

STEEL+ TECHNOLOGY

THE TECHNICAL MAGAZINE FOR IRON AND STEEL PROFESSIONALS AROUND THE WORLD



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Performance delivered – The Yıldız Demir Çelik cold mill complex in Turkey

STEEL PROCESSING

The smart future of metal-working: digital networking of production and logistics

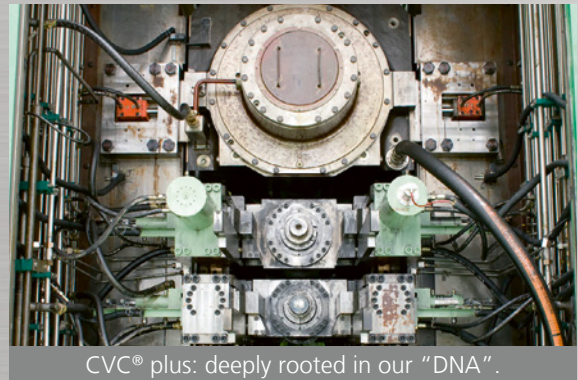
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the success of the CCM®. A great advantage of the CCM® is its flexibility in production planning. We offer our customers technological support and add-on features to allow the CCM® to grow with increasing market demands in terms of product grades, quality and production. One example is the performance module X-Pact® Total Roll Gap Control (TRC®), providing significant yield increase. Another one is AFC. Let's add value along the entire value chain, together.

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Climate change is transforming the metallurgical value chain

The steel sector faces political pressure to reduce emissions at the rate required to keep global warming below 2°C. It is common knowledge that more than 90% of metal produced in the world is steel, and the steel industry generates between 7% and 9% of global greenhouse gas emissions from fossil fuel use and industry. To align with the International Energy Agency's 2-Degrees Scenario (IEA 2DS), the sector will be required to reduce its emissions intensity by 65% by 2050, compared to 2014 levels. The industry has historically achieved significant improvements in energy efficiency. However, modern steel plants are currently operating near optimal technological limits. To align with a transition to a low-carbon economy, the steel industry will require a step-change in emissions reductions through the deployment and commercialization of radical mitigation technologies and alternative steelmaking processes.

Many steel companies have prepared already for the low-carbon transition, as feature articles in this issue illustrate. German steelmakers Dillinger and Saarstahl are taking a new approach to decreasing carbon emissions. They will invest 14 million euros for an innovative system to be implemented at their blast furnace site. They have plans to construct an innovative system to charge the blast furnace with a portion of the hydrogen-rich coke gas produced inside the integrated steel plant. This measure will lead to hydrogen replacing carbon as a reducing agent, thus achieving a significant reduction in carbon emissions.

Global steel giant ArcelorMittal has published its first Climate Action report in which it announces its ambition to be carbon neutral in Europe by 2050. A 2030 target is to be launched next year, replacing the company's current target of an 8% carbon footprint reduction by 2020, against a 2007 baseline. That report by ArcelorMittal explains in greater detail the future challenges and opportunities for the steel industry, the plausible technology pathways the company is exploring as well as its views on the policy environment required for the steel industry to succeed in meeting the targets of the Paris Agreement.

These are just two examples underlining the fact that the steel sector has indeed embarked on the transition to low-carbon steelmaking. For those who think it is still a long way off: ESTAD chairman Prof. Dr.-Ing. Wolfgang Bleck commented in an interview recently: "The topic of low-CO₂ technology is not so much basic metallurgical research as a scaling-up of solutions that have proven feasible in the laboratory. Test facilities – even on an industrial scale – are already in operation at various locations worldwide. The task now is to bring these new processes to industrial maturity."



Arnt Hannewald, Dipl.Ing.
Editor

Arnt Hannewald

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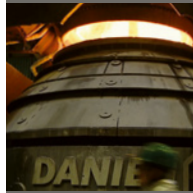
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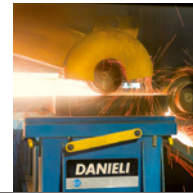
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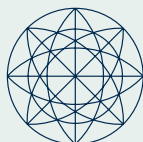
PROCESS CONTROL
SYSTEMS

Danieli Automation automates plants through integrated systems for equipment, process and power control, handling jobs from order placement through product delivery. Event-prediction and problem-solving operator assistance are ensured by the innovative 3Q system.

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ENVIRONMENTAL
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HOT STRIP, PLATE
AND COLD MILLS



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HEAVY SECTION,
RAIL, BAR AND
WIREROD MILLS



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SEAMLESS AND
WELDED TUBE
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Ironmaking/Steelmaking

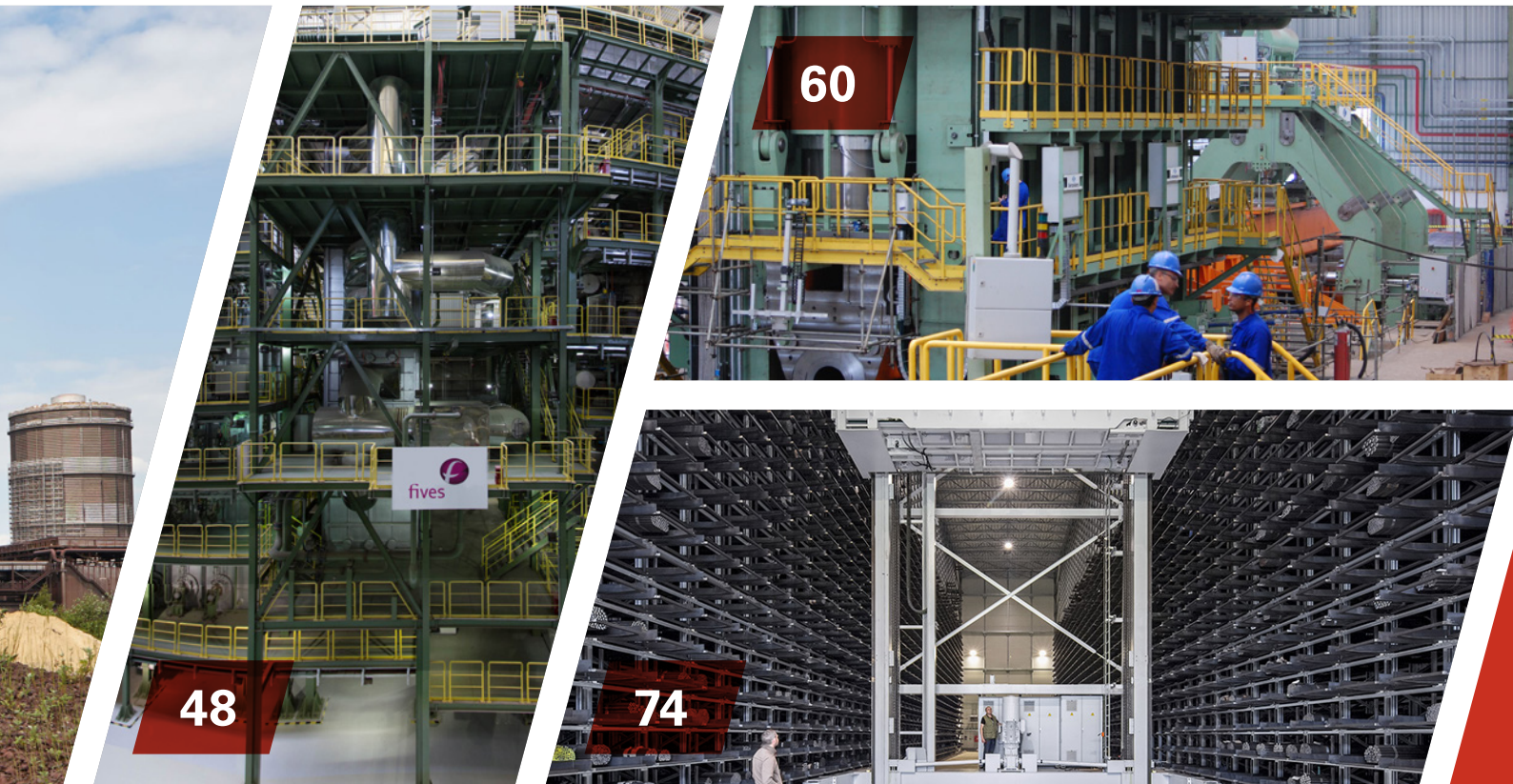
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Cover picture: © SMS group, Düsseldorf, Germany

Electric arc furnace at Big River Steel, Osceola, Arkansas, USA

■ SMS group

Executive board of thyssenkrupp Steel Europe headed by new chairman



Premal Desai, new chairman of the executive board of thyssenkrupp Steel Europe (Picture: thyssenkrupp AG)

Premal Desai is the new chairman of the executive board of thyssenkrupp Steel Europe AG. He has been chief financial officer of thyssenkrupp Steel Europe AG since 2015 and was previously head of strategy at thyssenkrupp AG.

In view of the cancellation of the joint venture with Tata Steel, Andreas Goss has resigned from his position as chief executive officer by mutual agreement as of June 15, 2019. Heribert Fischer, who has also left the board, will remain with thyssenkrupp Steel Europe AG in an advisory capacity at the request of the company.

Bernhard Osburg, previously responsible for sales management in the Steel segment, has joined the executive board of thyssenkrupp Steel Europe AG as chief

commercial officer. In this function, he is responsible for all sales and innovation activities in the steel business.

The future board will thus consist of only four members. Aside from Desai and Osburg, the executive board of thyssenkrupp Steel Europe AG will continue to include Dr. Arnd Köfler, responsible for production, and Dr. Sabine Maaßen, responsible for personnel and social policy. The responsibilities of the smaller management board will be realigned. In the future, Premal Desai will take over the strategy and planning function as well as the financial function and will lead the management board.

■ *thyssenkrupp AG*

New chief financial officer at Commercial Metals Company

Effective September 1, 2019, Paul J. Lawrence assumed the role of vice president and chief financial officer of Commercial Metals Company.

This is in accordance with the company's normal succession planning, as

Mary A. Lindsey has announced her retirement as senior vice president and chief financial officer of the company. Paul J. Lawrence will have responsibility for all financial and IT functions of the company. Mary A. Lindsey will remain employed with the company for a period

of time to ensure a smooth transition of the CFO role to Lawrence, who most recently was vice president of finance and treasurer.

■ *Commercial Metals Company*

Newly elected chairman of the supervisory boards of Dillinger and Saarstahl



At their recent meetings, the supervisory boards of Saarstahl and of Dillinger elected Reinhard Störmer as their new chairman.

Reinhard Störmer has been a member of the Saarstahl supervisory board since

In addition to the position of chairman of the Board of Trustees of the Montan-Stiftung-Saar, Reinhard Störmer is now also chairman of the supervisory boards of Dillinger and Saarstahl (Picture: Stahl-Holding-Saar)

1992 and has been its deputy chairman since July 2016. Since January 2018, he has also been a member of the Dillinger supervisory board. In March 2019, Reinhard Störmer had been elected chairman of the board of trustees of the Montan-Stiftung-Saar, as the successor to the late Dr. Michael H. Müller, who had also chaired the supervisory boards of Dillinger and Saarstahl.

■ *Stahl-Holding-Saar*

Change in management at Mechel's Beloretsk works

Sergey Fedorov has been appointed chief executive officer of Beloretsk Metallurgical Plant AO, replacing Viktor Kamelin.

During Viktor Kamelin's tenure as CEO, Beloretsk Metallurgical Plant

implemented several important investment projects and launched a large-scale upgrade of its steel wire and rope facility. Sergey Fedorov, prior to his recent appointment as CEO, Beloretsk Metallurgical Plant, headed

Mechel's Lithuanian-based Mechel Nemunas plant.

■ *Mechel PAO*

Dan DiMicco receives lifetime achievement award

Former Nucor Corporation chairman and CEO Dan DiMicco has received a Lifetime Achievement Award from the Charlotte Business Journal.

These awards recognize established local leaders who have a strong vision for their companies, have shown commitment to culture in the workplace and have made significant contributions to the Charlotte community. DiMicco was recognized for his work as Nucor CEO, as well as for work he has done in the community following his retirement. DiMicco led Nucor Corporation from September of 2000 through the end of 2012.

| Nucor Corporation

New CEO at FSP Finnish Steel Painting

Jarno Huttunen has been appointed CEO of FSP Finnish Steel Painting Ltd.

Jarno Huttunen succeeds Pentti Virtanen who has expressed his wish to resign as



Jarno Huttunen is the new CEO of FSP Finnish Steel Painting (Picture: FSP Finnish Steel Painting)

chief executive officer after 18 years on this post. Pentti Virtanen will continue his services as vice chairman of the board.

| Finnish Steel Painting



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Canada

Stelco completes batch anneal production facility

Stelco is starting shipment of fully processed, annealed cold-rolled steel sheet.

With completion of this project, Stelco will now be able to increase service to markets that demand these high-quality products such as the automotive, appliance and service centre markets, as well as the pre-painted steel market for architectural applications.

The restart of a modernized and upgraded temper mill, along with installation of new annealing furnaces, will allow Stelco to add a full range of up to 200,000 t of fully processed cold-rolled steel to its product mix. "This milestone marks another important step in Stelco's journey as we continue to deliver on our business plan," stated David Cheney, Chief Executive Officer of Stelco Holdings.

DTE Energy Services to be strategic co-generation partner

Stelco and DTE Energy Services are going to pursue the further develop-

ment of a strategic cogeneration project at Stelco's Lake Erie facility in Nanticoke, Ontario. The partnership between Stelco and DTE represents an important next step towards the construction and commissioning of cogeneration capacity that will serve to reduce the company's costs by utilizing excess industrial gases and reducing exposure to peak electricity pricing. DTE has been engaged to conduct detailed design, engineering and development services to pursue the next phase of the cogeneration project.

Former Stelco Hamilton lands

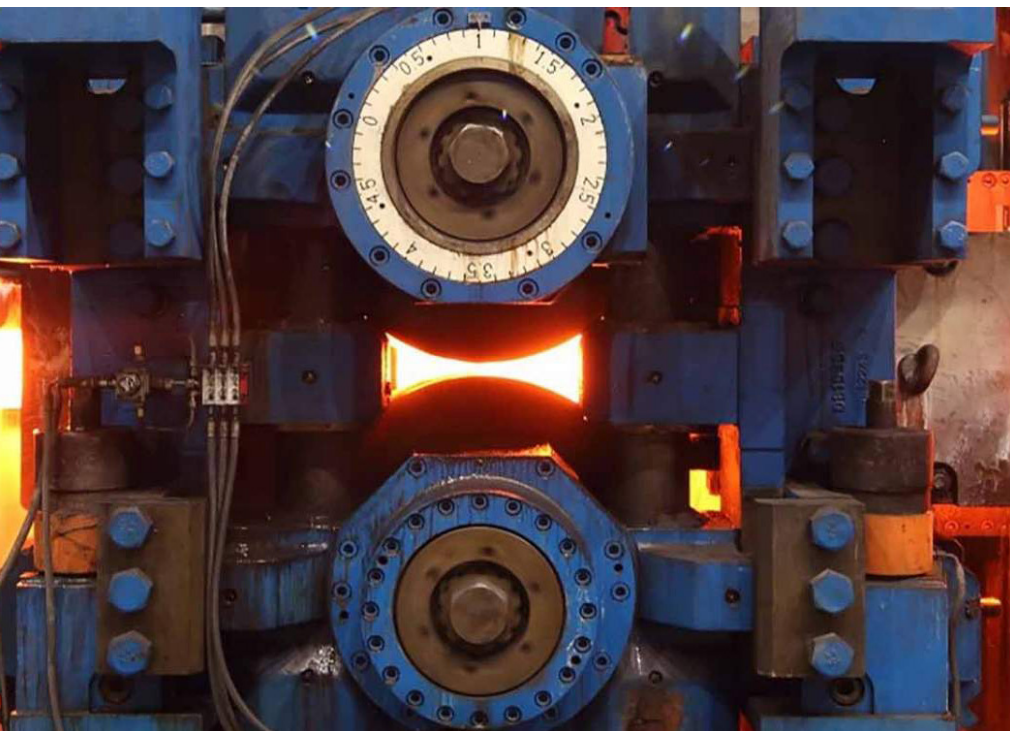
Stelco has completed the acquisition of the remaining about 4,000 m² of land located adjacent to Stelco's Hamilton Works operations. The purchase completes the return to Stelco of control over all of the Hamilton Works lands previously held by it prior to the commencement of the Companies' Credi-

tors Arrangement Act (CCAA) proceedings. Stelco has recently started to generate returns from its existing surplus land. The acquisition provides a necessary contiguous footprint for the Hamilton property that will provide Stelco with the flexibility to develop the lands in a manner that both complements its current and future operations and pursue other uses. "Since our initial acquisition of lands in both Hamilton and Nanticoke almost one year ago, we have worked diligently to unlock their value and generate significant value for our shareholders," stated Alan Kestenbaum, Executive Chairman of Stelco Holdings. "We have put in place a team to specifically pursue these opportunities and capitalize on the very strong demand that exists for industrial lands in the Greater Toronto Hamilton Area."

| Stelco

Peru

Aceros Arequipa continues rolling mill modernization



Two roughing mill stands will be installed as part of the mill upgrade at Aceros Arequipa (Picture: Danieli)

Corporacion Aceros Arequipa has placed an order with Danieli to install two additional roughing mill stands to improve product yield and mill utilization.

The two additional roughing mill stands will be installed as the second phase of the mill upgrade contract to allow billet sizes to be increased to 160 mm square and improve product yield and mill utilization. The equipment design will provide for the rolling of 180 mm square billets as part of the third phase of the modernization, becoming effective by September 2019.

Danieli will supply one horizontal and one vertical 6548 cartridge-type stand complete with the relevant lubrication system and hydraulic valves bench. Danieli Automation will supply the electrical equipment and integrate the level 1 system. Start-up is planned for the second quarter of 2020.

| Danieli

USA

Noodle.ai and SMS group partner to advance the learning mill for Big River Steel

To help Big River Steel conserve resources and control energy output, SMS group and Noodle.ai have come together to couple SMS group's process knowledge and expertise in the metals industry with Noodle.ai's AI expertise.

The joint solution was created by implementing Noodle.ai's learning algorithms into SMS group's X-Pact® MES 4.0. Noodle.ai was able to seamlessly leverage the

fact that SMS group's X-Pact® MES 4.0 was engrained into the steel mill's IT environment and into their SaaS (Software as a Service) applications. Noodle.ai's software and Enterprise AI Data Platform analyze historical and current high-frequency data from the mill's about 50,000 sensors attached to SMS group's equipment. In addition to the mill's data plus these sensor values, external data sources are used to sense, predict, and recommend correc-

tions that maximize production yields, enhance product quality, mitigate safety risks, and minimize costs. For example, these insights can help minimize transition losses regarding steel grade, strip width or strip thickness, and predict how much energy is being consumed by the mill each hour and/or each day.

■ *SMS group*

EVRAZ North America to build new premium rail mill

EVRAZ North America, producer of engineered steel products for rail, energy and industrial markets, has chosen Danieli to supply its new rolling mill.

The new mill to be built in Pueblo, Colorado, will be designed for the production of 100-m-long premium-quality rails and a capacity of 610,000 t. The mill's product range will include flat-bottom rails and

thick-web rails up to 88 kg/m for heavy-haul and high-speed railways, and other applications. Rails will be manufactured according to AREMA specifications in customized grades, with hardness up to 425 BHN and lengths up to 100 m.

The rail mill will feature flexible rolling processes both in the break-down and in the ultra-flexible reversing mills, achieving

very low roll consumption and precise geometrical tolerances. A Danieli Automation control system, based on level 1 and 2, with dedicated PLCs and HMI, will guarantee automatic process settings and automatic control of the mill.

■ *Danieli*

Liberty Steel acquires Johnstown Wire Technologies

Liberty Steel, part of the global GFG Alliance, has further expanded its footprint in the US steel downstream products market with the acquisition of Johnstown Wire Technologies (JWT) in Johnstown, Pennsylvania.

The acquisition from private investment firm, Aterian Investment Partners, was financed by group equity along with loans

from PNC Business Credit and gives Liberty valuable capacity to manufacture a range of high-value carbon and alloy wire products for multiple end markets including the infrastructure, automotive, utility and consumer sectors.

The Johnstown site has been a high-profile steel manufacturing facility for over 100 years. Products include cold heading quality, electro-galvanized, alu-

minized and spring wire. Liberty Steel intends to drive growth at JWT as the infrastructure and electricity networks in the country are being upgraded, thereby increasing demand for steel products such as support cables and guard rails for bridges and for electrical power lines.

■ *Liberty Steel*

Nucor Corporation orders water-treatment plants

The two new water-treatment plants will complete the minimill projects implemented by Danieli at Nucor Sedalia (Missouri) and Nucor Frostproof (Florida).

Both minimill plants have indirect cooling circuits of about 4,000 m³/h for the electric arc furnace, the fume treatment plant and the

continuous casting machine, and direct-cooling circuits of about 1,400 m³/h for the caster and the rolling mill. The selected technologies comply with Nucor's request for minimized civil construction cost and time, easy and fast erection, reliable and flexible operations, and high-level process control. Installing just three DanFilter™ units ensures high-quality water

circulation. Containerized electrical cabins and package cooling towers are preassembled before delivery, ready to connect. Danieli Automation will integrate the water treatment plants to the plant automation package.

■ *Danieli*

Nucor to invest in South Carolina bar mill

Nucor Corporation will add vacuum degassing to its engineered bar capabilities

at its bar mill in Darlington, South Carolina.

Adding this technology will enable the mill to produce engineered bar products meet-

ing some of the most stringent quality specifications in the industry. The vacuum degassing system is expected to begin operations in late 2020.

“This strategic investment complements our existing bar mills that primarily

produce engineered bar products in Norfolk, Nebraska, Memphis, Tennessee, and Wallingford, Connecticut. It will position us to better serve our customers in the Southeastern United States and support the growing demand in the region for higher

quality automotive and other specialty steel applications,” said John Ferriola, Chairman, CEO and President of Nucor Corporation.

■ *Nucor Corporation*

USA

Nucor Steel Gallatin orders fume-treatment plant for new meltshop

The new fume-treatment plant supplied by Danieli will ensure compliance with local regulations, achieving dust emission at the stack of less than 4 mg/Nm³.

Following the orders for a new meltshop and the conversion of the thin slab casting and rolling plant, Nucor Steel Gallatin selected Danieli to design, manufacture,

and supply the complete fume treatment plant. It will collect the fumes coming from the 170 t EAF, twin ladle furnace, and other auxiliary suction lines, and treat approx. 3.6 million m³/h (subject to performance guarantee verification.)

The fume-treatment plant will consist of a twin reverse-air baghouse, five ID fans with variable-frequency drives, a complete

set of ducts and supporting structures, a pneumatic dust conveying system, a dust collecting system with a movable dust discharging system, and the electrical and automation systems integrated with the meltshop systems.

■ *Danieli*

U. S. Steel to install Arvedi ESP line

Primetals Technologies will supply an Arvedi ESP (Endless Strip Production) line to United States Steel Corporation for its Edgar Thomson Plant at Braddock, Pennsylvania.

This will be the first ESP line to be constructed in the USA. The casting-rolling plant has a rated capacity of 2.5 million t of high-quality, ultra-thin strip. With a maximum strip width of 1,956 mm, it

will be the widest ESP line ever built. The Arvedi ESP line is designed to produce strip with thickness between 0.8 mm and 6 mm in a width range from 965 to 1956 mm. Primetals Technologies is responsible for the engineering of the Arvedi ESP plant and will supply mechanical equipment, media-control systems, technological packages and automation systems. The entire line is controlled by a completely integrated basic (Level 1) and process optimization (Level 2) automation, which fully controls all casting and rolling operations. Level 3 automation is also included in the scope of supply as well as the power supply transformers and substation. For coil transport, a modular shuttle car will be provided.

With this investment, Mon Valley Works will become the principal source of substrate for the production of the company's industry-leading XG3™ Advanced High Strength Steel (AHSS) that assists automotive customers in meeting fuel efficiency standards. This project, in addition to producing sustainable AHSS, will improve environmental performance, energy conservation and reduce the carbon footprint associated with Mon Valley Works. First coil production is expected in 2022.

■ *Primetals Technologies*



Arvedi Endless Strip production lines directly link casting and rolling (Picture: Primetals Technologies)

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China

Angang orders slab caster

Angang Iron & Steel Group Co. (Angang) has placed an order with Primetals Technologies to modernize a continuous slab caster at its Anshan plant.

installed in 1999, has a production capacity of 1 million t/year. It produces slabs with a thickness of 250, 300 and 360 mm in a width range of 1,500 to 2,000 mm. Cast-

tundish car, mould, oscillator, bender, segments and alignment stands, the supply of incorporated parts for the strand guide system as well as the complete supply of



Slabs produced in a single-strand caster (Picture: Primetals Technologies)

The modernized caster will replace the existing CCM 1 in its steel works No. 1. The objectives of the project are to improve the slab quality for use in the subsequent plate mill and to increase maximum slab thickness from 300 to 360 mm. The modernization is scheduled for completion in the third quarter of 2019.

The single-strand continuous slab caster CCM1 in steel works No. 1, originally

ing speeds vary from 0.4 to 1.5 m/min. The caster will be equipped with LevCon mould level control. The straight cassette-type Smart Mold is equipped with the Mold Expert breakout detection system, DynaWidth for automatic width adjustment, and the DynaFlex mold oscillator.

The modernization project also includes the detail engineering of the tundish,

hard reduction segments. The “Connect & Cast” principle, based on preconfigured and pretested packages forms the basis for a fast plant start-up. Advisory services of erection, start-up and commissioning round of the scope of Primetals Technologies.

■ *Primetals Technologies*

Baosteel Zhanjiang builds continuous galvanizing line

Baosteel continues to expand its Zhanjiang integrated steel production complex in southeastern Guangdong province. Fives has been contracted to supply the complete thermal part for the continuous annealing line.

The expansion project at Zhanjiang comprises the installation of the cold rolling mill N3, aiming to meet the demand for auto-

motive grade steel in the South China and Southeast Asia markets. The line will produce both standard steel grades and advanced high-strength steels. The first coil will be produced by the end of 2021.

Fives’ scope of supply includes detailed design, supply and installation supervision of a Stein Digiflex® furnace and induction heaters. The furnace includes a jet preheating furnace, Advantek® combustion system

and the waste gas system. Fives’ rapid cooling system includes Dry FlashCooling® with high hydrogen content for high cooling rates and Wet FlashCooling® for ultra-rapid cooling rates to produce martensitic grades. The line will be also equipped with CELES induction heaters, serving as in-furnace heating boosters to perform the most stringent thermal cycle required. Part of Fives’ equipment will be engineered and manufactured in China under close supervision by Fives’ subsidiary in Shanghai.

■ *Fives*

Digiflex® furnace of the type to be supplied to Baosteel (Picture: Fives)



China

Fujian Luoyuan Minguang to install new section mill

SMS group has received an order from Fujian Luoyuan Minguang Iron and Steel to supply a new section mill for parallel flange beams of up to 750 mm web height.

The section mill will be designed for an annual capacity of 1.3 million t and equipped with a state-of-the-art breakdown stand and the latest-generation CCS® universal mill stands in reversing tandem arrangement, featuring hydraulic adjustment sys-

tems and automatic quick program change. The new CRS® roller straightening machine, which is also equipped with hydraulic adjustment systems, ensures minimal program change time as well as best straightness and minimal residual stress level of the finished products.

Furthermore, SMS group's scope of supply includes the technology and engineering for the entire rolling mill, the supply of hot and cold saws, in-line profile gauge with surface defect detection and

other mechanical key components. The supply will be complemented by the basic automation for the rolling mill as well as electrical main and auxiliaries drives. The theoretical training of the customer's personnel will be held in SMS group training center in Mönchengladbach. Hot commissioning of the new mill is scheduled for the second half of 2020.

■ SMS group

Zero-bucket EAF in operation at Guihang Metal Products

On May 5, 2019 the first heat was processed in the Danieli Zero-bucket EAF with ECS scrap preheating. The acceptance certificate was signed as early as 13 days later.

Thanks to a very quick learning curve, more than 110 heats were processed in less than two weeks. Guihang selected Danieli's Zero-bucket solution to replace induction melting in order to reduce electrical energy and electrode consumption. The Danieli EAF features a horizontal continuous scrap charging system. Currently, the tap-to-tap time is 43 min with 100% scrap or 90% scrap + 10% pig iron charging.



The first Zero-bucket EAF in China is in operation at Guihang Metal products (Picture: Danieli)

■ Danieli

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- Complete Ladle Solutions

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China

Jiangsu Shagang to upgrade BOF converters

Jiangsu Shagang has placed an order with Primetals Technologies to install automatic tapping systems on two BOF converters in its converter steelworks in Zhangjiagang in Jiangsu Province.

This modernization project marks the first commercial implementation of Primetals Technologies' automated tapping system in a steelworks. The package will reduce tapping time and minimize slag carry-over, improving subsequent phosphorous refining. Automated tapping sequences will

optimize tapping performance and make it independent from the operator's experience. In addition, working safety will be largely improved.

The upgrade of BOF operation by Primetals Technologies encompasses the hardware and sensor system for automated tapping, the safety system to prevent ladle overflowing, the implementation of automated tapping sequences, the installation of additional features for safety tapping as well as the integration of the existing slag stopper system. The auto-

mated tapping system developed and installed by Primetals Technologies acts as a "digital assistant" and allows for a safe and fully automatic converter tapping procedure, including the control of vessel position, ladle car movement during tapping, as well as the positioning of the chute for ladle alloying. Start-up of the systems is expected for the third quarter of 2019.

■ *Primetals Technologies*

Shougang Jingtang starts up new hot-strip production facility

The new mill supplied by Danieli features Danieli's universal endless technologies and can produce hot-rolled strip in coil-to-coil, semi-endless and endless mode.

The single-strand thin slab caster at Shougang Jingtang has been producing slabs

from a mould exit thickness of 130 mm down to 110 mm with dynamic soft reduction. 130 mm slab thickness at the mould exit allows stable conditions in the mould, while 110 mm final slab thickness, together with high casting-speed, leads to high productivity. The ability to provide the rolling mill with 110 mm slabs, i.e. slabs thick-

er than in the traditional thin slab approach, reflects in a significant increment in the reduction ratio from slab to strip, which in turn allows the production of a wider product mix.

■ *Danieli*

Luzhou Xinyang orders two Zero-bucket UHP EAFs

Luzhou Xinyang Iron and Steel selected Danieli Zero-bucket EAF technology for two new electric arc furnaces to be installed in the new meltshop in Luzhou City, Sichuan Province.

The two new 100 t UHP Ultra-High Power furnaces feature Danieli's original ECS end-

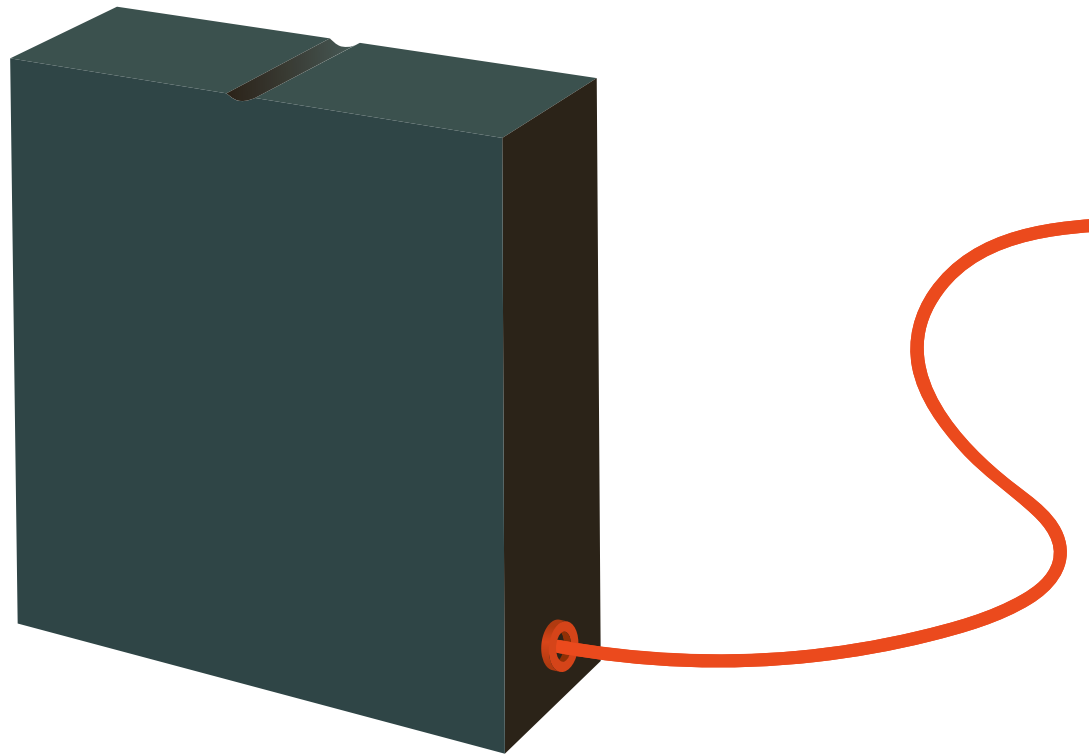
less charging system for continuous scrap charging and preheating. Each furnace will be equipped with a chemical package based on combined carbon and oxygen injectors, and a side Palmur lance with dynamic positioning based on the steel level. Additional technological packages such as dynamic spray for electrodes, energy saving double

layer Q-panel, automatic sampling and automatic tapping systems will allow Luzhou Xinyang to reduce consumption and increase safety. Start-up of the furnaces is expected by beginning of August 2020.

