

STEEL+ TECHNOLOGY

THE TECHNICAL MAGAZINE FOR IRON AND STEEL PROFESSIONALS AROUND THE WORLD



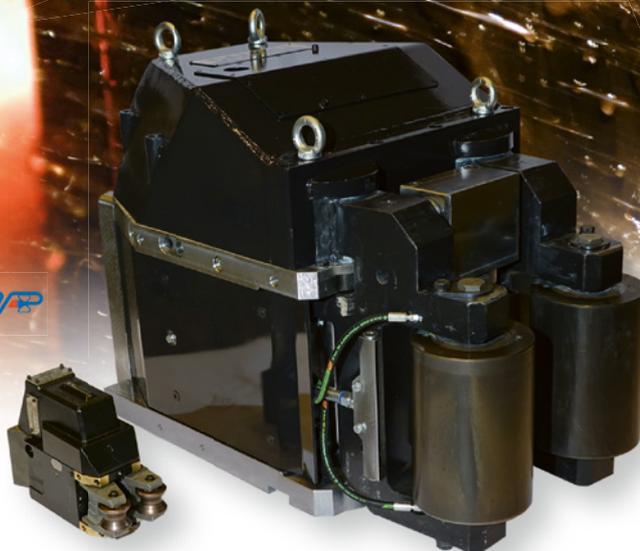
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Massive headwinds in an unpredictable environment

The Covid-19 pandemic and its consequences are having an extremely severe impact on the global economy. Being a cornerstone of the economy, also the steel sector is facing dramatic economic challenges. Around the world, shock waves to the steel industry are coming from a number of main customer segments: car makers have closed down plants, the oil & gas sector is showing signs of weakness due to lacking demand and sagging oil prices, and construction is at standstill with lockdowns in so many countries. In just a few weeks steel demand has collapsed worldwide.

Consequently, steelmakers have reduced production in many areas, by idling blast furnaces and steel mills, for example. The Covid-19 pandemic is expected to be the greatest economic challenge the steel industry has been facing in the past decade. The main point is, by common consent, to monitor the evolution of the coronavirus in the respective region and take decisions as appropriate to ensure the wellbeing of employees. Nevertheless, steel companies are still also taking measures to meet their customers' demands, while initiating short-time work, reducing accumulated overtime and holidays, and even starting layoffs. Due to the economic uncertainties caused by the Covid-19 outbreak, companies are hardly able to plan ahead.

In this unpredictable environment also trade media like us are facing the challenge. Remote work from home is not an issue from a technical point of view. But without face-to-face meetings at press conferences, exhibitions and congresses, for example, journalism has become kind of telediagnosis. However, we remain focused on factors we can control. First, for all readers who are currently unable to receive the hard copy of our magazine because offices are closed we provide free access to our online edition until the end of June 2020. Users can register for a free subscription to the online edition via <https://t1p.de/h8f6>. Additionally, we have combined STEEL + TECHNOLOGY Nos. 2 + 3 into one issue. This means there will be a quiet period for a few months, until we publish the next issue in August. By that time, the situation in the steel sector will hopefully have returned to normal so we should be able to reflect on how the steel sector has come out of the Covid-19 crisis.

All of us shall take the risks associated with the corona virus outbreak very seriously. The safety and wellbeing of colleagues and employees are of paramount importance. Let us follow governmental and World Health Organisation advices and guidelines in order to protect people and contain the spread of the infection. We shall overcome the pandemic and also the crisis. Please take care!

Arnt Hannewald



Arnt Hannewald, Dipl.Ing.
Editor



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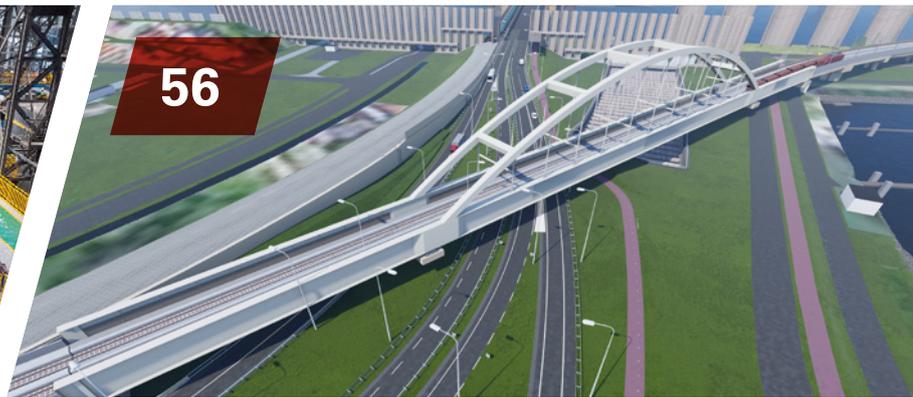
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Cover picture:
Morgårdshammar AB

Outokumpu President & CEO to step down

Roeland Baan, president & CEO of Outokumpu, has informed the company's board of directors that he will resign from Outokumpu in May this year to take a CEO position in a company outside Finland.

Roeland Baan will continue as the company's CEO until May 15, 2020. "Under Roeland's leadership, Outokumpu has gone through a major transformation leading to improved productivity and efficiency as well as a stronger market position," says

Kari Jordan, chairman of the board." The search for Baan's successor has been underway since last autumn.

■ *Outokumpu*

New chief financial officer at Russel Metals

Martin Juravsky will succeed Marion Britton as Russel Metals' next chief financial officer.

While Martin Juravsky will begin his employment with Russel Metals in May, Marion Britton will remain with the company throughout 2020 to ensure a seam-

less transition. Martin Juravsky currently serves as senior vice president and chief financial officer of Interfor Corporation with overall responsibility for their capital markets, corporate development and financial/public reporting functions.

Russel Metals is one of the largest metals distribution companies in North

America. It carries on business in three metals distribution segments: metals service centers, energy products and steel distributors, under various names.

■ *Russel Metals*

Executive changes at Stelco

Stelco has seen two executive changes in the first two months of the year: Alan Kestenbaum has returned as Stelco's chief executive officer, and chief financial officer Don Newman has resigned from the company. Roy Collins, will be assuming the role of interim CFO.

Alan Kestenbaum is succeeding David Cheney who has stepped down to return to Bedrock Industries. Alan Kestenbaum previously served as Stelco's chief executive officer from the closing of Stelco's Initial Public Offering to February 2019. Most recently he acted as Stelco's executive

chairman. Don Newman has resigned from the organization for personal family reasons. Roy Collins, vice-president, Internal Audit, has assumed interim CFO.

■ *Stelco*

New managing director at Schuler



Frank Klingemann is the new managing director of Schuler's Industry division
(Picture: Schuler)

Frank Klingemann has taken over the management of the Industry division at Schuler.

Frank Klingemann is now responsible, among other things, for the technology field of fully automated mechanical ProgDie and transfer presses, blanking lines, systems for the production of electrical motor laminations, and

coin minting presses. The graduate engineer has 30 years of experience in the industry, which he gained in various managing positions at the robot manufacturer Kuka. Most recently, he was head of the Robotic Automation Business Unit at HLS Engineering.

■ *Schuler*

Nucor announces new board member

Joseph D. Rupp has been elected as a new director to the Nucor board of directors.

Joseph D. Rupp currently serves on the boards of directors of Cass Information Systems, Inc., O-I Glass, Inc. (formerly

Owens-Illinois, Inc.), Quanex Building Products Corporation and Dot Foods, Inc. (non-public), and is on the Board of Trustees of the Missouri University of Science and Technology. From 2002, he served as a director of Olin Corporation. He brings extensive experience in the metal-related

manufacturing industry as well as strong executive leadership and strategic management skills and significant public company board experience.

■ *Nucor Corporation*

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 **KOCKS**

New executive board chairman at thyssenkrupp Steel Europe AG



Bernhard Osburg is the new chairman of the executive board of thyssenkrupp Steel Europe AG (Picture: thyssenkrupp)

Bernhard Osburg has been appointed chairman of the executive board of thyssenkrupp Steel Europe AG., succeeding Premal Desai who has stepped down from the position due to differing views on the direction of the steel business.

Bernhard Osburg has been chief commercial officer of thyssenkrupp Steel Europe AG since 2019 and was previously responsible for sales management of the steel business.

Carsten Evers will join the executive board of thyssenkrupp Steel Europe AG as chief financial officer, a position previously held by Premal Desai. Evers is currently chief financial officer of the Automotive Technology business of thyssenkrupp AG. The changes on the executive board are subject to the approval of the Supervisory Board of thyssenkrupp Steel Europe AG.

■ *thyssenkrupp*

PSI Metals completes generational change

New Strategy Committee will secure continuity of PSI Metal's product and consulting strategy. Sven Busch to step down.

Jörg Hackmann and Harald Henning have been appointed as new directors at PSI Metals. Together with Thomas Quinet, managing director since 2017, the new strategy committee will focus on accelerating the transformation of PSI Metals

towards group standard technologies based on the state of the art PJF3 framework. Sven Busch, managing the metals business of PSI for 22 years, is stepping down and will be available in an advisory role.

In addition to the technological transformation, the new strategy committee, which covers all PSI Metals units, will strengthen the project delivery capability with a growing team of consultants.

Jörg Hackmann will be responsible for product, technology and consulting, and also take over the managing director role in PSI Metals GmbH and PSI Metals Non Ferrous GmbH in Germany.

Harald Henning will be responsible for project execution and delivery, focused on providing customers with the benefits of PSI Metals solutions.

■ *PSI Software*

CEO leadership transition at Specialty Steel Works Incorporated

Specialty Steel Works Inc. (SSWI) has appointed current president and COO Michael Salamon, as CEO and president.

Michael Salamon succeeds Joel Hawthorne, who was appointed CEO as the

company emerged from bankruptcy in November 2017 and has now stepped down as CEO. While CEO, he stabilized the business and incorporated changes that set the stage for the businesses to achieve their full potential. Michael Salam-

on, the new CEO and president, will also become a member of the board of directors of SSWI.

■ *Specialty Steel Works Incorporated*

Changes to Schmolz + Bickenbach board of directors

Dr Oliver Thum has announced his resignation from the board of directors of Schmolz + Bickenbach AG with immediate effect.

Oliver Thum has been a member of the board since September 2013. He was also a member of the strategy committee and of the audit committee until the annual general meeting 2019. A successor for the vacant seat on the

board will be proposed for election at the annual general meeting in April 2020.

■ *Schmolz + Bickenbach*

Midrex names Chief Operating Officer

Midrex Technologies, Inc., has announced the promotion of KC Woody to chief operating officer.

Signalling a more focused commitment to customer service and support, Woody will be actively involved in the integration of

the Midrex operations and sales & marketing teams and the activities of the Midrex offices in India, China, Russia, United Arab Emirates, and the United Kingdom. In making the announcement, Stephen Montague, president & CEO of Midrex Technologies said, "The creation of the COO

position will allow us to better coordinate our sales & marketing, global services, and plant operations support teams under the leadership of KC Woody."

■ *Midrex Technologies*

CANADA

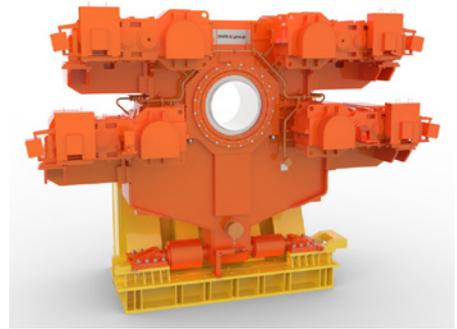
ArcelorMittal Dofasco to replace converter

ArcelorMittal Dofasco (AMD) has awarded SMS group the contract to supply a replacement 320-t KOBM converter and gear drive for its steel making plant in Hamilton, Ontario.

The project goals are to replace the existing equipment, which is approaching its end of life, with new equipment incorporating the latest technological developments. One featured technology is the unique, patented SMS group electro-hydraulic torque compensator, which is a system that actively reduces the resultant forces generated by highly dynamic bottom blown converters. The torque compensator will reduce the dynamic loading on the entire system, with resulting increases in availability and life.

SMS group has designed the torque compensator to operate with both the existing and future new gear reducers. It will be installed and fully commissioned on the reducer for the existing converter, during a vessel reline outage in May 2020. It will later on be incorporated into the new reducer during the complete converter replacement, scheduled for the second quarter of 2021.

The overall scope of supply includes the converter vessel, trunnion ring, the proven lamella-type vessel suspension system, trunnion bearings, gear reducer, hydraulic torque compensator system, the X-Pact® electrical and automation systems for the compensator, and supervision of erection and commissioning. SMS group will ship the complete vessel and trunnion ring



A converter tilt drive with torque compensator of the type to be installed in the new converter for ArcelorMittal Dofasco (Picture: SMS group)

assembly in one piece, considerably reducing the overall assembly effort on site.

■ SMS group

Gerdau completes rolling mill automation upgrade

AIC Automazioni Industriali Capitanio has successfully commissioned the rolling mill automation upgrade at Gerdau's Selkirk (MB) plant.

The scope of the project included the complete rolling mill automation starting from the reheating furnace exit up to the cooling bed, including the rougher area, pendulum shear, the 14-stand continuous mill and two start/stop shears, intermediate and dividing shears, a complete cooling bed entry conveyor, braking slide and cooling

bed. Along with the automation upgrade, strategic motor drives were replaced to increase the production capacity of the mill. As part of the solution, the obsolete PLC system was replaced by a new one. Also new auxiliary DC drives and AC drives were installed. The commissioning was completed within the previously agreed time frame. It took only two weeks, with production running at full capacity from day one.

