### In your experience, do the ideas that lead to groundbreaking innovations come mostly from people working alone, or are they the product of teamwork?

**Dr. Fleischanderl:** As with any innovation, it all starts with an idea, which then leads to a vision. These two steps must be part of a company's overall strategy. Up until this point, the innovation process can be done by people working alone, but later a team effort is vital to push and finalize an innovation.

### What was your vision that led to the Meros process?

**Dr. Fleischanderl:** My vision was and still is to improve the image of the steel industry with respect to air pollution, energy efficiency and sustainability.

### Can you say more about the importance of teamwork?

**Dr. Fleischanderl:** Innovation is an extremely complex process that requires intensive teamwork with both internal and external experts. External teamwork may involve universities, R&D institutes as well as strategic alliances. Recent examples for this include the successful partnerships we have with the U.S.-based companies LanzaTech for the biofermentation of carbon to fuel, and Harsco for BOO [built, own, operate] models that help steel producers minimize capital investments in non-core areas such as slag treatment, recycling and energy efficiency. We also cooperate with Baosteel Engineering and with the German company Loesche for the valorization of slag from steelmaking processes.

### Is a creative mind something that one is born with or can it be fostered over time with proper training and practice?

**Dr. Fleischanderl:** I think it's partly genetic and partly a product of training, practice and educational support. Even as a kid, I was always experimenting using these chemistry and physics kits. You definitely need the right working environment and you have to apply strict time management. There must be enough time to work on and to develop ideas. And you also have to really enjoy what you are doing.

**Thomas Edison, perhaps the most prolific U.S. inventor and co-founder of General Electric, once said, “Genius is 1 percent inspiration and 99 percent perspiration.”**

### Do you think this statement also applies to innovation?

**Dr. Fleischanderl:** Innovation is the entire process from the idea to market success. The initial idea is the most important step of the innovation process, but only a very small part of it. Siemens VAI has excellent processes in place that guide and support company employees to be creative.

### What other innovations may come from your areas of responsibility that could change the steel industry?

**Dr. Fleischanderl:** One of the areas that could lead to a technological quantum leap in the steel industry involves the generation of hydrogen by means of hydrogen electrolysis. This is because hydrogen can largely replace coal as a reducing agent for metallurgical processes, which would dramatically shrink the carbon footprint of steelmaking.

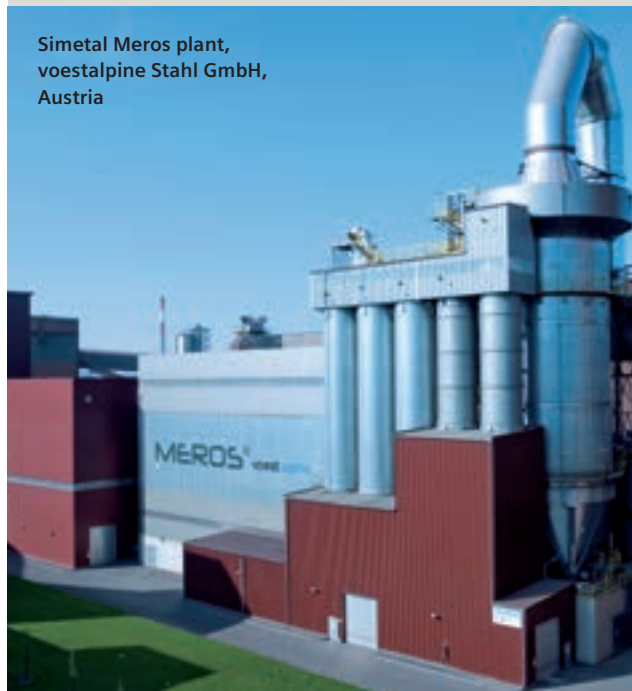
### One final question: If you had a million dollars and the best minds around to support you, what would you do?

**Dr. Fleischanderl:** Well, in fact I do have a million-dollar R&D budget and the best minds around to support me, so I'm already doing what I want to do, which is working for the bright future of our company. And you can be sure, this money is well invested.