■ *Danieli*



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China

Masteel invests in furnace automation

Ma'anshan Iron & Steel Co., Ltd (MaSteel) has selected Fives to design, install and tune its proprietary thermal optimization solution – Virtuo® – for a hot-dip continuous galvanizing line and a continuous annealing line at the Ma'anshan-II site in the Anhui Province.

Virtuo®, a new generation of a thermal solution developed by Fives, is based on 3D thermal modeling and uses sophisticated model predictive control. The interface is also being upgraded to be more intuitive and user-friendly.

The Virtuo® solution will be able to perform enhanced thermal calculations for higher temperature accuracy, provide greater flexibility and reactivity to process changes, help maximize production output and reduce fuel consumption through optimized thermal control. Other features provided by the system include determination



HMI of the thermal optimization system for processing lines

(Picture: Fives)

of the real average tube temperature to model furnace behaviour, prevent overheating and forecast forthcoming furnace change. On the continuous galvanizing line, the project will be implemented in

2019, on the continuous annealing line in 2020.

Fives

Shandong Minyuan orders high-speed bar mill



High-speed rebar rolling mill (Picture: Danieli)

Minyuan I&S Group in Shandong is going to install a new mill for the production of 12 to 40 mm rebar, produced at up to 240 t/h. The mill will be supplied by Danieli.

The main equipment to be installed includes four SHS housingless stands followed by two four-pass finishing blocks. Through an advanced multi-strand slit-rolling system, rebars from 12 to 22 mm will

be rolled on two strands at finishing speed higher than 40 m/s, from 165 mm billets weighing 2,300 kg. An on-line water-cooling system will ensure a final product with ultrafine grain structure. A double high-speed twin channel performing fast discharge of the bars on the cooling bed will complete the supply.

Danieli

Ningbo Baoxin Stainless to install new cold rolling mill

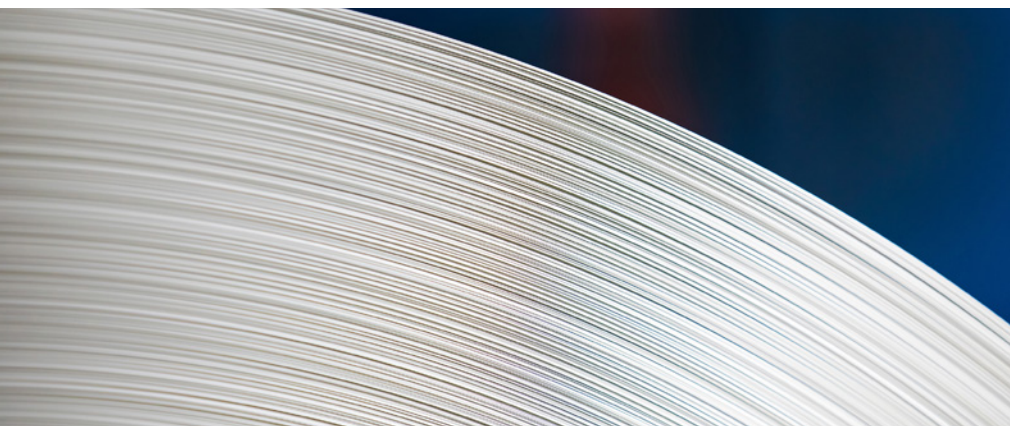
Ningbo Baoxin Stainless Steel has ordered a new cold rolling mill DMS 20Hi EcoMill from Fives to process precision stainless steel for high-end applications.

The new DMS 20Hi EcoMill will be able to roll strip down to 0.03 mm over the width of 1,040 mm. The mill will have an annual production capacity of 50,000 t of steel

(30,000 t of the final products) for automotive, electronics and photovoltaic panels applications. A large portion of equipment for the mill will be manufactured locally under the supervision of Fives' subsidiary in China. The mill is scheduled to begin production by the end of 2020.

Fives

The new 20-high mill will produce precision steel for highly demanding applications (Picture: Fives)



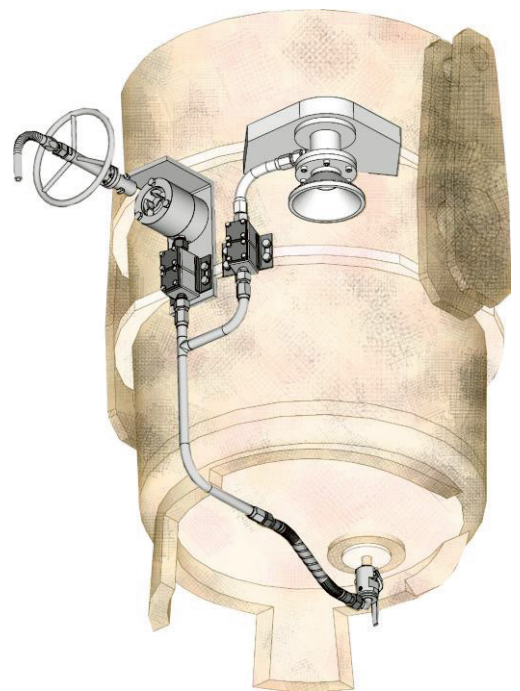


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India

SAIL Durgapur to modernize steelmaking plant



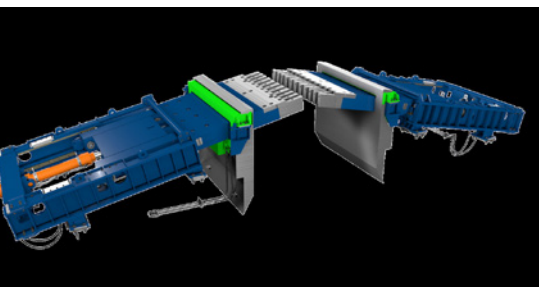
BOF converter equipped with maintenance-free lamella suspension system of the type supplied to SAIL (Picture: SMS group)

SAIL has awarded SMS group a turnkey contract for the supply of three new 110 t converters for its steelmaking plant No. 2 and secondary dust collecting systems for the three converters.

The new converters are to replace the converters SMS group supplied 25 years ago and increase the volume by 10%. SMS group will also supply secondary dust collecting systems for the three converters. The order scope comprises the turnkey installation of the equipment, design and supply of the converters with maintenance-free lamella suspension systems, the bottom stirring system for combined blowing, secondary dust collection systems, and X-Pact® electrical and automation systems, as well as the erection and commissioning work. Commissioning of the complete plant is scheduled for September 2020.

■ SMS group

Tata Steel to upgrade caster of CSP line



Electromagnetic brake as to be installed in Tata Steel's CSP® line (Picture: SMS group)

Tata Steel Ltd. has awarded SMS group the contract to upgrade the two-strand continuous caster of the CSP® line at its Jamshedpur plant.

Both strands will each be equipped with an electromagnetic brake. This brake reduces the flow velocity of the liquid steel immediately as it enters the mould, steadying the mould level. As a result, the quality of the hot strip can be further improved while maintaining a consistently high throughput rate.

SMS group's scope of supply covers the engineering, delivery of the electromagnetic brakes, the implementation, and the X-Pact® electrical and automation system. Commissioning of the first strand is scheduled for end-2019, with the upgrade of the second strand planned for end-2020.

■ SMS group

Japan

JFE Keihin implements audited process, equipment and maintenance practices



JFE Keihin adopts audited practices on oil-film bearing components (Picture: Danieli)

Danieli Service provides DanOil advisory services for flat product producers.

Danieli Service has successfully audited a training on assembly/disassembly procedures of oil-film bearing components, as well as inspection, failure analysis, predictive maintenance, fault-finding and evaluation of operating spares, aimed to increase

mill productivity by preventing any major oil-film bearing failure.

At JFE Keihin, Danieli Service successfully transferred the process, equipment and maintenance practices of DanOil HLU (Hydraulic Locking Unit) to a wide plate mill.

■ Danieli

Kazakhstan

Convincing performance of wear plates in hot strip mill

In December 2014 Danieli Service executed a revamping including the geometrical re-alignment of the mill windows by means of on-site machining at a hot strip mill plant in Kazakhstan.

During this project new DanLiner wear plates were supplied and installed, includ-

ing an automatic greasing system. The new equipment was purpose designed to improve the opening stability of the window.

After four years of operation and 16 million t of steel rolled, the mill window opening of the stands was measured again. It showed an average increase of only 0.3

mm over its width. This result shows a wear rate lower than 0.05 mm/year and proves the high performance of DanLiner wear plates.

| Danieli

South Korea

Daehan to install new finishing facilities in straight bar line

Daehan Steel has awarded SMS group the order to add finishing facilities to the rebar rolling mill in its Pyeongtaek plant.

The new equipment will allow Daehan to bundle rebars in different sized packages. Starting material will be billets 130 and/or 150 mm square with a length of 12 m in low and medium carbon grades. The throughput rate will be 70 t/h. The rebars having a diameter range from 10 to 32 mm

will be bundled to packages of commercial lengths from 6 to 12 m. The scope of supply includes a new crop and dividing shear, a new cooling bed fitted with HSD® (High Speed Delivery) system, a newly designed cold-cutting system acting with counting stations, equipment for bundling and tying.

| SMS group



Contract signing ceremony with Byoung-Do Kim, Deputy General Manager Daehan Steel (left), and David Maurizio, Area Sales Manager SMS group (Picture: SMS group)

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South Korea

Hyundai Steel to revamp heavy section mill

SMS group is going to revamp the heavy section mill at Hyundai Steel's Incheon plant.

With this project Hyundai Steel aims to expand its product range towards larger sections with webs of up to 1,100 mm and sheet piles up to a system height of 800 mm. SMS group takes up this challenge as the leader

of a consortium with Hyundai Rotem, a subsidiary of Hyundai Motor Group.

As part of the project, various new functions will be added to the existing two-high breakdown mill stand, and a new side-guard manipulator will be installed. The rolling line downstream of the breakdown stand will be replaced by a new CCS® (Compact Cartridge Stand) tandem group

and one additional CCS® finishing stand. The stands will feature nominal rolling forces of 12,000 kN for the horizontal rolls and 8,000 kN for the vertical rolls. Commissioning of the new rolling line is scheduled for October 2020.

■ *SMS group*

United Arab Emirates

Emirates Steel accelerates digital roadmap

Emirates Steel has implemented a software solution from Commvault, provider of software for the management of data for cloud and on-premises environments headquartered in Tinton Falls, New Jersey, USA.

Emirates Steel chose Commvault HyperScale™ to support its digitalization ambitions and safeguard its manufacturing operation. The company's digitalization efforts include moving its SAP modules to

the cloud through Microsoft public cloud solutions.

"Backup was a challenge with underlying technology scattered across different environments and running on aging Dell hardware," said Mohammed Azam, IT Infrastructure Head at Emirates Steel. Commvault HyperScale™ and Commvault Complete™ Backup & Recovery protect 400 terabytes of data hosted across SAP systems, and including SQL databases, email archives, and 20 virtual machines.

The system is interoperable with both public cloud and on-premises environments. Two Commvault HyperScale™ clusters replicate data between the company's data center and disaster recovery site to provide robust business continuity capabilities. Commvault also helps accelerate Emirates Steel's digital roadmap by making it simple to add new services and datasets.

■ *Commvault*

Austria

2019 AIST European Steel Forum

The AIST European Steel Forum, to be held from 23 to 25 October 2019 in Leoben, Austria, will highlight economic and technological issues of key interest to today's steel industry.

This year's edition of the annual innovation forum will for three days be the meeting point of European industry rep-

resentatives for knowledge sharing and networking.

The three-day program features keynote presentations, panel discussions and plant tours. The 2019 forum will delve into a variety of subjects. It will bring into focus ongoing efforts to improve steelmaking technology, reduce steel's carbon footprint and make the industry safer. The attend-

ees will learn about research and development initiatives aimed at investigating the potential of CO₂-free steelmaking process routes. Key representatives from industry and academia will share their views on the evolution of robotics in the steel industry.

■ *AIST*

Slovakia

U.S. Steel Košice places order for annealing and coating line

Annealing and coating line built by Tenova (Picture: Tenova)



Tenova LOI Thermprocess is going to supply an annealing and coating line for dynamo steel strips to U.S. Steel Košice.

The contract scope includes the engineering, to a large extent the turnkey delivery of all equipment as well as the supervision of the assembly and commissioning including training.

Tenova, with its companies Tenova LOI Thermprocess and Tenova Italmimpianti, sup-

plies the complete annealing and coating line for the production of non-grain oriented electrical steel including heat treatment section (furnace) of the plant, the entire strip handling and chemical processing with drying oven following the coil coating, the associated electrical, instrumentation and control technology, including automation system.

■ *Tenova*

Europe

ArcelorMittal prepares to further reduce primary production in Europe as market weakness continues

ArcelorMittal is prepared to take additional steps to adjust its European production levels to further align its production to the current market demand.

As a result, ArcelorMittal will reduce primary steelmaking production at its facilities in Dunkirk, France and Eisenhüttenstadt, Germany. At its facility in Bremen, Germany, a planned blast furnace stoppage for repair works will be extended. Also at its plant in Asturias, Spain, the stoppage planned in the fourth quarter of this year to repair a blast furnace will be extended.

On 6 May, ArcelorMittal had announced its intention to temporarily

idle production at its steelmaking facilities in Kraków, Poland, and reduce production in Asturias, Spain. The announcement also impacted the planned increase of shipments at ArcelorMittal Italia to a 6-million-t annual run-rate; the planned increase will be slowed down following a decision to optimize cost and quality over volume in the current environment.

Asset deal with Liberty House completed

ArcelorMittal has completed the divestment agreed with the European Commis-

sion during its merger control investigation into the company's acquisition of Ilva S.p.A. Assets included within the divestment package are:

- ArcelorMittal Ostrava (Czech Republic),
- ArcelorMittal Galati (Romania),
- ArcelorMittal Skopje (Macedonia),
- ArcelorMittal Piombino (Italy),
- ArcelorMittal Dudelange (Luxembourg) and
- several finishing lines at ArcelorMittal Liège (Belgium).

■ ArcelorMittal

Finland

SSAB takes part in research project on bio-based coated sheet product

SSAB and its subsidiary Ruukki Construction are involved in a sustainability research project that aims to reduce the use of fossil raw materials in sheet products in the construction industry.

The project is headed by Häme University of Applied Sciences (HAMK) in conjunction with color coating manufacturers, makers of coated sheet materials and products, and equipment suppliers.

SSAB wants to develop solutions that can be used to increase the use of quality, lasting, bio-based color coatings in building product solutions. SSAB's role in the research project is to develop various bio-based coating concepts in which traditional fossil raw materials have been replaced by components based on renewable natu-

ral resources and to study the suitability of various bio-based coatings for large-scale production and for outdoor use applications.

SSAB's patented GreenCoat® BT technology improves the coating's ecological properties and performance. It features a bio-based technology (BT) in which a substantial amount of the traditional fossil components have been replaced with a bio-based alternative. In other words, unlike in traditional coatings, the bio-based solvent remains a permanent part of the end coating, thereby making it eco-friendlier and also reducing the release of volatile harmful substances into the air.

■ SSAB



Color-coated GreenCoat® steel products are eco-aware options for roofs, façades and rainwater systems (Picture: SSAB)

Germany

Salzgitter AG to build a new hot-dip galvanizing line

Salzgitter Flachstahl GmbH (SZFG), a subsidiary of Salzgitter AG, has selected SMS group as project partner for its "Hot-Dip Galvanizing 3" (FV3) project, one of the company's largest single investments of the last decade at the Salzgitter location.

The new production facility, with an annual capacity of 500,000 t, supplements

SZFG's already existing hot-dip galvanizing lines. The new facilities to be supplied by SMS group will produce hot-dip galvanized sheets with thicknesses of between 0.7 and 2.5 mm and widths from 800 to 1,700 mm. The strip is wound to coils with a maximum weight of 32 tons.

"This project is a key component in the strategy of the Salzgitter Group that focuses on qualitative growth for its strip steel

business. It will help us strengthen our market position as a producer of premium products for national and international customers from the automotive industry. We have decided to make this investment, even though the political and social framework conditions for major industrial projects in Germany and Europe are currently going in an unfavourable direction," explains Prof. Dr.-Ing. Heinz Jörg Fuhr-



A hot-dip galvanized coil produced by Salzgitter Flachstahl (Picture: SMS group)

Germany

thyssenkrupp aims to be climate neutral by 2050

In addition to aiming to be climate neutral from 2050 onwards, as early as 2030 thyssenkrupp plans to cut emissions from production and outsourced energy by around 30%.

In February 2019 thyssenkrupp was named as a global leader in climate protection for the third year in a row by the non-governmental organization CDP, which assesses whether companies have formulated a coherent strategy on how to further improve their own environmental performance as well as that of customers and suppliers. thyssenkrupp once again achieved the highest score possible and was placed on CDP's

global "A List". The list includes roughly 130 businesses worldwide and only five DAX companies.

The targets now announced take in thyssenkrupp's own production operations, the energy it purchases and its products. In steel production, for example, thyssenkrupp is currently pursuing two approaches to reducing CO₂ emissions: The Carbon2Chem project, which converts steel mill emission gases, including the CO₂ they contain, into valuable chemicals, is expected to be available on an industrial scale before 2030, and the so-called hydrogen route, which should take full effect by 2050 and make the biggest contribution to directly avoiding CO₂.

mann, Chief Executive Officer of Salzgitter AG.

FV3 is scheduled to become operational in 2022 and will then produce third-generation AHSS (Advanced High-Strength Steel) grades for chassis and body applications which play an important part in lightweight automotive construction and in vehicle safety.

The production of high-strength and ultra-high-strength steel grades will be ensured by the integration of a high-performance furnace from Drever International, a member of SMS group. A Duma-Bandzink JetPro air knife system with integrated strip stabilization will be used to precisely adjust the zinc coat thickness.

■ SMS group

Italy

Padana Tubi orders new 16¾-inch ERW tube welding line

The new 16 ¾-inch tube welding line, to be supplied by SMS group, will be installed at Padana's Guastalla works. A 14-inch tube welding line from SMS group is already in operation.

With the new line Padana Tubi will increase the product portfolio for round tubes up to 406 mm diameter, square sections up to 350 x 350 mm and rectangular sections up to 500 x 200 mm. Besides heavy wall

thicknesses up to 18 millimeters, the mill will be specially designed to produce high grades up to 700 N/mm².

SMS group will supply the complete mill equipment from strip preparation to the cut-off saw, including entry equipment, shear and end welder, horizontal strip accumulator, edge miller, forming, welding and sizing section, and a travelling milling cut-off machine. The line will be equipped with URD® (Uniform Rigid Design) stands for automatic

To make its products carbon neutral, the group already offers a technology for the cement industry that permits CO₂ emissions from the combustion processes to be captured for subsequent storage or processing.

Other key areas include the e-mobility sector, where thyssenkrupp supplies battery production lines and special steels for electric motors. The group is also actively involved in the development of energy storage solutions, for example with electrolysis systems that convert electricity into hydrogen.

■ thyssenkrupp

quick-change of the rolls. The quick-change system is controlled by the X-Pact® Quick-setting system, which sustainably improves the product quality by database-assisted plant settings. These features combined with a maximum mill speed of 45 m/min will allow Padana Tubi to achieve a high output and very flexible and efficient production.

■ SMS group

Italy

Acciaierie di Verona starts up second phase of wirerod mill project

The mill project implemented by Danieli has given Acciaierie di Verona the capacity to produce 750,000 t/year of plain and deformed wirerod from 5.5 to 21.5 mm dia.

With a shutdown lasting just three weeks, the wirerod mill extension and addition of fans for coil treatment have been successfully completed. This project for Acciaierie di Verona, which belongs to the Pittini group, also included the installation of a second compactor to increase wirerod mill productivity. This project represents the 500th rolling mill completed by Danieli.

I Danieli



Control room of the extended wirerod mill (Picture: Danieli)

Russia

Mechel upgrades mining fleet

Mechel has ordered 15 dump trucks from CTP BELAZ-24 for its mining operations.

The deal was signed on the sidelines of the international specialized mining technologies exposition "Russian Coal and Mining" held in Novokuznetsk.

The new trucks with capacity ranging from 130 to 220 t will be used at Mechel group's facilities in the Kemerovo and Irkutsk Regions, with eleven trucks intended for work on the Southern Kuzbass Coal Company's open pits and four for Korshunov Mining Plant. "Upgrading our mining

fleet is an important priority for our program of capital investment in our mining facilities," said Chief Executive Officer of Mechel Mining Management, Pavel Shtark.

I Mechel

NLMK to upgrade steelmaking operations and cut air emissions

NLMK Lipetsk has embarked upon a large-scale overhaul of its steelmaking capacities, namely BOFs and associated dedusting equipment in BOF Shop No.2.

The overhaul will increase the shop's production by 18% from 8.5 million to 10 million t/year of steel and cut air emissions by 70%. The two-phase project will be completed in late 2020. NLMK Lipetsk has already started the first phase of the overhaul, which is expected to take around five months: the 300 t BOF No. 2 will be replaced with a 330 t one, off-gas ducts will be upgraded, and an efficient BOF gas capturing and purification system will be installed. The second phase, involving the replacement of BOF No. 3 with a more efficient one, will begin in 2020.

New by-product recovery complex and by-product fuelled facility

NLMK has launched a recovery complex to capture and process chemical by-products from coke and chemical operations. And it has started hot testing at its new briquetting plant. The green coke and chemical by-product recovery project will enable an increase in the production of raw materials for the chemical industry and for agribusiness, and halve the shop's air emissions. The new complex captures the entire volume of gas generated during the heating of coals in coke oven batteries and purifies it, while the chemicals released during the purification process are further processed into products for third parties: benzene, ammonium sulphate, etc. Purified coke oven gas is used as fuel for the

coke ovens themselves and for the site's power plants.

The second project, the by-product fuelled facility will enable the production of feedstock from blast furnace by-products, and the recycling of previously accumulated waste. The new production facility has a total capacity of 700,000 t/year of briquettes. The production technology of the facility is NLMK's in-house development. Briquettes are produced from Fe-containing waste, generated during blast furnace gas treatment, and coke and coal dust recovery. The technology is based on an environmentally friendly roasting-free pressing method. The resulting briquettes will be used as feedstock for hot metal production and will partially substitute primary iron ore and coal raw materials.

Waste energy recovery power plant

NLMK is set to reduce carbon oxide emissions by 3,000 t/year, greenhouse gas emissions by 650,000 t/year. The waste energy recovery power plant, on which NLMK and Lipetsk Region have recently signed a memorandum, will run on by-product gases from hot-end operations. The power plant will have a capacity of 300 MW. By-product gases generated during hot metal and steel melting will be used as fuel for heat and electricity generation. The new plant will increase NLMK's self-sufficiency in energy from 60% to 95%, while reducing its environmental footprint. The project will enable a reduction in carbon oxide emissions by 3,000 t/year and a decrease in greenhouse gas emissions by 650,000 t/year.

Cooperation agreement with Fort Ross Ventures signed

NLMK group and venture capital firm Fort Ross Ventures, a partner of Sber-

bank, have penned an agreement to cooperate to support innovations. Under the agreement, Fort Ross Ventures will provide NLMK Group with information on projects related to the Internet of Things, artificial intelligence technologies, cyber-security, cloud technologies, etc., that will enable the company to improve production and business processes. In turn, NLMK Group plans to test and implement the most successful innovative solutions and technologies at its companies in Russia, Europe and the USA.

Cooperation agreement in sustainable development

NLMK, the Ministry of Natural Resources and the Environment of the Russian Federation, the Federal Supervisory Natural Resources Management Service and the Administration of the Lipetsk Region have signed a four-way cooperation agreement in sustainable

development. The agreement calls for a consolidated effort by the parties to efficiently address sustainability challenges. Under the agreement, NLMK group will implement a number of upgrade and new construction projects. The document also sets targets to reduce gross air emissions and emissions of specific substances monitored by Natural Resources Management Service. "NLMK is guided by the principle of achieving the best available technology (BAT) level in executing its upgrade projects. BAT implies the most efficient equipment and technical solutions that ensure a reduced environmental footprint. The goal for the next five years is to reach the EU BAT level," said Grigory Fedorishin, NLMK Group President and CEO.

■ NLMK

Serbia

HBIS Serbia to replace BOF converter



BOF converter meltshop of HBIS Serbia where Primetals Technologies will replace converter No. 2 (Picture: HBIS)

Primetals Technologies has received an order from HBIS Serbia to replace BOF converter No.2 at the production site in Smederovo.

The aim of the project is to improve the process and to raise production capacity. This will be achieved by increasing the converter vessel's shell volume. At the same time, the critical outer dimensions will remain the same, so that adjacent interfaces may be kept. Primetals Technologies is responsible for the engineering to increase the vessel shell volume, while keeping supporting bearing distances the same in order to avoid the necessity for civil works.

The scope of supply includes the new vessel with detachable BOF bottom part, the trunnion ring, the Vaicon Link 2.0 suspension system, new supporting bearings with housings a new tilting drive including a pneumatic emergency drive system, bottom stirring system, a dart machine for slag retention as well as the implementation of slag splashing technology. Primetals Technologies will also supply the electrics and the new basic (level 1) automation system for the new tilting drive and existing melt shop equipment. Start-up is expected for the second quarter of 2020.

■ Primetals Technologies

Sweden

HYBRIT commended by Swedish Environmental Protection Agency

The Swedish Environmental Protection Agency has awarded HYBRIT, an initiative, conceived by SSAB, LKAB and Vattenfall, its Environmental Goals Prize for "Boldness and momentum".

The initiative plans to produce fossil free steel by replacing coal with fossil-free elec-

tricity and hydrogen. The by-product from steelmaking will then be water rather than carbon dioxide.

The Environmental Goals Prize was founded by the Swedish Environmental Protection Agency to recognize and reward ambitious and successful environmental work, which contributes to Sweden

achieving its environmental goals. This is the first time the prize has been awarded and the idea has been to inspire perseverance and innovativeness in environmental work.

The Environmental Protection Agency's citation reads: "They have shouldered the enormous challenge of chang-

ing Swedish steel production to make it completely fossil free. With a groundbreaking new approach and great courage, the initiative has shown there to be no impediment to producing steel with hydrogen instead of coal. The HYBRIT initiative is a trailblazer in the true sense of the word.”



Martin Pei, chairman at HYBRIT Development and executive vice president and CTO at SSAB, was present to receive the prize (Picture: SSAB)

SSAB

Turkey

Erdemir to build two new blast furnaces

Paul Wurth has been awarded orders for two new blast furnaces to be built at Erdemir’s Eregli and Iskenderun integrated steel plants.

In both cases, one completely new furnace will replace an older production unit. Paul Wurth will execute both projects on an EP basis including the supply of technological key items and related supervision of erection and commissioning. The orders include basic engineering of the blast furnaces with profile, cooling and lining concepts as well as the design of the stockhouses, top gas cleaning plants, slag granulation plants and BF cooling units. Paul Wurth will provide detail engineering for some non-supply items like process vessels, especially the BF shells, and for the piping of the BF cooling systems. While Erdemir’s new furnace will be plate

cooled, at Isdemir the thin-wall concept with vertically arranged staves will be applied to the furnace.

For both furnaces, Paul Wurth will supply Bell Less Top® charging systems and bleeder valves, refractories for the hot blast mains and bustle pipes, tuyere stocks with tuyere phenomena detection system, technological and critical items for the top gas cleaning plants (consisting of axial cyclones, annular gap scrubbers) as well as for three INBA® slag granulations systems. In the case of Isdemir, Paul Wurth will additionally supply key items for the 4-stoves hot blast generation plant, the common Level 1 automation of the BF plant and a Level 2 BFXpert® package.

Under the same contracts, TMT Tapping Measuring Technology, a joint company of Dango & Diententhal and Paul Wurth, will supply fully hydraulic taphole machinery for equipping the total of six tapholes. Blow-in of the new blast furnaces is scheduled for March and May 2021 respectively.

Paul Wurth

Uzbekistan

Uzbek Metallurgical Plant to build minimill for hot strip production

Uzbek Metallurgical Plant has chosen Danieli to supply a new minimill with an annual production capacity of one million t of hot rolled coils.

The plant will be installed within the existing site in Bekabad. The meltshop will consist of a 120 t EAF, a twin-ladle furnace and a twin-tank, twin-cover VD-OB plant. The QSP® (Quality Strip Production) compact line will include a vertical curved thin slab caster, a Danieli Centro Combustion tunnel furnace, a 5-stand (+1 future) hot rolling mill, followed by a laminar cooling system and downcoiler. Complete electrical supply and integrated

plant process control will be provided by Danieli Automation. The final strip thicknesses will range between 1.4 and 12 mm. The strips, 800 to 1,300 mm wide, will come in 30 t coils. The project will enable Uzbekistan to become self-sufficient in hot-rolled coil production. The majority of the coils are meant to be processed locally.

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Significant achievements in digitalization offensive

SMS group consistently pursuing its growth strategy

The Germany based plant making company reaches operational and financial targets in 2018, in particular a slight rise in order intake and earnings before taxes. The digitalization offensive is making progress, and so is the transformation program. Global flagship projects are on track in plant construction, port logistics and green hydrogen production.

In the 2018 business year, SMS group reached its operational and financial targets as well as significant milestones in its growth strategy. At EUR 3,087 million, order intake for SMS group was EUR 217 million (7.6 percent) higher than the previous year's total of EUR 2,870 million. Sales of EUR 2,805 million, slightly (2.8 percent) below the 2017 level, reflect the lower order intake of the preceding years. In terms of the earnings before taxes, SMS group achieved a moderate increase of 16.5 percent to EUR 27 million. The equity ratio rose slightly to 20.5 percent. The number of employees in Germany and abroad fell slightly to around 13,900 at the end of 2018.

Transformation program remains on track

One of the reasons for the positive developments is the implementation of the measures from the "Task Force '21" transformation program. The program's stated targets were met as planned and in some cases exceeded. As part of Task Force '21, over 1,100 measures are being implemented worldwide to develop new fields of investment while simultaneously realizing cost savings potential. Torsten Heising, CFO: "Overall, we are satisfied with developments in 2018. We expect the positive trend to continue in 2019 and our medium-term targets to be reaffirmed."

Growth strategy will be pursued further

As well as sustainably strengthening the core business and the four strategic growth areas, SMS group's strategy continues to incorporate selected investments and acquisitions. The global megatrends of urbanization, connectivity, sustainability and mobility rely heavily on innovative metal solutions. Rising expectations regarding the weight and strength of metals and the energy efficiency of the manufacturing process are driving global demand for premium plant construction solutions. As a leading technology provider, SMS group benefits strongly from this trend.



Realigned Managing Board of SMS group (from left): Torsten Heising, CFO; Burkhard Dahmen, CEO; Katja Windt, CDO; Hans Ferkel, CTO; Michael Rzepczyk, COO (Picture: SMS group)

Burkhard Dahmen, CEO: "We are continuously strengthening our position as the global market leader in plant construction. We are systematically implementing the transformation of our company as planned. Our successes in the market confirm that we are on the right path."

Significant successes for digitalization offensive

The digitalization of SMS group along the entire value chain brings about quantifiable benefits for customers. SMS offers its products and services in three core categories with the goal of enabling customers to make commercially successful use of plant and production data:

- On-site consulting by industry experts to take the digitalization of plants or business units to the next level of development
- Tailored data analysis to optimize product quality and plant efficiency
- Field-tested apps, some of which can be installed and start adding value within 48 hours, especially in production planning, condition monitoring and quality control.

Having experienced rapid growth, the SMS digital unit is achieving further success with its industry leading platform mySMSgroup. To drive this market offensive, the number of digitalization employees worldwide has already more than doubled. This growth is expected to continue in 2019.

Prof. Katja Windt, CDO: "We are pleased that our alliance of experienced industry experts and young software developers has made such a strong start. The recent market successes reinforce our ambitions to further expand SMS's leading role in digitalization".

Product, project and process – optimal realignment of the Managing Board

Additional innovations in product development, project management and process

optimization are made possible by the realignment of the Managing Board. The close cooperation between CDO Prof. Katja Windt and the new Managing Board members Prof. Hans Ferkel (CTO) and Michael Rzepczyk (COO) will actively promote the integration of process, product and project. Burkhard Dahmen, CEO: "We are now optimally equipped as a Managing Board to implement our growth strategy and to remain the partner of choice for the most demanding customers."

Worldwide flagship projects – from plant construction and green hydrogen production to port logistics

Since the successful planning and realization of Big River Steel, the world's first "learning steel plant", SMS group has won several other major projects that will serve as important references. Further details will be announced shortly.

Michael Rzepczyk, COO: "As a leading supplier in the industry, we are the partner of choice for our customers. We achieve this through technologically superior solutions and first-rate project management."

One long-term focus of SMS group is the CO₂ footprint of the steel industry. As a central development partner of the steel industry along the entire value chain, SMS group pursues the clear goal of minimizing CO₂ emissions in the medium term and eliminating them in the long term. An important part of this vision is the strategic investment in and technological partnership with Sunfire GmbH, the developer and manufacturer of a highly efficient process for producing "green hydrogen". For the SMS subsidiary Paul Wurth, this partnership is an important step on the path towards green steel production and an opportunity to enter the growing market for e-fuels.

Prof. Hans Ferkel, CTO: "We want to accompany our customers on the path

towards hydrogen-based steel production and help them meet climate protection targets. Our goal is clear: The world's first CO₂-free slab shall be produced on SMS equipment."