■ AIC Automazioni Industriali Capitanio



The automation upgrade covered the production chain down to the cooling bed (Picture: AIC Automazioni Industriali Capitanio)

MEXICO

Simec places order for bar-sizing technology for SBQ mill

Danieli has installed a four-roll bar-sizing package, with fast stand-changing and a robotized workshop, as part of the 600,000 t/year, greenfield SBQ steel mill of Simec in the city of Apizaco.

The DSD Draw Sizing Danieli 4-roll stand technology combines free-sizing, fast stand-changing, and a robotized workshop. The Danieli Automation Q-Shape system assures continuous automatic control of the machine, setting parameters through the measurement of the

rolled bar sizes detected by the Hi-Profile gauge installed downstream. The mill achieves shape tolerances of up to 1/8 DIN.

■ Danieli

Four-roll bar-sizing installation for SBQ production (Picture: Danieli)



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138
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SUPPLIED
WORLDWIDE



38
ENERGIRON
DIRECT REDUCTION
PLANTS



647
SHEARS, BALERS
AND SHREDDERS



259
ELECTRIC
ARC FURNACES



147
BLAST FURNACE
AND CONVERTER
PROJECTS



405
SECONDARY
METALLURGY
STATIONS



2521
CASTING STRANDS
FOR SLABS, BLOOMS,
AND BILLETS



665
SLAB, BLOOM,
AND BILLET
GRINDING MACHINES

710
PROCESS CONTROL
SYSTEMS

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333

HOT STRIP, PLATE
AND COLD MILLS



526

HEAVY SECTION,
RAIL, BAR AND
WIREROD MILLS



115

SEAMLESS AND
WELDED TUBE
AND PIPE PLANTS



390

EXTRUSION AND
FORGING PRESSES



150

ALUMINIUM HOT
AND COLD MILLS



1799

STRIP
PROCESSING AND
FINISHING LINES



508

DRAWING
AND PEELING
MACHINES

USA

ArcelorMittal Columbus introduces coil grading system

To eliminate surface rules subjectivity, ArcelorMittal Columbus has been using a coil grading system through a partnership with QuinLogic, a company of SMS group.

Inspectors at ArcelorMittal Columbus use two systems: computers and cameras. Process control computers show

sales order information on production coils. They allow inspectors to input data – such as thickness, width, defect codes and comments. A camera system shows a defect map, but inspectors could only see the defect's pictures and limited past input information. The solution was a QuinLogic coil grading system, an online tool which provides critical infor-

mation to inspectors with well-defined business rules. Inspectors can now see important customer information in a more efficient layout. Coil surface defect quality rules enable inspectors to grade the coil.

■ *ArcelorMittal*

CMC Steel Florida upgrades reheating furnace

Automazioni Industriali Capitanio has revamped the Level 1 combustion control system of the reheating furnace at the Jacksonville mill of CMC Steel Florida.

AIC's scope of supply included the design, manufacturing, internal testing, delivery, installation assistance, commis-

sioning and startup of the electrical and automation part, and a new PLC / HMI system for the combustion control system. The factory acceptance test carried out successfully at AIC's workshop included the functionality testing of the main route for the gas feeding, of the safety controls, and simulation of combustion.

This is the first part of the upgrading project that will allow CMC to improve the performance efficiency and flexibility of the automation system, reducing gas consumption of the reheating furnace and scale formation on the products.

■ *AIC Automazioni Industriali Capitanio*

North Star BlueScope Steel to build new meltshop

The meltshop project sealed by handshake (Picture: Danieli)

Danieli is building a new meltshop and supplying two Danieli Centro electric overhead travelling (EOT) charging cranes to North Star BlueScope Steel, Delta, Ohio.

The new meltshop will include a single-bucket-charging 180 t EAF, two ladle metallurgy furnaces and a pulse-jet fume treatment plant with fume quenching technology. The new EAF will be equipped with the Q-Melt® dynamic heat suite for adaptive melting process control, including the Danieli Q-Reg Plus electrode regulation system, pressurized water-cooled roof and panels, and MORE injection technology for gas and slag builders injection. An adaptive elec-

trode-cooling spray system, in combination with dynamic control of fume suction parameters, will minimize EAF and LF electrode consumption. The first heat is expected to be produced by the end of 2021.

The custom-designed charging cranes will be equipped with a regenerative system that recovers the braking energy of all the movements. Danieli will manufacture the two charging cranes in its workshop in Thailand, where they will be fully assembled and functionally tested in all their movements with trolley operating on the bridge.

■ *Danieli*

Nucor Steel Arkansas to install additional coil paint line

Nucor will add a coil paint line at its sheet mill in Mississippi County, Arkansas.

Nucor Steel Arkansas opened in 1992 and produces approximately 2,600,000 t/year of

hot-rolled sheet steel for many applications including automotive, pipe and tube. The new coil paint line will have a capacity of 250,000 t/year. It is expected to start up in the first half of 2022. In addition, Nucor Steel

Arkansas recently completed construction of a new speciality cold mill complex and is currently building a new galvanizing line.

■ *Nucor*

USA**SDI to upgrade galvanizing line furnace**

Steel Dynamics Inc. (SDI) has placed an order with Andritz for the supply of key process equipment for the existing continuous galvanizing line No. 1 furnace at its Columbus, Mississippi plant.

The scope of supply includes engineering and delivery of a new direct fired furnace,

new differential rapid jet cooling, and after-pot coolers.

The Andritz delivery also includes the supply of model-predictive advanced furnace control for the complete furnace sections, automation and electrical equipment, and supervision of erection and commissioning. Modification of the cur-

rent continuous galvanizing line No. 1 furnace will allow Steel Dynamics Columbus to produce advanced high strength steels (AHSS) for the automotive industry (e.g. dual-phase steel DP980).

■ *Andritz*

Sumitomo Corporation of Americas invests in additive manufacturing

Sumitomo Corporation of Americas (SCOA) has invested in Elementum 3D, Inc., an additive manufacturing research and development company that specializes in the creation of advanced metals, composites and ceramics.

Elementum holds a patent for a metal powder blended with ceramics that enables higher printing speed, stronger mechanical properties and a wider usage

of metal grades that have not traditionally been suitable for additive manufacturing. This investment will help expand the marketing and sales of Elementum's proprietary powder.

"This investment is an excellent complement to our growing portfolio in the additive manufacturing space," says Mr. Kazuaki Tsuda, senior vice president and general manager, steel and non-ferrous metal group at Sumitomo Corporation of

Americas. Elementum is one of several investments made by SCOA in the additive manufacturing space, which include Sintavia, a leading Tier 1 additive manufacturer for the aerospace and oil & gas industries, Arevo, a 3D printing company using carbon composite materials and Shapeways, a 3D printing service company.

■ *Sumitomo Corporation of Americas*

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CHINA**Baosteel orders new peeling machine**

A second peeling machine for large-diameter round bars will be supplied to Baoshan (Picture: Danieli)

Danieli is going to supply a peeling machine for large diameter bars to Baosteel.

Following the excellent operational results achieved by the peeling machine for special steel bars in operation at Baoshan plant since February 2019, Baosteel has now ordered another peeling machine from Danieli for its Baoshan plant. The new machine will be designed to peel large-diameter bars of up to 200 mm. It will feature a fully automatic machine concept that does not require changing of the tool position. This technical solution reduces production time by up to 15% and performs both cylindrical and conical shape bar peeling. The machine is very compact and its stiffness guarantees continuous production to ISO h8 tolerance.

| Danieli

Beihai Chengde awards preliminary acceptance for new continuous tandem mill

Beihai Chengde Stainless Steel has achieved their full reduction program on their new Power X-HI 3-stand mill supplied by Primetals Technologies.

The rolling mill has a rated capacity of 600,000 t/year of cold strip and is designed to produce 300 and 200 series steels as white and black coils. It is the

first application of a Power X-HI mill for the direct processing of stainless black coils. The new mill relieves the hot rolling mill and allows additional thickness reduction.

Beihai Chengde is using the new cold rolling mill to produce wider strip. It is able to achieve exit thicknesses from 0.8 to 5.5 mm from entry thicknesses of between 2.0 and 8.0 mm. The width of the strip varies between 1,000 and 1,550 mm. Primetals Technologies was responsible for the complete engineering, the manufacture of key components, the overall technical coordination, as well as supervision of erection and commissioning. The scope of supply also included variable-speed drives with a total power of approximately 10,000 kW, and Level 1 and Level 2 automation. An HMI solution handles operator control and monitoring tasks. It also enables distributed supervision and features easy-to-use diagnostic and alarm functions.



Six months from the rolling mill start-up, Beihai Chengde awarded the PAC for the 3-stand Power X-HI continuous tandem cold mill (Picture: Primetals Technologies)

| Primetals Technologies

CHINA**Chengde Jianlong to build new bloom caster**

Chengde Jianlong has contracted Danieli for the supply of a new, five-strand bloom caster to be installed at their Chengde plant in the Hebei Province.

This is going to be the second Danieli caster for long products at that location. The new, five-strand 12-m-radius caster, designed to cast 240 mm squares and 210 and 400 mm rounds in SBQ grades, will make use of Danieli Q-EMS dynamic final stirring technology to ensure top quality blooms in all grades. Through the liquid pool control system to be supplied by Danieli Auto-



A casting machine for blooms will be installed at Chengde Jianlong (Picture: Danieli)

mation along with the process control system, the caster will be able to automatically position the final stirrer around the radius, while regulating the

current and frequency for the highest internal quality.

■ Danieli

Guangdong Shaoguan purchases reducing-sizing block

Guangdong Shaoguan Iron & Steel has awarded Kocks the order for the supply of an RSB® in 5.0 design.

With the decision to implement a Kocks RSB® 370++/4 in the existing 490,000 t/year bar mill, Shaoguan intends to further

expand and strengthen their share in the demanding SBQ sector for high quality engineering steels for the automotive industry.



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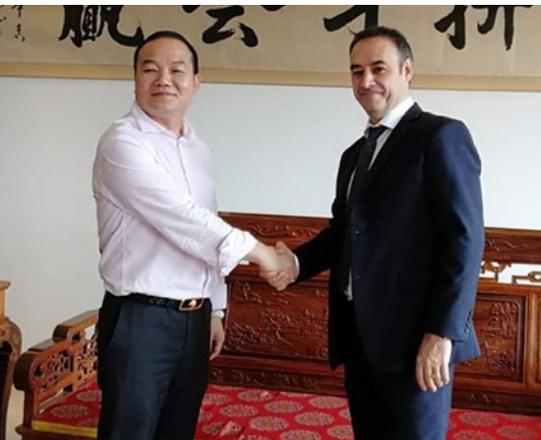


With the new reducing-sizing block, Shaoguan intends to increase SBQ production
 (Picture: Friedrich Kocks)

The new block will produce straight bars steplessly within a diameter range from 17 to 80 mm. It will be installed after the roughing and intermediate mill as a finishing unit. It will consist of 20 stands in H/V arrangement. The Kocks scope of supply also includes a roll shop for offline stand and guide preparation as well as supervision of erection and commissioning. Start-up of the new RSB® is scheduled for 2021.

| Friedrich Kocks

Hangda Steel to install new bar mill



Danieli will supply a new rebar mill for 12 to 40 mm diameter products to Sichuan Derun I&S Group Hangda Steel Co.

The mill, to be installed in Dazhou, Sichuan province, will mainly consist of four housingless stands followed by two, four-pass finishing blocks. Starting material will be 170 mm billets weighing up to 2,600 kg. Through an advanced, multi-strand slit-roll-

ing system, rebars from 12 to 22 mm diameter will be rolled on two strands at finishing speeds of 45 m/s. The plant will be equipped with a water-cooling system for on-line cooling of bars. A double high-speed twin channel arrangement will perform fast discharge of the bars on the cooling bed. The high-speed technological equipment will be manufactured at the Danieli headquarters and integrated with equipment manufactured by Danieli China.

Handshake after signing the contract for the supply of the new bar mill (Picture: Danieli)

| Danieli

Henan Jiyuan places order for grinding technology



The new grinders will be designed for 150 mm square billets (Picture: Danieli)

Danieli will supply two special steel billet grinders to Henan Jiyuan.

The two grinders will be designed to process 150 mm square special steel billets up to 12 m long in full skin and spot/pattern grinding modes. They will be equipped with a belt-driven spindle, driven by 160 kW main motors, and the Danieli Hi-Grind removal control system. The equipment design will assure an output ranging between 70,000 and 90,000 t/year.

| Danieli

Shigang orders scrap pre-shredder

Shigang Steel Mill, part of the Hebei steel group, has placed an order with Danieli for a twin-shaft pre-shredder.

The machine, type ZDS 220-600, will have a mouth of 2.2 m width and an installed



power of 600 kW. It will enable an extremely wide range of scrap, including flattened and baled cars, to be processed. The rotors will be equipped with manga-

nese teeth to ensure high and continuous performance. The new pre-shredder will be supplied with a downstream radial stacking conveyor to improve scrap logistics by optimizing the loading of the existing shredder.

The new pre-shredder for Shigang will be designed for a processing rate of 30 t/h, with the possibility of future expansion to over 60 t/h (Picture: Danieli)

| Danieli

Shougang Jingtang starts production on new hot-dip galvanizing line



Shougang Jingtang successfully commissioned the new hot-dip galvanizing line for high-strength steels supplied by SMS group.