## Overview of the Meros process

Meros, which stands for maximized emission reduction of sintering, is an environmental milestone for the cleaning of sinter plant offgas. The process features a series of treatment steps that comprise an additive dosing system, a conditioning reactor and a bag filter. Nearly 99% of the pollutants present in the waste gas – including dust, acidic gases (e.g., sulfur oxides), heavy metals and organic components – are removed before the cleaned gas is emitted to the atmosphere. To date, Siemens has built three turnkey Meros plants in Austria and China. Five more have been ordered in Italy and Turkey, and additional plants are in the decision phase.

Simetal Meros plant, voestalpine Stahl GmbH, Austria



## Siemens VAI participation in regional iron & steel conferences

# Close to the Customer

### Turkey

## 4th Eurasia MENA Steel Summit, Istanbul

The Eurasia MENA (Middle East North Africa) conference is Turkey's largest international steel summit. It has taken place each year in Istanbul since 2011. This time the event included two presentation sessions, where a total of 31 lectures were held, followed by separate round-table discussions that examined a variety of topics and issues of keen interest for regional steel producers.

During the first presentation session on January 29, 2014, Siemens VAI speaker Deniz Catan outlined the Simetal EAF Quantum electric steelmaking solution as a cornerstone technology within a highly efficient minimill complex. On the second day of the conference, Johann Kriechmair presented the portfolio of solutions and services that Siemens VAI offers as a life-cycle partner for the metals industry.

Each of the lecture sessions was followed by in-depth round-table discussions where Siemens VAI participants held one-on-one dialogues with steel producers. Numerous customer and project conversations continued at the Siemens VAI information counter where visitors had the opportunity to discuss technical and commercial matters in more detail.



Siemens VAI's Deniz Catan (left), Karl Baumgartner (center left) and Johann Kriechmair (center right) in round-table discussions with regional steel producers at the Eurasia MENA Steel Summit (January 29–30, 2014)



Strong participation at the 17th Middle East Iron & Steel Conference in Dubai (December 9–11, 2013)

### United Arab Emirates

## 17th Middle East Iron & Steel Conference, Dubai

Siemens VAI was a Bronze Sponsor of the 17th Middle East Iron & Steel Conference, an important event that is oriented to the trends and needs of the region's steel industry. Organized by Metal Bulletin, more than 450 delegates attended the conference, which focused on local steel supply and demand.

Thomas Reh from Siemens VAI lectured on EAF steelmaking technologies that enable flexible minimill solutions to be applied on the basis of charge materials and production targets. For example, the Simetal EAF Quantum, a highly innovative shaft-type electric arc furnace, allows simultaneous scrap charging and steel production using up to 50% direct-reduced iron (DRI) as the feedstock. In combination with holistic process models based on continuous offgas analyses and nonstop monitoring of ongoing furnace operations, a fully optimized and low-cost electric steelmaking process is ensured. In his presentation, Reh also covered highlights of the new greenfield minimill project at Qatar Steel Company.

For more information,  
please contact

Manuela Merz  
Event Manager





The surge in social-media usage has defied all expectations

# On the Fast Track

The impact that social media is having on communication is unprecedented. Once the realm of the very young and Silicon Valley pioneers, alien terms like LinkedIn, XING and Flickr are now mainstream. Join us on an exciting journey into a new world of communication.

**N**o one could ever have anticipated the dramatic developments that have recently taken place in connection with social-media activities. Who ever heard of Facebook, Twitter, YouTube and all of these newfangled toys ten years ago? TOYS? Did you know that at the end of 2013 Facebook had 1.23 billion monthly users – and that this trend is steadily increasing?<sup>1)</sup> This is the reason why Siemens VAI now promotes additional communication opportunities to make it easier for users to find out what's up in steelmaking and to get the latest news and insights into The World of Siemens VAI Technology.

All communication activities at Siemens VAI are increasingly being integrated and linked in a coordinated approach. For example, press releases are simultaneously dispatched as e-mails, web placements, tweets and Facebook postings. Live reports are available from conferences, and live streams can be offered for special events. The maga-

zine in your very hands is announced in Facebook and Twitter.