The "New Horizon" strategy of SMS group opens up additional new business areas. For instance, SMS group boasts a pioneering role in additive manufacturing. This is another area that benefits from an integrated and technologically sophisticated approach: SMS group has developed an innovative plant for producing high-quality metal powder for 3D printing. The powder, currently produced at the Demo Center in Mönchengladbach, is then used in a 3D printer from the strategic cooperation partner Additive Industries to manufacture functionally optimized products. In this way, the powder atomization system, powder and printer are perfectly coordinated to produce optimal end products.

The joint venture BOXBAY, founded together with DP World, a leading port operator, in Dubai, also stems from the New Horizon strategy. This project involves a new interpretation of the proven storage and transport technology from SMS subsidiary AMOVA for handling metal coils that weigh up to 50 tons. The High Bay Storage system triples storage capacity on the same floor area, resulting in massive efficiency gains thanks to faster handling in overcrowded and high-priced port zones.

Burkhard Dahmen, CEO: "Our New Horizon successes in particular are proof that SMS's strategy is taking effect. This is where our innovative spirit and the entrepreneurial mindset of all our employees reaches its full expression. We have high expectations for the future. Together, we will do everything we can to reach our ambitious goals."

■ SMS group

Digitalization: cross-industry applications and services for the IIoT

SMS digital and Voith cooperate to push IIoT platform development

Voith and SMS digital, the digital subsidiary of SMS group, announce plans to bundle competencies in platform development. The aim of the cooperation is to offer platform services for their Industrial Internet of Things (IIoT) solutions. The two companies are joining forces to digitalize business with smart applications and efficiently share development resources and competencies.

Voith and SMS Digital want to bundle resources and exchange expertise to develop a joint platform for cross-industry applications and services for the IIoT. The joint platform provides both companies the opportunity to use new applica-

tions across different industries in the other's worldwide core markets and speed up the development process of customer-relevant applications. For example, SMS digital can introduce its digital product Smart Alarm more efficiently in Voith's core markets and the process industries. Meanwhile, SMS benefits from Voith's OnCumulus apps designed for production efficiency enhancement and asset management.

While most of the platform services are industry-independent and can be jointly used by both companies, some that are app- or industry-specific, will be reserved for the respective company. The customer gateways MyVoith and mySMS still remain the central and cross-sector contact points for customers, partners and suppliers of each company. Additionally, these gateways serve as company-specific access points to the respective IIoT applications. The platforms and applications are accessible via all common mobile devices.

Building on deep domain knowledge in their respective industries, both the Voith Group and SMS group make effective use of these competences, developing highly efficient digital applications specifically for their customers' needs. Both companies share not only this common background, but also a common vision. "Together, we provide platform solutions and technologies for the digital age that offer real added value to our customers," states Dr. Benedikt Hofmann, CTO Voith Digital Ventures.

"SMS digital identifies and develops innovative products for the metals industry and we are very pleased to have the opportunity to take a further step in the digital transformation of key global industries together with Voith," says Prof. Dr.-Ing. Katja Windt, Member of the Managing Board, SMS group GmbH.

■ SMS group



Development of smart applications and services for the IIoT (Picture: Voith)

About the Voith Group

With its broad portfolio of systems, products, services and digital applications, global technology company Voith sets standards in the markets of energy, oil & gas, paper, raw materials and transport & automotive. Founded in 1867, the company today has more than 19,000 employees, sales of € 4.2 billion and locations in over 60 countries worldwide and is thus one of the large family-owned companies in Europe.

The Group Division Voith Digital Ventures bundles the Voith Group's long standing automation and IT expertise with the deep know-how in the fields of hydropower, paper machines and drive engineering. As an incubator, this Group Division is pushing for the development of new digital products and services. For decisively shaping the digitalization of mechanical and plant engineering, Voith is driving the industrial Internet of things (IIoT) forward. The Group Division plays a central role in digital innovations and applications for new markets as well as the development and responsibility for existing and new digital venture activities.

■ www.voith.com

Mergers and acquisitions

MHI and Primetals Technologies to acquire ABP Induction Systems

Mitsubishi Heavy Industries (MHI) and Primetals Technologies will acquire ABP Induction Systems (ABP), a global manufacturer and servicer of induction furnaces and heating systems from CM Acquisitions, a Chicago based private equity firm. MHI and Primetals Technologies will jointly take ABP's shares. Future business activities will be conducted in close cooperation with and under the leadership of Primetals Technologies. The completion of the acquisition of ABP is subject to the approval of the relevant authorities, and is planned to close in late Q3/2019.

ABP provides state-of-the-art equipment for ferrous and non-ferrous metal casting, forging and steel making. Its main

products are induction melting, holding and pouring furnaces as well as induction heaters. ABP's business is built upon a large and global customer base with more than 1,600 active units worldwide. ABP also has a core competence in the service business and provides comprehensive aftermarket solutions to customers through the entire product lifecycle. Service centers are strategically located close to the major industrial areas in Germany, the United States, China, India, Mexico, Russia, South Africa, Sweden and Thailand. ABP also exclusively provides special induction heaters to Primetals Technologies for endless strip production, which helps provide a competitive edge.

"ABP's induction heaters are one of the most crucial elements for endless strip production, a flagship process for Primetals Technologies. With ABP becoming one of MHI's group companies and the further close ties that will bring, we can develop and provide customers with even more advanced technologies. Also, with the acquisition of ABP, we combine its competence in induction heating and related activities with our know-how as a worldwide engineering, plant-building, lifecycle services and digitalization partner for the metals industry," said Satoru Iijima, Chairman of the Board and CEO of Primetals Technologies. "ABP's well-experienced portfolio and its know-how

ABP's induction heaters are one of the most crucial elements for endless strip production, a flagship process for Primetals Technologies

Satoru Iijima, Chairman of the Board and CEO of Primetals Technologies

will certainly complement our wide range of customer plants, namely mini mills and long rolling plants, especially in emerging markets, as well as in endless strip production."

Till Schreiter, CEO of ABP, added: "ABP's state-of-art induction products and technology-driven culture will fit well with both shareholders. Through a closer tie-up with MHI and Primetals Technologies, ABP can pursue further growth potentials, which will also lead to a contribution to

them." With MHI and Primetals Technologies, ABP has access to their resources worldwide, which will improve ABP's global market presence, provide

opportunities to develop new business sectors, and drive digitalization. "This will assure long-term stability for our facilities, employees and customers".

ABP will be a group company of MHI under the ownership of Mitsubishi Heavy Industries America, Inc., headquartered in Houston, Texas, and Primetals Technologies USA LLC, Alpharetta, Georgia.

■ *Primetals Technologies*



Induction melting furnace IFM 7 Twin Power from ABP, capacity 13.4 tons, rated power 6 MW (Picture: ABP Induction Systems)

Interview with managing director Kumar Subramaniam

GSB Group – the new pearl of Dalmia Refractories

Earlier this year we reported GSB Group joined hands with the Indian refractory giant Dalmia OCL. STEEL + TECHNOLOGY invited GSB's managing director Kumar Subramaniam to explain the new strategy of the business.

How do you summarize the new business for both, Dalmia and GSB Group in a nutshell?

Kumar Subramaniam: Dalmia OCL provides a full range of refractory products – not only for the steel industry but also for the cement and for the non-ferrous sector. GSB Group, however, is famous for its small range of outstanding refractory products characterized by best quality and highest performance. This can be witnessed by the kind of market share we enjoy in Europe. Both, Dalmia OCL and GSB Group can now offer an extended portfolio of products and services to their customers with a good geo presence.

Will Dalmia assimilate GSB Group?

We keep our own famous brand name: GSB Group. Our products will remain a special range under the Dalmia OCL umbrella. GSB will become the flagship range, however. Generally speaking, in a big consortium, a niche product or technology can also take the lead, if they have a strong position in the market, and the strategy is executed well. That's actually the case at GSB Group. Consequently, GSB

will remain a German company with a strong brand of high-quality, speciality products within the Dalmia group.

What are the new tasks for GSB Group?

GSB is making the Dalmia OCL portfolio of famous products available and known in the Western markets. When we now start bringing additional Dalmia OCL products to our customers in the iron and steel industry, we do have the same approach as before in terms of excellence and performance. When any customer deals with GSB, it means they can be confident about our consistency, quality and performance commitment. That is valid now also for ladle refractories. Now we can offer a much broader portfolio to provide the best solution for the needs of our customer.

Will isostatic products from Dalmia OCL complement your offerings?

Isostatic products are used in the tundish area, as for instance ladle shrouds etc. The isostatic products from Dalmia OCL are well established particularly in the Indian subcontinent, in Turkey and the Middle East region. Because of outstanding char-

acteristics and consistent high performance, even customers in Western Europe have indicated their interest in Dalmia OCL's isostatic products. We are happy that we have started selling the same to GSB's existing customers. There are only few suppliers being able to provide high-performing isostatic products.

What are your recent achievements in terms of outstanding products?

GSB Group have gathered a high expertise in refractories for ultra-clean low carbon steel production. We have developed a refractory concept which avoids any carbon pick-up. It is based on fired alumina/magnesia spinel bricks. These new products play a vital role in clean steel production – a growing market segment.

What is your strategy for the next years?

There are at least two major targets on our agenda. First, GSB Group has developed a road map to become the dominating solution provider for the transportation of hot metal and liquid steel. Material flow logistics is a crucial factor for every steelmaking plant, and torpedo ladles and charging ladles are of utmost importance. Here, GSB Group will be the expert providing high-performance solutions, customer can trust.

Second, we are currently building our European service team – a group of technical experts, i.e. metallurgists and ceramic engineers, who understand the iron making and steelmaking process chain. Our European service team will provide additional benefits for our customers. With their deep understanding they are able to analyse what are the weak points in the steelmaking operations, particularly in terms of refractory consumption and the related



Kumar Subramaniam is the managing director of GSB Group. He has been living in Europe for more than 25 years. During this period he has gathered a lot of expertise in refractories for the iron and steel industry. He is used to work in a multicultural environment. He says: "I personally believe: the harder I work the luckier I am." (Picture: GSB)



For the first time Dalmia OCL and GSB Group presented themselves together to the trade visitors of METEC 2019 with an impressive exhibition stand and highlights from the comprehensive refractories range. (Picture: GSB)

metallurgical processes. They will advise the best performing materials for the respective product mix and more importantly, how to install the particular refractory product, including overseeing the lining processes, etc. Then, they can watch out how it is performing. Our refractory expert will be the technical contact person who will have the knowledge not only of refractory products, but also of lining or installation in general, the performance etc. They can point out the important and critical objectives. Such technological services will pay off very quickly for the customer.

The refractory business is dominated by big players providing products manufactured in the far east. What are your prospects?

I think, there are some good reasons why China shall not become the one and only source worldwide for refractories in future. India has a potential to develop as an alternative source. The country is politically stable and growing at decent pace. Also, with regard to the production of refractories, the environmental standards in India are higher than in many countries in the far east. Peo-

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At METEC 2019 Managing Director Kumar Subramaniam (right) was a highly sought-after discussion partner (Picture: GSB)

ple and authorities in India actually take care of the environment. So, refractory companies from India are well qualified as suppliers to the Western steel companies.

What do you expect to be the future of your company in the mid term?

I see great opportunities down the line. There are still rumours around, about what is going on in the refractories industry, because big players have joined forces. That means, there are great opportunities for us to have a sound

base for our business. Also, the steel industry in Europe is generally in a stable situation, despite few of the companies are undergoing individual changes. I expect we can grow in Europe as we have a strong position especially in

“Both, Dalmia OCL and GSB Group can now offer an extended portfolio of products and services to provide the best solution for the needs of our customers.”

Kumar Subramaniam

Western Europe. We have high-quality products and will continue to serve our customers with solutions they need. Our customers trust on this, which is also one of the reasons why we are like a “hidden champion”. People know about our activities and the change we bring.

Dalmia OCL and GSB Group – the new big player

- Dalmia OCL and GSB Group have a long tradition in the refractory business: GSB Group since the 1970ies, Dalmia OCL since the mid-1950ies.
- Together they have a huge product portfolio and can always provide the optimum solution and product for every task.
- Some of the key products are silica bricks. Dalmia OCL is well known for their quality and reliability in terms of delivery, flexibility, own capability of making the moulds etc.
- Dalmia OCL is also famous for their isostatic products and the ladle solutions.
- GSB Group is a supplier of high-performance monolithic lances and snorkels for RH degassing plants.
- Like some other global players, Dalmia OCL operates their own mines as the preferred source of key raw materials for the refractories.
- The group has production facilities in Germany, India and China.

What about synergies for your company after having joined hands with Dalmia OCL?

Usually, man power is reduced as a result of a merger. However, we are thinking in a different way. We’ll need even more staff to achieve our targets, doing more business with our customers. Also, we will strengthen our production site in Bochum, Germany. Now we have a stronger financial backing of a company employing 1,200 people and 1.7 bn US dollars turn-over. That’s really a benefit for us.

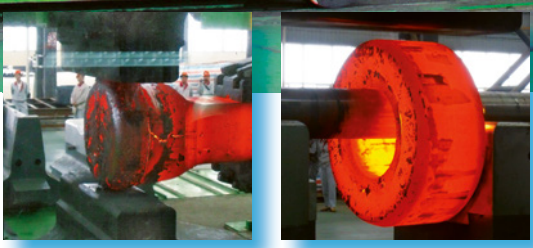
Thank you for the interview.

■ *The interview was conducted by Arnt Hannewald.*

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Amir Tanbakouchi

Sales Manager North America, Russia, Middle East





ArcelorMittal Bremen's blast furnace No. 2 is the 3rd largest in Germany (Picture: Marten Bockhacker ©Copyright: ArcelorMittal)

ArcelorMittal publishes first Climate Action Report

ArcelorMittal to be carbon neutral in its European operations by 2050

ArcelorMittal has published its first Climate Action report in May in which it announces its ambition to significantly reduce CO₂ emissions globally and be carbon neutral in Europe by 2050. To achieve this goal the company is building a strategic roadmap linked to the evolution of public policy and developments in low-emissions steelmaking technologies. A target to 2030 will be launched in 2020, replacing the company's current target of an 8% carbon footprint reduction by 2020, against a 2007 baseline.

ArcelorMittal's first climate action report explains in greater detail the future challenges and opportunities for the steel industry, the plausible technology pathways the company is exploring as well as its views on the policy environment required for the steel industry to succeed in meeting the targets of the Paris Agreement.

Commenting, Lakshmi Mittal, Chairman and CEO, ArcelorMittal, said: "We believe it can be possible for the steel industry to deliver carbon emissions reductions targets in line with the Paris agreement. We are committed to this objective and are actively piloting several low-carbon

steelmaking technologies. Central to achieving this aspiration will be supportive policy to ensure a global level playing field, access to sufficient clean energy at competitive prices and access to finance. The energy industry has made great strides in creating a pathway to lower emissions through supportive policy and we are confident the same can be true for steel."

"Limiting the temperature increase to two degrees or less is no easy challenge. Real and genuine understanding of the complexities and an approach of collaboration and flexibility will be critical if we are to succeed. Specifically, we will need a more supportive policy environment that

considers the global nature of steel, the cost implications of significantly changing the way steel is made and the clean energy supply needed to do so. If we can work together to solve the problem, I'm convinced the steel industry will be able to make a significant contribution to reducing carbon emissions globally."

As one of the world's most prolific materials, with 1.7 billion tonnes of steel produced in 2018, the steel industry today accounts for approximately 7% per cent of global emissions. And with demand for steel and materials set to further increase – forecasts show demand rising to 2.6 billion tonnes in 2050 – it is vital the industry



finds ways to significantly reduce its carbon emissions to successfully meet the ambitions of the Paris agreement and help limit the global average temperature rise to less than two degrees.

“We will need a more supportive policy environment that considers the global nature of steel, the cost implications of significantly changing the way steel is made and the clean energy supply needed to do so. If we can work together to solve the problem, I’m convinced the steel industry will be able to make a significant contribution to reducing carbon emissions globally.”

Lakshmi Mittal, Chairman and CEO, ArcelorMittal

Pathways that have the potential to deliver a significant reduction in carbon emissions

At present carbon is used as a reductant in the blast furnace to separate oxygen from iron-ore as a critical part of the steel-making process. Significantly reducing the emissions footprint of steel will, in

all likelihood, require a fundamental change in the science of steelmaking

As the world’s leading steel company, ArcelorMittal recognises it has a leading role to play in developing breakthrough technologies that will support and enable a global transition to a low-carbon economy. The company has identified three distinct pathways that have the potential to deliver a significant reduction in carbon emissions. These are:

- clean power steelmaking, using clean power as the energy source for hydrogen-based steelmaking, and longer-term for direct electrolysis steelmaking;
- circular carbon steelmaking, which uses circular carbon energy sources, such as waste biomass, to displace fossil fuels in steelmaking, thereby enabled low-emissions steelmaking;
- fossil fuel carbon capture and storage, where the current method of steel production is maintained but the carbon is then captured and stored or re-used rather than emitted into the atmosphere.

ArcelorMittal believes that all three pathways offer significant emissions reduction potential aligned with science-based targets and is currently testing various technologies across all three pathways in its European operations. This tech-

nology portfolio will enable the company to pursue the appropriate option depending on the pace of technology and public policy development, which will impact which pathway becomes the most viable in the countries and regions where the Group operates.

In terms of public policy recommendations, ArcelorMittal advocates the develop-

ment and implementation of carbon regulations and market mechanisms to enable the deployment of low-emissions steelmaking that will help to deliver the global objectives of the Paris agreement. The company’s global policy recommendations include:

- global level playing field is needed to maintain the competitiveness of low-emissions steelmaking and to avoid the risk of carbon leakage, for example, through green border adjustments;
- access to abundant clean energy at affordable prices will be key to be able to scale up low-emissions technologies;
- facilitating necessary clean energy infrastructure will be needed to advance large-scale implementation of low-emissions technologies;
- access to sustainable finance in order to accelerate and roll out technology development;
- accelerate transition to a circular economy by incentivising the use of waste streams as inputs in manufacturing processes.



ArcelorMittal Asturias, Spain, Continuous casting line, Avilés steel shop (Picture: C. Gutiérrez ©Copyright: ArcelorMittal)

ArcelorMittal will also intensify dialogue with stakeholders who have an important role to play in enabling these technology routes to become a viable reality and highlights the need for a more collaborative approach if the full potential is to be unlocked.

■ *ArcelorMittal*

Targets for a low-carbon economy

Steel sector faces significant losses from future climate regulation

According to a new report published by CDP, on average, 14% of steel companies' value is at risk from rising carbon prices¹. The sector is expected to reduce emissions by less than 50% by 2050, compared to the 65% reduction needed to keep global warming below 2°C. However, Chinese, Russian and US companies lagging behind European and East Asian peers on environmental performance and transparency.

A new report analysing a US\$259bn grouping of the world's 20 largest steel companies, has found that the steel sector is failing to reduce emissions at the rate required to keep global warming below 2°C – putting, on average, 14% of the companies' potential value at risk.¹

More than 90% of metal produced in the world is steel, and the steel sector is responsible for up to 9% of global greenhouse gas emissions from fossil fuel use and industry – more than the entire emissions of India. With 650 million tonnes of steel recycled each year, it is also the world's most recycled material and as such has a central role to play in driving forward the circular economy.

The pace at which the steel sector is reducing emissions is too slow

The 2019 'Melting Point' report, from environmental non-profit and investment research provider CDP, finds that there is a significant gap between company emissions reductions and the required trajectories for keeping global temperature rises below 2°C. To achieve this, the sector must reduce its emissions by 65% by 2050. However, cumulative company targets suggest a reduction of less than 50% by 2050.

Alarming, existing steel production techniques are already close to the limits of their efficiency and so meeting the goals of the Paris Climate Agreement will require a radical step change by the industry.

This is creating material financial risk for steel giants. Approximately 86% of steel production is covered by existing or planned carbon pricing markets and, given the scenario of a \$100 carbon price by

2040, the average value at risk for these 20 companies would be 14%.¹

The report also reveals a significant geographical divide between the highest and lowest performing companies. European and East Asian companies have been proactive, setting ambitious emissions reduction targets and investing in a number of innovative low-carbon technologies. Chinese, Russian and U.S. companies lag behind in terms of disclosure and performance across most key areas and have demonstrated little evidence of developing low-carbon technologies.

Water is used throughout the steelmaking process so is crucial to the survival of the steel industry. It is therefore concerning that across the 20 companies, over 50% of inland steel capacity is exposed to high levels of water-stress risk, such as a decrease in supply of freshwater and an increase in the frequency and severity of extreme weather events such as drought. Company operations located in China and India are most at risk.

Driving a step-change in emissions performance

Encouragingly, some companies are taking steps to decarbonize and six of the companies have delivered technologies that could drive a step-change in emissions performance. These include:

- SSAB has set a goal to reach carbon neutrality by 2045 across its entire operations, while Hyundai Steel have targeted an 80% reduction in emissions by 2050.
- SSAB is co-developing the HYBRIT project to develop green hydrogen steelmaking technologies.
- ArcelorMittal is developing a suite of innovative technologies including SID-

ERWIN which uses electricity for the direct reduce of iron oxides, and Carbon2value – a Carbon Capture Utilisation and Storage (CCUS) technology to separate CO₂ from waste gases.

- Four companies (ArcelorMittal, Baoshan Iron & Steel, Beijing Shougang and Inner Mongolia Baotou Steel) have partnered with the carbon recycling company Lanzatech, which converts waste gases from the steelmaking process to produce bioethanol.

Luke Fletcher, Senior Analyst at CDP commented: "The pace at which the steel sector is reducing emissions is too slow for the transition to a low-carbon economy and it needs to deploy and commercialise radical technologies if it is to avoid looming carbon costs and remain competitive. Recent events at British Steel are an example of the huge financial risks the sector faces and companies need to show evidence that strategies are being adopted to ensure resilience for the changes ahead.

The good news is that technologies to decouple carbon emissions from steel production are emerging; from hydrogen steelmaking to electrolysis using clean electricity. Plus, the sector is already a global leader in recycling, with steel now the world's most recycled material."

¹ The analysis finds that under a 2°C scenario where global carbon prices rise to US\$100 per tonne CO₂ by 2040, the weighted average Value at Risk for the company sample is 14% of net present value (NPV), ranging from 2.5% to 30% for individual companies.

■ CDP (formerly Carbon Disclosure Project) – www.cdp.net

Break-through ironmaking technology

Carbon-free, hydrogen-based direct reduction process for iron ore fines

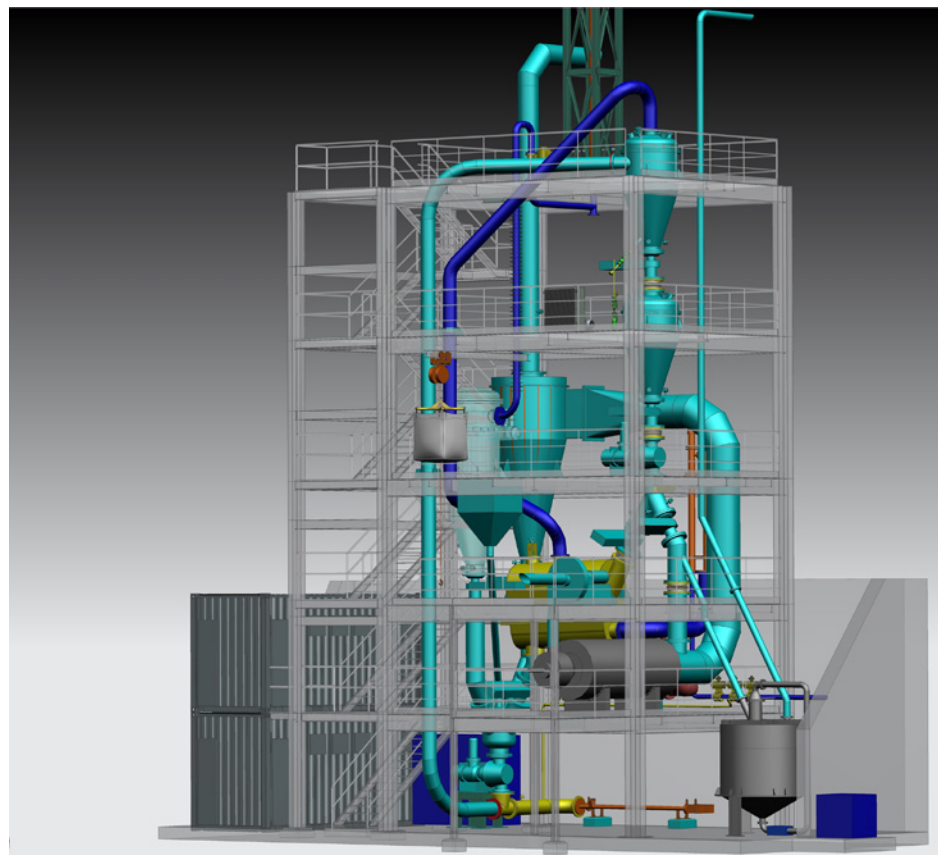
Primetals Technologies develops a world-first direct reduction process directly using iron ore concentrate fines. This new DR process is CO₂-free and H₂-based. The technology will excel by lower Opex and Capex cost due to no agglomeration step required. A pilot plant for testing purposes will be set up at voestalpine Stahl Donawitz, Austria.

Primetals Technologies has developed the world's first direct reduction process for iron ore concentrates from ore beneficiation not requiring any pre-processing like sintering or pelletizing. Primetals can resort to the comprehensive experience from the earlier Finmet development and plant installations. The new technology can be applied to all types of beneficiated ore and particle sizes of 100% smaller than 0.15 mm. As primary reduction agent, the new process uses H₂ from renewable energy or alternatively H₂ rich gases from conventional steam reformers or H₂ rich waste gases. This results in a low or even a zero CO₂ footprint. The direct reduction plant comes in a modular design with a rated capacity of 250,000 tons per year and module, making it available for all sizes of steel plants.

The use of DRI/HBI is expected to continue to grow due to the need to reduce greenhouse gas emissions and the growing number of electric arc furnaces in service worldwide. Currently, all available technologies require agglomeration, like pelletizing to produce DRI or HBI. An additional challenge steel producers face, is the reduced quality of iron ore, resulting in the need to beneficiate the iron ores. In order to progress to a CO₂-free steel production, a process using mainly H₂ is most desirable. The solution developed by Primetals Technologies takes care of all the above considerations.

Pilot plant to be built in partnership with voestalpine

A pilot plant for testing purposes will be set up at voestalpine Stahl Donawitz, Austria and is due to be commissioned in the second quarter of 2020. The pilot plant will consist of three parts:



Computer-generated image of a direct reduction plant for iron ore fines developed by Primetals Technologies together with voestalpine Stahl Donawitz (Picture: Primetals Technologies)

- a preheating-oxidation unit,
- a gas treatment plant and
- the actual reduction unit.

In the preheating-oxidation unit, fine ore concentrate is heated to approx. 900°C and fed to the reduction unit. The reduction gas H₂ is supplied over the fence from a gas supplier. A waste heat recovery system from the off-gas ensures optimal energy use and a dry dedusting system takes care of dust emissions from the processes involved. The hot direct reduced

iron (HDRI) leaves the reduction unit at a temperature of approx. 600°C, which can be subsequently processed in an electric arc furnace or to produce Hot Briquetted Iron. The aim of the pilot plant is to verify the break-through technology and to serve as a testing facility to provide the data basis for setting up an industrial scale size plant at a later date.

■ Primetals Technologies

Sustainable ironmaking

Dillinger and Saarstahl to use hydrogen-rich coke gas in blast furnaces

German steelmakers Dillinger and Saarstahl are taking a new approach to decrease carbon emissions. An investment volume of €14 million will be used for an innovative system that significantly reduces the carbon footprint at the Dillingen ironmaking site.

For the first time hydrogen-rich coke gas will be used in the two blast furnaces of ROGESA Roheisengesellschaft Saar mbH (ROGESA) - a joint subsidiary of Aktien-Gesellschaft der Dillinger Hüttenwerke (Dillinger), Dillingen, and Saarstahl AG, Völklingen, (with each company holding a 50% direct and indirect share). The hot metal produced by ROGESA supplies the steel plants of Dillinger and Saarstahl.

"As major steel producers of the Saar region, we are committed to the carbon-reduction targets and are creating the technical conditions with this forward-looking investment for future hydrogen-based developments that avoid carbon emissions," said Martin Baues, Technical Director of Dillinger and Saarstahl. "This is an important component in our objective to

have the most technically advanced steel industry here."

Intensive research aimed at low-carbon steel production has been ongoing here for some time now. The research efforts have included, among other things, extensive studies and pilot plant trials carried out on the use of hydrogen-rich coke gas in blast furnaces, and large-scale concepts have been derived from this

By using hydrogen instead of carbon, we are forging a visionary new path toward reducing carbon emissions, and in doing so, we want to consistently use all possible methods to reduce carbon on the blast furnace route.

Martin Baues, Technical Director

research. Now there are plans to construct an innovative system to introduce a portion of the hydrogen-rich coke gas produced inside the integrated steel plant into the blast furnace. This measure leads to hydrogen replacing carbon as a reducing agent, thus achieving a significant reduction in carbon emissions. The investment includes the necessary machinery and plant components at both blast furnaces as well as the associated infrastructure. The construction work will largely be carried out during ongoing operations, so that this measure is anticipated to be implemented at the two blast furnaces as early as 2020.

"ROGESA's blast furnaces are already among the most modern and efficient in Europe," Martin Baues said. "We are continuously improving the environmental protections at our companies, and in the past 15 years alone we have invested around €500 million in environmental protection measures at the Dillingen site. By using hydrogen instead of carbon in the coke gas, we are forging a visionary new path toward reducing carbon emissions, and in doing so, we want to consistently use all possible methods to reduce carbon on the blast furnace route. Further research and development activities are aimed at helping leverage additional potential. We will be depending on support from subsidies for this," Baues continued.



The blast furnaces of ROGESA produce hot metal to be supplied to the steel plants of Dillinger and Saarstahl (Picture: SHS)

■ SHS Stahl-Holding-Saar

Supporting all automation concepts

Gas control for meltshops, casting plants and thermal processing technology

Bürkert is presenting gas controls customised for a variety of casting plants. The mass flow controllers are suitable for solutions fitted with analogue interfaces all the way up to complete Industry 4.0 systems.

Industrial plants for producing steel, for casting or for thermal processing technology place different requirements on their gas supply and rely on different automation concepts. Therefore, communication between components must always be tailored to the specific needs of the plant. Bürkert Fluid Control Systems is presenting a range of automation concepts for gas control based on its proven mass flow controllers (MFC). Possibilities range from data exchange through to "conventional" analogue standardised interfaces and digital networking using all common fieldbus protocols all the way to plug-and-play MFC assemblies, not to mention complete control cabinets including all components for gas control.

Tailored automation concepts

For smaller or simpler plants where only small amounts of data need to be transferred, the conventional analogue interface is the ideal choice. Start-up and maintenance are straightforward, and signals can be checked with the help of simple aids. These vendor-neutral devices oper-

ate independently of the controller and are extremely easy to replace.

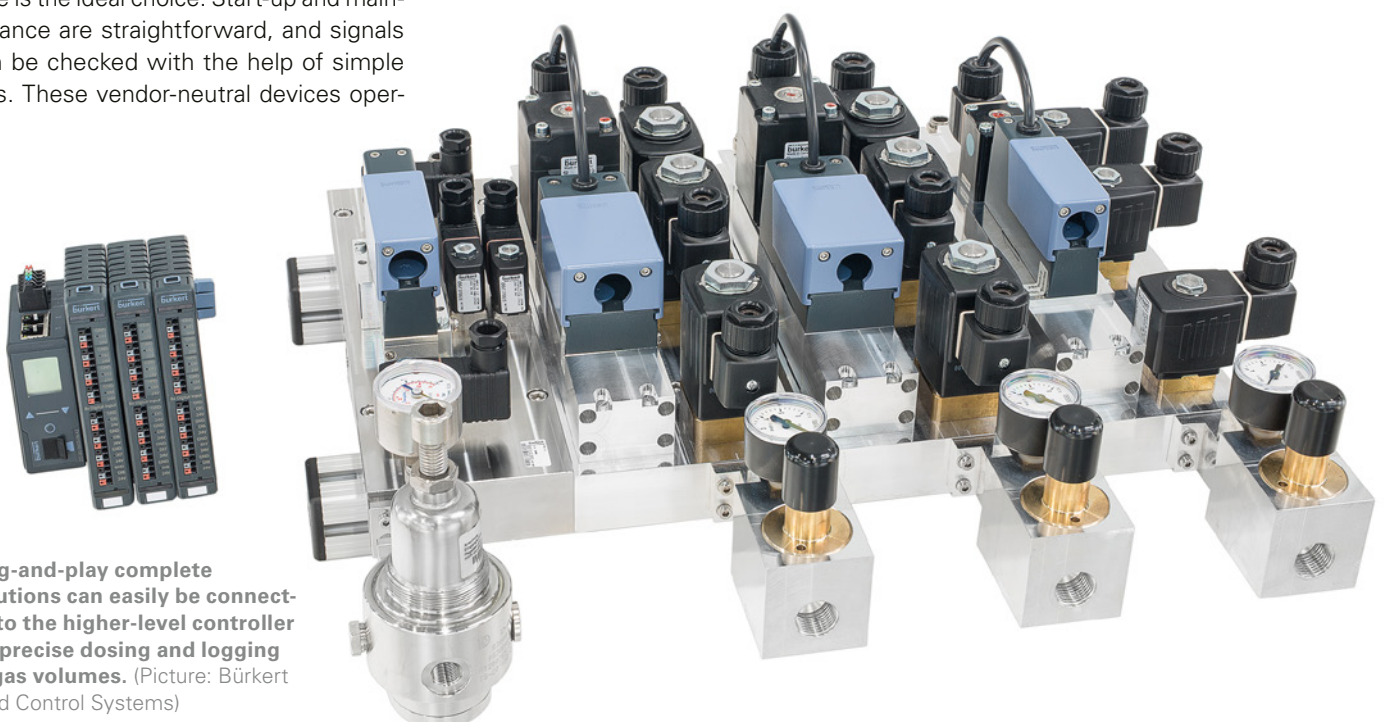
If diagnostic data, device state etc. are to be transmitted in addition to set-point and actual values, the mass flow controllers can communicate via digital interfaces, e.g. PROFINET, EtherNet/IP, PROFIBUS DP, Modbus TCP, EtherCAT, CANopen or RS485. Gateways and Bürkert's proprietary bÜS network also allow the integration of other protocols - for gas-control functions that are fully compatible with Industry 4.0.