The new line is especially equipped to produce high-strength grades with tensile strengths of up to 1,350 MPa. The capacity is 360,000 t/year of hot-dip

galvanized steel strip, which will be used mainly in the automotive industry to produce structural parts and car body shells for lightweight cars. The exit section is designed to even process steel strips with a tensile strength of up to 1,500 MPa, since Shougang Jingtang plans to use the line also for the development of new materials. Thus, especially the skin-pass mill, tension leveler and side trimming unit have been designed specifically for these requirements.

The commissioning team with the first coil: two hours later the line was producing sellable material (Picture: SMS group)



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Directly after the start-up, Shougang Jingtang was able to produce 1,000 t of sellable galvanized material. The hot-dip galvanizing line processes strips up to 1,580 mm wide and between 0.6 and 3.0 mm thick. Maximum strip speed

during galvanizing is 160 m/min. To satisfy particularly high demands on surface quality, a FOEN air knife sets the thickness of the zinc layer highly precisely and consistently. The strip guiding system including strip width measure-

ment and oil layer thickness measuring equipment was provided by EMG Automation.

■ *SMS group*

INDIA

Jindal Stainless digitalizes AOD converter



Jindal Stainless has issued the final acceptance certificate to Primetals Technologies for the new Level-2 process automation of AOD converter No. 1.

The Level-2 system for the AOD converter had been developed by Jindal Stainless. After several years of operation, Jindal Stainless decided to modernize the system.

The teams from Jindal Stainless and Primetals completed hot commissioning of the new Level 2 system in just two weeks (Picture: Primetals Technologies)

The new Level-2 system now installed by Primetals Technologies includes a dynamic process model and incorporates interfaces adapted to the existing IT environment at Jindal Stainless. After running the old and new systems in parallel, the hot commissioning of the new Level-2 system was successfully completed within two weeks. Process stability has increased substantially, and real-time calculation accuracy of carbon and temperature during production significantly improved.

■ *Primetals Technologies*

Sunflag places drive and process automation order for SBQ mill

Sunflag Iron and Steel has selected Danieli Automation to supply the drives and process automation for a new, 320,000 t/year SBQ mill to be installed in Bhandara, Maharashtra.

The new bar rolling mill will be placed after the existing blooming mill, previously

installed by Danieli Morgårdshammar. It will produce steel bars in diameters ranging from 45 to 120 mm. The supply includes new Level 1 automation, instrumentation, AC main drives, regenerative DC common bus technology, auxiliary drives, main stand and shear low-voltage motors, and motor control centres for the bar mill.

Sunflag's new integrated plant will produce high-quality, special steel rolled products (mild and alloy steel grades), starting from liquid pig iron and sponge iron.

■ *Danieli*

Tata Steel completes realignment of slab casters



Danieli Service has successfully performed the realignment of three slab casting machines at Tata Steel in Jamshedpur.

The activities included laser checking and restoration of the casting machines' alignment to their design tolerances. All these activities were

Three slab casters were successfully realigned at Tata Steel in Jamshedpur (Picture: Danieli)

Hot Material Transport Conveyors

performed during scheduled shut-downs. The target was to improve the final product quality by reducing the number and dimension of cracks, and to minimize breakouts, maintenance activities and costs.

| *Danieli*

JAPAN

Nippon Steel to build electric arc furnace

Nippon Steel Corporation has ordered an electric arc furnace of the Consteel® technology from Tenova.

The furnace will be installed at Nippon Steel's Hirohata works. Production is targeted to start in the first half of the 2022 financial year. The electric arc furnace operating on Tenova's Consteel® technology continuously heats and feeds metallic charge into the EAF, while simultaneously containing gaseous emissions.

| *Tenova*

SOUTH KOREA

Hyundai Steel orders direct fired furnace equipment

Andritz has received an order from Hyundai Steel to supply key process equipment for the No. 1 furnace in the continuous galvanizing line at Hyundai Steel's Dangjin plant.

The scope of supply includes engineering, delivery of a new Andritz Selas direct fired furnace, and supervision of erection work and commissioning.

By replacing the existing direct-fired furnace with the Andritz Selas furnace, current issues such as formation of soot and cracks in the burner nozzle will be eliminated. This modernization is a major step enabling Hyundai Steel to produce value-added products for the automotive market.

| *Andritz*



AUMUND Pan Conveyors

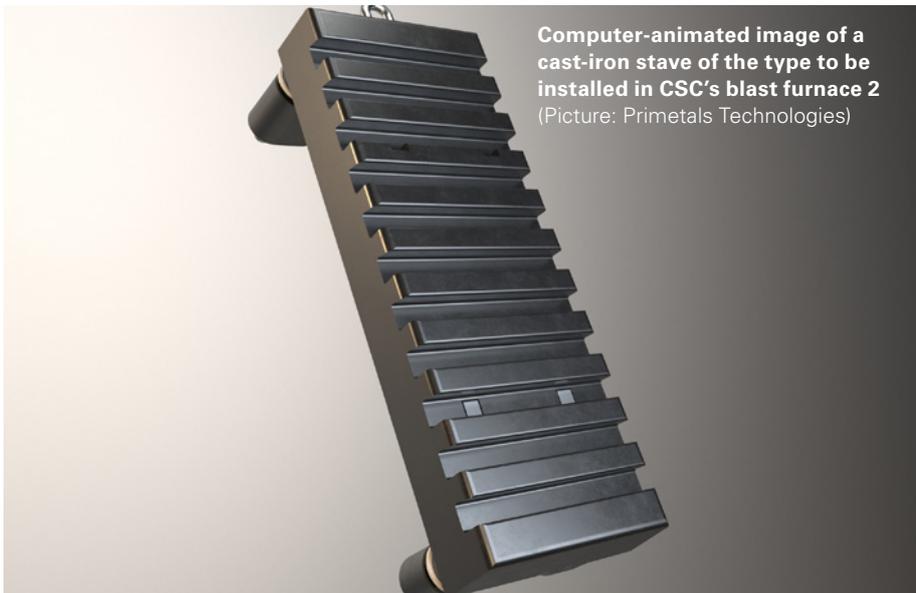
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TAIWAN

CSC to upgrade blast furnace with staves



Computer-animated image of a cast-iron stove of the type to be installed in CSC's blast furnace 2 (Picture: Primetals Technologies)

Primetals Technologies will supply staves for China Steel Corporation's blast furnace 2 at the Kaohsiung plant.

The blast furnace has a hearth diameter of 12 m and an inner volume of approximately 3,300 m³. The new staves are part of the third rebuild of blast furnace 2. The aim of the project is to extend the furnace's life-time by a further 18 years. The rebuild includes a complete shell and cooling system replacement. The cooling system will be a combination of copper and cast-iron staves from the hearth to the upper stack. Primetals Technologies was contracted to supply nine rows of cast-iron staves.

■ *Primetals Technologies*

CSC to revamp secondary metallurgy facility



China Steel Corporation (CSC) has awarded SMS Mevac, an SMS group company, the order to revamp the oldest of the RH units at its No. 1 steel works in Kaoshiung.

SMS Mevac will equip the RH unit with a new, state-of-the-art four-stage steam jet vacuum pump. SMS group's supply scope includes the design of the layout, the engineering, manufacturing and supply of the equipment, and commissioning. Thanks to

the increased extraction capacity of the new pump to 600 kg/h at 0.67 mbar, it is easier to compensate system leakages, and evacuation times will be shorter. Additionally, the new vacuum pump can be operated at condenser cooling-water temperatures of up to 38 °C, boosting the flexibility of the RH unit, especially during the hot summer months.

■ *SMS group*

CSC is going to equip the existing No. 1 RH facility with a steam jet vacuum pump (Picture: SMS group)

VIETNAM

Hoa Phat Dung Quat blows in second blast furnace



In November 2019, Hoa Phat Dung Quat blew in the second of four Danieli Corus greenfield blast furnaces.

Blast furnace No. 1 had been blown in June 2019 – within 24 months from contract signature. Each of the four furnaces, which

Greenfield construction of the blast furnaces for Hoa Phat Dung Quat (Picture: Danieli Corus)

were ordered under a single contract, will have a 1,080 m³ working volume and be designed for an annual production of 1 million t. Blast furnaces No. 3 and 4 are scheduled to be commissioned during 2020. The new blast furnace complex will add 4 million t/year to Hoa Phat's steelmaking capacity.

■ *Danieli Corus*

AUSTRALIA

Grange Resources orders pan conveyor for iron ore pellets

Aumund Fördertechnik is supplying a pan conveyor to Grange Resources (Tasmania) Pty Ltd. for the pellet works in Port Latta.

The Aumund steel plate conveyor of type KZB-H will be designed with a plate width of 1,000 mm for the transport of hot material of up to 1,000°C over a length of 92 m as a replacement of the existing belt conveyor at Grange, which has had to have its belts changed approximately every 40 days. A particular challenge for Aumund Fördertechnik was to propose a design suitable to handle the difference in dimensions of the new steel plate conveyor and the previous belt conveyor.



At Grange Resources, the new steel plate conveyor will transport iron ore pellets at a temperature of up to 750°C to the cooler (Picture: Aumund Fördertechnik)

■ *Aumund Fördertechnik*

Refratechnik to acquire Queensland Magnesia

Refratechnik has entered into a share purchase agreement to acquire 100% of Australian magnesia producer QMAG Ltd.

QMAG (Queensland Magnesia) is a fully integrated producer of high-quality magnesia products with mining and production in the state of Queensland servicing global markets with a combined production capac-

ity greater than 300,000 t/year of high-grade electrofused, dead burned and caustic calcined magnesium oxide products.

Refratechnik is a global network of companies, active in the refractory and industrial mineral business. Operating for 70 years, the family-owned refractory company now spans more than 27 global locations, employing more than 1,700 people, with headquarters in Munich, Germany. By the

agreed purchase contract QMAG will add vertical supply-chain integration, in addition to existing partnerships adding to Baymag's world class magnesia operations in Alberta, Canada and Refratechnik's recent start-up of magnesia operations by Haicheng Guozheng Mining in Haicheng, China.

■ *Refratechnik*

AUSTRIA

voestalpine Böhler Edelstahl places order for metal granulation unit

voestalpine Böhler Edelstahl has ordered a Granshot® metal granulation unit from Swedish engineering company UHT - Uvån Hagfors Teknologi AB.

The granulation unit will be integrated into voestalpine Böhler Edelstahl's new special steel plant project in Kapfenberg. Granshot® metal granulation converts liquid

metal into granules by rapid solidification in water. The new unit in Kapfenberg will be equipped with UHT's newly developed rotating tundish technology, which distrib-

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utes the metal through nozzle outlets in a radial direction over the water surface. This new granulation technology is especially suited for steel and ferroalloy granulation. UHT will supply the plant complete with process engineering and automation.

■ UHT

The metal granulation unit for the new voestalpine Böhler Edelstahl special steel plant (Picture: UHT)

FRANCE

Celso France to build new wire rod mill

Construction has started for the new Celso France rolling mill. Plant technology for the new mill will be supplied by Russula.

The fully digitalized mill, located in the Boucau and Tarnos municipalities in the

New Aquitaine region, will produce wire rod for the France and Belux markets. As supplier of the complete plant technology, Russula will set a new benchmark in sophisticated mechanical equipment, advanced automation and ecological

design. A strong commitment to Industry 4.0 is at the heart of Russula's technological innovation.

■ Russula

GERMANY

ESF Elbe-Stahlwerke Feralpi to revamp tying area of bar mill



The four tying machines to be supplied to ESF Elbe-Stahlwerke Feralpi (Picture: AIC Automazioni Industriali Capitanio)

ATS Mechatronics, a company of AIC Automazioni Industriali Capitanio, has successfully completed the internal test and the delivery of four tying machines to Feralpi Stahl.

ATS Mechatronics' scope of supply includes four TMB400 tying machines and a roller table conveyor as part of the revamping of the final tying area for round bundles at the bar rolling mill of ESF Elbe-Stahlwerke Feralpi. Besides the mechanical equipment, ATS will supply the electrical and automation system, hydraulic circuit and auxiliary equipment. The internal test and equipment delivery were completed by the end of 2019, as scheduled. Commissioning is scheduled for mid-2020.

■ ATS Mechatronics
AIC Automazioni Industriali Capitanio

thyssenkrupp sells Elevator Technology business

thyssenkrupp entirely sells its Elevator Technology business to a consortium

led by Advent, Cinven and RAG foundation.

While the purchase agreement has been signed, closing of the transaction is expect-

ed by the end of the current fiscal year. thyssenkrupp will reinvest part of the purchase price of €17.2 bn (assuming closing on June 30, 2020) in a stake in the elevator

business. The funds generated by the transaction will remain within the company. They are to be used to the extent necessary to reduce debt and to lower struc-

tural costs. Specifically, the company plans to partially fund its pension obligations.

■ *thyssenkrupp*

New dates for wire and Tube in Düsseldorf

wire and Tube, the world's leading international trade fairs for the wire, cable, tube and pipe industry, have been rescheduled to 7 to 11 December 2020.

Messe Düsseldorf announced the new dates shortly after it had postponed the wire and Tube trade fairs as a precautionary measure against the dynamic spread of the Corona virus. Existing contracts with Messe Düssel-

dorf will remain valid for the new dates, visitor tickets already purchased remain valid as well.

■ *Messe Düsseldorf*

ITALY

Acciaierie Fonderie Cividale upgrades electric arc furnace

Danieli Automation has completed the upgrade of the AC electric arc furnace at Acciaierie Fonderie Cividale.

The 35 t AC electric arc furnace is now powered by Q-ONE, a Danieli-patented system based on electronic insulated-gate bipolar transistor (IGBT) power technology. Two Q-ONE modules sized 12.5 kA each for a total power of 15 MVA have been installed.