The Siemens VAI Facebook database now comprises a growing audience of some 9,300 fans that includes young engineers and technicians working in the metals industry. And these people will be the managers and decision makers of tomorrow – or maybe they already are today! Siemens VAI Facebook and Twitter postings are regularly dispatched three times each week and cover a wide range of topics, such as company news, events, innovations as well as interesting facts about the steel industry.

You too can profit from the news available on the Siemens VAI social-media channels. We sincerely look forward to tweeting with you.

**Marlene Peter**  
Manager for New Media



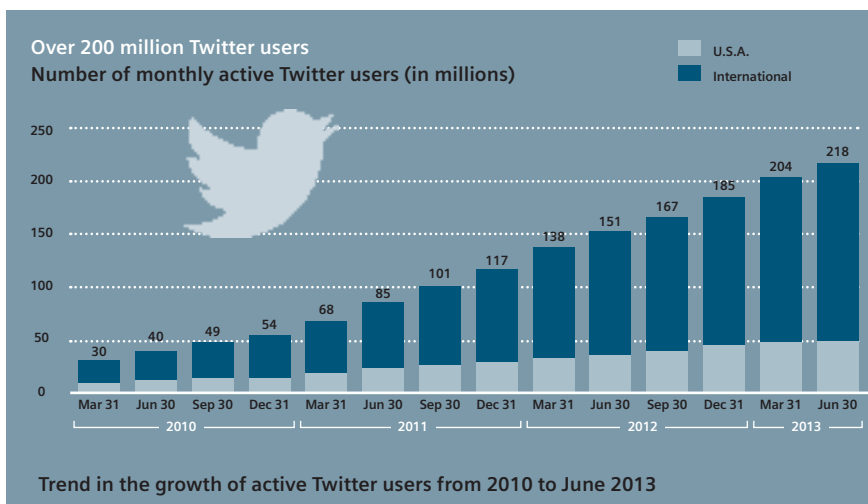
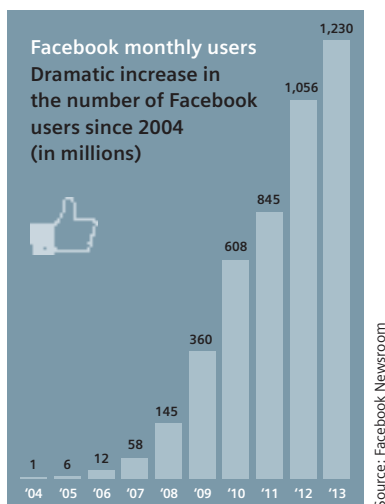
Sign up now and get networking!

Access to the Siemens VAI social-media channels is via the following link:

[www.siemens-vai.com](http://www.siemens-vai.com)

- Facebook
- Twitter
- Flickr
- YouTube
- XING

<sup>1)</sup>Source: <http://www.theguardian.com/news/datablog/2014/feb/04/facebook-in-numbers-statistics>; February 7, 2014



# Know More, Know Why – Siemens VAI

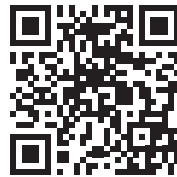
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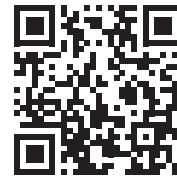
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# Be a champion in the metals industry – with life-cycle service from Siemens VAI

**Publisher:** Siemens VAI Metals Technologies GmbH · Turmstrasse 44 · 4031 Linz, Austria

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**Publishing house:** Agentur Feedback, Munich, [www.agentur-feedback.de](http://www.agentur-feedback.de)

**Publication date:** May 2014

**Circulation:** 10,000

Order No.: E10001-M10-A20-V1-7600

ISSN 2194-5381

Dispo No.: 21661

K. No.: 28105

**Photo credits:** Getty Images, pages 1, 2, 14/15, 23, 75; Qupik, pages 18/19, 20, 22 (u.I.&r.), 23 (u.I.), 28 and 29 ([christof.huemer@qupik.com](mailto:christof.huemer@qupik.com))  
All other photos: Siemens VAI.

Metals Magazine is published quarterly.

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