Plug-and-play complete solutions, which can easily be connected to the higher-level controller for precise dosing and logging of gas volumes, can be realised with digital as well as analogue interfaces. The MFC assemblies and complete control cabinets are tailored to the application requirements. The entire fluid control layout is factory-tested, ensuring that installation and start-up can be completed easily and quickly on site.

Simple configuration, parameterisation and diagnostics

In all automated gas-control solutions, the "Communicator" software simplifies the configuration, parameterisation and diagnostics tasks. This practical EDIP tool (Efficient Device Integration Platform) is suitable for analogue and digital devices. It gives the user a complete overview of all cyclical process values as well as all acyclic diagnostic data. Device configurations can be backed up and restored and the integrated, graphical programming environment makes it possible to create control functions for decentralised sub-systems. Connections to a PC can also be established on the fly using a USB-CAN adapter.

■ *Bürkert Fluid Control Systems, Ingelfingen, Germany*



Plug-and-play complete solutions can easily be connected to the higher-level controller for precise dosing and logging of gas volumes. (Picture: Bürkert Fluid Control Systems)



RH vacuum degassing plant installed in the converter steel works No. 2 of Altos Hornos de Mexico (Picture: Primetals Technologies)

Steelmaking - secondary metallurgy

Altos Hornos de Mexico invests in steel refining facility to produce steel with very low hydrogen content

The Mexican steel producer expands its product portfolio to steel grades for the oil and gas industries. An 150-t RH vacuum degassing plant was installed at AHMSA's converter steel works No. 2 in Monclova.

Recently, Mexican steel producer Altos Hornos de Mexico, S.A.B. de C.V. (AHMSA) issued the Final Acceptance Certificate (FAC) for a twin RH vacuum degassing plant supplied by Primetals Technologies. The 150-t RH plant was installed in AHMSA's converter steel works No. 2 in Monclova, in the state of Coahuila. It is able to handle 50 charges per day, the equivalent of about two million metric tons of liquid steel per year. The new plant allows AHMSA to produce steels with very low hydrogen content, required for applications in the oil and gas industries.

For AHMSA's twin RH plant Primetals Technologies supplied the mechanical vacuum pumps, the structural steel work and treatment station using a combined vessel ladle lifting system (CVL). This solution requires little space, enabling vessels to be lifted in places inaccessible to cranes. The scope of supply from Primetals Technologies also included the electrical and automation equipment for the RH plant. Introducing the technology of dry mechanical vacuum pump system into the RH process yields excellent metallurgical results in terms of degassing and decarburization,

Dry mechanical pump solution saves operation costs

Dry mechanical pumps are being used more frequently lately, mainly for tank degassing and smaller heat sizes. Meanwhile, this technology has been further developed and Primetals Technologies is

one the first suppliers which can offer and implement the complete technology adapted to RH degassing systems, also for larger heat sizes. Main benefits of this technology are reduced operational cost as long as only electrical energy is used for vacuum creation instead of steam and large amounts of cooling water. Also, the vacuum pump only requires a short preparation time before production start, since the dry mechanical pump just needs to be switched on electrically versus a steam ejector pump used to heat up the boiler system and complete steam system before any vacuum treatment can be started. In addition, the water treatment plant only requires a small cooling system. In comparison, in case a steam ejector is used, intensive water cooling is required, including sludge handling for dust removal via condenser cooling water.

The main functions of RH degassing plants are the removal of hydrogen, natural and forced decarburization, chemical heating of the liquid steel and alloying adjustment, which are processed under vacuum conditions. Low hydrogen content is the main prerequisite for producing high-strength steel grades and grades intended for use in the oil and gas industries. The applied technology allows to achieve very low hydrogen contents in a short vacuum time.

During production, the operators are guided by a process automation system. This system uses a number of mathematical models in order to forecast metallurgical parameters and to create set-points, for example for steel temperature, cyclically

calculated based on different received parameters and processing time, chemical composition by determining received steel samples and added materials through the process. Forecasts and set-points are also created for status of degassing functions like hydrogen and nitrogen removal depending on initial contents, degassing time, vacuum pressure curve, lift gas rate and others, status of decarburization by determining cyclically carbon and oxygen content of steel, and set-pointing for various functions like oxygen blowing, vacuum and lift gas patterns etc. Furthermore, the level 2 system is connected to the production planning and the process automation of preceding and subsequent aggregates as well as with the laboratory, in order provide all relevant data to the operator. The data tracking is collecting all relevant data from level 1 system and process models for the creation of different heat and production reports. All these data are stored in a database to make the system ready for future data applications and Industry 4.0 features.

AHMSA operates the largest integrated steelworks in Mexico and is the country's only producer of heavy plate. The company generates more than 5 million metric tons of crude steel every year. The company primarily produces flat rolled steel, including hot- and cold-rolled coils, heavy plates, tin-coated and tin-free sheets, and a variety of heavy sections.

■ *Primetals Technologies*

Steelmaking of high-performance stainless steel grades

Electromagnetic stirring solution for the new special steel plant of voestalpine Böhler Edelstahl in Austria

ABB to supply ArcSave® patented technology to save time, energy and materials while improving yield at the new voestalpine Böhler Edelstahl special steel plant in Kapfenberg, Austria. The technology enhances stirring during the melting process and improves overall EAF operation.

ABB's ArcSave electromagnetic stirrer will be delivered in March 2020 and installed on an energy-efficient, 55-t electric arc furnace (EAF) at the new voestalpine Böhler Edelstahl – a company of technology Group voestalpine – steel plant in Kapfenberg, Austria. The technology will help optimize annual output of 205,000 t of high-performance steels from mid-2021.

Requiring no contact with the bottom of the EAF, ArcSave enhances stirring during the melting of large scrap items, reducing stratification via forced convection. This improves EAF operation by homogenizing temperature distribution and chemical composition, while speeding scrap and ferroalloy melting compared with natural convection alone.

ArcSave, with its patented technology also contributes to lowering environmental impact by reducing electricity usage, process additions such as alloys and lime, and consumables such as electrodes.



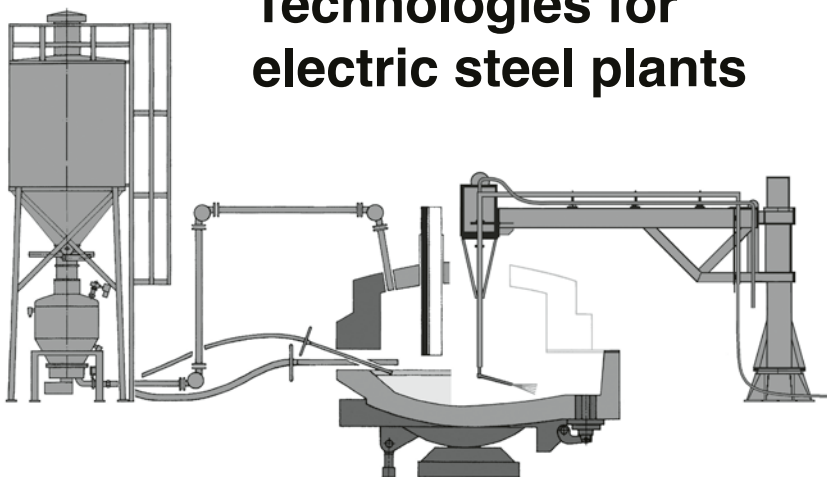
ArcSave's advanced, efficient technology aligns perfectly with voestalpine's ambition to be at the cutting edge of specialist steel production (Picture: ABB)

"We created ArcSave to help manufacturers improve productivity while also prioritizing safety, energy efficiency and product quality," says Anders Lehman, Vice President of ABB Metallurgy Products. "As the leading provider of electromagnetic stirring solutions, we are extremely proud to supply one

of the world's most advanced special steel plants." Plant supplier SMS group, which is responsible for the engineering, process technology and start-up of the fully automated meltshop, specified ArcSave at the core of the Kapfenberg plant, which unites cost- and energy-efficiency with a high degree of automation and digitalization.

▀ *ABB Metallurgy Products; ABB Ltd, Zurich, Switzerland*

Technologies for electric steel plants



Forming of foaming slag

Injection installations for fine carbon with 1 – 4 conveying lines

Injection technique

Installations for injection of filter dust, additives etc. into furnaces or ladles

Pneumatic addition of lime

Injection of coarse lime via the furnace roof for the protection of the hot spots

Refractory repair systems

Slinger machines, gunning machines and gunning manipulators for the quick and effective repair of EAF and ladles etc.

Gunning manipulators for RH-degassers

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Challenges and benefits

Temperature profiling in reheating furnaces

“Hot Box” profiling and survey systems have been part of the heat treatment industry for many years. It is a discipline that requires a good understanding of the process itself, a commitment to accuracy of the data, and development of hardware and software that is innovative, cost effective and reliable.

Hot Box temperature profiling in the industrial furnaces has been around for over twenty years. The principle of operation of these systems is generally well known: a multi-channel data logger is protected by an insulated thermal barrier which allows the system to travel through a furnace together with the product being heat treated (**figure 1**). Thermocouples feed temperature data back to the data logger and at the end of the process the complete temperature profile can be examined. Critical calculations can be made using purpose build software supplied by the system manufacturer. Further developments have allowed the data to be sent out of the furnace via RF telemetry allowing examination to be made in real time.

Benefits of “Hot Box” temperature profiling

Prior to the development of these systems long “trailing” thermocouples were often

used to determine the actual product temperature profile through continuous furnaces. Feeding thermocouples through a continuous furnace has obviously disadvantages. Mainly the difficulty of the operation itself, the limited number of thermocouples that could be used, disruption of production. Another point is the accuracy of the data, given that products could not follow the test basket into the furnace (due to the trailing thermocouples), so the furnace loading decreased as the trial progressed.

As the “Hot Box” method was adopted the monitoring operation simplified, the disruption to production was minimized, and the measurement could always be carried out in a fully loaded furnace reproducing actual product conditions. Data obtained from “Hot Box” profiling trials gives an accurate assessment of how long a product soaked at a specific temperature, the differences in product temperature around the product basket, quench rates, etc. This data being used to calculate

performance against specification, investigate process problems, and optimize the process. An important development has seen these systems used as a primary method to survey furnaces to the AMS2750 specification, allowing the survey to be carried out with minimal disruption to production, and saving many hours of furnace downtime while the furnace was cooled and degassed to fit the trailing thermocouples.

Engineering design – the challenges

Although the operating principle of these systems seems relatively straight forward, the design is often complex as the “Hot Box” system is expected to perform repeatedly in processes as diverse as steel slab reheat, where ambient temperatures will exceed 1,250°C (**figure 2**), to aluminium solution treatment, where after many hours at a temperature of around 550°C the system and products are immersed in quench water, then sent back into the furnace.

When designing the system thought must be given to whether the system itself will have an effect on the process. For example when “Hot Box” systems are used in an inert atmosphere there is a possibility that oxygen containing air may leak into the nitrogen furnace atmosphere during the process, and affect the quality. To prevent this, before delivery to the end user, the “Hot Box” system undergoes a mild heat treatment process where air is extracted from the insulation under vacuum, then back filled with nitrogen.

All components of the system have to be designed with the specific heat treatment process firmly in mind, and manufacturers of these systems generally run through a check list of questions regarding the process to establish the basic design of the insulated “Hot Box” or thermal barrier. This will in turn govern the type of data logger and thermocouples to be used in

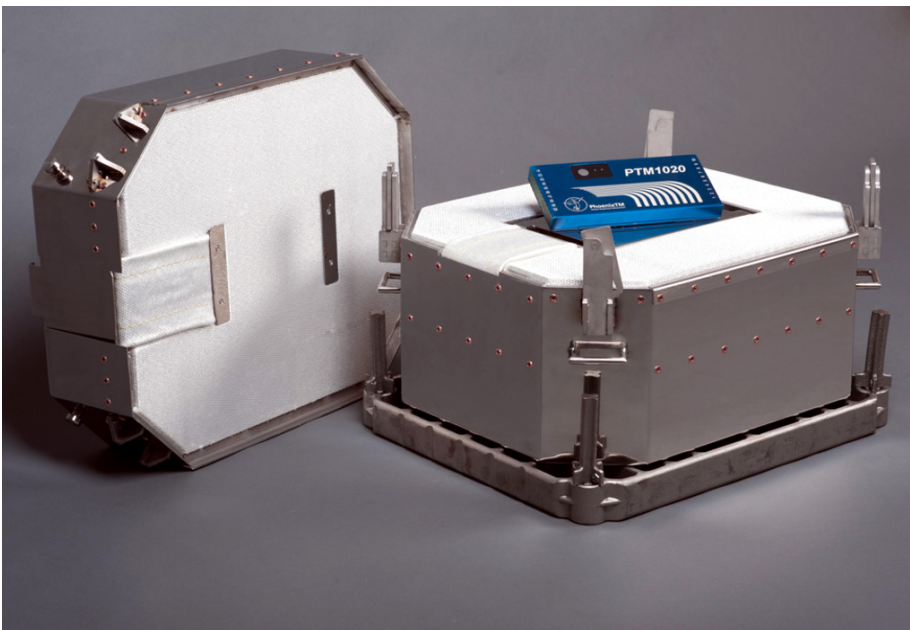


Figure 1. The “Hot Box” system contains the “Octagonal” thermal barrier and the data logging unit (Figure: PhoenixTM)

the process. There are some really important criteria as following:

Space or clearance in the furnace. Thermal barriers used in these processes will have a certain minimum size to withstand the process temperature and duration. Therefore, adequate clearance must be in place at the furnace entrance and exit to allow the system go through. Examination of other “pinch points” in the furnace, such as baffles, or “knuckles” to separate heating zones, should also be made (**figure 3**).

Furnace temperature. This does not just refer to the maximum process temperature, which is used to determine the type of insulation to be used, and the thermal barrier material, but also a calculation needs to be made to determine the “Adjusted Process Temperature” (APT). This takes into account rates of heating, cooling, and soaking at the various temperature levels, and is used by the system manufacturer to determine the actual thermal barrier size required to get the system through the process.

Process duration. The full process time within the furnace is used in this calculation. Added to this is the time period after exit from the furnace until the system can be accessed, and the data logger removed. A safety margin is also added to in case of stoppages in the process. Knowing the full process duration and the APT, the size of the thermal barrier can be determined.

Atmosphere in the furnace. The furnace atmosphere will not only determine the material the thermal barrier will be constructed from, but may also affect the performance of a thermal barrier e.g. a hydrogen atmosphere will lessen the thermal performance, whereas a vacuum will increase the performance. The furnace atmosphere will also determine the ther-



Figure 2. Monitoring a steel slab being reheated prior to hot rolling (Figure: PhoenixTM)

mal barrier “technology” that can be used. There are two basic technologies that keep the data logger at a safe operating temperature (**figure 4**):

- “Heat sink” technology is a “dry” technology, where the data logger is housed in a heat sink (a container filled with an eutectic salt) which changes phase at 58°C, keeping the data logger at a stable temperature during the phase change period. A lower operating temperature data logger can be used in this type of barrier.
- “Evaporative” technology uses boiling water to keep the data logger at a stable operating temperature of 100°C as the water changes phase from liquid to steam. The advantage of this is that a physically smaller barrier will have an equal or greater thermal capacity than a “heat sink” barrier. A high operating temperature data logger is used with this type of technology.

A furnace atmosphere or environment, for example carburizing, vacuum, nitrogen etc. will prohibit the use of “evaporative” technology as steam is vented into the fur-

nace. In this situation, only thermal barriers using “heat sink” technology can be used.

Quench within the process. If a quench is involved then the type and duration of the quench is important:

- Gas quenches in low pressure carburizing processes are common, but the thermal barrier may require a “deflector” if the pressure of the quench is high.
- Water quenching in T6 processes require the thermal barrier to resist full immersion in water from high temperature and the technology for this is well established.
- Salt bath quenches. The technology exists now that allows a thermal barrier to pass through a salt bath quench, but this needs a different thermal barrier technology and a higher cost per trial is required.
- Oil quench. The technology for passing a “Hot Box” system through an oil quench has now been developed and this will be discussed in more detail.

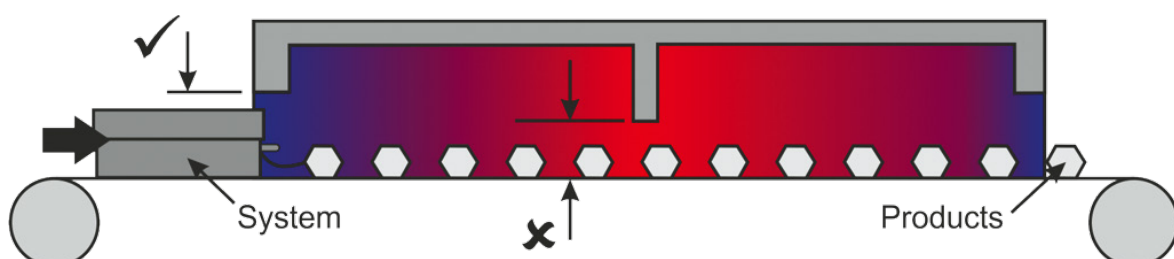


Figure 3. Clearances at furnace entrance and exit are ok, but is tight at the baffle within the furnace (Figure: PhoenixTM)

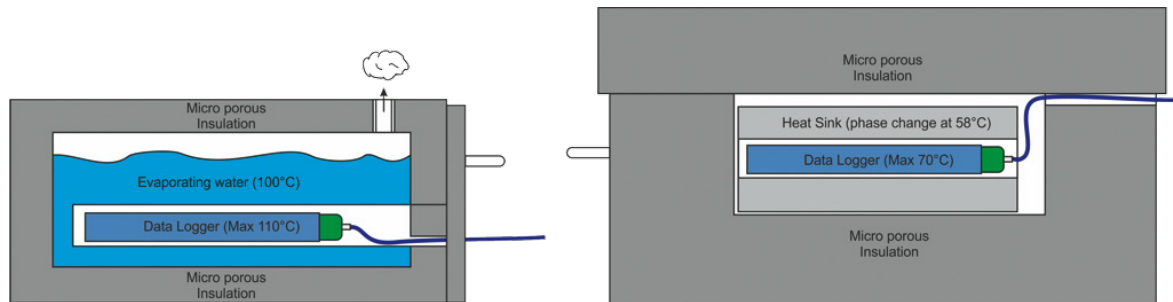


Figure 4. Thermal barriers operate on either “evaporative” or “heat sink” technology (Figure: PhoenixTM)

Use case: monitoring the homogenization of blooms and ingots in walking beam furnaces

After casting, blooms and ingots are homogenized before supplying to a rolling mill or forge. This heat treatment process can be carried out in batch furnaces but, today there is an increasing use of walking beam furnaces for continuous production (figure 5).

The objective is to monitor the temperature profile of the products throughout the homogenizing process, to ensure adherence to the heat treatment specification throughout the product, and to optimize the process. In the walking beam furnace, the process durations can be long depending on the products’ length and diameter. As an engineering challenge, the system has to be attached to the product as it rotates and travels through the furnace. Therefore, the thermal barrier cannot exceed the diagonal length of the bloom or ingot. Also, the interface between the product and the thermal barrier has to be strong enough to prevent the heavy system sagging. Thermocouples by necessity are long (up to 8 metres) and have to be kept within the boundary of the product.

Given the process duration, the temperature, and the dimensional restriction on the thermal barrier, an evaporative system is often the best option for this application. As the thermal barrier cannot exceed the dimension of the product it often means that more than one barrier size is required to accommodate the production size range. The design of an evaporative thermal barrier is complex as it needs to hold the maximum amount of cooling water, and due to the rotation of the barrier it needs to be filled with water from a central position. This means that the water level inside the barrier needs to be higher than the filler spout, without water leakage. The interface between the barrier and the product is often the outer shell of the barrier itself and is bolted to the product to maximize strength. A certain amount of machining of the test bloom is required to allow the thermocouples to stay within the product boundary as it rotates.

Use case: survey in a continuous carburizing pusher furnace

This process is often used for high volume production of transmission parts in the automobile and aerospace industries. The objective is to survey the furnace to the AMS2750 specification. Big savings in furnace downtime can be achieved if the survey can be carried out as part of the normal production process.

In a pusher type furnace, parts are placed in baskets which are then set on to trays. These enter the furnace singly through air tight entry and exit doors. Process time is generally 6 to 7 hours, with temperatures up to 950°C. Oil quench is common in these processes, but can often be avoided. It is a challenging task for “Hot Box” manufacturers to design a system with enough thermal capacity to get through the process, without exceeding the boundaries of

the tray, and to keep within the height restrictions in the furnace. It is not possible to extend thermocouples from the system placed on one tray, to the tray preceding, or following the system as the pusher mechanism generally allows only one tray at a time through the furnace doors, and internally trays may turn through 90°C to go from one zone to the next.

To fulfil this task, the system must use the “heat sink” design as an “evaporative” system cannot be used in a carburizing atmosphere. The system can be kept within the boundaries of the tray, and the thermal capacity maximized by using an “octagonal” thermal barrier design where the catches (which secure the lid to the base) are placed on the “short corners”. Surveying the furnace presents a difficulty as the thermal barrier, of necessity, takes up the whole space on the tray, preventing the positioning of a central surveying thermocouple. However as the process is continuous, then surveying to AMS2750E using the “plane method” is allowable, and there is generally enough room at the leading edge of the barrier to accommodate the measuring thermocouples.

Conclusion

There is no single solution to all heat treatment processes, rather individual solutions that are engineered for a given process and to the customer’s requirements. Advances in the technology of insulation materials, electronics and RF telemetry, have seen major developments in the type of processes that can be monitored now, and further advances may increase the number of processes that can be monitored in future.

PhoenixTM GmbH, Bad Oeynhausen, Germany

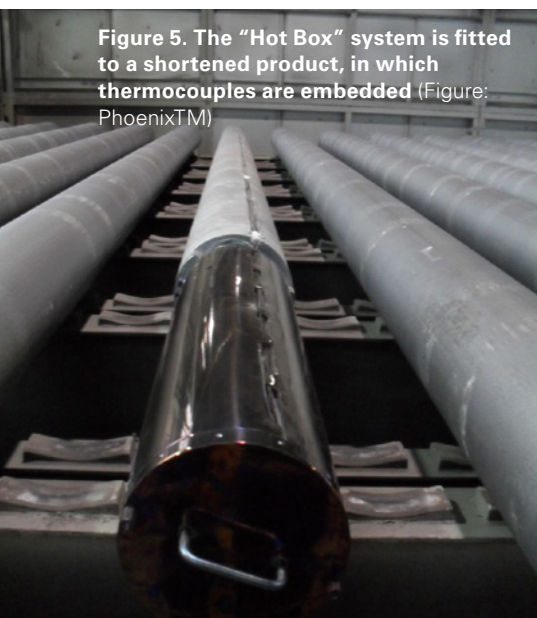
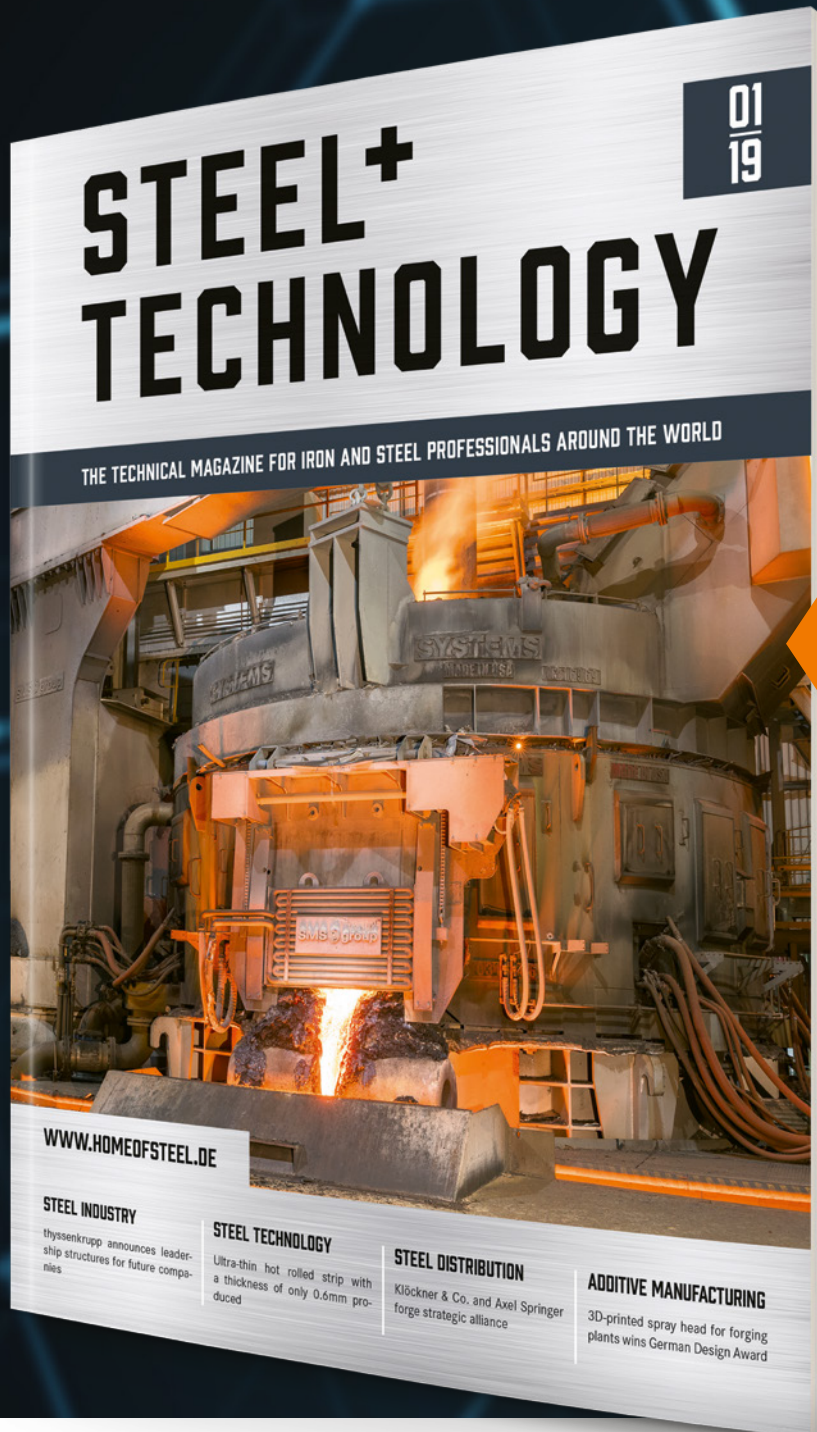


Figure 5. The “Hot Box” system is fitted to a shortened product, in which thermocouples are embedded (Figure: PhoenixTM)

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Heat treatment of flat products

Wet FlashCooling® – a flexible and high-performance quenching technology for 3rd generation AHSS

The heat treatment of advanced high-strength steels (AHSS) in a continuous strip processing line requires proper cooling control. The Wet FlashCooling® technology was developed by Fives to control the required thermal cycles for each grade and to guarantee a stable production of first-class products with improved flatness and mechanical properties.

Figure 1. With Wet FlashCooling® all steel qualities can be produced in a single continuous annealing line, from CO to martensitic grades (Picture: Fives)



Water quench technologies have been implemented in some continuous annealing lines for the production of high-strength steel (HSS) grades for more than 30 years. The automotive steel market tendency for HSS grades is accelerating today, and a large variety of 3rd generation AHSS (advanced high-strength steel) has been developed in which, besides yield strength, other properties are also considered, particularly to improve formability. The production of AHSS grades in a continuous processing line requires proper cooling control to follow the required thermal cycles for each grade and to secure a stable production of first-class products with improved flatness and mechanical properties. The Wet FlashCooling® technology was developed by Fives to reach these goals, offering complete and flexible control of the strip cooling cycle, including control of final strip temperatures, accurate modulation of cooling rates and strip crosswise temperature homogeneity control.

This technology has been successfully operating in a large capacity industrial annealing line for the last 10 years and it is under implementation in another new automotive strip processing line. This paper summarizes new challenges of quenching technologies to respond to the 3rd generation AHSS production needs and describes the main features of the Wet FlashCooling® technology.

Strip rapid cooling process requirements

Various water quench process cycles have been developed and applied in industrial annealing lines for more than 30 years to

reach very high cooling rates in the range of 1,000°C/s or above. In addition to the rapid cooling needs, a tempering or partitioning treatment is performed after the water quench (WQ), with the aim to improve the mechanical behaviour of the steel. A typical annealing cycle sketch is presented in **figure 2**. It should be mentioned that thermal cycle requirements can be very different from one grade to another, and that the tempering treatment requires a high capacity induction reheating after WQ cooling.

This WQ process must comply with several requirements as following:

- a high cooling rate of the strip, typically above 1,000°C/s;
- proper control of the cooling rate and strip thermal homogeneity during all the process. This is required to achieve a good crosswise homogeneity of the mechanical properties with good strip flatness;
- flexibility in the strip temperature choice, for both, the start and the end of the WQ cooling.

The conventional water quenching technologies, such as a hot water quench tank with or without turbulences, reach enough performances regarding to the expected cooling rates, but with no control of the cooling key parameters. These technologies based on rough quenching of strips by dipping into a water tank are not satisfactory regarding the flexibility of temperature control, especially the ability to stop the cooling at any required strip temperature with good crosswise temperature homogeneity.

The Wet FlashCooling® was developed to overcome the drawbacks and constraints of the conventional water quench systems through an extensive R&D and industrialization program, followed by the first full scale industrial application and operation.