It took just three days of plant shutdown to switch from the transformer to Q-ONE technology. Acciaierie Fonderie Cividale has not stopped production ever since. The new equipment has improved arc stability considerably, generating improvements in the overall



The project team after the successful completion of the EAF upgrade (Picture: Danieli)

melting process that showed initial, though preliminary, savings of 5-10% energy consumption and up to 25% power-on time reduction, while the expected 20% reduction of electrode

consumption will require more heats to be confirmed.

■ *Danieli*

ROMANIA

Liberty Galati upgrades hot strip mill

Danieli Service has restored the correct geometry of two roughing stands at the Liberty Galati hot-strip mill.

The revamping project consisted of the geometrical re-alignment of mill windows by means of on-site machining and use of

new technological equipment, including DanLiner wear plates, new and modified clamping systems, modified change sledges, a complete new greasing system, and other minor spare parts.

Correct mill-stand geometry is essential for effective and accurate gauge control, strip/

plate quality, and preventive maintenance of the mill and its associated parts. Cost savings are realized as a result of reduced spare parts consumption and less downtime.

■ *Daniel*

RUSSIA

Evraz orders casting-rolling plant

Danieli has been contracted by Evraz to supply a QSP-DUE (Danieli Universal

Endless) plant for Evraz' new facility in Novokuznetsk.

The Danieli QSP-DUE technology enables the production of hot-rolled strip in the coil-

to-coil, semi-endless or endless rolling modes. The Danieli Universal Endless plant for Evraz will be designed for a total capacity of 2.5 million t/year of hot-rolled strip from 0.8 to 16.0 mm thick and 950 to 1,700 mm wide. The vertical-curved thin-slab caster features a 5.5 m main radius designed to operate with a slab thickness range from 100 mm to 123 mm. The casting machine will apply dynamic soft reduction and operate at a maximum casting speed of 6 m/min, depending on the steel grade.

A tunnel furnace, supplied by Danieli Centro Combustion and serving as a buffer, will enable work-roll changing without affecting the caster and meltshop operation. The line will be completed with a laminar cooling system and a coiling area made up of a high-speed shear to cut the coil to length when working in endless mode, pinch rolls and down coilers.

In addition to the QSP-DUE line, Danieli will supply a twin-station ladle furnace, twin-tank vacuum degasser, and associat-

ed auxiliary equipment, including fume and water treatment systems for the whole facility. Danieli Automation will develop and supply the process control system for the complete process chain from the liquid steel to the rolled coils, including on-line instrumentation, medium voltage and low voltage drives, and control of auxiliary plants.

■ Danieli

NLMK pilots automated production planning system

NLMK Lipetsk has integrated an automated production scheduling system into business processes at all stages of production and sales planning.

Vyacheslav Vorotnikov, NLMK Lipetsk Managing Director, says: "The introduction of a production scheduling system is a combination of IT optimizers and a

transformation of business processes encompassing our sales, planning, production, logistics and maintenance services."

When a new order comes in from a customer, the system automatically determines its feasibility, and calculates the lead time based on the current order book and capacity utilization rates, the optimal

schedule and other factors. The manufactured products will be delivered to the customer just in time. Key goals of the project are to optimize the production load, grow output, and to improve the quality of customer service.

■ NLMK

NLMK to build new hot-dip galvanizing line

Tenova is building a new hot-dip galvanizing line for NLMK. The new line will be designed for a throughput of 450,000 t/year.

NLMK's new line will be able to process input material including interstitial-free,

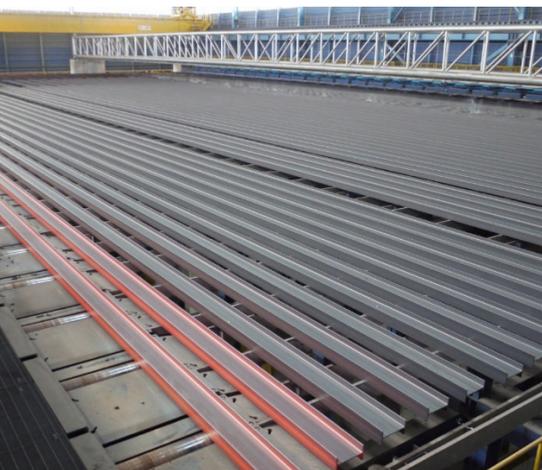
high-strength and advanced high-strength steels. It will include a hybrid furnace, which combines horizontal heating with vertical heat treatment, and a closed cooling chamber to achieve high flexibility in strip annealing. Also a new skin pass and tension leveller section for multiphase

steel grades will be supplied. A new online Level 2 mathematical model will guarantee consistent high quality even with different production scenarios.

■ Tenova

SPAIN

Celsa Barcelona to upgrade medium-section mill



SMS group has been contracted by Celsa Barcelona to revamp the section mill at Castellbisbal.

Since 2000, Celsa Barcelona has been producing I and H beams on a medium-section mill supplied by SMS group. The mill was originally designed for an annual production of 500,000 t. SMS

group first expanded the initial range of products rollable on the mill during a revamp in 2007. Continuous plant optimization in cooperation with SMS group has raised the mill's annual capacity to 1 million t since then.

The recent contract for SMS group now covers the replacement of the existing cooling bed with a new, higher-capacity one and the upgrade of the CRS® (Compact Roller Straightener) to make it capable of straightening heavier products. These measures will require adjustments to and upgrades of the existing electrical and automation sys-

A cooling bed with aerosol system will be installed at Celsa Barcelona's Castellbisbal medium-section mill. (Picture: SMS group)

tems, all of which will be performed by SMS group.

The new cooling bed will come with an aerosol cooling system that will

boost cooling efficiency and, consequently, the mill's productivity. Another special feature of the new cooling bed will be a turning device designed to turn

I and H beams through 90° into or out of the upright position.

■ SMS group

UNITED KINGDOM

Universities of Leeds and Sheffield join forces to research steel industry decarbonising

Scientists at the Universities of Leeds and Sheffield have secured funding to investigate ways the UK steel industry can be decarbonised within 30 years.

According to figures from the World Steel Association, every tonne of steel that is manufactured creates 1.8 tonnes of carbon dioxide, a key gas responsible for climate change. With the UK legally committed to be a net-zero emitter of greenhouse gases by 2050, the industry faces an uncertain future unless it ends its dependence on carbon.

An interdisciplinary team from the Universities of Leeds and Sheffield has won £1.26 million from the Centre for Research into Energy Demand Solutions (CREDS), which is funded by UK Research and Innovation, to develop approaches that blend technology and policy with the aim of eliminating the industry's dependence on fossil fuels.

Professor William Gale, an energy expert at Leeds and the project's principal investigator, says: "The reality is the steel industry in the UK has to decarbonise, but this has to be done sensitively

otherwise there is a risk the industry will relocate to where the rules on carbon are more lax." The project will bring together a range of experts: from scientists and engineers involved in researching alternative methods of production or ways to recover it from scrap – to policy and business experts analysing the policy initiatives and incentives needed for this change.

■ Centre for Research into Energy Demand Solutions (CREDS)

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Early reaction on the Covid-19 pandemic

thyssenkrupp to implement new steel strategy and crisis package

The German steel maker has started implementation of the “steel strategy 20-30” with the target to become a technology leader at competitive costs. Additional investments are planned. At the same time, cost reductions and 3,000 layoffs are required.

In late March thyssenkrupp and IG Metall agreed firstly on an immediate “Corona crisis package” to deal with the pandemic and secondly on the conclusion of a collective agreement. The company regulations necessary for implementation, the reconciliation of interests and the social plan were also agreed. The framework conditions for the implementation of the “steel strategy 20-30” are thus in place. The agreement applies to all German steel locations of thyssenkrupp. The collective agreement will run for 6 years until March 31, 2026.

3,000 permanent layoffs

The first step of the implementation is a reduction of up to 2,000 jobs in the next 3 years. Roughly another 1,000 jobs are to be cut by 2026. The plan is to strengthen the integrated production site in Duisburg by closing individual units at other locations. Of the total of approximately 3,000 jobs, around 1,000 will be cut in administration. 800 jobs are affected in the heavy plate segment. Here thyssenkrupp sees no development prospects within the Group. In addition, around 1,200 jobs will be cut beginning in 2022 through the optimization of the production network. The job reductions have been firmly agreed and will be carried out in a socially responsible manner.

Additional investment of 800 million euros in six years

The steel strategy also provides for an additional investment framework totaling approx. € 800 million over 6 years, which adds to the annual investments of approx. € 570 million already included in the planning.

In addition to optimizing the production network, the product portfolio is to be systematically aligned to future markets and profitable steel grades. These include multiphase steels and lightweight steels as

Martina Merz remains Chief Executive Officer of thyssenkrupp AG

Martina Merz has been permanently appointed Chief Executive Officer of thyssenkrupp AG for a three-year term effective April 1, 2020. Her delegation from the Supervisory Board thus ended. Merz resigned from the Supervisory Board accordingly. CFO Johannes Dietsch resigned from the Executive Board effective March 31, 2020. His successor as Chief Financial Officer is Dr. Klaus Keysberg, who has already been a member of the Executive Board of thyssenkrupp AG since October 1, 2019. Keysberg remains responsible for the materials businesses in addition to his new role as CFO. The Plant Technology business unit is the responsibility of Martina Merz.

well as grades with high surface quality. In addition, the production of high-quality, non-grain-oriented electrical steels, which are becoming essential for electromobility, will be strengthened. The course taken to develop and offer climate-neutral steel products will be continued at full speed.

The prerequisites for implementing the steel strategy are in place. Even before agreeing on the collective agreement “Future Pact for Steel 20-30”, the parties had already jointly drawn up a general works agreement with a social plan and a reconciliation of interests. Restructuring has started immediately on 1 April. This includes the implementation of a new, significantly leaner functional concept in administration. The first investments in new facilities are also to be initiated this year.

Immediate pandemic crisis package

At present the Covid-19 pandemic is leading to a sharp decline in customer call-offs and a deterioration in the order situation. thyssenkrupp is therefore going to make production adjustments in the steel business at short notice. Against this background thys-

senkrupp and IG Metall have also agreed on an immediate “Corona crisis package”.

The immediate package also includes the requirement for thyssenkrupp Steel Europe’s operations to increase short-time work compensation to 80% in the event of short-time working. In addition, it is agreed that a collectively agreed special payment will be converted into days off.

I thyssenkrupp



Martina Merz, Chief Executive Officer and Siegfried Russwurm, Chairman of the Supervisory Board of thyssenkrupp AG
(Picture: thyssenkrupp)

Investment in the future

Dillinger to build a new training centre

Transformation of steel companies will require highly trained specialists. As a consequence, Dillinger is investing in its future by building a new training centre offering attractive metal careers for its own employees and those from other companies. Training content will focus on Industry 4.0.

Steel is the material of the energy transition. Without high-quality steel for wind turbines, hydroelectric power plants, photovoltaics and other applications, the energy transition cannot succeed. The company is building a state-of-the-art digital training facility for the region and its employees at a cost of EUR 6.5 million. The facility will enable Dillinger to continue its ongoing transformation to green steel. It'll ensure that Saarland is home to the most highly advanced steel industry.

At the cornerstone ceremony for the new building, Peter Schweda, Chief Human Resources Officer and Labour Director at Dillinger, said: "Even in these challenging times, we are planning for the future and pointing the way for Saarland steel with the new workshop. We believe the knowledge and skills of our trainees and employees are central to Dillinger's competitiveness." Jürgen Barke, State Secretary in the Saarland Ministry of Economics, expressed confidence: "The steel industry is a cornerstone of our economy in Saarland and a guarantee for the suc-

cess of the energy transition. With the new training centre, Dillinger is ensuring that the cleanest and best steel in the world will continue to be produced in Saarland. The trainees and employees in the steel industry can contribute significantly to ensuring the success of the transformation to carbon-free steel production and help ensure that Saarland remains an innovative location for business."

Up to 180 apprentices will be taught simultaneously in the workshop in the fields of metalworking, maintenance and machining. The workshop covers an area of approx. 2,000 square metres. The training will focus on the new requirements of digitalization within industry. "A lot has changed in vocational training. Today the trainees are practically programmers. That was not the case when I was trained," Raimund Mansion said at the cornerstone ceremony. He started his vocational training in 1970. After 50 years, he has been the longest-serving former apprentice here.

3D printers, scanners and powerful mobile workstations with high-resolution

27-inch monitors will be used to optimize the training and integration of 3D CAD/CAM processes. The trainees will work with state-of-the-art software and acquire the qualifications for "rapid prototyping." This is knowledge that will be required as part of additional Industry 4.0 qualifications in metal and electrical occupations.

They will learn how to measure and plan three-dimensional workpieces using 3D coordinate-measuring machines. In the new training workshop, "authentic" production of steel products is learned in a machine park with ultra-modern machining centres. Working at the machines, the young people will be given the instruction they need to work under real-world conditions. Only professional training on professional machines can guarantee Dillinger's quality standards for its products.

The quality of training at Dillinger is also recognized by other companies. The company's trainees are regularly among the best in Saarland every year. Many companies in the region therefore send their employees to Dillinger for complete inter-company training or for individual training modules in the metal and electrical trades. Around 60 external trainees are currently training at Dillinger and Saarlust, either long term or in modules and courses. With the new training centre, even more people from other companies will be able to take advantage of Dillinger's highly qualified training program from summer 2021 onwards.

Together with Saarlust, Dillinger operates the largest company training centre in the German federal state Saarland, and with over 500 young people currently undergoing initial vocational training, the number of apprentices has remained consistently high for years. The company is investing approx. EUR 6.5 million in the new construction of the workshop, thus demonstrating its commitment to its employees and to the Dillinger site.



Laying of the foundation stone for the new training centre: Peter Schweda, Chief Human Resources Officer and Labor Director of Dillinger, Jürgen Barke, State Secretary Saarland Ministry of Economics, Franz-Josef Berg, Mayor Dillingen, Michael Fischer, Chairman of the Works Council of Dillinger, Cornelis Wendler, Head of Training and Personnel development, Patrik Hüttel-Gier, Head of Technical Training, as well as the longest-serving and youngest apprentices, Raimund Manion and Aylin Meißner (Picture: Dillinger)

■ Dillinger, Dillingen, Germany

Company profile: Saarmetall group

A quality supplier to the global metallurgical industries

Over decades Saarmetall and its subsidiary Solocuire have served the metallurgical industries worldwide, with water cooled copper fittings for all applications. In a world of mergers and acquisitions, Saarmetall remains a highly specialized, independent and still family owned enterprise.

Today the Saarmetall group comprises three companies, operating as independent entities in the markets. The companies Saarmetall and Solocuire mainly support the iron, steel and metal producing industries, while SM France serves the automotive industry and its suppliers. The group operates three production sites at two locations in Germany and France.

Corporate headquarters of Saarmetall group is located in Saarbrücken, Germany. Its history dates back to 1925, when it was founded as supplier to the local iron industry in the Saar – Lorraine – Luxembourg region. Initially copper tuyeres were the main products, installed at the numerous blast furnaces in this traditional European region of heavy industry. Today Saarmetall employs some 85 people and comprises a (CNC-) machining shop and a shop for all kinds of fabricated structures, made of forgings or various semi-finished materials.

Since 1935 Saarmetall has been represented in France by its own subsidiary Solocuire, based in Sarreguemines in

East Lorraine and employing some 35 people. With a 2,000 t forging press and a ring rolling machine Solocuire is the forging centre of the group, producing all kinds of both, die forgings and open die forgings made of non-ferrous materials. These products are partly further processed by Saarmetall in Saarbrücken.

With 150 employees the Saarmetall group generates a consolidated business volume of about 35 million Euro. The group covers the three basic manufacturing methods in-house, i.e. forging, welding/soldering and (CNC-) machining. Such potential enables Saarmetall and Solocuire to choose the most appropriate manufacturing method for individual applications and for each specific customer demand. The work is carried out on modern machines in state-of-the art workshops. Qualified consulting – in product design and process matters – is daily business.

The product range of Saarmetall and Solocuire comprises:

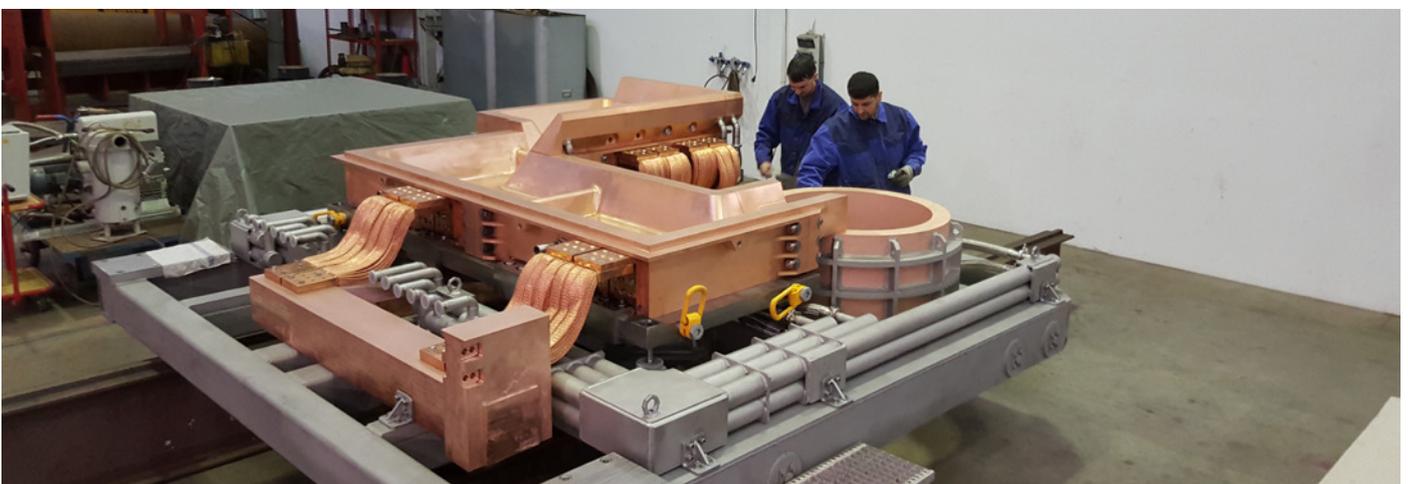
- lances, lance tips and sub lance tips for BOF converters, lance tips for special

applications and post combustion distributor lances (PCD),

- copper crucibles for re-melting furnaces (VAR, ESR, SM, EB and PAM),
- copper fittings for submerged arc furnaces and smelters for the production of ferro-alloys and non-ferrous metals (contact clamps, pressure rings, cooling elements, launders and tap holes),
- copper fittings for electric arc furnaces (contact clamps, cooling elements),
- copper moulds for continuous casting machines (mould tubes, mould plates),
- copper fittings for blast furnaces and cupola furnaces (tuyeres, tuyere coolers, cooling elements),
- copper rings for electric motors and generators.

About 50 international representative offices ensure close customer relations around the world.

■ *Saarmetallwerke GmbH – Contact:*
www.saarmetall.de
info@saarmetall.de



Saarmetall group can perform a variety of complex manufacturing methods for individual applications and specific customer demand (Picture: Saarmetall)

METPACK 2020 has been postponed



METPACK is a globally significant meeting place of the international metal packaging industry (Picture: Messe Essen)

METPACK exhibition which was planned for the period from May 5 to 9, 2020 is being postponed and will take place at Messe Essen from February 23 to 27, 2021.

The international trade fair for metal packaging will, as accustomed, run parallel to interpack which is also being postponed. Messe Essen stipulated the new dates together with the members of the METPACK committee. The decision was preceded by a general ruling which was issued by the City of Essen and, against the background of the spread of the coronavirus, is prohibiting the staging of events until further

notice. The sector is supporting the new dates of the fair. "For the participants in our fair, we have created planning security with the new dates," explained Oliver P. Kuhrt, CEO of Messe Essen. "I am very pleased that, in close coordination with the cooperation partners of METPACK, it has been possible to reschedule the trade fair to the end of February 2021 into the accustomed surroundings of interpack. I thank everybody involved for the close and trustful collaboration in this particular situation characterized by force majeure."

■ *Messe Essen*

SeAH invests in management platform for distributed additive manufacturing

SeAH (South Korea) has invested in Israeli software company Assembrix which offers a platform that enables organizations to securely manage and control their distributed additive manufacturing activities.

Assembrix's virtual platform represents and connects to physical 3D printers in multiple locations and gives the user full control over the 3D printing process. Metal 3D printing is among the fastest growing technologies in the market, attracting key players to develop new metal powders, 3D

printers with metal capabilities and dedicated software applications.

"The collaboration with SeAH supports our strategy to expand in Asia and be the platform of choice for clients adopting additive manufacturing in the aerospace, automotive and medical devices industries. In addition to the investment, Assembrix will be able to leverage SeAH's expertise and network of clients all over the world," says Lior Polak, CEO of Assembrix.

■ *SeAH
Assembrix*

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Ideas from home integrated into business operations

Innovative method for drying out raw materials

Iron ore and coal for the blast furnaces need to be prepared so that they are always available in the best possible quality for use in production. As the materials take a long time to dry, engineers at thyssenkrupp started looking for possible solutions – and found inspiration from an unlikely source.

thyssenkrupp Steel's Duisburg plant is the fifth biggest steel site in the world. Integrated iron and steel mills of this kind operate without interruption around the clock, 365 days a year. Huge amounts of raw materials are delivered to thyssenkrupp Steel's port in Duisburg every day – mainly iron ore and coal for the blast furnaces. These raw materials need to be prepared so that they are always available in the best possible quality for use in production.

The various materials are removed from the ships by grabs for onward transportation at the mill. As all of this happens outdoors, rain can be a real problem for the grabs: Some of the materials are so fine that they turn to sludge if they get wet, making it impossible for the grabs to pick

them up. As the materials take a long time to dry, and it often rains again before they are ready, engineers at thyssenkrupp started looking for possible solutions – and found inspiration from an unlikely source.

"We need a chemical solution to dry the ores more quickly" – that was the task chemical engineer Dr. Stefan Wienströer and his team set themselves. And straight away father-of-two Wienströer hit on an idea: diapers. Sodium polyacrylate is normally used

"Reliable production flow is a key factor in an integrated iron and steel mill. This method gives us greater process stability at an important step in the chain."

Dr. Stefan Wienströer, chemical engineer at thyssenkrupp Steel Europe

in diapers to absorb fluid. This material is a superabsorbent polymer, capable of absorbing and retaining extremely large amounts of liquid relative to its own mass.

Less work, lower costs

This turned out to be the perfect solution for the port: In numerous tests the team in cooperation with their colleagues from raw material procurement demonstrated that the technology can be integrated seamlessly into the existing workflows with no loss of quality in the raw materials, while at the same time improving logistics and lowering port handling costs.

"Instead of waiting days or weeks for materials to dry out, we now use the superabsorbent polymers whenever needed. We mix them in using one of the grabs, and the raw materials are ready to go within two hours," says a satisfied Stefan Wienströer. "Reliable production flow is a key factor in an integrated iron and steel mill. This method gives us greater process stability at an important step in the chain."

And in addition to the satisfaction of seeing their idea work in practice, the project developed by Wienströer and the team also won the "steeltomorrow" award in December 2019, which thyssenkrupp Steel bestows every year on internal innovation projects.



Huge amounts of raw materials are delivered to thyssenkrupp Steel's port in Duisburg every day (Picture: thyssenkrupp)

thyssenkrupp Steel Europe AG,
Duisburg, Germany



Fig. 1. Started up in 2015, the DRI plant at Ezz Steel is a reference for a high capacity module (Picture: Danieli)

ENERGIRON direct reduced iron

Combining energy with iron: not just DRI, but valuable DRI

Tenova HYL and Danieli teamed up to promote and develop the innovative technology for direct reduction plants under the trademark of “ENERGIRON”. Not only the plants can process multiple typologies of iron ore, they can use fossil-free hydrogen as reducing agent. The brand highlights the high-energy content as one of the outstanding characteristics of the final DRI product.

As the ENERGIRON brand suggests, this technology is designed to produce Direct Reduced Iron (DRI) with high internal energy and value in use. ENERGIRON provides the flexibility to set the DRI characteristics as required by final user.

ENERGIRON plants can produce high-quality DRI, with guaranteed metallization up to 96% (Nucor operates the only DRI plant in the world with guaranteed metallization of 96%).

Carbon content is easily adjustable 1.5 - 5.0%, up to 95% as iron carbide (Fe_3C), that provides additional energy to the EAF and stabilizes the DRI vs. re-oxidation. Customers that experienced the benefits of high-carbon DRI never came back to traditional DRI (Ternium, Suez Steel, Nucor: all producing DRI with $>3.5\%$ C). Other technologies proved to be capable producing

DRI with carbon content up to only 3.0%, and most of it ($>70\%$) is in free form (graphite) which provides neither dissociation heat nor stability vs. re-oxidation, and on the contrary increases fines generation during handling. Competitors are now struggling to modify their process in order to produce DRI with similar quality to ENERGIRON. Up to now, this has not happened.

The most efficient way to decrease the liquid steel production costs is to recover the thermal energy of the DRI and feed it directly to the EAF, still hot. ENERGIRON offers the most reliable and efficient system to connect the direct reduction plant and the steelmaking plant up to 500 m distance.

DRI quality

The chemistry of DRI is highly dependent on the material that is feeding the direct

reduction plant, either in pellet or lump form, or a mix of both of these. DR-grade pellet is similar to BF-grade, with some stricter requirements, as lower acidic gangue and higher Fe content. Neither of these requirements is directly driven by limitations related to the direct reduction process, but instead are focused to optimize the steelmaking process: lower gangue will result in electric energy consumption at the EAF and the acidic gangue has to be neutralized with lime and dolomite to protect the EAF's refractory and promote foamy-slag generation. Moreover, it's required to minimize $\text{Na}_2\text{O} + \text{K}_2\text{O}$ to reduce the swelling phenomena inside the reactor.