Controlled cooling rate performance

In order to develop a flexible and controllable cooling technology, our development programme was based on a spraying cooling process using single fluid nozzles

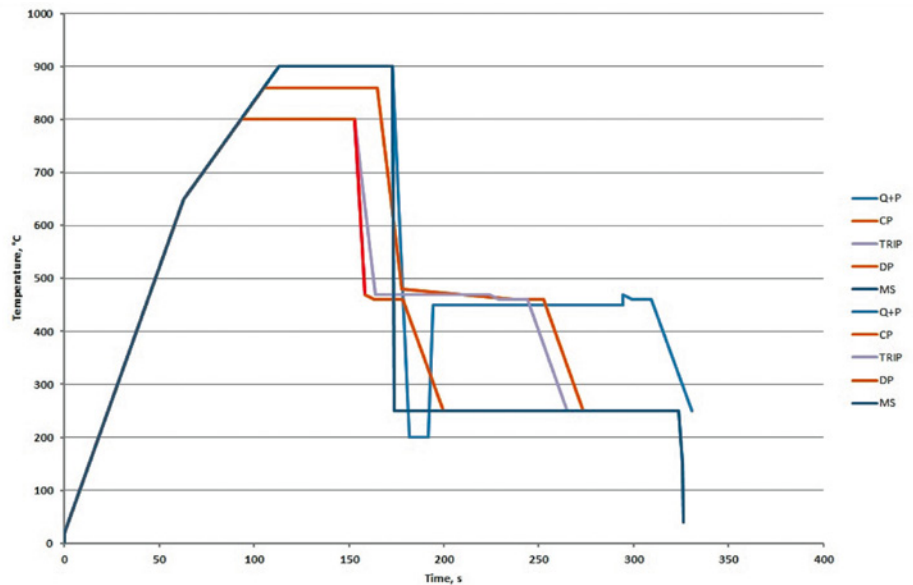


Figure 2. Typical annealing cycle with water quench (WQ) process (Picture: Fives)

(water spray) and bi-fluid nozzles (water-nitrogen mixture). Various types and arrangements of spraying nozzles have been tested in order to optimize the cooling nozzles

mesh and performance. The objective was to characterize and enhance the heat transfer coefficient according to several parameters, but also to get the required cooling

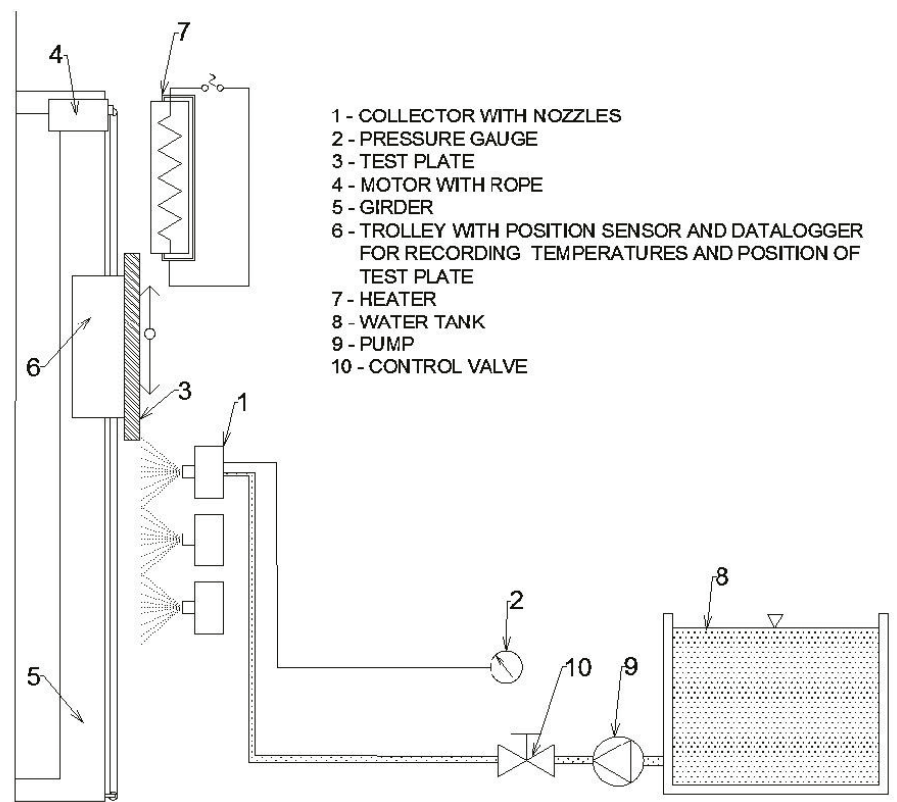


Figure 3. Sketch of the test rig (Picture: Fives)

Stéphane Mehrain, Sébastien Lemaire, Fives Stein, Fives Group, France
 Contact: Stephane.Mehrain@fivesgroup.com

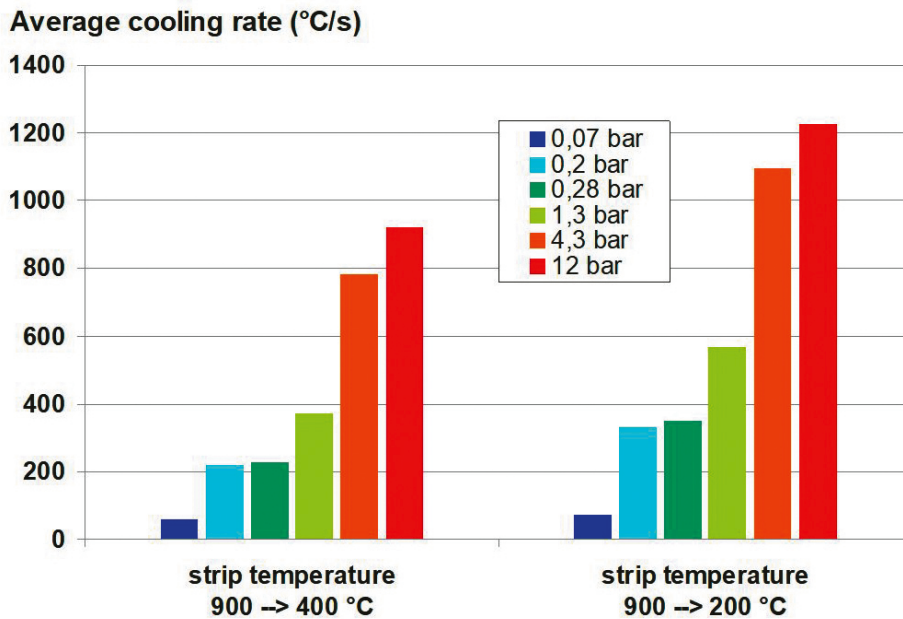


Figure 4. Influence of the final strip temperature on the global cooling rate (Picture: Fives)

control flexibility. Several experimental test rigs were used, including heating and cooling devices for a steel sample (figure 3).

The cooling test bench allows the steel sample to be quickly heated up to 900°C, and then to be moved downward at constant speed representing industrial process conditions. This test programme leads to the development of several high-performance spraying systems and

geometries which can be used in different applications depending on the needs for high cooling rates and cooling rate control flexibility. The main step done in the Wet FlashCooling® performances are the accuracy of temperature control (cooling end temperature, crosswise uniformity) and flexibility of control of cooling rates within a typical range of 1 to 10.

Furthermore, it is well known that the heat transfer coefficient of water cooling

process varies with the strip temperature level, based on film boiling and transition boiling conditions with regard to the Leidenfrost temperature. Figure 4 shows the influence of the final strip temperature on the global cooling rate which can be achieved.

Some results are illustrated in figure 5, showing the cooling rate control flexibility of two types of spray cooling geometries, based on the water pressure control. The cooling geometry of spray system 1 achieves its optimum performance at approx. 6 bars water pressure and shows good control capabilities for adjusting different cooling rates at lower water pressures. The cooling geometry of spray system 2 allows higher cooling rates at higher water pressures but has limited flexibility to control lower cooling rates.

In the industrial design, the nozzles are fed with both water and nitrogen, or only with water, depending on the cooling rate targets and needs of flexibility of control. The strip cooling rate is controlled by the water pressure (figure 5), the gas flowrate being adjusted accordingly. This water pressure can be controlled separately in each group of nozzles, in order to control the cooling rate during the whole cooling time. It is also possible to switch off some groups of nozzles to change the cooling pattern.

Cooling cycle control flexibility

In a conventional water quench process the final strip temperature is close to water temperature (in any case below M_f). This requires a further reheating of the strip to proceed to tempering. The Wet FlashCooling® process allows an accurate control of the cooling, i.e. initial and final strip temperatures can be accurately controlled with the required cooling rate. This brings the ability to produce for example Q&P grades. In these grades, a partial transformation from austenite to martensite is required by cooling the steel to a predetermined quench temperature, followed by a partitioning step at a suited temperature, in which carbon migrates from oversaturated martensite to austenite. An example of such an annealing cycle is shown in the figure 6.

Thanks to the controllability of the cooling rate and the ability to start the rapid cooling at higher temperatures, it seems clear that this process is well suited to control the required phase transformations

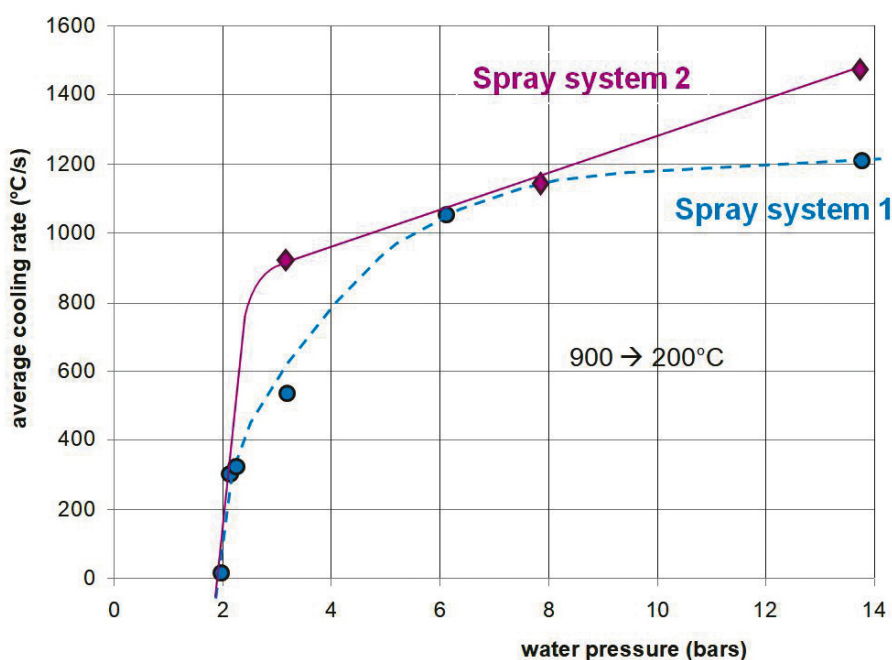


Figure 5. Influence of water pressure on average cooling for two spraying configurations (Picture: Fives)

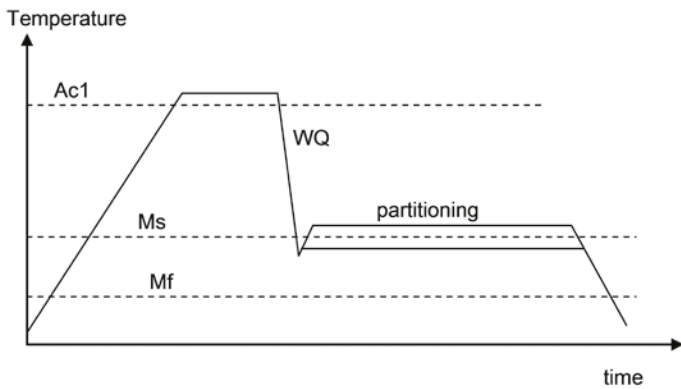


Figure 6. Example of a quenching and partitioning cycle (Picture: Fives)

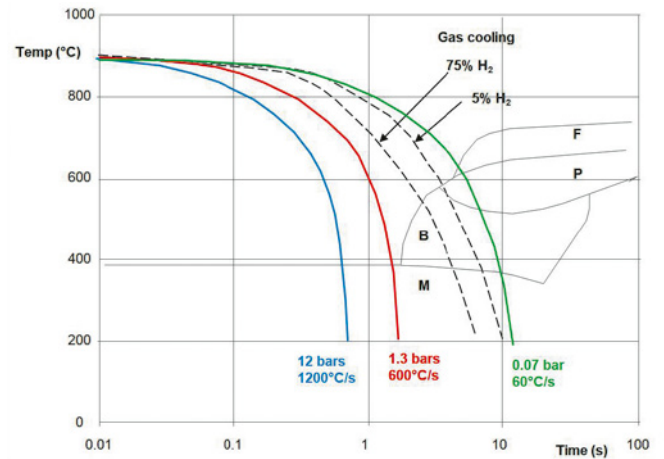
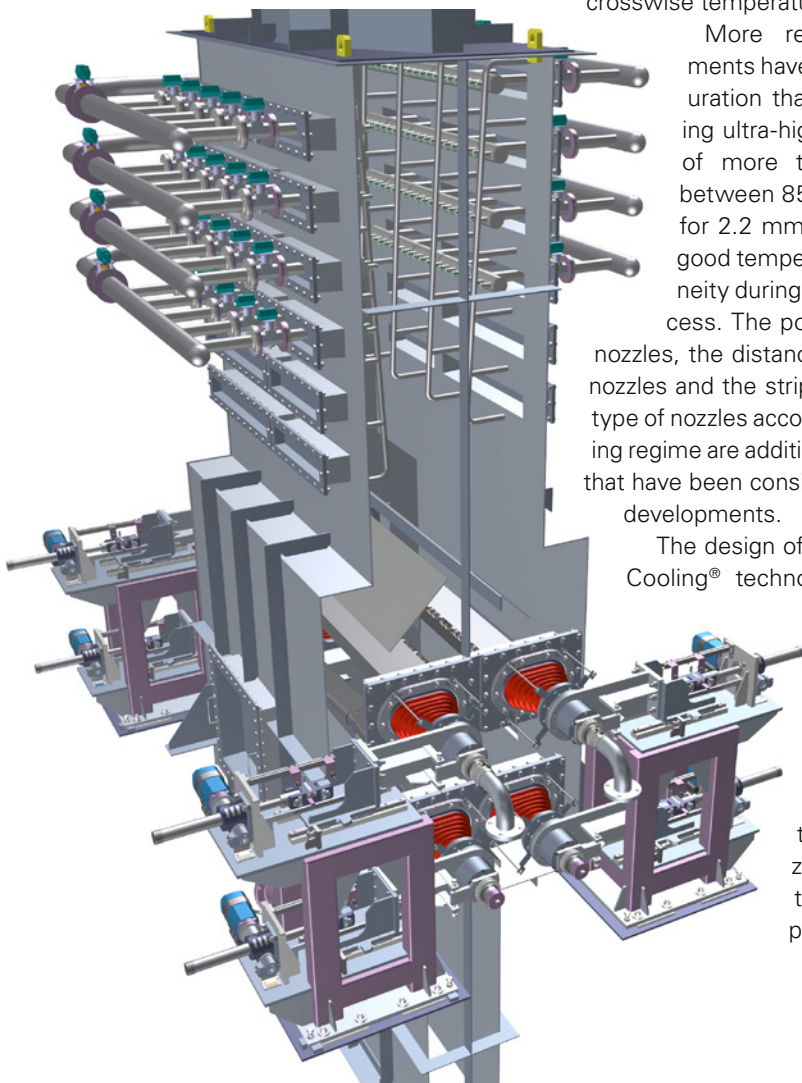


Figure 7. Comparison of various cooling rates on a typical CCT diagram vs conventional gas jet cooling technology (Picture: Fives)

and achieve the desired structure. As compared with a dry jet cooling technology, in which the cooling rate is controlled by the blowing speed and the hydrogen content in the blowing atmosphere, the Wet FlashCooling® offers a wider process window, as shown in the **figure 7**.

Figure 8. Typical design of the Wet FlashCooling® (Picture: Fives)



Industrial application and latest developments

The Wet FlashCooling® technology has been in operation since more than 10 years in a large capacity continuous annealing line. The technology was proven to give the required high cooling performances as well as system controllability of cooling rates, strip end temperature and crosswise temperature uniformity.

More recent developments have led to a configuration that allows reaching ultra-high cooling rates of more than 1,000°C/s between 850°C and 100°C for 2.2 mm thick strip and good temperature homogeneity during the cooling process. The positioning of the nozzles, the distance between the nozzles and the strip as well as the type of nozzles according to the boiling regime are additional parameters that have been considered for these developments.

The design of the Wet FlashCooling® technology for ultra-high cooling rates incorporates three rows of spray nozzles by blowing box and five transversal zones to adjust the temperature profile across the

strip width. A typical design is shown in **figure 8**.

Conclusions

The Wet FlashCooling® technology is a high performance and flexible tool to produce all steel qualities in a continuous annealing line, from CQ to martensitic grades. The design of nozzles and their mesh geometry allow a full flexibility to reach the optimum cooling pattern. The ability to stop the cooling at any strip temperature is of course of prime interest to produce specific 3rd generation AHSS grades, such as Q&P. This advanced technology is currently installed in continuous annealing lines and more recent developments are ongoing to implement it in a hot dip galvanizing line dedicated to the 3rd generation AHSS.

It is the latest disruptive technology that Fives is introducing to the market which will completely change the way the steelmakers can view their way of producing steel. The Wet FlashCooling® will be implemented into a hot dip galvanizing line with a non-oxidizing technology which will prevent the strip from oxidation. It is a real breakthrough as it will allow steelmakers to produce 3rd generation AHSS coated directly in the hot dip galvanizing lines instead of bringing it into continuous annealing and coating it afterwards.

Performance delivered

The Yıldız Demir Çelik cold mill complex in Turkey

Yıldız Group built its first steel processing plant: a new, complete cold-mill complex to transform hot rolled coils from the market into added-value cold-rolled, tempered and coated coils. At the beginning of 2018 it started operating in sequence, and now is producing in excess of the contractual rate and at highest level of performance.

Favourable market conditions in Turkey led Yıldızlar Yatırım Holding to start a new business, entering the cold strip processing sector. Yıldızlar Yatırım Holding has more than 100 years' experience in the forestry products, fertilizers, chemistry, port operations, energy generation, and insurance sectors.

In 2015 it decided to enter the steel business through its subsidiary company, Yıldız Demir Çelik. Danieli was selected as technology partner and single-source supplier of its first steel processing plant: a new, complete cold-mill complex setup representing latest technologies to produce 1.5 million t/year of high quality cold-rolled, tempered and coated coils.

The location selected for the cold-mill complex was Kocaeli, an industrial area in northern Turkey. Heart of the process equipment is formed by a Turboflo Pickling line coupled to a 5-stand 6-Hi OSRT tandem cold mill, a galvanizing line with vertical furnace arrangement, a temper mill as well as a batch annealing facility. At the beginning of 2018 it started operating in sequence, and now is producing in excess

of the contractual rate, up to 1.5 million t/year.

The products are targeted to enter the local and international markets at the highest level, satisfying most demanding end users. The product range includes automotive, white goods applications, commercial, structural and construction grades, IF, HSS, HSLA and DP material.

The applied innovative technological solutions and process know-how developed by Danieli through continuous in-field experience and R&D improvements, along with the trustful relationship between Danieli and Yıldız Demir Çelik, led to a very successful start-up. In this way, Yıldız Demir Çelik entered the steel business at the highest levels of quality and productivity in the Turkish and European markets.

Danieli pickling and cold rolling plant – a step ahead in technology

This coupled pickling line and tandem mill supplied to Yıldız Demir Çelik is the first investment in such a huge cold rolling facility in Europe in the recent years. With its

benchmarking technology it produces 1,5 million t/year cold strip of highest quality. The entry area is designed for high reliability by an "any-coil-feed" concept to avoid production losses due to coil preparation and joining.

The pickling section, based on the Danieli patented Turboflo® technology, is preceded by a powerful scale breaker, operated at up to 500 kN of tension, to improve the shape of incoming strip and to increase the effectiveness of the subsequent pickling process. Turboflo's advanced turbulent channel concept achieves the highest energy savings and pickling condition flexibility regardless of the strip grade and speed situation.

The tandem mill section includes five six-high mill stands with 25,000-kN separating force to produce whole potential product mix for automotive markets, from ultra-soft material (IF, ULC steel) to ultra-hard material (DP1000 – DP1200). With bending systems applied on work and intermediate rolls, selective cooling system in the last mill stand, as well as the Danieli OSR technology and new sophisti-



Yıldızlar Yatırım Holding cold mill complex layout (Picture: Danieli)



Pickling section (Picture: Danieli)

cated setup models, superior flatness correction capabilities are ensuring best strip flatness performance.

A new system has been developed by Danieli to accurately control roll-bite lubrication and to stabilize the friction coefficient of the roll bite at any mill conditions.

A heavy-duty exit flying shear which, together with the carousel reel, ensures flying gauge change and an endless rolling process, is designed to cut all material grades and sizes at a speed of up to 300 mpm, minimizing mill slowdowns that could cause compromises in strip quality in terms of shape, thickness, and surface.

A strip inspection station, arranged Inline at the exit side, ensures fast visual and ergonomically optimized inspection of both strip sides.

Two weeks after first pickled and rolled coil, PAC was issued, as 60% of the nominal productivity was already achieved.

OSRT – the new name for best flatness performance

Best flatness performance at wide product mix, reduced sensitivity at changing process parameters, easy handling for operators and maintenance – these are the highlights of this newly developed system.

OSR (Optimized Shaped Roll) Technology is using a special contoured intermediate roll barrel, based on a combined polynomial and trigonometrical function, in combination with an axial intermediate roll shifting device. This special designed roll contour allows maximum influence to the roll bite by creating a resulting roll crown, and at the same time reduces the necessary diameter differences on the intermediate rolls to reduce roll wear and thus extend roll life times.

Depending on the product mix, even cylindrical ground intermediate rolls with a one sided tapered part can be used. Furthermore, the OSRT mill stand is less sen-

Turkish steel market

Turkey experienced robust economic expansion in recent years and it is expected to show continuous growth in the near future. The iron and steel industry grew in parallel to the growing economy, in a climate where much of Europe will see slight increases or no growth at all in the industry.

Turkey's success in the iron and steel industry is evident as it is among the top 10 crude-steel producing countries in the world. Steel production is expected to continue and reach 47 million t, which is an annual increase of approximately 5.5%. Domestic and international investors are ramping up their investments for qualified steel and finished steel products to capitalize on Turkey's economically attractive iron and steel industry.



Tandem mill section (Picture: Danieli)

sitive with respect to changing process parameters. This ensures good flatness performance also during acceleration and deceleration phases, in which process parameters are changing significantly. From the beginning the tandem cold mill achieved astonishing results for the strip shape. Added by online flatness control

No compromises in strip quality – at all grades and dimensions

The OSRT mill concept is further dedicated for producing even thin gauge material stable and with excellent performances. Final strip thickness of 0.24 mm could be produced already short time after start

supported by OSRT high stiffness mill concept ensures very tight thickness and flatness deviations.

Material yield savings around the weld seam is one essential advantage of a continuous rolling process. In the L2 and L1 control systems special attention is given on reducing the out of thickness length before and after the weld seam as much as possible. To classify material yield losses in a proper way, a tight limit has been defined for out of thickness length: strip thickness deviation exceeding just $\pm 2\%$ of its nominal value. Already within short time after start up, impressive results have been achieved showing the capability of the Danieli OSRT tandem mill during both, flying gauge changes as well as non flying gauge changes.

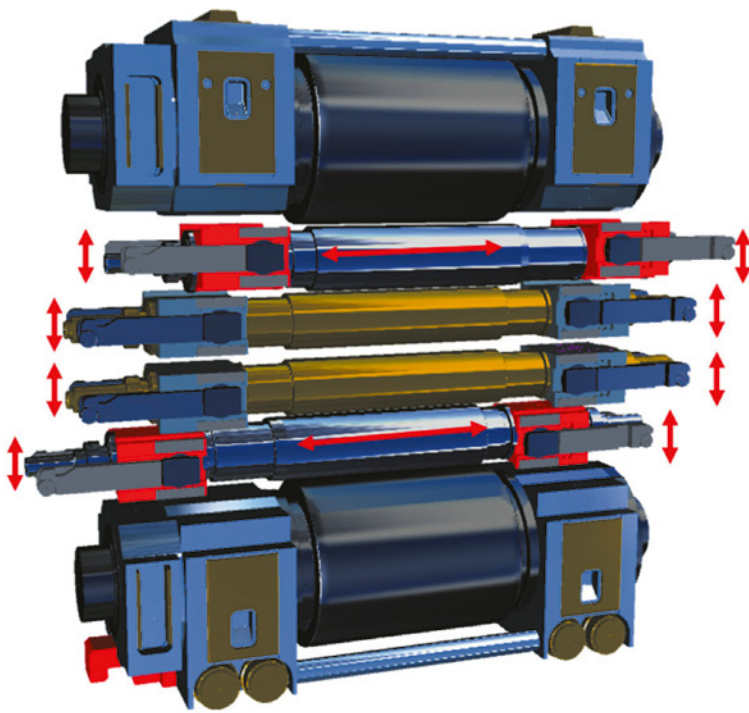
Our main aim in making an investment in a cold rolling plant with a 1.5 million tons production capacity is to contribute 1 billion dollars to Turkey’s struggle against its current deficit. Yıldız Demir Çelik is one of the largest industrial investment in Turkey that has been implemented by Yıldızlar Yatırım Holding.

Yıldız Demir Çelik

based on exit side installed shapemeter roll, more than 97% of all strip flatness deviations in steady state rolling conditions have been detected to be equal or below 6 I-units. Even in transient areas (acceleration and deceleration phases) the achieved flatness performance is nearly at the same level.

commissioning. Ultra-low hysteresis HAGC with a 45% faster response time as well as low friction bending blocks are ensuring precise control of strip thickness. As a result, strip thickness tolerances achieved are exceeding the guarantee values. Even at final strip thickness of 0.20 mm, Danieli Automation thickness control

To ensure high product surface quality and appearance, an innovative strip-drying system called Confined Jet Dryer is installed, in addition to the equipment used to seal the exit strip gap of the last mill stand. At the Yıldız Demir Çelik plant this system proved to reduce droplets and thus stain spots on the strip surface down to zero, thanks to its up to 20 times higher shear forces compared to conventional nozzles. Number of downgraded coils is reduced significantly.

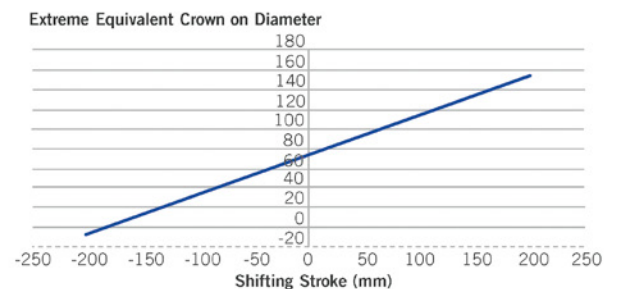
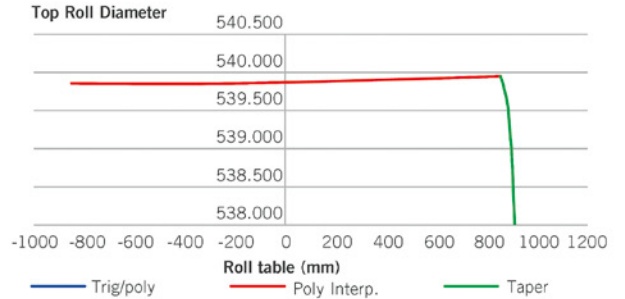


Yıldız Demir Çelik OSRT technology (Picture: Danieli)

OSRT function with polynomial and trigonometric component for top and bottom IR:

$$Top\ y_1(x) = D + C \cdot \sin\left(\frac{\alpha}{b} \cdot (x)\right) - A_1 \cdot x - A_3 \cdot x^3$$

$$Bottom\ y_1(x) = D - C \cdot \sin\left(\frac{\alpha}{b} \cdot (x)\right) + A_1 \cdot x + A_3 \cdot x^3$$



Benchmark in economical hot dip galvanizing

In the last 10 years Danieli has supplied most of the worldwide construction and high speed thin coating plants. Remarkable results have been achieved, such as

- consistent yearly average coating <100 g/m² and consolidated 80 g/m² at 180 mpm on GI
- consistent operation at 180 mpm on GI and 200 mpm on GL
- consistent reliability (MTBF > 200 hours availability > 97%).

In this respect, also the galvanizing line supplied to Yıldız Demir Çelik is no exception. The line is dedicated to process LC, MC, and HSS grades with an annual capacity of 400.000 tons. Strip thickness and width is ranging from 0.2 to 3.0 mm and from 700 to 1,300 mm, respectively. The line is designed to process incoming coils of more than 30 t at process speeds of up to 200 mpm. In the exit section, minimum coil weights down to 5 t can be provided, suitable for steel service centers.

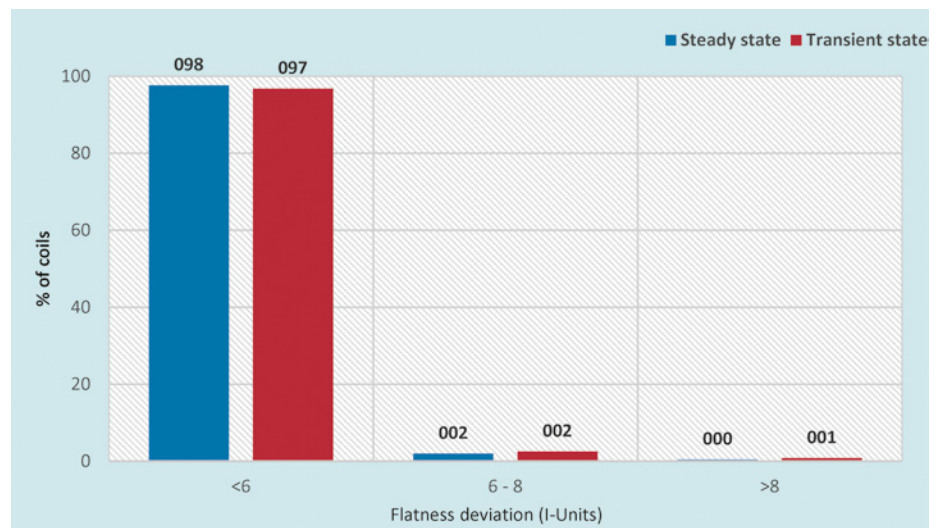
The vertical annealing furnace, supplied by Danieli Centro Combustion includes a recuperative room to uniformly heat up the strip; a direct-fired section with multi-burner doors zone to completely clean the strip sur-

face (avoiding installation of a cleaning section); radiant tubes zone equipped with 2P gas-fired tubes for superior temperature uniformity along the strip width (less than 30 °C on central leg); jet cooling section and an equalizing zone for HSS grades production.

This line proved its capability e.g. by producing CQ grades sized 0.24 mm x 1150 mm and 0.28 mm x 1250 mm without any heat buckles and with best strip flatness, a target which is usually ambitious to achieve.

Due to its innovative design the latest generation Danieli Kohler X-Jet wiping system allows extremely accurate control of final zinc coating thickness, which is even going down to 35 g/m² on each side (at 170 mpm). At the same time it is giving excellent coating uniformity along the strip, leading to Line OpEx reduction by 5% per year.

To reduce human operation in the zinc pot area, a Q-Robot-Zinc is installed to skim the surface of the zinc bath, remove dross



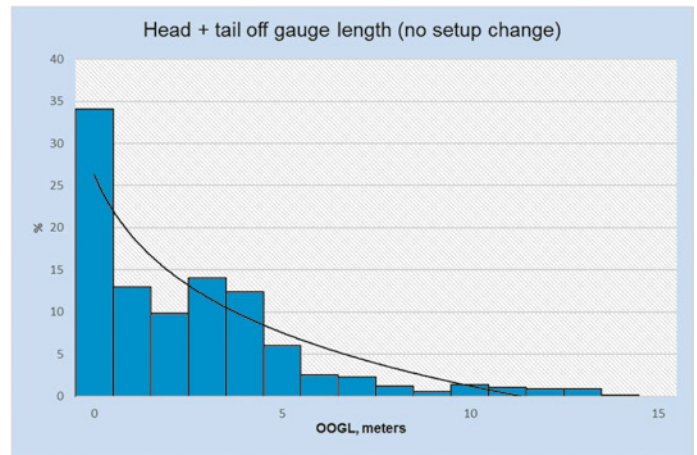
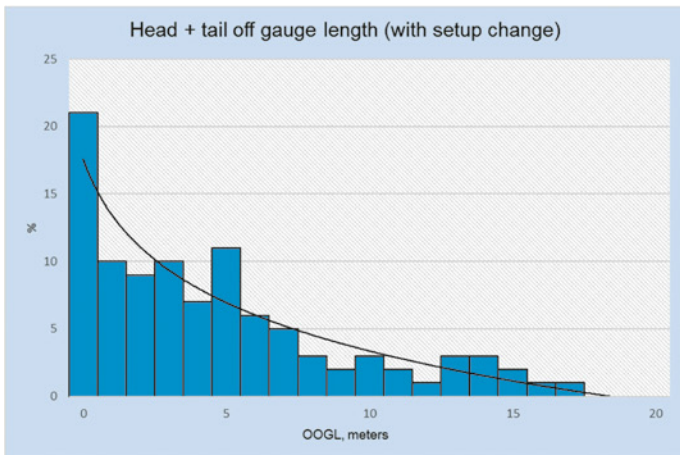
Achieved flatness performance (Picture: Danieli)



Achieved thickness performance (Picture: Danieli)

working bases, six (6) heating furnaces and six (6) cooling bells.

The equipment, fully supplied by Danieli Olivotto Ferrè, represents state-of-the-art technology for high-convection coil annealing in 100% hydrogen atmosphere, to ensure optimal heat transfer along coil width and perfect strip surface cleanliness. The high convection provided by the base high-flow fan guarantees the absence of spot overheating on coil turns and uniform heating for the whole mass of the coil. Consequently, the structure and the mechanical properties of the annealed product will be the same on all the parts of the coil, especially regarding tensile strength and elongation. During the subsequent cooling



Out of gauge tolerance at weld seam passage (Picture: Danieli)



and place it in a dross container. Q-Robot Zinc is fully integrated in the Level 1 automation and automatically follows the bath level, optimizing the skimming action.

Since the start of operations, the HDG line achieved high quality standards allowing Yıldız Demir Çelik to enter the market at a very high level. Targeted nominal average hourly production has been already achieved and surpassed consistently after just 2 months of production. Proven and robust line equipment in mechanics, electrics and automation resulted in an overall plant availability of 99%.