Iron ore can be fed in lump form too, but in that case the maximum rate shall be evaluated case by case, depending on the properties of the material. The gangue

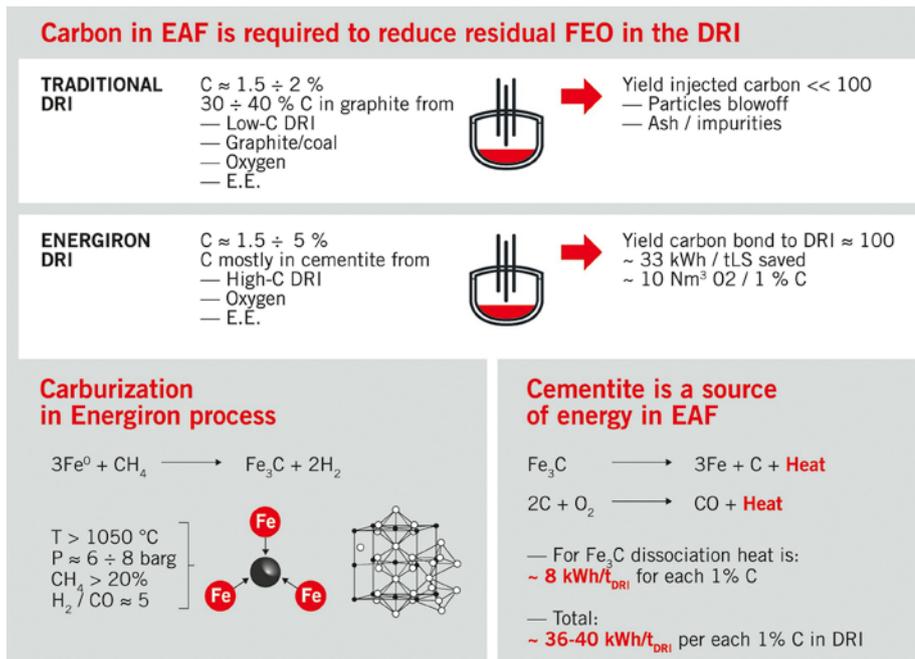


Fig. 2. ENERGIRON processes (Picture: Danieli)

content of the DRI will be the same as the pellet but concentrated by the yield ratio of oxide to DRI conversion, since it's inert towards the DR process. On the contrary, the direct reduction process can be calibrated as required according to the content

of metallic iron. The iron content of DRI is generally expressed as metallization [%], which is defined by the ratio of metallic iron vs. total iron. Therefore, metallization represents the fraction of iron oxides reduced by means of the DR process,

ENERGIRON direct reduction technology

The ENERGIRON process technology is designed for the direct reduction of iron ores by using reducing gases. Oxygen is removed from the iron ores by chemical reactions with hydrogen (H_2) and carbon monoxide (CO), for the production of highly metallized Direct Reduced Iron (DRI).

The ENERGIRON technology is based on a continuous process, i.e. the solid material flows continuously through the reactor (shaft furnace), with relevant benefits to both the product quality and process efficiency that have been significantly optimized over the years. This technology, characterized by its uniquely simple process configuration, is currently the most flexible option for producing DRI as it allows wide flexibility using different energy sources and available raw materials.

Operating conditions of the ENERGIRON process are characterized by high temperature (~1080°C) and high pressure (6-8 bar at the top gas). The elevated pressure allows higher productivity (of about 10 t/h x m²) and low reducing gas velocities (of about 2 m/sec) as compared to processes using lower operating pressure, for which the gas velocities are >5 m/sec, thus minimizing dust losses through top gas carry-over. This improves the overall iron ore consumption, which in turn lowers the overall operating costs.

Additionally, a unique characteristic of this process is the selective removal of both by-products of the reduction process: H_2O and CO_2 , thus significantly increasing the process control and efficiency.

regardless of the initial Fe content of the pellet. Modern DR plants produce DRI with metallization of 94 - 96%.

The ENERGIRON process has the further advantage to set the desired carbon content of the DRI within the range 1.5 - 5.0%, and to deposit it not as free carbon (graphite) but as iron carbide Fe_3C . These two forms have a completely different behavior in the EAF. Free carbon is easily segregated and lost during handling of cold DRI, and in the case of hot DRI it's partially burnt before entering the steel bath. On the contrary, if carbon is chemically bound with iron (Fe_3C) it completely penetrates the steel bath, and therefore it's converted into Fe and CO_2 .

As previously mentioned, carbon in the EAF is required to reduce the remaining FeO in the DRI. For this reason, when using high percentages of DRI in the metallic charge the carbon content in the bath has to be set according to the need to maximize melt shop productivity. At this regard, the best solution for reaching required carbon content in the EAF is feeding DRI with the desired amount of combined carbon, in the form of cementite Fe_3C , thus minimizing external carbon (graphite) additions. This combined carbon is more efficiently and completely used in the EAF. As a matter of fact, while coal and graphite additions to the EAF give yields of 60% or less, due to particle blow-off and impurities in ash and other materials in coal, the combined carbon in DRI has a yield of 100%.

Furthermore, the conversion of Fe_3C into iron and carbon is an exothermic reaction that further improves the thermal efficiency in the EAF, thus decreasing electric power requirements and promoting easy foamy slag generation. Depending on post-combustion factor, each 1% increase in DRI carbon content provides 36 - 40 kWh/t_{DRI} of electrical energy savings at the EAF. The only Fe_3C dissociation heat into Fe and C provides approximately 8 kWh/t_{DRI} for each 1% of carbon. In other words, using ENERGIRON high-carbon DRI is like adding chemical energy to the EAF.

Worldwide, ENERGIRON is the only proven process that produces high-carbon DRI. Further to the above-mentioned advantages that this product brings to EAF operations, it has also higher stability than DRI typically obtained in other DR processes. The reason is the high-cementite content present in the DRI, which inhibits the

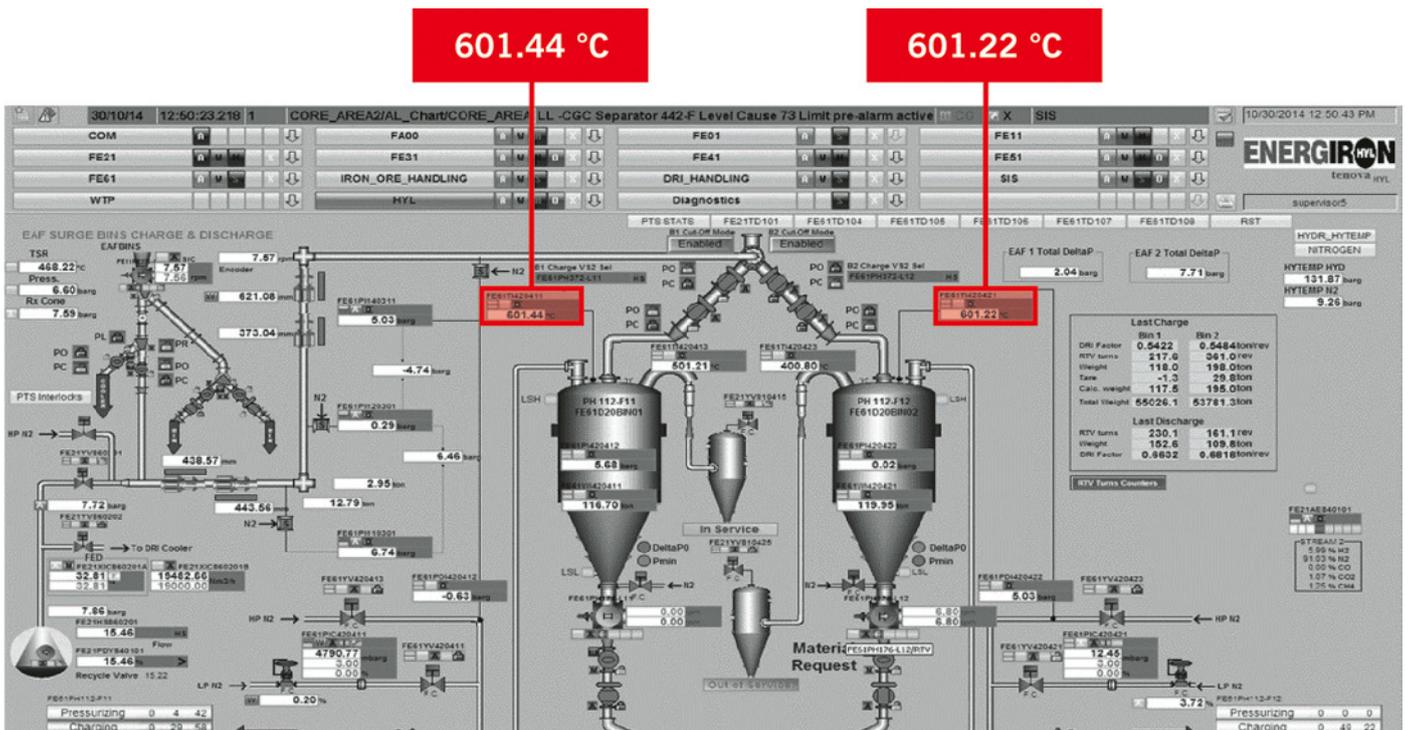


Fig. 3. HMI of the Hytemp DRI plant at Suez Steel (Picture: Danieli)

reoxidation of metallic iron in contact with air. In general, carbon in ENERGI-RON DRI is in the form of cementite, and 1% of carbon is linked to 14% of iron or Fe° . The high-carbon DRI with 4.5% C has about 63% of Fe° and C linked as Fe_3C , which increases significantly the DRI stability. This product is then safer for handling, transport and storage.

ENERGI-RON plants can vary both metallization and carbon content of DRI as required, simply by adjusting a few operating parameters. Higher metallization and carbon content imply higher natural-gas consumption, therefore the optimal balance between DR plant and EAF consumptions and benefits shall be calculated.

DRI form

Direct reduced iron is available in the following forms: Cold DRI, Hot DRI, HBI, high-carbon DRI.

Cold DRI is reduced iron in pellet form, with bulk density of 1.6 - 1.8 t/m^3 and high porosity, therefore it has the tendency to re-oxidize in contact with water and, at temperature above 80°C, also with air. Therefore, it has to be stored in a covered and dry area, with blanketing of inert gas, such as nitrogen, in case of an enclosed storage.

Hot DRI is extracted from the DR plant reactor and conveyed directly to the EAF at high temperature. This solution allows recovering the thermal energy of the DRI, which is leaving the reactor at temperatures of approximately 700°C. For every 100°C increase in DRI temperature, approximately 26 kWh/t_{LS} are saved at the EAF and a 5% decrease in tap-to-tap time is achieved.

HBI is DRI mechanically compressed at high temperature (above 650°C) into pillow-shaped briquettes, with minimum density of 5 g/cm^3 . Hot briquetting of DRI closes internal pores of the material, lowers the accessible surface to oxidants, increases the apparent density and improves thermal conductivity, all of which reduce the DRI reactivity. Thanks to these properties, HBI is a stable product for long-term storage and ocean shipping, therefore it's the preferred DRI form for merchant market applications. HBI doesn't require any particular precaution for handling and can be treated as steel scrap.

High-carbon DRI is a premium form of DRI, peculiar to the ENERGI-RON direct reduction process. It's defined as DRI with carbon content greater than 3%, most of which (>90%) in cementite (Fe_3C) form. Traditionally, DRI products have carbon levels

around 1.5% or less. In contrast, ENERGI-RON DRI can be produced with a wide range of carbon contents (1.5 - 5.0%) simply acting on a few process parameters: humidity of the process gas and NG injection to the reactor's cone. As described above, carbon adds chemical energy to the DRI and contributes to the smelting process in the EAF enhancing the overall productivity of the steelmaking plant.

High Carbon Briquette (HCB) is a unique and novel product of the Energiron technology. HCB is a perfect combination of the advantages provided by High Carbon DRI and HBI, providing the same chemical energy of the High Carbon DRI together with the transportability of HBI. Because of lower molecular weight of C with respect with Fe, HCB has lower density than HBI and comparable surface quality and mechanical strength, resulting in equivalent transportability and better behavior during melting process.

Several HBI test programs were conducted since the late 1980s – before the first HYL-ENERGI-RON HBI plant was built – up to recent years. Some of these tests have been carried out with the support of Köppern GmbH & Co. KG in its facilities at Hattingen, Germany. The most recent work consisted of testing high-carbon DRI produced in the Emirates Steel #3, ZR

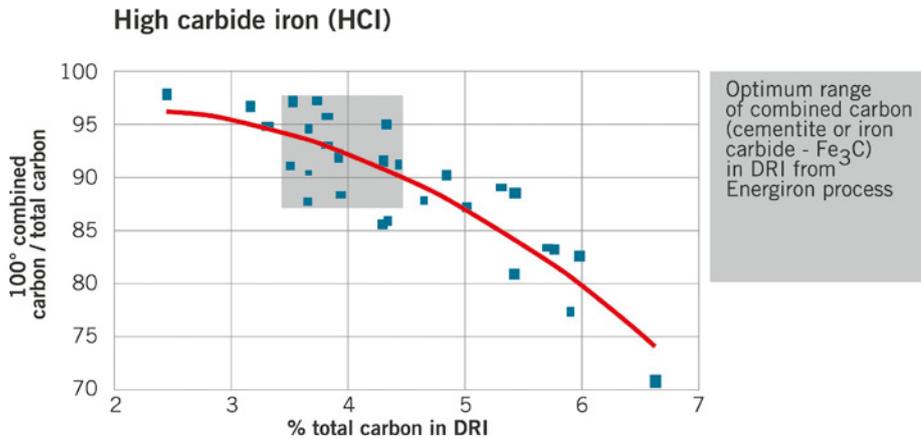


Fig. 4. Combined C-Fe graph (Picture: Danieli)

Micro-Module DR plant located in Abu Dhabi, UAE, and, more recently, using the high-carbon DRI from 3M ZR DR plant at Ternium Monterrey.

HBI, as per IMO directions for overseas export [scheduled as DRI(A)], must comply with a density of 5.0 g/cm³. However, the higher the %C the lower will be the density, simply because of the density difference between Fe and C. As per the above-mentioned tests, high-carbon HBI presents a density of 4.8 - 5.0 g/cm³, depending on:

- iron ore origin and characteristics,
- DRI particle size,
- DRI temperature,
- HBI cooling method,
- % carbon in the DRI.

For inland transport and domestic distribution, the density is not a factor; what is more important is the integrity of the bri-

quette during handling, to avoid fines generation that have higher tendency to re-oxidize. Therefore, the main parameters defining the quality of HBI are:

- the compression strength, which is a more indicative parameter in terms of handling and exposed surface; and
- the abrasion resistance, which indicates the integrity of the briquette in terms of fines generation, and which is about the same as the standard low-C HBI.

In general, all strength-related testing results have demonstrated that produced high-carbon briquettes have acceptable strength and density values which are totally comparable to the traditional HBI product currently in the market, but with the significant difference that the high-carbon briquettes will provide additional chemical energy when being melted in the EAF.

Hytemp

Since 1998 ENERGIRON has been offering the Hytemp[®] system: it operates by using a transport gas (either inert gas or the process gas) to carry the hot DRI through a pneumatic pipe to a holding bin above the electric furnace. The transport gas is removed from the circuit and then recycled back to the DR plant. The hot DRI is discharged from the holding bin for continuous feeding to the EAF at the desired rate, and at a temperature above 600°C on EAF charge nozzle. Recently, Suez Steel achieved a hot DRI temperature of 630°C at the charge of the EAF, by means of the Hytemp system. The Hytemp can cover lengths up to 500 m and provides zero leakages of either gas or DRI dust, because the system is completely sealed. The operation is fully automated and minimal maintenance is required. To date, more than 25 million tons of hot DRI have already been transported, with time availability record of 100%.

Other proven solutions to convey hot DRI to EAFs are by means of mechanical conveyor or hot vessels. Mechanical conveyors are made of steel and an insulated canopy provides thermal insulation and, to some extent, gas sealing. To prevent hot DRI being immediately re-oxidized by air, all the volume within the canopy is inerted by nitrogen and a special design sealing skirt limits gas leaving the canopy towards the surrounding atmosphere. Anyhow it must be noted that this system does not provide a perfect seal, therefore small releases of nitrogen shall be taken into account. Mechanical conveyors

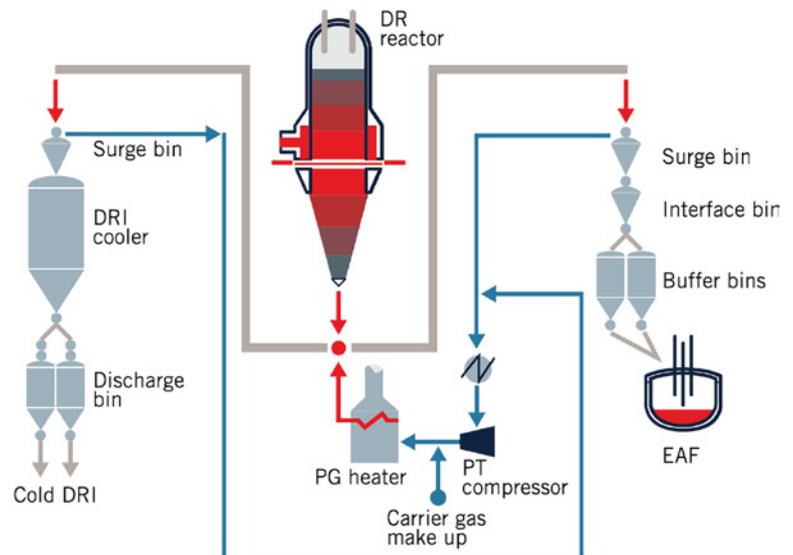


Fig. 5. The Hytemp system arrangement (left) and installation (Picture: Danieli)

require higher maintenance and provide lower availability than the Hytemp system, but it can be a valid solution for brownfield applications where the installation of a tower close to an operating EAF is not feasible. Mechanical conveyors can cover lengths of 250 m, with losses of approximately 100°C and 1% metallization.

Hot vessels are insulated with refractory and provided with a sealing system. They carry batches of hot DRI travelling on rails or transfer cars and can cover long distances, overcoming layout constraints. The downside is that performances in terms of metallization and temperature preservation are poorer than for the other solutions, and operation is less automated. Moreover, it implies the use of meltshop cranes for vessels movement, which can affect the meltshop sequences.

Improving efficiency in the EAF through DRI

The easiest way to feed EAFs with cold DRI or hot briquetted iron (HBI) is by bucket charge, but there is a limitation if the EAF is not designed to be charged by 100% of DRI: to prevent formation of the so-called "icebergs" due to higher volumetric weight of DRI than scrap, it's recommendable to limit the cold DRI charge to no more than 20% of the feed mix, while HBI shall be further limited to a maximum 10%.

Proper bucket preparation also will affect the efficiency, quality and yield of the melting process. The best results are achieved by charging DRI in the 2nd bucket: in this way, DRI/HBI is plunged into liquid steel for faster melting. With this insight in mind, it's possible to take advantage of the DRI pure iron units without any modification to the existing equipment, either for material handling or the furnace design. Moreover, thanks to its higher density, adding DRI to the feed mix can reduce the number of bucket charges and therefore the process efficiency.

If DRI is more than 20% of the EAF feed mix a continuous charging system must be foreseen. Dosing equipment, such as a rotary valve or a weight belt feeder, will discharge the DRI into the EAF at the correct rate and moment, according to the furnace's melting profile. While charging cold DRI, a first bucket charge of scrap (needed just for the first heat of the planned sequence) is followed by the continuous DRI feeding through a fifth hole. A belt conveyor reclaims



Fig. 6. ENERGIron plants able to exceed 2.0 million t/year production (Picture: Danieli)

the cold DRI from the storage yard and collects it in a small bin close to the EAF. A weight belt feeder extracts the DRI from the bottom of the bin at the desired rate and, finally, a chute channels the DRI to the furnace through the fifth hole.

Similarly, hot DRI is extracted from the bottom of an inertized bin by means of a rotary valve and then a chute channels the DRI to the furnace through the fifth hole.

Operating data from several plants using the Hytemp system shows that while feeding the EAF with hot DRI it's possible to save approximately 26 kWh per ton of liquid steel produced during the melting process for every 100°C increase in DRI temperature. At the same time, the EAF productivity is increased by approximately 5% by reducing the tap-to-tap time.

Lower OpEx is the key to long-term competitiveness

In terms of operating expense (OpEx), ENERGIron is by far the best-performing NG-based direct reduction technology. For any direct reduction plant, the sum of iron ore pellet, natural gas and electricity costs accounts for more than 90% of the total DRI production cost.

In terms of yield, thanks to the higher operating pressure, gas velocity through the reactor is lower, therefore smaller pellets are acceptable (less screening losses) and material losses due to dragging is reduced. Remet generation is minimized thanks to the possibility to bypass the reactor during the early stage of plant ramp-up.

To achieve a high energy efficiency, NG consumption is as low as 2.6 Gcal/t (for the ENERGIron III process). The energy of the excess steam is recovered in order to pro-

duce electricity, leading to the lowest electrical energy consumption for any DR technology. The ENERGIron ZR process further improves the overall energy efficiency up to unattainable levels for any other DR technology. Since the reducing gases are generated inside the reactor, most of the energy supplied to the process is taken by the product, with minimum energy losses to the environment. As compared to other processes for which the overall efficiency is below 70%, for this scheme the efficiency is above 78%. This arrangement ultimately turns into very low natural gas consumption, even lower than 2.35 Gcal/t.

Conclusion

Thanks to the past decade's experience gained implementing high-capacity DR plants, ENERGIron has completely debugged the design, optimizing process and plant equipment in collaboration with operators and vendors. As a result, today the ENERGIron high-capacity plants can properly perform according to standard operational availability.

ENERGIron plants have demonstrated and proved an optimal learning curve compared to competitors. Scaling ENERGIron DR plant capacity up from 1.6 to 2.5 million t/year was simple and smooth, thanks to the higher operating pressure, as reflected in smaller reactor diameter for the same plant capacity. A world-record start-up period for the EZZ ENERGIron plant, i.e. 29 days from first DRI to full production, ensured for the customer a 20% shorter payback period compared to competitors.

| Danieli

Platform economy research project in metal processing in Finland

Process monitoring systems and expert systems for metallurgical processes

The two-year platform economy research project in metal processing – AMET – in Finland brings together two universities, five SMEs and two industrial partners, one of which is SSAB Europe. The project aims to improve the efficiency of metallurgical production processes and the supply chains of metal products. The purpose of the project is to develop process monitoring systems and expert systems for chosen processes, such as the electric arc furnace, continuous casting and rolling.

The manufacture of SSAB's increasingly demanding premium products also requires more accurate process control. The main focus of the project is to improve the production process using new measurement solutions, models, the horizontal linking of data streams as well as more advanced analysis of process data.

"Among other things, we aim to utilize novel, innovative and unique measurements in monitoring the process and improving quality production capacity. We also want to introduce certain measurements that are not in use elsewhere. These include measurement of the hot metal desulphurization lance based on acceleration sensors and the use of online water analytics," says Jarmo Lilja, process development manager at SSAB Europe's Raabe mill.

"Besides this, we want to improve cost and production efficiency by greater optimization of the blast furnace by developing the quality control of feedstock input and

The AMET project will promote regeneration of an industry that is vital to the national economy and will lower the threshold for SMEs to develop industrial-scale solutions and new business for the needs of the steel industry.

Sakari Karppinen, Business Finland

briquetting. We also aim to speed up the monitoring of steel cleanliness, to optimize the quality production capacity of the continuous casting process and to use models, monitoring and enhanced process control to improve the throughput and quality of more challenging products in hot rolling," adds Jarmo Lilja.

"The AMET project will promote regeneration of an industry that is vital to the national economy and will lower the threshold for SMEs to develop industrial-scale solutions and new business for the needs of the steel industry. The indus-

trial processes developed in the project will also have major positive environmental benefits," says expert Sakari Karppinen at Business Finland.

One example of the applications of the project is the electric arc furnace process, which is considered a best available technology and which will become more widespread as the main technology in low-carbon steelmaking also at SSAB along with the HYBRIT technology aimed at fossil-free steelmaking. In the project, SMEs are developing scrap bucket identification through Bluetooth technology, monitoring scrap bucket fill and discharge as well as the heat-specific consumption measurement of electrodes.

SSAB Europe Oy's and Ovako Imatra Oy Ab's steel mills will serve as industrial test environments for the solutions developed in the project. Kaltio Technologies Oy, Luxmet Oy, Quva Oy, Sapotech Oy and Sensmet Oy represent the SME sector in the project. The universities involved in the project are the University of Oulu and Åbo Akademi University. The two-year project has a total budget of around EUR 5.65 million and is being funded by Business Finland and consortium partners.



The project is targeting to speed up the monitoring of steel cleanliness, to optimize the quality production capacity of the continuous casting process (Picture: SSAB)

■ SSAB

Continuous casting

Q-Roll slab caster rolls

Reliability and performances of caster rolls are two of the main key factors to increase productivity and reduce plant OpEx. Based on the experience gained from lots of caster projects Danieli has introduced the Q-ROLL brand for its slab caster rolls.

Caster rolls are the primary consumable parts of the continuous casting machine. Their reliability, easy maintainability and performances significantly affect a caster's total economic assessment.

Danieli Q-ROLL slab caster rolls are the result of the long experience collected from all caster projects engineered and commissioned by Danieli worldwide, combined with the technological know-how developed in the company's research centre.

Q-ROLL design. Slab caster rolls are designed to be installed in every type of caster according to the different requirements along the caster curve, in terms of mechanical and thermal loads. Roll designs are based on Danieli engineering and, thanks to the technical and the research developments, these can be highly customized according specific plant requests, in terms of operational and maintenance practices.

Q-ROLL manufacturing. Q-ROLL quality and reliability are guaranteed by Danieli worldwide manufacturing workshops. Danieli guarantees the quality and reliability of its caster rolls production step by step, starting from the raw materials supplied by Danieli-selected worldwide manufacturers according Danieli's specifications; up to in-house manufacturing carried out in accordance with the Danieli Quality Control Plan QCP. High-tech CNC lathes, work centers, milling units and cladding machines, together with a careful and on-time supplying production, ensure that the customer always receives the most reliable product installed in the casting machine.

Q-ROLL cladding. Experience has shown that the performances of the microstructure of the roll surface has a significant effect on roll performance. Specifically, Danieli has experienced and proven that

stainless steel clad rolls with a microstructure characterized by high levels of retained austenite and/or delta-ferrite perform poorly due to unacceptable levels of wear, corrosion-erosion, and thermal fatigue cracking. Longer roll life directly influences the number of stoppages due to segment changes.

The selection of overlay material is generally based on pit corrosion resistance, thermal fatigue-cracking resistance, wear and bruise resistance, corrosion cracking resistance and weldability. Today, martensitic stainless steel is the preferred material due to its properties, costs and good flexibility in its application. Danieli selected submerged-arc welding for the cladding process in all its worldwide workshops, based on reliability, quality and high level of process control ensured by this technology. Every cladding parameter is carefully checked by operators and guaranteed by standardized procedures.

Because each caster (customer) and each part of the casting machine (from top to bottom) have a different deterioration effect on the rolls, Danieli has developed

its own wire brand named Danieli UHP wire (Ultra High Performance wire), with the aim to provide a selection of wire types with different alloy compositions and final hardness in order to meet customers' needs.