Innovation in the batch annealing process route

Batch annealing furnaces. The annealing facility, with a nominal production capacity of 0.3 million t/year, includes twelve (12)

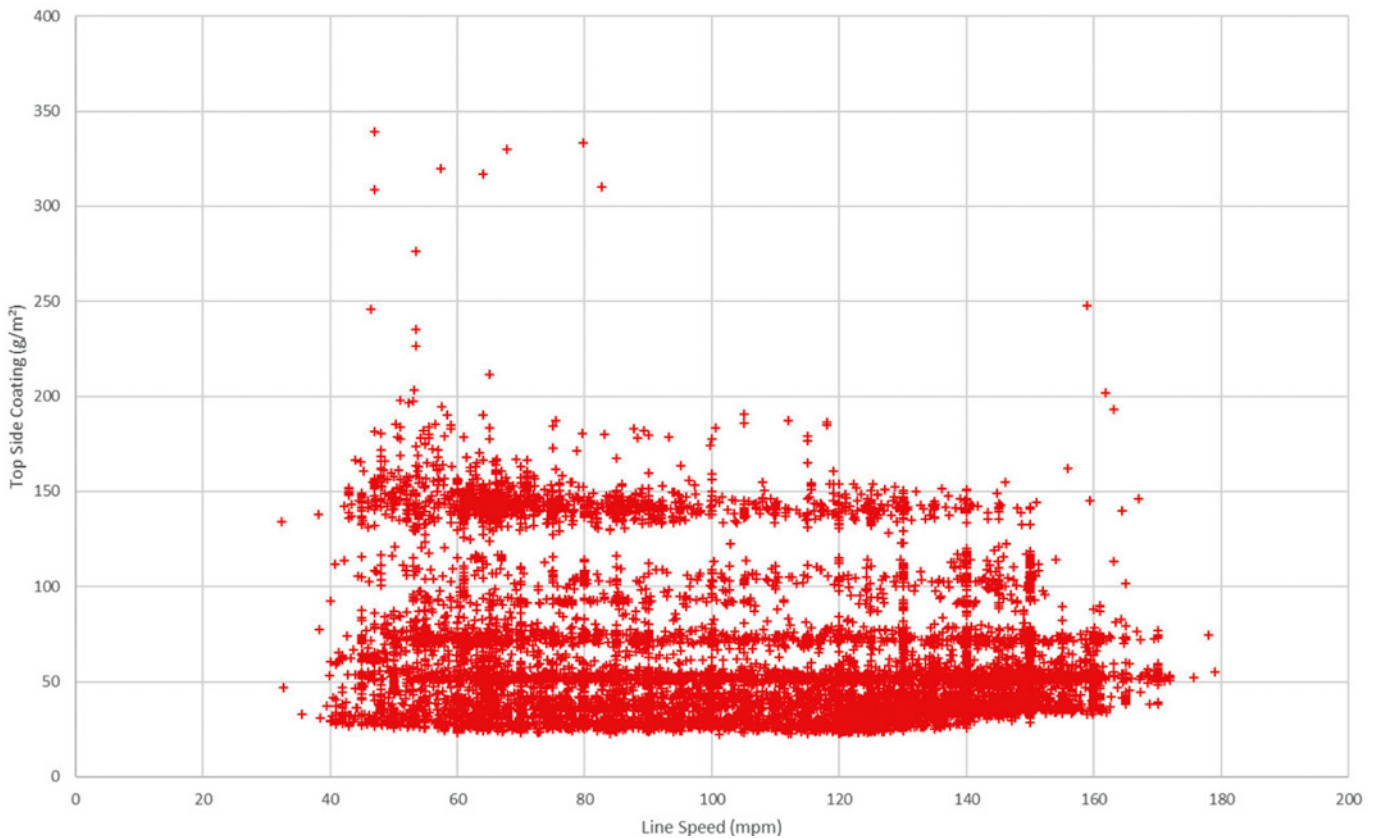
Galvanizing line (Picture: Danieli)

cycle, finally, the coil layers will not stick to each other, even at thin product.

The all-metal working chamber ensures a dew point around -50/55°C during the whole heat-treatment cycle, thus absolutely avoiding decarburization. Danieli Olivotto Ferrè also supplied an innovative set of nine (9) Double Final Cooling Units (DFCUs), which perform an additional cooling (from 160° to approximately 60°C) of the charge after the “standard” annealing cycle. This shortens the waiting time between annealing treatment and Temper mill rolling, reducing intermediate storage areas.

Temper finishing mill. Designed with a nominal production capacity of 0.45 million t/year, the Temper rolling mill features equipment such as entry bridle for stable thin gauge rolling, 4-Hi mill stand with 1000 tons installed rolling force, visual strip surface inline inspection and electro-

Coating vs Speed Chart



Performance of the Yıldız Demir Çelik galvanizing line: coating weight vs. line speed (Picture: Danieli)

static oiling device to serve market demands.

The 4-high Temper mill itself is designed to operate with two different work roll diameters as well as in dry and wet mode. This widens the range of steel grades and possible elongation rates that can be processed (from EDDQ to HSS).

Electrics and automation

Danieli Automation supplied all the electrical equipment and control systems for the entire complex, providing an integrated and optimized system configuration up to Level 3. The single-source automation system and the experience of Danieli Automation, which has been developing innovative solutions in the steel industry for the past 40 years, is a guarantee for a smooth project execution, quick start-up, and easy know-how transfer, resulting in high plant efficiency and yield.

Conclusions

Latest rolling mill technology like OSRT and latest processing technologies like



Batch annealing furnaces (Picture: Danieli)

New Generation Wiping System have been applied to At Yıldız Demir Çelik cold complex. Intensive cooperation with the customer through the whole project execution phase finally created such successful results like a remarkable start-up of the tandem mill, which has delivered zero waste from day one, and followed by a daily increase in throughput and quality, as well as producing at high performance at the customer’s full satisfaction and

even exceeding the expectations. The successful project confirms the Danieli leadership in cold-mill complex integrated technology, and as a point of reference for customers looking for the “single-source responsibility”, ensuring high-quality steel production at the best CapEx and OpEx.

| Danieli, Buttrio, Italy

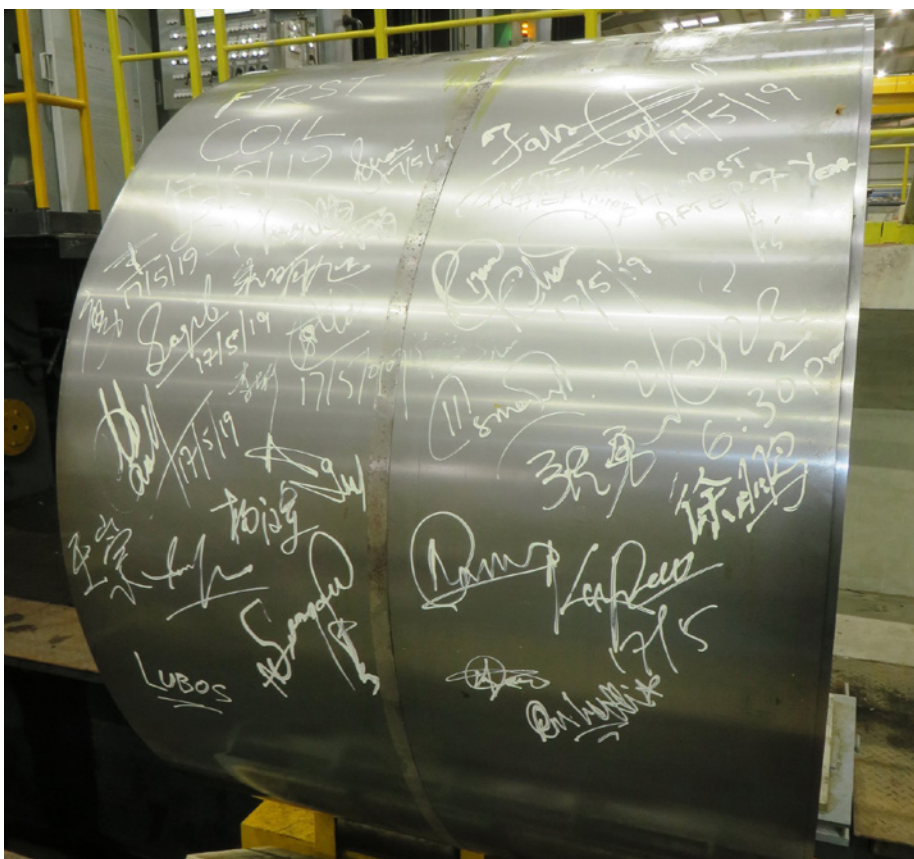
CCM cold strip plant installed in Pakistan

Aisha Steel Mills to increase cold strip production

By rolling the first coil, SMS group has successfully put into operation the new CCM® (Compact Cold Mill) of Aisha Steel Mills Limited (ASML) in Karachi, Pakistan. Since 2015, this has already been the third successful installation of the two-stand type of cold rolling mill by SMS group in Pakistan.



Overview of the CCM® provided with two four-high mill stands, entry- and exit-side as well as roll change equipment (Picture: SMS group)



The new CCM® at ASML is designed for an annual cold strip production capacity of 500,000 tons. The new facility enables ASML to supply the local market with high-grade cold strip according to international standards and helps the company to make its contribution to reducing the country's dependency on high-quality cold strip imports. The products rolled on the CCM® are up to 1,250 millimeters wide and down to 0.15 millimeters thin.

The CCM® features two mill stands in four-high design with the proven roll shifting technology CVC®plus (Continuously Variable Crown) by SMS group. CVC®plus is supplemented by further actuators to infinitely adjust the roll gap, for example positive and negative work roll bending. The quality-determining technical highlights of the plant include two X-Shape flatness measurement rolls, installed at the entry and exit sides, together with multi-zone cooling system and automatic flatness control.

The highly productive CCM® is equipped with the holistic X-Pact® electrical and automation system from SMS group. SMS group supplied the complete plant with all auxiliary equipment, such as modern technological instrumentation, emulsion plant, high- and low-pressure hydraulics as well as the fume exhaust system.

With this CCM® from SMS group, ASML operates a high-quality and modern plant technology suited to meet present and future requirements.

www.sms-group.com

On May 17, 2019, the first coil was successfully rolled on the new CCM® of Aisha Steel and was signed by the members of the project team (Picture: SMS group)



thyssenkrupp's new coating line in Andernach will be the basis for state-of-the-art coating methods for packaging steel (Picture: thyssenkrupp)

Modernization at the world's biggest manufacturing site for packaging steel

thyssenkrupp invests in new state-of-the-art coating line for packaging steel

The new line secures competitiveness for high-quality coated packaging steel. thyssenkrupp started an investment in the low three-digit million euro range.

thyssenkrupp has approved the investment funds to build a new, state-of-the-art coating line for packaging steel at its Andernach site, Germany. As well as meeting the technical requirements for a new process for the production of chromium-coated packaging steel, this will further improve health, safety and environmental performance. The new process will replace the current production method which, due to the EU-wide ban on chromium (VI) compounds in production processes, will not be permissible in the future. Coating with chromium is one of the key steps in the production of high-quality, printable packaging at thyssenkrupp Rasselstein in Andernach.

Strategic decision for premium producer in Andernach

thyssenkrupp's Rasselstein plant in Andernach is the world's biggest packaging steel manufacturing site. Through the tight-knit network of its German sites, thyssenkrupp pursues a consistent premium strategy all the way from its starting product steel through to end products such as high-end tinplate. The new coating line will further strengthen the thyssenkrupp subsidiary's competitive position and make a major contribution to protecting people and the environment.

"As a premium manufacturer of packaging steel we take our responsibility towards our customers very seriously. As a reliable partner we deliver one of the most eco-friendly packaging materials," says Premal A. Desai, CEO of thyssenkrupp Steel. "This investment is therefore clear evidence of our strategy to focus consistently on sustainability and the associated growth markets so as to safeguard the future of our business".

"We are pleased because this is a strong signal for our site. It marks the success of generations of highly motivated and skilled employees at an innovative, modern production site," says Dr. Peter Biele, CEO of thyssenkrupp Rasselstein. "With this decision we can supply our customers with our high-quality products on the basis of an even more advanced process chain. As the region's biggest industrial employer, we provide secure jobs for our employees and motivated young people entering the labor market."

Sustainable and competitive packaging steel from Andernach

On completion, the new coating line will be the most advanced production line of its kind and will set new standards in the areas of process reliability, quality, environmental protection and occupational safety.

As the most recycled packaging material, packaging steel has great potential for the future in terms of sustainability. For over 10 years now, packaging steel has been consistently exceeding the planned recycling rate targets in Germany. thyssenkrupp contributes to this by supporting the recycling of packaging steel in Germany – partly through its own recycling companies such as Deutsche Gesellschaft für Weißblechrecycling, and partly through cooperative ventures such as Blechverpackungen Stahl GmbH.

thyssenkrupp Rasselstein GmbH is a leading global supplier of high-quality, precision-made packaging steel. The site in Andernach – the world's biggest production site of its kind – produces 1.5 million tons of packaging steel each year. The plant's 2,400 employees serve around 400 customers from numerous markets in 80 countries – from producers of food and pet food cans to manufacturers of beverage and aerosol cans, containers for chemical products, and bottle caps. Expert service, sales and aftersales teams round out the product portfolio. They work closely with customers to maintain consistent high standards of quality and reliability worldwide.

thyssenkrupp Steel

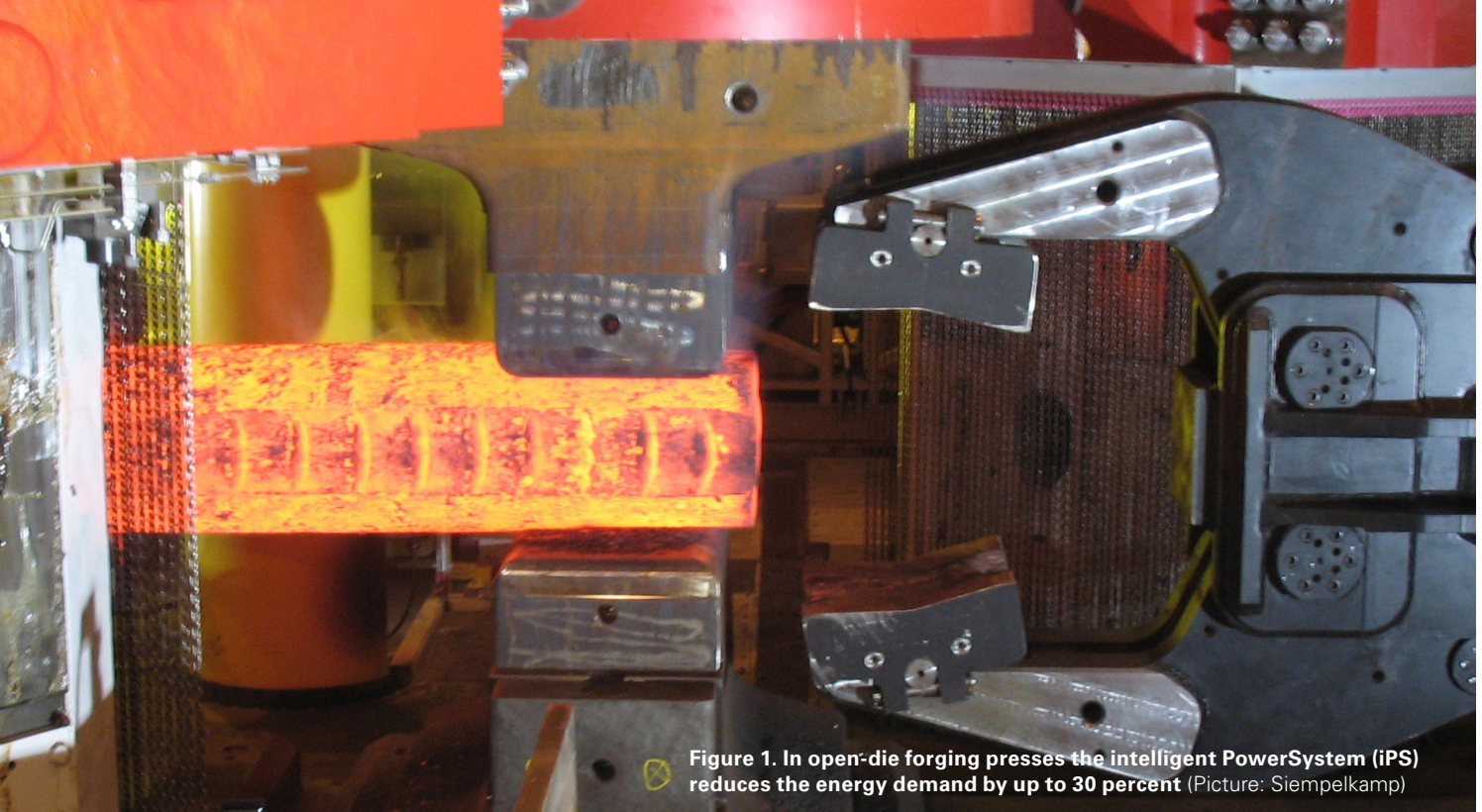


Figure 1. In open-die forging presses the intelligent PowerSystem (iPS) reduces the energy demand by up to 30 percent (Picture: Siempelkamp)

Energy-savings potential of hydraulic presses

Energy-efficient drive concepts in metal forming

The production of large forgings, such as blanks of high-strength alloys for aircrafts, has increasingly come into the focus of the public interest throughout the world due to the high energy demand involved in making these forgings. The intelligent PowerSystem (iPS) reduces the energy demand of Siempelkamp presses for metal forming by up to 50 percent.

To get an idea of the energy consumed by the presses involved in such forging processes just imagine that, for example, the closed-die forging press Siempelkamp supplied to Nanshan generates a pressing force of 500 MN. This corresponds to the weight of 185 Airbus A380 aircrafts concentrated on one square meter. The energy use of such a large-scale press for an entire year can be compared to the energy consumption of a medium-sized suburb with approximately three thousand single-family homes.

As presses of this size can only produce high forces by utilizing large hydraulic drives, the largest savings potential is in the hydraulic system itself. For this reason,

the topic of energy efficiency has always been the focus at Siempelkamp.

The iPS system

With the help of the intelligent PowerSystem (iPS) Siempelkamp provides customers with a modular tailor-made concept not only for new open-die (**figure 1**) and closed-die forging presses: in principle a retrofit is beneficial to all oil-hydraulic presses.

Four modules tailored to the specific requirement profiles of the customer are the foundation of the Siempelkamp iPS: the intelligent start-stop system iPS.eco-start; the iPS.secondary drives module, which integrates auxiliary equipment into

the energy management; highly dynamic iPS.servo drive pumps, and the iPS.energy recuperation module.

Every project, be it the building of a new plant or a retrofit, starts with the collection and evaluation of the production data of the plant. This is a complex process during which all process parameters for the respective products are collected, relevant performance data of the involved aggregates verified and the necessary standstill times for loading and unloading mapped.

With the collected data, a simulation program can precisely determine the entire energy consumption of the complete press cycle. On this basis, Siempelkamp's hydraulics and electronics spe-

Gregor Endberg, Dr. René von Dombrowski, G. Siempelkamp Maschinen- und Anlagenbau GmbH, Krefeld, Germany
Contact: gregor.endberg@siempelkamp.com



Figure 2. The O-press at Tenaris Confab is the first press using the intelligent PowerSystem iPS (Picture: Siempelkamp)

cialists design a solution that exploits the full available savings potential.

Automatic start-stop system

Due to the process, closed-die forging presses are rarely running in continuous operation: the blank has to be placed in the die; after the forging process the finished part has to be removed from the tooling, and the dies have to be cleaned. Additionally, there is the time needed for loading and unloading. During this time the manipulators have to travel long distances inside the shops with the blanks and semi-finished products. The downtimes of some large-scale presses can easily be far greater than the time needed for the actual forging operation.

For this reason, the intelligent start-stop system switches the electric motors of the main drives off even during short standstill and handling times. Thus, no-load losses can be eliminated and the components of the main drives conserved, which in turn results in longer component durability.

For reasons inherent to the system, the standstill times of open-die forging presses are shorter by about 30 percent than

those of closed-die forging presses. Nevertheless, also the open-die forging process provides enormous potential for cost savings.

In contrast to conventional market concepts, Siempelkamp does not use frequency converters for the main drives. This eliminates not only the very large initial start-up costs for the installation of the frequency converters. Due to the limited service life of the converters, the regularly incurring high costs for component replacements are also saved. Yet, the starting and stopping performance of the presses is very smooth.

Also during the actual production process, dispensing with the use of frequency converters pays in the form of an improvement in the energy balance because with frequency converters the press efficiency would be approximately two percent lower.

The use of an upstream low-pressure tank to ensure the necessary feed pressure on the inlet side of the main pumps eliminates the need for boost pumps, and their associated high energy costs. This is of great significance due to the fact that the no-load losses of the feed pumps

alone are, in general, of the same magnitude as those of all main drives.

Reduced cooling requirement and significantly decreased noise emissions are welcome side effects of this configuration.

Demand-led control

The iPS.secondary drives module enables an additional energy efficiency increase by integrating auxiliary equipment into the energy management. The feeding, cooling and filter pumps are equipped with variable speed drives. The demand-led control of the volume flow depending on the current fluid temperature and current particle concentration of the fluid avoids the energy costs for the otherwise necessary continuous recycling of clean and adequately heated fluid. The energy input is always exactly as high as the amount needed, never higher.

High-efficiency pumps

A further increase in energy efficiency is achieved by the displacement system iPS.servo drives. The control of displacement pumps takes place directly via the

ACHIEVED ENERGY SAVINGS IN THE AREA OF METAL FORMING

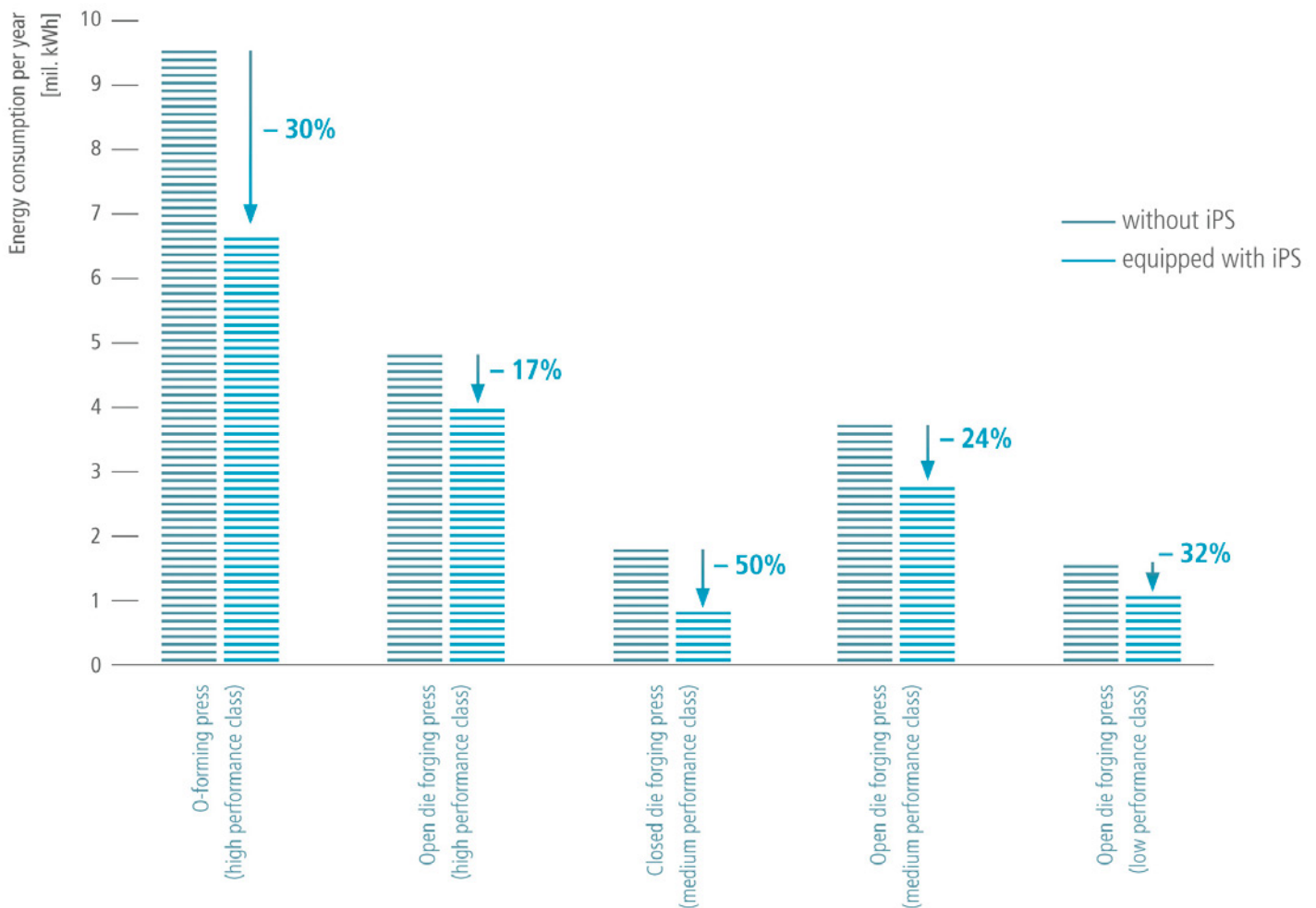


Figure 3. Reduction of the energy demand by press types (Picture: Siempelkamp)

volume flow control of the pump drives. As these pumps make control valves superfluous, throttle losses in the hydraulic system are reduced. By means of intelligent load-sensing control strategies, high-performance variable displacement pumps provide exactly the flow and pressure needed for the current forging process.

Together with other energy recovery measures, iPS.servo drive realizes a proven savings of up to 30 percent of operating energy.

Also in this case, reduced cooling and a marked decrease in noise emissions come as positive side effects.

Effective energy recovery

In metal forming, energy is stored during two process phases. On the one hand, during the lifting of the moving beam, elec-

trical energy is converted into potential energy. On the other hand, when the fluid is compressed during the pressing process, energy is induced into the fluid. This energy is still stored inside the hydraulic system after the forging process.

With the iPS.energy recuperation module, this energy can be recovered by means of adjustable axial piston pumps which during lowering of the running beam and during decompression of the hydraulic fluid run in generator-based mode in order to generate electrical energy which can be fed into the electricity grid for use by other electrical or electro-hydraulic drives.

Bottom line

An energy-efficient drive concept in the maximum configuration level was rigorously implemented for a 50,000 t pipe

forming press for Tenaris Confab, the leading Brazilian manufacturer of pipeline pipes (figure 2). The press is equipped with variable-speed pump drives and variable displacement pumps, and refrains from using control valves as controlling devices.

With the energy recovery module iPS.energy recuperation, a significant amount of energy stored in the hydraulic system can be recovered in the process. The press has an about 30 percent lower energy demand than conventional press configurations.

Experience gained during various years of press operation in metal forming shows that the intelligent Power-System is able to reduce the energy demand of open-die forging presses and O-presses by about 30 percent, and of closed-die forging presses by about 50 percent (figure 3).

80 million euro investment in a production facility for truck components

thyssenkrupp to build its most advanced forging line in Homburg, Germany

thyssenkrupp announced its decision to build a new forging line at its Homburg site in Germany's Saarland region. The company will invest some 80 million euros in a new facility to produce forged components for front axles of trucks. Long-term delivery contracts have already been signed with truck manufacturers. This production expansion represents the biggest single investment ever made at thyssenkrupp's Homburg site.

The centerpiece of the new highly automated and digitized forging line in Homburg will be a 16,000-t forging press measuring 10 meters in height and weighing 1,700 t. The pressing force of 16,000 tons is equivalent to the weight of 30 of today's biggest passenger aircraft.

Dr. Franz Eckl, COO of the Forged Technologies business unit at thyssenkrupp: "The main press of the new forging line will be the world's first eccentric press of this size, capacity and output to go into operation. It will produce around 360,000 forged components per year, and will not be restricted to one product. In addition to front axle systems this forging line will also be able to produce crankshafts and other forged parts as required."

thyssenkrupp has been manufacturing forged components at the Homburg site since 1947. With a roughly 750-strong workforce it is one of the region's biggest employers. The plant has long been one of the most efficient production sites in thyssenkrupp's global forging network. It is market leader for forged crankshafts, supplying automotive customers worldwide.

The production of truck front axles will open up a new market and product segment for the company. These chassis components are powertrain-independent and will continue to be needed even when e-mobility starts to make greater inroads into the transportation sector.

Dr. Alexander Becker, CEO of the Forged Technologies business unit at thyssenkrupp: "Our customers have made a conscious decision to place their orders with our Homburg site in order to secure the reliable supply of these specialized parts in Europe in times of international customs risks and rising logistics costs. This will allow the Homburg site to demonstrate its production expertise, product

quality and delivery performance in the international marketplace."

The new investment will create around 70 new jobs. Construction of the world's most advanced forging line is scheduled to start in early 2020. The roughly 12,000 square meter facility will be built on the existing site, with completion and start of production planned for early 2021.

thyssenkrupp has consolidated its global forging activities in a business unit within its components division

thyssenkrupp's forging business currently employs around 7,500 people. The company operates some 50 forging presses at 17 sites worldwide and has a broad distribution network in over 70 countries.

In 2017 thyssenkrupp consolidated its global forging activities in a new business unit within its components division. This allowed the company's worldwide forging plants to be managed more efficiently while at the same time combining its value creation capabilities to develop new products for new and existing markets. The Forged Technologies business unit is now one of the world's largest forging operations with annual sales in excess of 1 billion euros. Its product portfolio includes forged and machined components and systems for the automotive, construction machinery and general engineering sectors.

thyssenkrupp AG, Business Area Components Technology



The centerpiece of the new highly automated and digitized forging line in Homburg will be a 16,000-t eccentric press (Picture: thyssenkrupp)

Additive manufacturing

SLM Solutions opens application center for selective laser melting in Shanghai

SLM Solutions celebrates the grand opening of their new expanded office facilities and application center for their head office in China. After establishing Chinese operations in Shanghai in 2015, the new facility will strengthen SLM Solutions' presence in China and allow local staff to collaborate with customers to foster selective laser melting innovation.

With over 100 customers, industry contacts, and local government representatives, SLM Solutions celebrated with festivities and a tour through the new customer service and application engineering center. A publicly traded company, SLM Solutions Group AG is headquartered in Germany with offices worldwide. SLM Solutions' robust Selective Laser Melting® metal additive manufacturing systems optimize fast, reliable and cost-efficient production for complex, completely dense metal parts.

Customer success stories, such as from Divergent3D on the prospects for industrializing metal additive manufacturing, were also incorporated into the day and a second day of customer workshop training will also be offered on SLM Solutions' technical products and services as well as standardization processes.

The new facility in Shanghai has four selective laser melting machines installed, one SLM®125, two SLM®280, and one SLM®500 system. The application center also includes equipment to represent the supporting process chain to an SLM build, including post-processing capabilities, a

China is a growth market for us as the manufacturing sector is continuing to transform with industrial selective laser melting applications.

Meddah Hadjar, CEO of SLM Solutions Group AG

met-allurgical lab and best-practice examples for powder storage and operation. Expanded capacity for calibration equipment, spare part storage and a growing customer support team will allow the company to continue its growth in the region.

"China is a growth market for us as the manufacturing sector is continuing to transform with industrial selective laser melting applications," Meddah Hadjar, CEO of SLM Solutions Group AG said. "This new office not only continues our commitment to the Chinese market, but also provides more resources for our local experts to support customers, ensuring they are successful and facilitating their innovation."

"As we continue to grow our Chinese team, the opening of our Shanghai Applica-

tion Center is an important milestone in SLM Solutions' development and indicates the confidence in the Chinese market. As part of the global strategy for growth we have the capacity to more than double our number of employees and the equipment to support all Chinese users with the technological resources shared by our applications centers around the world. We can also provide high-quality, fast technical services to better promote the development of selective laser melting and create more value for customers," says Jerry Ma, General Manager of SLM Solutions (Shanghai) Co., Ltd.

■ *SLM Solutions Group AG, Lübeck, Germany*



The new facility has four selective laser melting machines and numerous metal components (Picture: SLM Solutions)

Inaugural steel industry certification standard, ResponsibleSteel™, on track for market launch

ResponsibleSteel™ is the steel industry's first, multi-stakeholder certification initiative that aims to set a single, global standard for the entire 'mine-to-metal' steel value chain. The multi-stakeholder initiative, of which ArcelorMittal was a founding member and has played a leading role in developing, was first established in 2015.

Following a two-day members' meeting, hosted by ArcelorMittal at the ArcelorMittal Orbit at the Olympic Park in Stratford, East London, version four of the new draft ResponsibleSteel™ certification standard has been reviewed by members with formal market launch of the standard now expected towards the end of the year. Efforts to accelerate the creation of the standard, including extensive public consultation periods, have increased over the past 12 months, leading to the approval of

draft version four. The standard will enable steel producers to prove their production processes and products meet rigorously defined standards across a broad range of social, environmental and ethical criteria. It will also serve to improve responsible sourcing of raw materials used in steel-making and reduce supply-chain risk.

Commenting at the event, Alan Knight, head of sustainable development at ArcelorMittal and co-chair of ResponsibleSteel™ said: "I am encouraged both by the progress we have made in developing the ResponsibleSteel™ standard and the broad-based interest in the scheme. For a scheme like this to truly gain market acceptance we need involvement, collaboration and input from multiple stakeholder groups."

ResponsibleSteel™ currently has 19 full members and 18 associate members including steel producers (Aperam, Arce-

lorMittal, BlueScope Steel, VAMA and voestalpine), financial institutions (HSBC), automotive majors (BMW and Daimler), NGOs (International Union for Conservation of Nature, Fauna and Flora International, CDP and others) and associated industry bodies (IndustriALL, International Tin Association and International Zinc Association).

ArcelorMittal has undertaken readiness assessment against version three of the standard across nearly all its European flat products production sites, and at sites in the USA and Brazil, with positive results. It is currently working on a site assessment and verification plan, starting in Europe, in anticipation of the market launch of the standard later this year.

ArcelorMittal

ArcelorMittal wins 2018 best raw material supplier award from Fiat Chrysler Automobiles

Fiat Chrysler Automobiles (FCA) recognized its best suppliers in Latin America during the company's annual supplier conference held in June 2019 in Belo Horizonte.

ArcelorMittal received the award for best raw material supplier in the region during

2018. The award was accepted by Eduardo Zanotti, vice-president commercial for ArcelorMittal Flat Carbon South America.

ArcelorMittal was one of 14 companies recognized in 16 categories. The winners were all outstanding suppliers who have demonstrated their commitment to deliver value through innovation, quality, and com-

petitiveness. They are all aligned with FCA's principles of proactive collaboration, continuous improvement, integrity, long-term thinking, mutual transparency, and social responsibility.

ArcelorMittal

ArcelorMittal buys Münker Metallprofile

After more than 40 years on the market, Münker Metallprofile has transferred the company to ArcelorMittal Construction Deutschland GmbH.

As part of its expansion strategy in the field of roofing and facade technology, ArcelorMit-

tal has taken over all shares of Münker Metallprofile GmbH in Reichshof. Managing director Frank-Udo Münker, his management team and all employees of Münker Metallprofile remain with the company. Production will be further expanded through ongoing investment, securing the company location and the

independent brand "Münker Metallprofile" in the long term. The company plans to hire additional employees.

*ArcelorMittal
Münker Metallprofile*

Strategic partnership in metal 3D printing between Indo-MIM and Desktop Metal

Under the partnership, Desktop Metal and Indo-MIM will offer innovative solutions to enable companies around the world to design and produce metal additively manufactured parts at scale and shorten time to market.

Indo-US MIM Tec. Pvt. Ltd. supplies precision-engineered products using metal injection molding (MIM) as the core manufacturing technology. Desktop Metal, Inc. is committed to making metal 3D printing accessible to manufacturers and engineers. As one of the first companies to

deploy the Desktop Metal Production System in its state-of-the-art factories, Indo-MIM will draw upon its renowned expertise in design, tooling, sintering, materials, and its full range of finishing and assembly operations, to deliver high-precision metal 3D printed parts to companies spanning

the automotive, aerospace, medical, industrial machinery industries and more. As a strategic partner, Indo-MIM will become a full-service manufacturing partner for Desktop Metal, providing companies looking for a wide range of mass production with quantities of high-quality metal parts, ranging from tens of thousands to one million. Indo-MIM will also offer customers

consulting services around downstream manufacturing and finishing processes key to going to production with metal additive manufacturing.

Powered by single pass jetting technology, the production system is designed to print a broad range of alloys, including reactive metals such as titanium and aluminium, enables the use of

metal powders that are lower in cost than laser powder bed fusion metals. Indo-MIM will install the production system in its San Antonio, Texas factory and begin working with customers as early as fall 2019.

█ *Desktop Metal*

Yunlin offshore wind farm uses monopiles from Steelwind Nordenham

Dillinger subsidiary Steelwind Nordenham is to supply 40 complete monopiles for the construction of the Yunlin offshore wind farm off the west coast of Taiwan.

Added to this are 120 sections that will later be used locally by Formosa Heavy Industries Corporation (FHI) to assemble another 40 monopiles. The input material – heavy plate in the required grades and

dimensions – will come from Dillinger, Germany or its subsidiary Dillinger France in Dunkirk. “This order makes a sustainable contribution to the generation of renewable energies and ensures capacity utilization at the Nordenham site for an entire year,” said Dr. Ralf Hubo, Managing Director of Steelwind Nordenham, when the final contracts were concluded.

Production for the order has already started; the last monopiles will leave the

plant in early June 2020. The journey by ship from Nordenham to Mailiao, the port of destination in Taiwan, takes about 45 days. The Yunlin offshore wind park will be built 8 km off the west coast of Taiwan with 80 Siemens 8 MW turbines, at water depths ranging from 8.5 to 38 m.

█ *Aktien-Gesellschaft der Dillinger Hüttenwerke*

EOS presents new materials and processes for series additive manufacturing

Four new metal materials presented by EOS, technology supplier in the field of Industrial 3D printing of metals and polymers, open up new application possibilities.

The new metal materials EOS StainlessSteel CX, EOS Aluminium AlF357, EOS Titanium Ti64 Grade 5, and EOS Titanium Ti64 Grade 23 have been tailored to suit a broad array of applications, ranging from automotive to medical applications.

EOS StainlessSteel CX is a new tooling grade steel developed for production with the EOS M 290 that combines excellent corrosion resistance with high strength and hardness. Components made from this material are easy to machine and enable an excellent polished finish.

EOS Aluminium AlF357 is the ideal material for applications that require a light metal with excellent mechanical/thermal strength. Components made from this material are characterized by their light weight, corrosion resistance and high dynamic loading. EOS Aluminium AlF357 has been specially developed for production with the EOS M 400, but it is planned to also make the material available for the EOS M 290 system in the near future.

EOS Titanium Ti64 Grade 5 has been specially developed for its high fatigue strength without hot isostatic pressing (HIP). Suitable for production with the EOS M 290, the material also offers excellent corrosion resistance, making it ideal for aerospace and automotive applications.

EOS Titanium Ti64 Grade 23 has also been specially developed for its high fatigue

strength without hot isostatic pressing (HIP) and for production with the EOS M 290. Compared to Ti64, Ti64 Grade 23 offers improved elongation and fracture toughness with slightly lower strength. Thanks to these properties, it is particularly well suited to medical applications.

EOS classifies the technological maturity of all its polymers, metals, and processes in the form of Technology Readiness Levels (TRLs). The TRL concept was developed by NASA and is established in numerous industries. Level 5, for example, refers to a verification of the technical solution, while the highest, level 9, refers to full production capability with extensive statistical data documentation.

█ *EOS*

New Helix Steel products for ultra high-performance concrete

Helix Steel has introduced two new Helix® products designed to meet the needs of the ultra high-performance concrete (UHPC) market.

The new products are based on the company's patented Twisted Steel Micro

Rebar™ technology. The twisted, screw-like shape of Helix® has been shown to provide advantages over the smooth steel fibers that are common in the industry. The products are manufactured in Grand Rapids, Michigan under an ISO 9001:2015 certified quality management system.

These new Helix products for ultra high-performance concrete (UHPC) will reduce the dependency on high dosages of specialty small diameter steel fibers to achieve UHPC performance. UHPC mixes are used to increase the durability and lifespan of roads and bridges.

Helix Steel offers free webinars to the public

Helix Steel has partnered with the Registered Continuing Education Program (RCEP) to offer Continuing Education (CE) credits and Professional Development Hours (PDHs) to industry professionals.

RCEP is a nationwide registry of CE providers that have demonstrated adherence to high-quality, effective practices in the development and delivery of professional education activities for engineers, surveyors, and related architecture and construction industry professionals. As an RCEP provider, Helix Steel will issue PDHs and CE credits to webinar attendees. RCEP

credits are recognized and accepted by state licensing boards across the country.

Helix Steel webinars are designed to educate engineers, contractors, architects, and builders on how to effectively use Helix® Twisted Steel Micro-Rebar™ reinforcement products.

■ *Helix Steel*

175 years of KASTO - from a one-man company to a global player

In its long history, KASTO Maschinenbau has developed into an internationally active sawing and storage technology specialist with a close-knit network of branches and agencies.

Over several decades, the family-owned company specialized in sawing and storage technology for bar stock has successfully expanded its abroad activities out from its headquarters in Achern, South Germany. The first step abroad led to France, where in 1977 KASTO established its first branch outside Germany. The compa-

ny's current main site in France is in Obernai, Alsace, only a few kilometres away from the German headquarters. Today KASTO France has 30 employees, who serve around 4,000 customers in France, Belgium, Luxembourg and North Africa.

Today, the company has subsidiaries in six countries. In Pittsburgh, USA., American KASTO Inc. has around 40 employees and an extensive spare parts warehouse and is also the contact for KASTO users in Canada. In 2018, the company inaugurated a new showroom with a Technology Centre in Chicago.

At the beginning of the 1990s, after the unification of the Germany, KASTO established a plant in Schalkau, Thuringia. In 2003, the company opened a subsidiary in the UK. Today KASTO UK's 13 employees provide support for customers in the United Kingdom, Ireland, Denmark, Finland and the Middle East.

In 2015 and 2016 followed the opening of branches in Singapore and China. 2016 also saw the opening of a branch in Rheinfelden, Switzerland.

■ *KASTO*

Thermodynamic database to speed up steel grade development

Researchers from the National University of Science and Technology "MISIS" have developed a database that will help create and speed up the process of creating innovative steel grades with specified strength and ductility, which will allow manufacturing car bodies of the most complex shapes.

In modern materials science, the basis for the synthesis of new materials is the so-called phase state diagrams, which show the interaction of chemical elements at different temperatures. Based on this information, it is possible to predict the

physical properties and microstructure of alloys, and, most importantly, the conditions and technology for their production. Today, the production of flexible steels for car bodies, capable of bending into the most complex shapes, but at the same time withstanding the load on impact, is very topical for the industry. It is known that the strength and ductility of steel can be increased by adding lanthanum. However, the overall mechanism of rare earth elements' influence on steel properties remained unknown until recent times.

The researchers have now created a thermodynamic database which describes

the interaction of iron and carbon with lanthanum additives. This makes it possible to accurately assume the phase composition, crystallization temperature and microstructure of the material. This data allows optimizing the development of new steels, as it significantly reduces the time to search for new compositions and conduct the necessary experiments. With the database, the period of development of new steel grades can be reduced from one year to one to two months.

■ *The National University of Science and Technology MISIS, Moscow, Russia*

Ruukki Construction to divest Building Systems

Ruukki Construction has agreed to divest its Building Systems business to Donges Group, which is fully owned by the German-based investment company Mutares.

Building Systems constitutes around 20% of Ruukki Construction's total sales. The divestment will allow Ruukki Construction

to fully focus on its product businesses residential roofing and building components. Building Systems employs some 500 persons, who will transfer to the service of the new owner. Building Systems is a project business that specializes in the design, manufacture and installation of building frame, envelope and bridge structures.

The transaction will have no impact on the residential roofing business or building components business, which focuses on building products and serves partly the same customers.

■ *SSAB*

Saarstahl expands treatment capacity for bright steel

Work is underway to expand the heat treatment capacity at Saar-Blankstahl. Saorstahl is investing 17 million euros in this project.

With the decision to expand the annealing capacity of its subsidiary Saar-Blankstahl, Saorstahl AG is responding to an expected increase in worldwide demand for heat-treated bar material and to demand for higher-quality steels, which also play an important role in electric mobility.

Saar-Blankstahl is a specialist in advanced products made from bright bar steel. In the first construction phase, the investment comprises the construction of a roughly 4,300 m² hall with complete infrastructure and cranes, a roller hearth furnace for heat treatment and a straightening machine with a corresponding packaging unit. The new heat treatment plant is scheduled to begin operation in autumn 2020.

The company uses state-of-the-art equipment and manufacturing process-

es to produce innovative and high-quality solutions tailored to customer specifications, above all for the automotive industry, mechanical engineering, the electromechanical industry and the turned parts and rolling bearing industry. Saar-Blankstahl purchases rolled material exclusively from its parent company Saorstahl AG.

■ *Stahl-Holding-Saar*

Gnotec orders servo press

Schuler is supplying an MSD 800 servo press to automotive supplier Gnotec.

Sweden-headquartered Gnotec Group, international manufacturers of metal components with production sites also

in China, Slovakia and the USA, has ordered the third servo press from Schuler. Like the other two presses, also the new MSD 800 press will come with a complete forming system, including a coil line and roll feed. Servo press-

es enable manufacturers to individually program both the stroke height and forming speed.

■ *Schuler*

Schuler strengthens international sites and reduces capacities in Germany

The Executive Board of Schuler AG has adopted a program of measures aimed at adapting operating capacities in Germany to the changed competitive conditions and increased pressure on costs.

The objective of the program is to improve the utilization of growth opportunities by strengthening international sites and expanding the product portfolio in line with market needs. At the same time, a sustainable perspective will be created for the remaining business activities in Germany.

The main reason for the adaptation measures is that demand for fully automated press lines, mechanical presses, servo

technology and forging from customers in the automotive, industrial and hydraulic sectors has been steadily shifting away from Germany and Europe in recent years – and toward Asia in particular. This trend is set to continue across all customer groups.

The plan is to close new machine production at the Göppingen/Germany facility. Field service and on-site assembly will stay in Göppingen, which will also remain the Schuler Group's head office with the corresponding corporate functions and an important location for research and development, innovation, engineering and service.

Schuler will also reduce capacities for manufacturing, on-site assembly and

in-house assembly in Erfurt and other German sites. The reasons are the stronger use of existing plants in China and Brazil, as well as a general reduction in vertical integration across all divisions. At the same time, there will be a significant increase in value added by Schuler's facilities in China. Production in Brazil will also be strengthened and the hydraulic business expanded. Equally, Schuler's global localization strategy means that customers in Europe will continue to be served from Germany.

■ *Schuler*

Beam-IT and SLM Solutions expand cooperation

Additive manufacturing service bureau Beam-IT, based in Italy, and SLM Solutions, Lübeck, Germany, have signed an agreement to deepen their long-term cooperation.

Beam-IT expands its product portfolio with two new SLM[®] machines for their production and to work on the development of new parameters. The exchange of knowledge regarding new research results and param-

eter development are planned to create added value for both companies.

Beam-IT specializes in additive manufacturing and has one of the largest additive manufacturing machine fleets in Europe. Operating internationally, they have consolidated partnerships with the most prominent companies and research institutions across all industries. The company has now expanded its equipment portfolio to include an additional SLM[®]280 Selective Laser

Melting machine with twin lasers and a quad laser SLM[®]500, bringing their total of SLM[®] machines to seven.

In a joint venture project Beam-IT and SLM Solutions will work on further material parameters for the nickel-based alloys IN939 and IN718, focusing on certain material properties.

■ *SLM Solutions*

Separation and guidance of the individual strands on slitting lines

Automatic adjustment of separator shafts reduces unproductive downtimes

Setting-up of separator shafts can be as simple as the push of a button. Heinrich Georg now also manufactures its automatic separator-disk adjuster shafts for slitting lines for strip of up to 6 mm gauge thickness.

“Push-button setting of the separator disks has proven its value in a number of European mills, and significantly increased the productivity of those lines. I am confident that our presence at the SMU Steel Summit 2019 will also enable us to convince our American customers.”

Antonio Garcia, head of Georg's Strip Lines division

Setting-up of the separator shafts on slitting lines has, up to now, been extremely time-consuming. It was necessary, for every slitting program, to remove the conventional separator shafts, fit the necessary separator disks and spacer rings manually, and then replace the shaft. The result was unproductive downtimes during separator-shaft changing, high labour costs and significant space requirements for the changing table.

GEORG's patented automatic separator system moves each individual separator disk automatically to precisely the required position. This procedure takes only a few seconds and significantly

enhances the productivity of slitting lines.

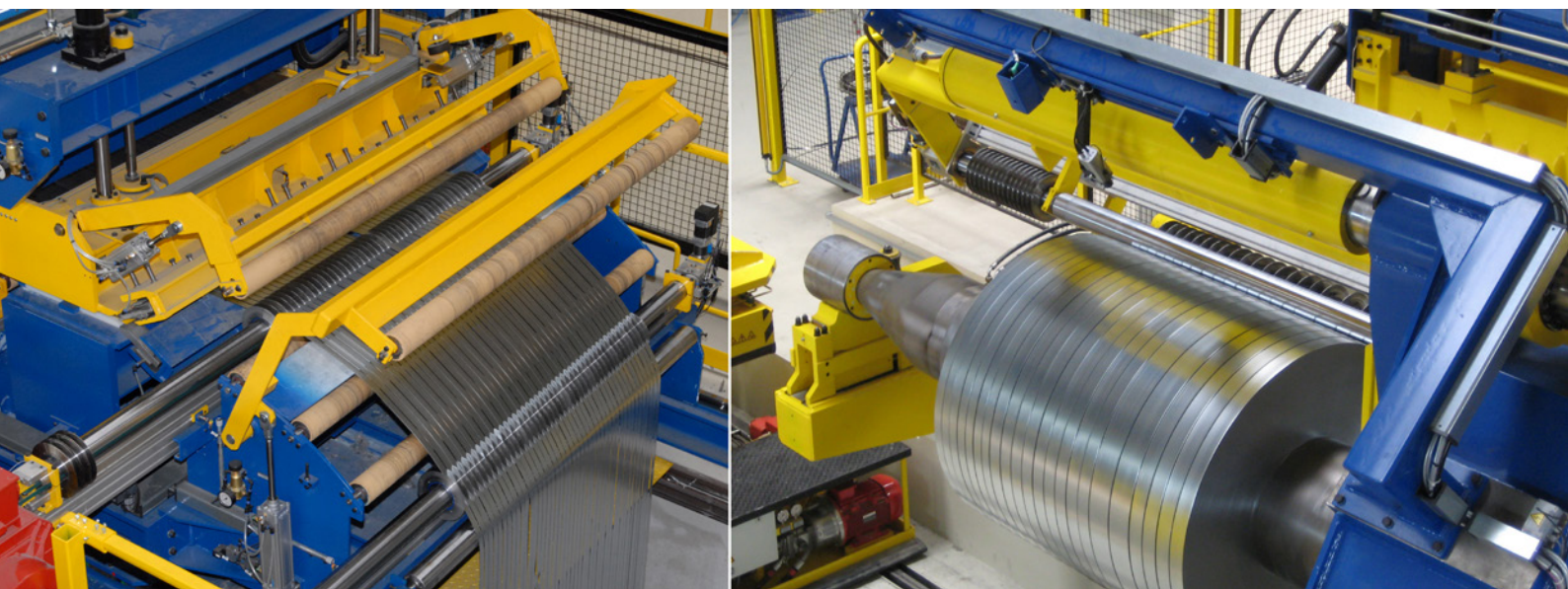
At program changes, the shaft control system receives the new position data from the higher-level distributed control system (DCS) and positions the separator disks accordingly.

The system is set up for the various programs by means of a user-friendly man-machine interface on the main operating panel or on a separate control desk. For maintenance purposes, the shafts can be replaced in less than five minutes by means of a simple cassette change. The separator cassette can be inspected away from the production line.

Boosting the efficiency of slitting lines

The individual disks are moved by electric motors to their position on the shaft and are locked there pneumatically. The drive system is located inside the shaft. It is thus both protected, on the one hand, and of compact layout, on the other: only minimal modifications are necessary even for retrofitting into an existing line.

Heinrich GEORG GmbH Maschinenfabrik, Kreuztal, Germany

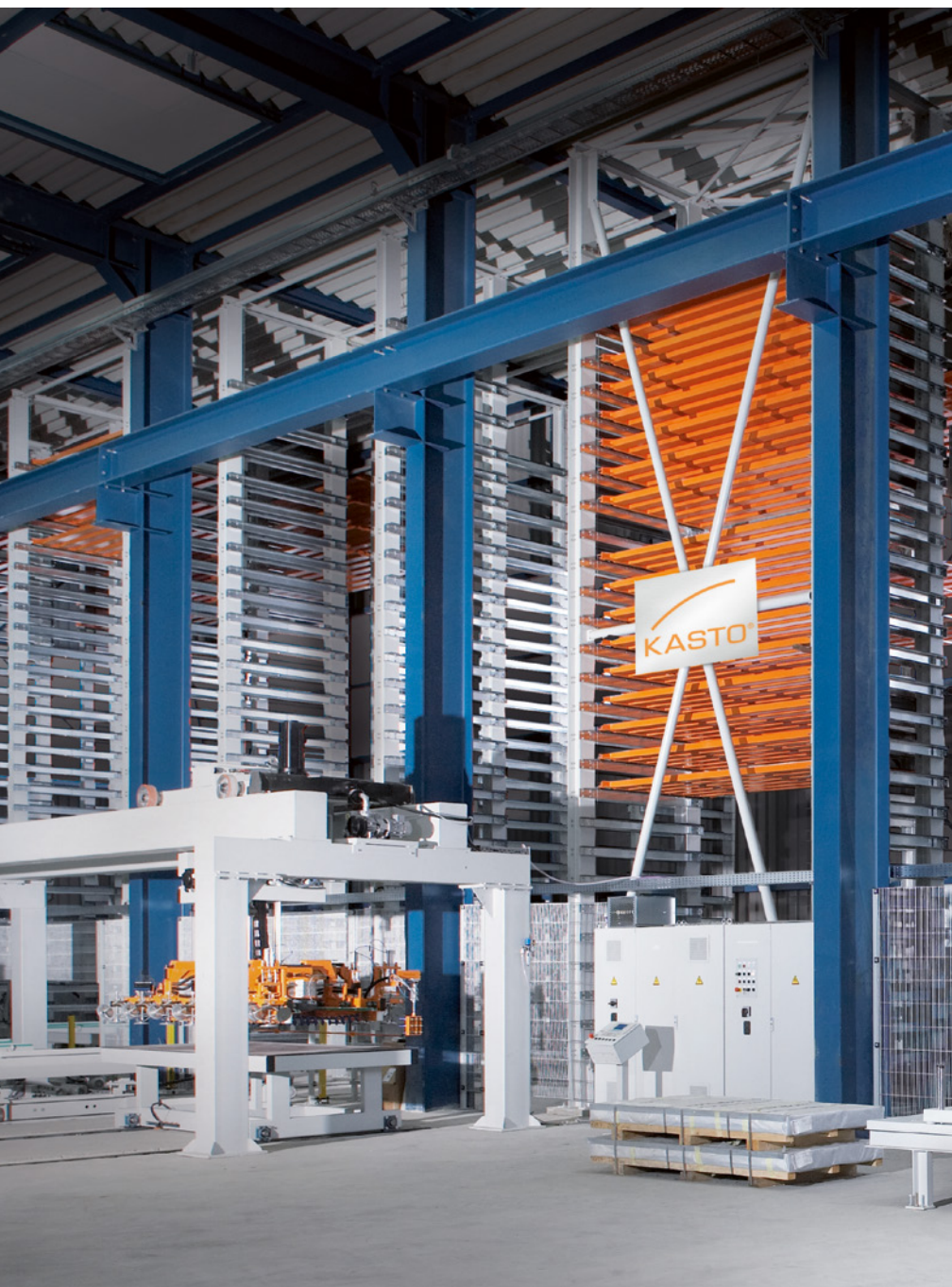


The automatic separator shaft at the discharge end of a slitting line (left) and on a coiler (Picture: Heinrich Georg)

Digital networking of production and logistics processes

The smart future of metalworking

Digitalisation and networking are rapidly gaining ground in metalworking – and the same trend is also taking place in storage & sawing technologies. Manual and mutually-isolated processes are increasingly giving way to a continuously-controlled, intelligent material flow, in which all the components involved communicate autonomously with each other. At Kasto, this topic has long since ceased to be simply a dream of the future, because the sawing and storage technology manufacturer already has numerous solutions in its portfolio that make metalworking more efficient, more flexible and more cost-efficient in today's Industry 4.0 era.



The digitalisation and networking of production and logistics processes is gaining ground in metalworking (Picture: Kasto Maschinenbau GmbH & Co. KG)

In the steel trade, the automotive and supplier industry and in mechanical and plant engineering, metalworking companies across all industries have been facing increasing demands for years now. Customers increasingly want greater manufacturing flexibility, from batch sizes of one item to large-volume production, while variety of materials and sizes is steadily increasing. At the same time, quality standards are rising and there is continuous pressure to cut costs. To hold their own against international competitors, companies need versatile and efficient solutions for a wide variety of production tasks.

Production can organise itself

One solution here is the digitalisation and networking of production and logistics processes – also known as Industry 4.0. In modern metalworking, machines, plants, goods and load carriers are connected via the Internet of Things and can communicate with each other. Intelligent sensor systems provide up-to-date status information in real time. All process-relevant data is recorded and analysed, enabling users to optimise their entire value chain in a decentralised, autonomous and demand-oriented manner. The route from raw material to the finished product becomes shorter, more flexible, resource-saving and cost-efficient – and it starts with storage. Today's metalworking companies are increasingly relying on fully automated storage systems for long goods, instead of the previously widespread floor and cantilever arm storage methods. These automated software-controlled systems have completely convinced users with their significantly higher storage density, fast access times and maximum stock transparency. Moreover, saw-



With the Kastosort robot link, the removal of the saw cuts can be automated, together with a wide range of other tasks like deburring, chamfering, centring, threading, marking, printing, sorting, stacking and picking (Picture: Kasto Maschinenbau GmbH & Co. KG)

ing technology – often the first processing station after goods have been removed from storage – is being increasingly carried out with no manpower. Sawing machines can be seamlessly connected to the raw material warehouse and supplied with the required materials using manipulators and conveyor technology. The sawing process itself also runs autonomously if the machine is equipped accordingly, resulting in highly-efficient systems that are seamlessly integrated into a continuous material flow – the intelligent factory.

100% automation – from the raw material to the finished part

Kasto Maschinenbau is a leading supplier of Industry 4.0 solutions for metalworking. The company creates combined storage-sawing-robot systems for its customers, in which all the storage, handling, sawing, marking, palletising and bundling processes are performed fully automatically, from the raw material to the commissioning of the cut parts. Problem-free communication is particularly important, since all the components involved must “speak the same language”. This is

achieved by means of integrated control systems and suitable interfaces. With Kastologic, for example, Kasto offers a modular warehouse management system (WMS), which is specially tailored to the requirements of long goods and sheet metal storage. The WMS maps all the processes between goods receipt and dispatch clearly and transparently, ensuring efficient control of the entire material flow – and that includes the warehouse, the associated conveyor technology and the processing machines with their material handling.

The software optimises processes in and around the warehouse, making intralogistics faster, more reliable and more efficient. It makes the travel routes of storage and retrieval machines more efficient by avoiding empty runs and placing items that are needed often closer to storage and retrieval stations than the items that are not often required. Kastologic has even more efficient and user-friendly functions, like the management of orders, batches, remaining parts & first cuts. There is also a permanent inventory that allows you to flexibly apply different in-out strategies and picking principles. Compre-

hensive statistics and analysis tools monitor the utilisation of the entire system and individual components. This allows the potential of intralogistics to be fully exploited, avoiding superfluous routes and unnecessary waiting times. Possible changes can also be simulated in advance and tried out without risk.

The right interface for every system

Thanks to customised interfaces ranging from SAP, Infor and Microsoft Dynamics products to customer-specific software solutions, the WMS Kastologic can be easily connected to a higher-level host system within the company, as can individual Kasto machine control systems. The resulting uniform communication structure significantly increases transparency and efficiency. Users can easily control all the orders, and the data collected and recorded in the warehouses and sawing machines can be comprehensively analysed and utilised. This enables the continuous tracking of specific goods and workpieces and the uniform utilisation of the machine park with short non-productive times, improved quality

control & the enhanced planning of maintenance measures. Even remnant lengths and warehouse stocks can be sustainably optimised with relevant information, significantly reducing production costs.

Manually-operated warehouses can also be managed with Kastologic, and Kasto developed the Kastomobile app to do just that. The app is suitable for all Android mobile devices and it enables users to transmit all the information on storage & relocation, picking and shipping and inventory information to the WMS via smartphone or tablet. The Kasto handheld device was specifically designed to handle these tasks, equipped with an easy to read display, robust housing and integrated barcode scanner round off the features of this extremely useful device. Kasto knows that transparency and traceability are just as important for managing manually-operated systems as they are in automated, software-controlled warehouses – so the employee simply uses their device to collect the required order item information, which is then wirelessly transmitted to the management system. The “Pick-by-Crane” system can also be effortlessly implemented with Kastomobile – users can use the app to control a networked indoor crane, which then carries out the desired storage and retrieval procedures with the aid of the relevant coordinates.

Robot-assisted sawing for greater efficiency

Kasto also has a solution in its portfolio that automates production processes upstream and downstream of the sawing process and integrates these into a uniformly-controlled material flow – the Kastosort robot link. Industrial robots can not only remove the saw cuts independently, they can also perform many other tasks such as deburring, chamfering, centring, threading, marking, printing, sorting, stacking and picking. This robotic solution can be further integrated with a container management or driverless transport system. Depending on the customer’s requirements, Kasto can integrate the robot controls into the saw controls, its own Kastologic WMS or an existing ERP system, enabling users to also control and monitor this work step with a single interface and benefit from a perfectly harmonised process chain.

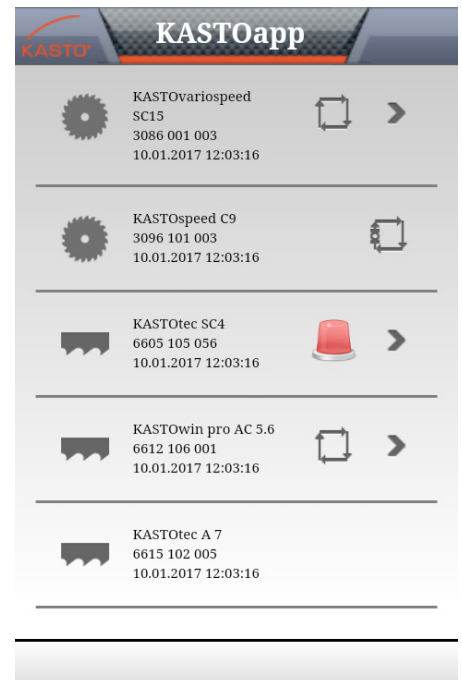
An app brings the machines always in view

The use of mobile devices is also gaining ground in industrial production and Kasto has marketed an application for the clear visualisation of its sawing machines – the Kasto app. This app displays the status of all the networked Kasto machines equipped with the SmartControl, AdvancedControl, ProControl or Expert-Control systems. Users can see the name, machine number and type of each saw at a glance. If a saw is running in automated mode, the Kastoapp can also access the information stored in its machine control programme. This gives users exact information on all the relevant parameters, like the article, cut length, target and actual quantity, feed rate and cutting speed. If a malfunction occurs, the app displays a graphic visualisation of the relevant error message, enabling users to react quickly and reduce downtimes to a minimum.

Remote maintenance with augmented reality

Kasto goes one step further with its VisualAssistance system, which uses the concept of augmented reality to simplify the remote maintenance of machines and systems. An interactive app for tablets, smartphones and smart glasses lies at the heart of the system – and customers can use it to connect to Kasto specialists via video and audio streams. Users and technicians see the same view in real time, greatly facilitating mutual understanding and helping to quickly identify individual plant components and any faults that may occur.

The app also gives Kasto experts the opportunity to provide visual assistance and to display markers in live video, for instance. Thanks to augmented reality, the customer can see all the necessary information on his display while he is carrying out on-site maintenance or repair work on the saw or storage system – and if he is using data goggles (smart glasses), his hands are also free, making his task even easier. Kasto service engineers are on site virtually, which means they can advise and help your employees as required, obviating the need for complex training courses involving costly travel.



The Kastoapp gives users an overview of the status of all the networked Kasto sawing machines at any time, enabling them to react quickly to malfunctions

(Picture: Kasto Maschinenbau)

Intelligent solutions with practical benefits

Kasto intends to expand its portfolio in the future – and the products will be oriented on Industry 4.0. The acquisition and analysis of process data offers a great amount of potential, e.g. for preventive maintenance measures. Every new development or refinement is totally focused on the impressive range of practical benefits for users – and thanks to Kasto’s Industry 4.0 solutions, metalworking companies can now make their manufacturing processes much more flexible and efficient, benefiting from the ideal utilisation of their machines, short non-productive times, lower maintenance costs, lower production costs and other advantages. Since the intelligent factory constantly monitors and optimises itself, the quality of the manufactured parts is also consistently high and operating errors are virtually eliminated. This in turn ensures a good competitive position and heightened customer satisfaction.

Kasto Maschinenbau GmbH & Co. KG, Achern, Germany

Bright steel for the Far North

Steeltec strengthens sales operations in Scandinavia

Steeltec – a company of the SCHMOLZ + BICKENBACH Group – has enhanced its two north European sites and has optimized the quality of its regional technical consulting and service capabilities. As a result, Steeltec has further improved the speed and reliability with which it supplies its bright steel products. The two north European sites are Steeltec’s link between the company’s bright steel production facilities in Germany and Switzerland and its customer base in the Scandinavian market.

Bright steel producer Steeltec has restructured its Scandinavian sales operations. The powerful sales team is now headed by the sales managers Johan Thyni in Boxholm, Sweden and Brian Nielsen in Nørresundby, Denmark. With the restructuring of its Scandinavian sales offices, Steeltec is now more than ever able to offer customers the optimum bright steel solution for their needs. Products are either dispatched from warehouse stock held in Boxholm, Sweden or, in the case of large quantities, are shipped directly from Steeltec’s production sites. Products supplied from Boxholm are also cut to length and chamfered. Steeltec’s reliable, rapid and flexible product delivery is always preceded by comprehensive technical advisory services provided by Steeltec engineers. “No other steel provider can do what we do and process an order for several tons of steel and ship it directly from the steelworks to the customer within two days,” says Sales Manager Brian Nielsen, explaining the capabilities of Steeltec’s Danish operations. That sort of response time applies to standard free-cutting steels with and without added lead and to S355+C. Brian Nielsen’s Swedish colleague Johan Thyni adds: “We deliver customer- and application-specific special steel solutions backed by locally based, premium-quality customer services.”

Material expertise moves closer to the client

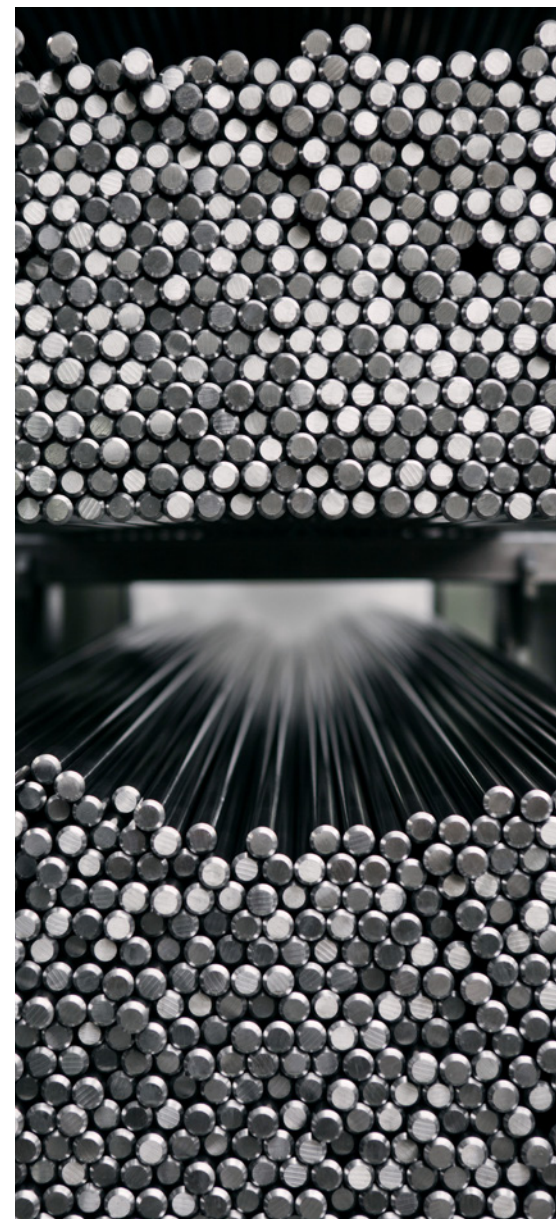
With two strongly staffed branches in Scandinavia, Steeltec has now strengthened its position in Northern Europe and that of the entire SCHMOLZ + BICKENBACH Group. The specialist bright steel

manufacturer has taken a major step forward in getting closer to its customers, responding to their needs and following regional market trends. Steeltec’s customers benefit from the company’s material expertise, from detailed discussions with locally based contacts and from modern, reliable logistics operations.

Leading position in the bright steel market

With a workforce of over 550 in Switzerland, Germany, Denmark, Sweden and Turkey, Steeltec is one of Europe’s leading manufacturers of special bright steels. The product portfolio covers high-strength and higher strength special steels, XTP®-treated steels, special quenched and tempered steels, free-cutting steels, case-hardening steels and engineering steels. By collaborating closely with the other business units within the SCHMOLZ + BICKENBACH Group and by working hand in hand with its customers and with external research institutions, Steeltec is able to develop and deliver high-performance steel solutions. The basis for Steeltec’s success lies in the continuous development of materials, processes, test methods and technologies. By accessing the SCHMOLZ + BICKENBACH Group’s global distribution network covering more than 30 countries in five continents, Steeltec guarantees delivery reliability to customers supplying advanced engineering applications in the automotive, hydraulic, mechanical engineering and other industries.

■ *Steeltec Boxholm AB (Schweden), Steeltec AS (Dänemark)*



Materials expertise and reliable logistics: Steeltec supplies application-specific special bright steel solutions to customers in Scandinavia and around the world (Picture: Steeltec AG)

Automatic warehouse for steel bars

Trinec Iron & Steel increases bright steel capacities

The new automatic storage for cold-drawn steel bars was put into trial operation at Trinec Iron and Steel in Staré Mesto, Czech Republic. It is the first part of a large investment totaling CZK 600 million (approximately € 23.2 million), which will lead to more efficient and increased production of bright steel.

Czech steel producer Trinec Iron and Steel has commenced operations of a new warehouse at the bright steel plant. The new storage facility is installed in a hall almost 20 meters high and 60 meters long. It contains 3,598 cartridges that can store up to 9,000 tons of products to be shipped to customers. The warehouse is fully automated and allows the company to optimally control inventory through permanent inventory.

"The new facility helps us speed up the truck logistics. We have also increased storage capacity that was still inadequate. The automatic operation of the line is also a significant benefit in the area of occupational safety," explains Petr Lapčík, head

The new facility helps us speed up the truck logistics. We have also increased storage capacity that was still inadequate. The automatic operation of the line is also a significant benefit in the area of occupational safety.

Petr Lapčík, head of the steel drawing plant at Trinec Iron & Steel

of the steel drawing plant at Trinec Iron & Steel.

Efficient use of space and warehouse space will enable the construction of a new 4,000 m² production hall for other automated production lines, which will lead the company to follow-up peeling and

grinding technologies. "The second stage of the expansion of the drawing plant operation envisages the installation of a peeling line, two grinding lines, a line for surface defects inspection and new dividing lines," says Radek Olszar, Director of Investment and Strategy at Trinec Iron & Steel.

Thanks to new investments, the drawing plant will satisfy the demand for top quality, cold-drawn steel bars, which are produced in lengths from three to seven meters. Cold-drawn bar is used in the automotive industry, but also in mechanical engineering, for bolts, furniture and threaded rods. The vast majority of production goes abroad, up to 70%.

The production capacity of the steel drawing plant is around 90,000 tons of products per year. New investments should increase it by about 20%. The workforce will also increase from the current 230 to the target number of 300. In particular, the company will hire operators for the production lines and maintenance personnel in the fields of electrics, hydraulics and mechanics.

The investment also includes the construction of new facilities for employees, ie changing rooms, sanitary facilities, canteens and office space. New lines shall begin operation early next year.



New warehouse for bright steel at Trinec Iron & Steel (Picture: Trinec Iron and Steel)

Trinec Iron and Steel – Moravia Steel Group

Online marketplace for steel extended

NLMK Group signs cooperation agreements with Russia's leading steel traders

NLMK Group, a global steel company, has signed cooperation agreements with leading players in the steel trading market: Metallservis and Steel Industrial Company, whose total sales in 2018 amounted to 4.3 million tonnes of steel products.

As part of the partnership, traders will be able to showcase their entire product range through NLMK's online marketplace, and gain access to NLMK's marketing services and IT expertise. In exchange, Metallservis and Steel Industrial Company will share their customer service and logistics networks with NLMK Group.

This will enable the companies to ensure prompt delivery of steel products to their customers through Russia's largest shared network of more than 70 warehouses. NLMK's marketplace will serve as a one stop shop for everything needed in the construction sector, offering more than 20,000 SKU's and sizes. Buyers will benefit from complete customer service, from the processing and prepping, to the packaging and shipping of steel products.

“By expanding our geography and online offering, we are giving our customers the opportunity to cut logistics costs, save time, and mitigate risks. Coupled with our highly customer focused e-marketplace, this creates a unique value proposition for our buyers.”

Ilya Guschin, NLMK Group Vice President, Sales

Online marketplace and customer service have migrated to new platform

NLMK Group is migrating its online marketplace and customer service to SAP C/4HANA platform (formerly known as SAP Hybris), a part of SAP Customer Experience solutions portfolio, to enable prompt delivery of a wide range of steel products and a unique customer service offer.

Migration to SAP Customer Experience solutions portfolio will enable omnichannel customers engagement and a seamless integration of the marketplace and customer services with NLMK Group's internal systems. The new platform will help speed up business processes and aid with the implementation of new customer services, such as product configuration and placing orders for production directly with a steel plant and tracking order fulfillment. NLMK's e-marketplace for SME's was launched in March 2018. Clients can buy a wide range of flat, long, and metalware products with a complete online experience from order placement to purchase documents. In 1H 2019, retail sales of steel products via this online marketplace doubled from 2H 2018, totalling 36,000 tonnes. In May 2019, sales reached 120,000 tonnes in annualized terms. The majority of clients (67%) are construction companies, followed by traders (17%), and steel structure manufacturers and consumers (16%). The nlmk.shop marketplace will feature the products of NLMK and its partner distribution networks and steel product processing companies. The platform will also enable prompt delivery of goods to any location in Russia, shipping products from any one of NLMK's or its partner trading companies' warehouses.



Novolipetsk Steel is the key production site of NLMK Group. It's currently the largest steelmaker in Russia and specialises in flat steel products (Picture: NLMK Group)

■ NLMK Group

Next milestone in digital transformation

thyssenkrupp presents artificial intelligence solution "alfred"

thyssenkrupp Materials Services relies on Microsoft for an in-house AI solution development as an essential component of the holistic digitalization strategy. Customers will benefit from individualized offers and more efficient processes.

thyssenkrupp Materials Services continues to drive digital transformation: Since early 2019 an artificial intelligence solution (AI), supported by Microsoft's cloud platform Azure, has been integrated into the processes of the largest materials distribution and service provider in the Western world. "alfred" supports his colleagues at Materials Services in dynamically managing the global logistics network with 271 warehouse sites and more than 150,000 products and services. As with his namesake – the ex-proprietor Alfred Krupp (1812 – 1887) – all information comes together at alfred. As a first step, alfred will help to optimize transport routes and thus save the transport of thousands of tons of material per year. In addition, materials will be available more quickly at the right locations in the future. In the medium term, Materials Services will be able to make all pro-

cesses along the supply chain more flexible, for example, in order to better take into account specific customer requirements for delivery speed, pricing or material quality.

Klaus Keysberg, CEO of thyssenkrupp Materials Services, summarizes alfred's

Azure Machine Learning, alfred analyzes all relevant information, generates important findings and supports employees with appropriate recommendations: Which materials have to be assigned to which industry? Where are materials processed? What would be the most intelligent trans-

"At this point in history, manufacturers need to become digital companies to lead in their industries."

Çağlayan Arkan, Global Lead Manufacturing & Resources, Microsoft

strengths: "Artificial intelligence is one of the technologies that will make a decisive contribution to competitiveness in materials distribution in the future. With alfred we are taking an important step towards making our processes even more efficient and optimizing our value chain. At the same time, he gives us better insight into our customers' needs so that we can align our offerings accordingly. In the medium term, this holistic approach will also open up new business opportunities for us".

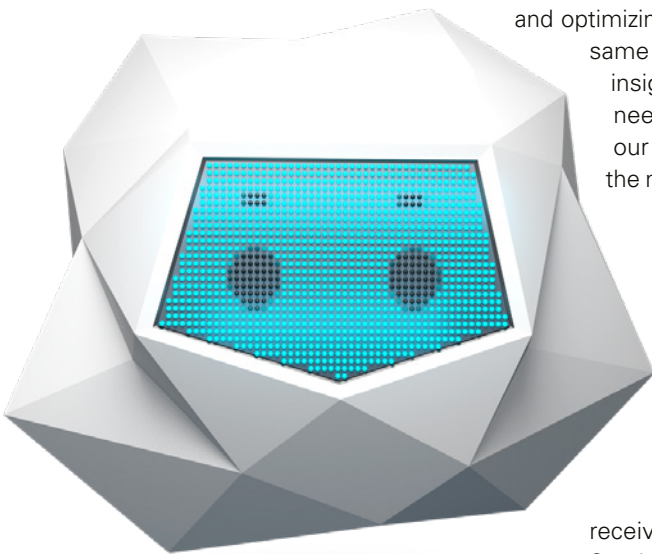
Using Big Data systematically

With the AI, the approximately 14 million order items received annually by Materials Services can be processed and analyzed much more efficiently. For the first time, the materials experts are also bringing all company data together on a single platform. Using self-learning algorithms based on Microsoft

port route to supply the customers with materials in the best possible way? What are the needs of the individual locations? "The intention is very clear: With alfred we are improving our own processes so that we can serve our customers all over the world more efficiently," says Axel Berger, Head of Digital Transformation Office at Materials Services.

The focus is on customer benefit

At Materials Services, the digital transformation is aligned along the value chain and consistently placed at the service of customer benefit – whether directly or indirectly. "From procurement through warehousing and logistics to sales, we rely on integrated digitalization concepts. While we simplify cooperation with our suppliers in the area of procurement by means of a cloud-supported platform, for example, we create possibilities for networking internal machinery with our self-developed IIoT platform toii. toii allows us to flexibly coordinate and optimize the processes of warehousing and logistics. In sales, we offer our customers access to 150,000 products and services at 271 warehouse sites sites in the world's largest virtual



Artificial Intelligence solution "alfred"

(Picture: thyssenkrupp)

thyssenkrupp Materials Services

With around 480 locations – including 271 warehouse sites – in over 40 countries, thyssenkrupp Materials Services is the biggest materials distributor and service provider in the western world. The broad service spectrum offered by the materials experts enables customers to concentrate more on their individual core businesses and spans two strategic areas: global materials distribution as a one-stop shop – from steel, tubes and pipes, nonferrous metals and specialty materials to plastics and raw materials – and tailored services in the areas of materials management and supply chain management. An extensive omnichannel architecture offers 250,000 customers worldwide cross-channel, round-the-clock access to more than 150,000 products and services. A highly efficient logistics system ensures that all requested services are smoothly integrated into customer production processes “just-in-time” or “just-in-sequence”.

materials warehouse,” says Klaus Keysberg. As a link between all these areas, alfred fits into the ecosystem and ensures continuous optimization of speed and service quality through intelligent data processing with corresponding recommendations.

Lifelong learning with Microsoft

In the company’s own Digital Transformation Office in Essen, all strands of digitalization flow together. Here, integrated teams of IT experts, engineers and business coordinators work under the direction of Axel Berger on various digitalization projects that arise directly from the core business of Materials Services – including

alfred. The materials experts were supported by Microsoft and its global cloud platform Azure. “Joining forces with Microsoft allows us to use advanced technologies for our in-house developments. This enables us to ensure that the projects are very closely linked to our core business on the one hand, and that they are technologically state-of-the-art on the other,” says Axel Berger.

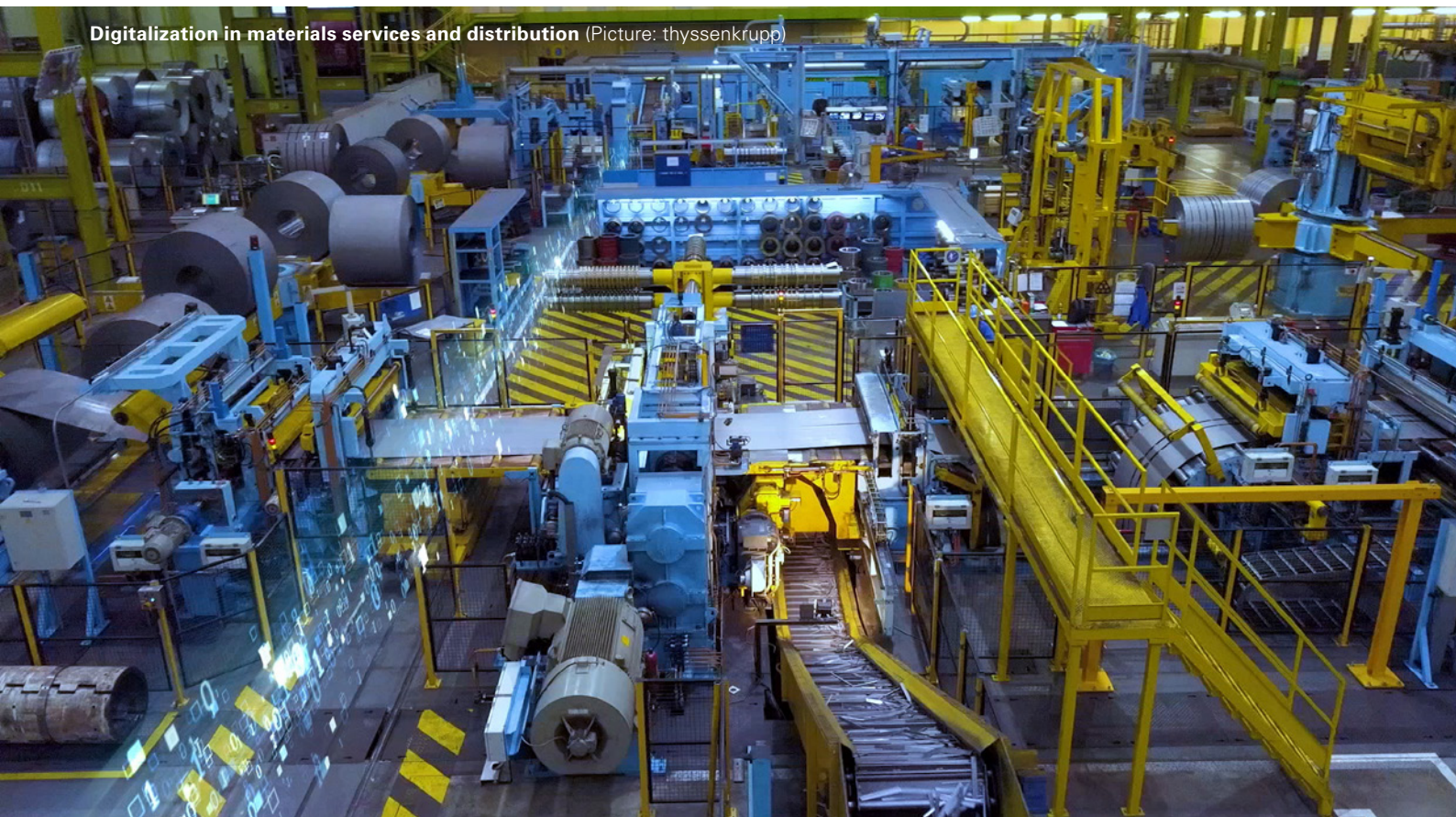
“At this point in history, manufacturers need to become digital companies to lead in their industries. thyssenkrupp Materials Services is not only adapting digital technologies, they are building their own digital capabilities and portfolio to elevate their logistics business with AI services to the next level. They unlock new business

opportunities by merging their industry know-how with the core of AI: large volumes of relevant data as well as strong machine learning methods and algorithms”, said Çağlayan Arkan, Global Lead Manufacturing & Resources, Microsoft.

Klaus Keysberg is also convinced of the synergies of the partnership. “The collaboration with Microsoft makes the implementation of projects like alfred much more efficient. Ultimately, it will enable us to apply our in-house developments more quickly, gather important insights there and develop new business models from them.

■ *thyssenkrupp Material Services*

Digitalization in materials services and distribution (Picture: thyssenkrupp)



The Americas

Mill Steel rebrands Steel Structural Products

Mill Steel Co., distributors of flat-rolled carbon steel, has rebranded its steel framing company, Steel Structural Products, to Mill Steel Framing.

The rebranding of its steel framing and accessory operations under the parent trademark is well-timed as this year marks Mill Steel's 60th anniversary. Headquartered in Grand Rapids, MI, Mill Steel operates six service center loca-

tions including Grand Rapids and Melvindale, MI, Anderson and Jeffersonville, IN, Birmingham, AL, and now Houston, TX.

Mill Steel Framing will continue to supply a full line of metal framing materials from all three processing and distribution centers located across the Midwest and Southern United States. The framing business will benefit from Mill Steel's strong purchasing power, expert processing, ded-

icated carrier network and strategic locations.

With the addition of several roll forming lines at its processing and distribution center in Houston, Texas, the company continues to diversify its product offerings to better serve its customers.

■ *Mill Steel Co.*

Europe

Klöckner & Co SE reorganizes management team and strengthens country organizations

Effective August 1, 2019, Dr. Oliver Falk and John Ganem are new members of the company's management board .

Jens Wegmann, who was a member of the management board of Klöckner & Co SE since December 1, 2017, left Klöckner & Co SE in agreement with the company as of July 31, 2019. His responsibilities as COO will be assumed by John Ganem in

the USA and by Gisbert Rühl, CEO of the company, in Europe.

The function of CFO, which was temporarily assumed by the CEO, Gisbert Rühl, has been taken over by Dr. Oliver Falk. The group management board of Klöckner & Co SE will thus consist of Gisbert Rühl, chairman of the management board and CEO Europe, Dr. Oliver Falk, CFO, and John Ganem CEO Americas.

With the realignment of the management board, the company also intends to take even greater account of the different structures in the countries in terms of organization and thus promote even more independent and entrepreneurial action in the group companies.

■ *Klöckner & Co SE*

Digital trading platform Metalshub for metals and ferroalloys

The industry is still lacking an organized venue for trading products such as ferromolybdenum, ferrovanadium or ferrochrome ferroalloys as well as metals not traded on an international exchange. For two years, Metalshub has been in place, a digital platform on which these products can be bought or sold.

Within only two years, Metalshub could win more than 300 companies among them major players such as Eickhoff, Outokumpu, Saarstahl or Traxys. Moreover, a large number of foundries have been using the plat-

form to purchase metals and ferroalloys. The purchasing on Metalshub is free. Only the seller must pay a small transaction fee to the start-up. A user needs to register on the Metalshub website, which takes less than two minutes. Then, the Metalshub team conducts a so-called Know Your Customer/Counterparty (KYC) check to guarantee that only serious companies are allowed to trade. Once a user is approved, he can create product specifications and list a requirement. As the first digital marketplace of its kind, Metalshub offers the option of transaction credit insurance.

Metalshub partnered up with credit insurer Euler Hermes. Another service Metalshub offers is logistics where instant trucking quotes can be provided.

Since the launch of Metalshub, more than 1,200 negotiations have taken place on the digital marketplace. The number of daily users has been growing steadily. New products, such as ferroboration and copper granules, have been added, with cobalt to come later this year.

■ *Metalshub*

thyssenkrupp Aerospace drives global certification forward

thyssenkrupp Aerospace is going to certify its 44 locations in more than 20 countries in accordance with the EN 9100/9120 standards, as the basis for the company's global quality management system.

During the last fiscal year, all units of thyssenkrupp Aerospace in Europe, the

USA, Canada and China had been converted to the new versions of EN 9100/9120 certification. thyssenkrupp Autómata, the Brazilian site of thyssenkrupp Aerospace, now also meets all the necessary criteria and has just received certification according to EN 9120 in addition to the existing EN 9100 certification.

With the successful implementation of the certification requirements, thyssenkrupp Autómata is one of the first companies on the South American continent that is certified to EN 9120.

■ *thyssenkrupp*

Market report

Weathering steel market to grow significantly by 2024

Major drivers of the market include the increasing demand from various end-use industries, government initiatives, and public & private investments. Asia Pacific is projected to be the largest consumer of weathering steel during the forecast period. Plates are expected to be the most consumed form of weathering steel during the forecast period.

According to the new research report “Weathering Steel Market by Type (Corten-A, Corten-B), Form (Sheets, Plates, Bars), Availability (Painted, Unpainted), End-use Industry (Building & Construction, Transportation, Art & Architecture, Industrial), Region – Global Forecast to 2024”, the weathering steel market is expected to grow from USD 1.0 billion in 2019 and is projected to reach USD 1.6 billion by 2024, at a CAGR of 8.8% from 2019 to 2024. Major drivers of the market include the increasing demand from various end-use industries, government initiatives, and public and private investments.

The Corten-B type is projected to lead the market

Based on type, the weathering steel market is segregated into Corten-A, Corten-B, and others. Among these, Corten-B is the most consumed type of weathering steel due to its properties such as high tensile strength and good wear resistibility as compared with Corten-A and other types. Moreover, Corten-B is available in various forms such as plates, sheets, and bars which diversify their application in various end-use industries. This factor is expected to drive the growth of the weathering steel market over the forecast period.

Plates to be the most consumed form

Based on form, the weathering steel market is segregated into plates, sheets, bars, and others. Among these, plates are anticipated to be the most consumed form of weathering steel. This growth in the demand for plates is due to the increasing infrastructure activities around the globe which majorly use plates as the primary form for construction, which is expected to fuel the growth of weathering steel market during the forecast period. Moreover, plates form to register the highest CAGR in the weathering steel market during the forecast period.

Asia Pacific is projected to be the largest consumer of weathering steel

By region, the weathering steel market is segregated into North America, Europe, Asia Pacific, the Middle East & Africa, and South America. Among these, Asia Pacific is expected to lead the weathering steel market during the forecast period. In addition, increasing investments from public and private sectors, government initiatives, and rising demand for steels with a longer shelf life & low maintenance is expected to drive the growth of weathering steel market in the near future.

Key players in the weathering steel market are United States Steel Corporation (US), ArcelorMittal (Germany), Nippon Steel & Sumitomo Metal Corporation (Japan), Tata Steel (India), POSCO (South Korea), and SSAB AB (Sweden), among others are considered for the study.

Weathering steel was developed to eliminate the need for painting, and form a stable rust-like appearance after several years' exposure to weather (Picture: SSAB)

MarketsandMarkets, Inc., Northbrook, IL, USA

Amepa: Clean steel with electromagnetic slag detection



8 pages, English

In this brochure Amepa presents the new generation of its ESD 300 and ESD 400 slag detection systems. While ESD 300 detects the onset of the continuous flow of slag, ESD 400 can detect individual slag droplets before the start of continuous slag flows. As an additional benefit steel penetration can be detected. The brochure also explains the key features of the system software.

Amepa GmbH, Karl-Carstens-Str. 12, 52146 Würselen-Aachen, Germany, phone: +49 2405 40808 0, info@amepa.de

Glama: Manipulators for the forging industry



16 pages, English and German

This brochure features heavy-duty equipment supplied by Glama for the forging industry. It contains photos, drawings and concise descriptions of machine designs and fields of application. Machines

described include railbound and non-railbound forging manipulators, tong and fork-type charging machines, heavy-duty floor-based and portal robots.

Glama Maschinenbau GmbH, Hornstr. 19, 45964 Gladbeck, Germany, phone: +49 2043 9738 0, info@glama.de

Holtmann: Mechanical engineering for the steel industry



16 pages, English and German

Holtmann manufactures machinery used in the liquid stages of iron and steelmaking. This brochure features machines for slag skimming, debricking and tap hole drilling, and stoking machines. In addition,

Holtmann provides blast furnace services such as salamander tapping, removal of burden and bottom layers, cutting of throat armour plates, etc.

Holtmann Fahrzeug- und Maschinenbau GmbH, Bemsweg 19, 47445 Moers, Germany, phone: +49 2841 73024, info@holtmann-moers.de

data M Sheet Metal Solutions: Your partner in the roll forming industry

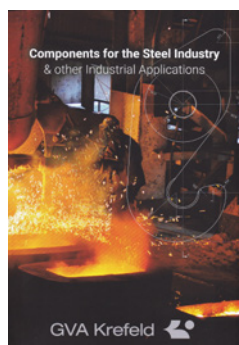


6 pages, English

The Copra® software offered by data M provides the user with a wide range of possibilities for process optimization in roll forming. Features of the software include simulation of elongations, setting of user-defined roll attributes, axis configurator, FEA model preparation, etc. data M participates in various German, European and international research projects.

data M Sheet Metal Solutions GmbH, Am Marschallfeld 17, 83626 Valley, Germany, phone: +49 8024 640 0, datam@datam.de

GVA Krefeld: Components for the steel industry



6 pages, English (also available in German)

GVA Krefeld makes cast and forged components, and welding constructions for tubemaking plants, rolling mills, continuous casting plants, etc. Parts produced include wear parts such as piercing plugs, frames for push benches and housings for rolls, wear plates, dummy bars, tundish spare parts, slag pots, ladles, moulds, funnels and roll chocks.

GVA Krefeld GmbH, Uerdinger Str. 540, 47800 Krefeld, phone: +49 2151 50756 0, info@gva-krefeld.de

Malmedie: Mechanical couplings for power transmission



8 pages, English

Malmedie has specialized in the manufacturing of custom-designed mechanical couplings for power transmission applications. Examples featured in the brochure include drum couplings for cranes, safety couplings for overload protection, gear couplings for torque transmission between shaft ends, and gear joint spindles for high torque transmission.

M.A.T. Malmedie Antriebstechnik GmbH, Dycker Feld 28, 42653 Solingen, Germany, phone: +49 212 25811 0, info@malmedie.com

Conferences and symposia

ESSC – European Stainless Steel & Duplex Stainless Steel Conference	30 Sep – 2 Oct 2019 Vienna, Austria	Austrian Society for Metallurgy and Materials (ASMET), www.stainlesssteel2019.org
11th International Rolling Conference	1 – 4 October 2019 Sao Paulo, Brasil	ABM – Brazilian Metallurgy, Materials and Mining Association, www.abmbrasil.com.br
7th AIST European Steel Forum 2019	23 – 25 October 2019 Leoben, Austria	Association for Iron & Steel Technology (AIST) www.aist.org/conference-expositions/
European Steel Conference 2019	28 – 30 October 2019 Milan, Italy	World Steel Dynamics https://globalsteelevents.com/
Alacero 60 – Latin American Steel Congress	11 – 13 November 2019 Buenos Aires, Argentina	Alacero - Latin American Steel Association www.alacero.org
Hüttentag 2019 German Steel Industry's Meeting Point	7 November 2019 Essen, Germany	DVS Media GmbH www.homeofsteel.de/huettentag/
4th Metal Additive Manufacturing Conference	25 – 27 November 2019 Örebro, Sweden	Austrian Society for Metallurg and Materials https://www.mamc2019.org/
23th Middle East Iron and Steel Conference	9 – 11 December 2019 Dubai, UAE	Fastmarkets https://t1p.de/5xol

Exhibitions, trade fairs

EMO 2019 – The world of metalworking	16 – 21 September 2019 Hanover, Germany	Verein Deutscher Werkzeugmaschinenfabriken www.emo-hannover.de
Stainless Steel World	26 – 28 November 2019 Maastricht, Netherlands	KCI Publishing B.V. www.stainless-steel-world.net
Metal Expo 2019	12 – 15 November 2019 Moscow, Russia	Metal Expo (Exhibition) www.metal-expo.ru
Tube & wire 2020	30 March – 3 April 2020 Düsseldorf, Germany	Messe Düsseldorf www.tube.de – www.wire.de

Seminars

Innovative Technologies for Production and Processing of Iron and Steel	19 September 2019 Kolkata, India	Steel Tech India www.steeltech-india.com
ABM Week 2019	1 – 4 October 2019 Sao Paulo, Brazil	ABM – Brazilian Metallurgy, Materials and Mining Association, www.abmbrasil.com.br
Automation & Information Technology in Steel & Mining Industries, 2019	17 – 19 October 2019 Ranchi, India	Spark Economy Research Centre www.steelscenario.com
Refractory Technology I	4 – 27 November 2019 Cologne, Germany	Steel Academy of the Steel Institute VDEh www.steel-academy.com

Preview of the December 2019 issue

Steel technology

Automation packages for continuous caster optimization

Primetals Technologies has installed 150 process optimization solutions for continuous casting machines in the last ten years. The advanced automation pack-

ages and cyber-physical models are in demand, especially from the USA and China. Steel producers show increasing interest in "digital twin".

Steel technology

Electromagnetic stirring solution applied to flat bath EAF

Bearing in mind the simultaneous needs of steelmakers to reduce overall production costs and increase plant productivity, an innovative technology especially has been designed to enhance the per-

formance of electric arc furnaces operating in flat bath condition, ie.: EAF using high volumes of continuously charged DRI/HBI in the raw materials charge mix.

Steel markets

Global can and coil coatings market advancements

Environmentally sustainable and technologically sophisticated products will present significant opportunities for can and coil coatings. The global market is slated to reg-

ister a steady compound annual growth rate (CAGR) of 4.7% from 2018 to 2025. Functionality is becoming a critical focus area for technological advancements.

Ad closing for the next issue: **22 November 2019**

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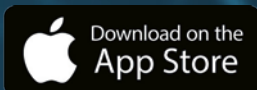
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HÜTTENTAG 2019

STEEL INDUSTRY'S MEETING POINT

Location: MESSE ESSEN | Messeplatz 1 | 45131 Essen, Germany

**FOLLOW
TRADITION,
SHAPE THE
FUTURE!**

Professional exchange and networking have a long tradition in the steel industry. The new HÜTTENTAG is continuing this tradition with a bright new touch in the Foyer East of Messe Essen. It offers participants and exhibitors a perfect mixture of lectures, panel discussions, company exhibition and Hüttenabend in one day.

PROGRAMME

THURSDAY, 7 NOVEMBER 2019

9:00	Registration and Start of the Company Exhibition
9:45 – 10:00	Welcome speech by DVS Media GmbH and MESSE ESSEN GmbH
10:00 – 10:30	Welcome speech Rudolf Jelinek , 1st Mayor City of Essen
10:30 – 11:00	Keynote Prof. Johannes Schenk , Ferrous Metallurgy, Montanuniversität Leoben, Austria „The European steel industry on their way to CO ₂ -free steel production through the use of hydrogen and electrical energy“
11:00 – 11:45	Panel „Current status and outlook for CO ₂ -free Steel Production“ Participants: Prof. Johannes Schenk , Dr. Markus Dorndorf a.o.
11:45 – 12:15	Coffee break
12:15 – 13:00	Panel „Outlook for Steel and the Challenges of Electromobility“ Participants: Wolfgang Eggert a.o.
13:00 – 14:00	Lunch break
14:00 – 15:30	Lectures in Room 1 and 2: Dr. Michael Krenz , Friedrich-Alexander Universität Erlangen and Klaus Gottwald , VDMA, about Supply Chain Management in Large-Scale Plant Engineering Dr. Horst Hill , Deutsche Edelstahlwerke, about Additive Manufacturing Dr. Andreas Quick , iba AG, about Digital Transformation and Industry 4.0 Further lectures by LOI Thermprocess , Linde AG , Steuler KCH , Vestas a.o.
15:30 – 16:00	Coffee break
16:00 – 17:30	Lectures in Room 1 and 2: Historical-technical lectures: Prof. Dr. Manfred Rasch , formerly thyssenkrupp Group Archive: Germany's first coastal steel mill Johan van Ikelen , Hoogovens Museum, IJmuiden: Founding history of IJmuiden Further lectures by Asinco , Magma , Schuh Anlagentechnik a.o.
18:00 – 23:00	„Hüttenabend“ and Company Exhibition

REGISTER NOW!

Conference price for participants (lecture programme, visit to the exhibition and Hüttenabend incl. food and drinks)

Conference price 149.00 €

Booking at:

www.homeofsteel.de/huettentag/huettentag-en



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