References: Danieli has designed and commissioned more than 150 caster strands worldwide. Danieli in the past 10 years has manufactured in its worldwide workshops more than 60,000 rolls. Danieli has been awarded in recent years five maintenance contracts to manage rolls/segment refurbishment in five non-Danieli casting machines. Average output (new + reconditioned) is more than 8,000 rolls/year. With Danieli technology it is possible to reduce the number of stoppages due to roll changes by an average of 40-50%. In a plant with a production of 1 million t/year this means an economical benefit of average 0.5 million €/year.

| Danieli



Designed and manufactured for superior performance – Danieli Q-Rolls (Picture: Danieli)

Unidirectional gateways deployed at Hyundai Steel

Safely enabling IIoT applications for a continuous casting plant

Unidirectional Security Gateways have been successfully installed at Hyundai Steel to protect Industrial Internet of Things (IIoT) deployments in a pilot project at the continuous steel casting plant in Dangjin, South Korea. This deployment is part of an ongoing project, allowing Hyundai Steel to assess the added benefits of using IIoT and cloud technology, while balancing cybersecurity concerns.

Waterfall Security Solutions, the OT security company, has successfully deployed its Unidirectional Security Gateways to protect Industrial Internet of Things (IIoT) deployments

in a pilot project at the Hyundai Steel continuous steel casting plant in Dangjin, South Korea. This deployment is part of an ongoing project between Waterfall and Hyundai Steel, allowing Hyundai Steel to

assess the added benefits of using IIoT and Cloud technology, while balancing cybersecurity concerns.

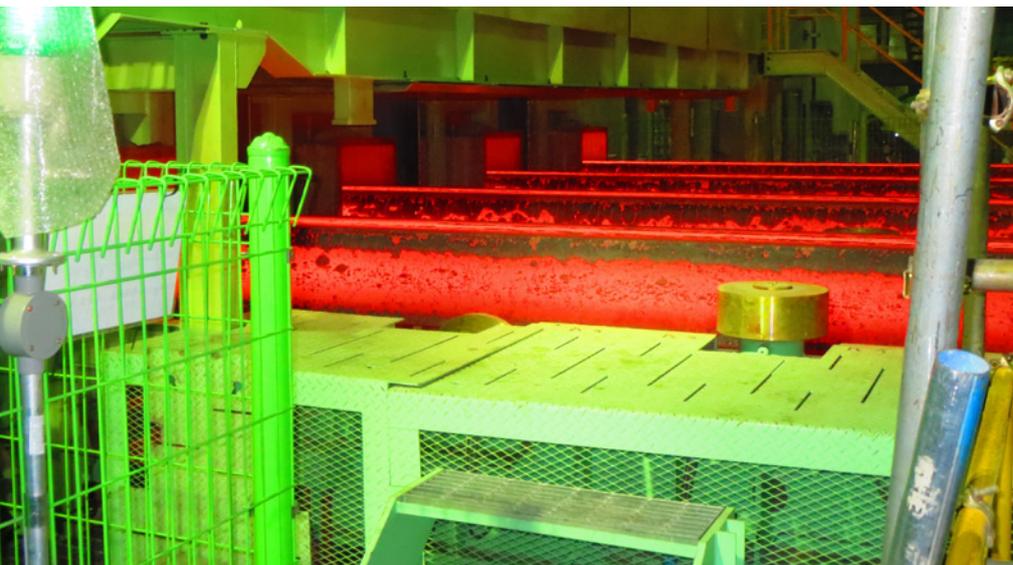
With the steadily increasing connectivity of digital devices in smart manufacturing plants comes a steadily increasing exposure to attacks. To ensure safe, continuous and efficient operations, modern highly connected manufacturers must keep attackers out, while providing enterprise, cloud and IIoT systems visibility into production operations in order to analyze and optimize production.

"Hyundai Steel partnered with Waterfall, because Waterfall is the world's #1 OT security company," said Dr. Joung Han Lee, Senior Plant Manager at Hyundai Steel. "Waterfall technology enables the benefits of IIoT connectivity and big-data analysis without the attack exposure that always comes with software-based security systems. We look forward to publicizing our findings on the added security that Waterfall brings to the table."

"Waterfall is very pleased to be selected to secure Hyundai Steel's industry-leading IIoT installation," said Lior Frenkel, CEO and Co-Founder of Waterfall Security Solutions. "Hyundai Steel is leading the industry by demonstrating how to both address modern threats and improve production efficiencies through safe IT/OT integration."

The Unidirectional Gateways deployment provides Hyundai Steel with protection from remote cyber attacks by unidirectionally replicating OPC-UA servers to Hyundai's enterprise network. The Waterfall replicas provide Hyundai's enterprise and IIoT systems with safe, transparent access to detailed real-time production data.

Waterfall Security Solutions, Ltd., Rosh Ha'ayin, Israel



Continuous bloom caster from Primetals Technologies at Hyundai Steel in Dangjin, Korea (Picture: Primetals Technologies)

Free remote access licenses for coronavirus emergency

With coronavirus travel restrictions in place, it may become impossible for engineers, IT people and vendors' support personnel to visit industrial sites to carry out essential diagnostics, maintenance or adjustments. To help customers in this difficult time, Waterfall is offering free unidirectional Remote Screen View (RSV) connector licenses for use through the end of September 2020.

Remote Screen View sends real-time images of industrial workstations to a web server that remote vendors can access. Remote personnel can use these real-time visualizations to provide advice to personnel on site.



First heat at the new minimill at Nucor Steel Sedalia on January 31 (Picture: Danieli)

From liquid steel straight into bars

Smooth start-up of the new minimill at Nucor Steel Sedalia, Missouri/USA

On January 31, Nucor safely struck the first EAF arc on the new MIDA plant located in Sedalia, Missouri, USA, producing a few hours later the first bundles of rebar #8, tagged and ready for shipment. After a few heats from the first heat, endless casting-rolling operation was successfully accomplished, confirming once more the full reliability of the MIDA process.

With a rated capacity of 380,000 short tons (345,000 t) per year for #4 to #11 rebars (dia. 12.7 to 35.8 mm) in straight and spooled bars, it features the latest energy-saving and environmentally friendly melting, casting and rolling processes. The Danieli ECS® scrap pre-heating system continuously charges hot scrap into a 40-t side-charge AC EAF, which is followed by a ladle treatment furnace. The core of the endless casting-rolling section is a single-strand, high-speed continuous

casting machine connected to a 16-stand ultra-compact rolling mill. Finishing facilities consist of Danieli-patented Direct Rolling and Bundling DRB system and K-Spool technologies.

Nucor Steel Sedalia (NSSD) is the tenth Danieli minimill featuring Endless Casting-Rolling ECR technology for long products in operation worldwide and third in operation in the USA. This will be followed soon by the second MIDA ordered by Nucor to Danieli, which is under construction in Frostproof, Florida.

With the Sedalia minimill, Nucor expands its market in new strategic areas of the USA, confirming the potential of the Endless Casting and Rolling solution, where energy savings lead to profits.

By the end of 2020, Danieli expects sixteen Danieli ECR MIDA minimills in operation worldwide (subject to possible delay of projects caused by the coronavirus pandemic).

■ Danieli

Thermomechanical rolling with LOOP technology

A new perspective in reinforcing steel production: the Lianxin case study

Since the end of the 1990s, SMS group has been promoting thermomechanical rolling and now this unique rolling process has become challenging among Chinese rebar producers. Lianxin Steel decided to introduce TMbaR process in their new rebar rolling mill designed for an annual production of 1,000,000 tons.

Processes traditionally intended for quality steels, such as the thermomechanical rolling, have been adapted to the field of rebar steels to decrease production costs. The main reason is the new high-strength rebar standard released in China in 2018, with Quenched and Tempered (Q&T) rebars no longer allowed. The new standard also eliminates the use of lower grade rebars in construction, and introduces new rules for three different high strength rebars, Grade 3 (400 MPa), Grade 4 (500 MPa), and Grade 5 (600 MPa). The new GB/T 1499.2-2108 standard is currently one of the most advanced rebar production standard in the world.

Rebars main features

Reinforcing steel for construction must meet some technological requirements, regulated by international standards, to fulfill all the demanding issues in civil constructions. The most important properties are the followings:

- Yield strength (YS) and ultimate tensile strength (TS). Most common mechanical property values for quality classification of all steel grades.
- Ductility. Uniform elongation (ϵ_u) is the most suitable mechanical property value representing the ductility of steel.

- Weldability. Classification of weldability is given in particular by the carbon equivalent value (C_{eq}). This is a composite analytical parameter calculated by $C_{eq} = \%C + \%Mn/6 + \%Cr+Mo+V/5 + \%Cu+Ni/15$.

The maximum carbon equivalent for Chinese rebars is 0.54-0.55 for grade 400 and grade 500 and up to 0.58 for grade 600

- Fatigue. In some technologically advanced applications, like long bridge construction, rebars must have high resistance to fatigue.
- Bonding. Rebars must have good bonding properties with the concrete, and this is achieved through a proper rib design.

Rebars manufacturing methods

The traditional methods of manufacturing bars and coils for reinforced concrete are essentially four (**table 1**). These methods are developed to enhance the intrinsic mechanical characteristics of a low-carbon construction steel (YS = 250-350 MPa) up to the values required by the rebars production standards (YS = 400-500-600 MPa and even more).

Over the last decades, the most widely used method in the world has been the Quenching and Self-Tempering (Q&T), due to the considerable technical and economic advantages, including:

- the reduction or elimination of micro-alloying elements, and therefore the reduction of production costs,
- the possibility of using various billet chemistry for many different diameters.

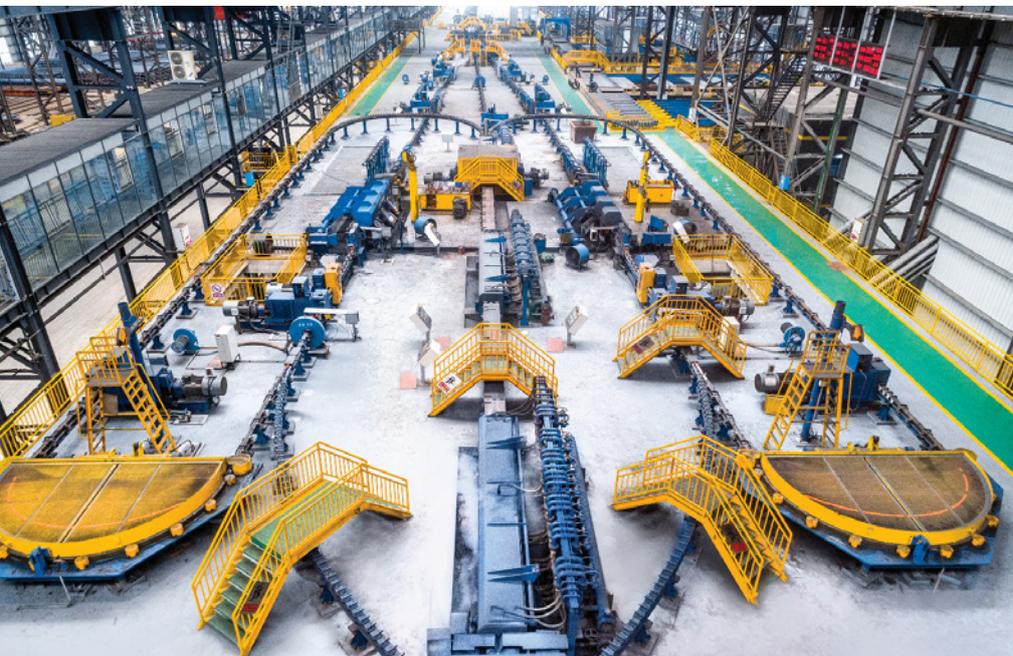


Figure 1. LOOP technology plant layout (Picture: SMS group)

Francesco Paternoster, Process Technology, Long Products; Andrea Taurino, Marketing Manager and Sales, Long Products; SMS group S.p.A., Tarcento, Italy; Michael Köberich, Process Technology, Long Products; SMS group GmbH, Mönchengladbach, Germany – Contact: andrea.taurino@sms-group.com

Table 1. Rebars straightening mechanism

How to increase the yield strength of a reinforcing steel				
Standard rolling	Micro alloying	Quenching and tempering	Cold deformed	Thermomechanical rolling
Increase the C_{eq}	Add Nb, V, Ti	Changing the microstructure	Strain hardening effect	Grain refinement
				Adjust specific microstructure
Decrease of weldability	High cost of micro-alloyed materials	Not allowed in some countries, like China	Low productivity	Innovative process
No higher weldable grades allowed		Not effective in old mills	Additional production step	New alloying and process concept optimization
Decreasing ductility properties		Min. 12 bar pressure utilization only, restricted ductility optimization	Expensive	Lower costs
				Increase of yield strength and tensile strength (Hall-Patch)

The Q&T process is extremely flexible and can be used to obtain the same mechanical properties starting from different billets.

- Another possibility is to obtain different rebar grades starting from the same billet standard composition, just modulating the intensity of the quenching process.

Recently, Chinese authorities issued the new version of the rebars production standard (Nov. 2018) eliminating the possibility of producing Q&T rebars, because the only acceptable structure is made of ferrite and pearlite, with martensite no longer accepted. The Chinese national standard, GB1499 part 2, refers specifically to steel ribs reinforcing bars for concrete and corresponds to the international standard ISO 66935-2: 1991.

The new fine grained rebars must be finer than No. 9, according to the GB/T 6394 standard, which corresponds to ASTM E112. The correspondent average grain diameter is 15.9 microns.

To achieve the necessary mechanical characteristics, one of the remaining options, without Q&T is the addition of alloying elements such as Manganese (Mn) and micro-alloying such as Niobium (Nb), Vanadium (V) and Titanium (Ti). The relevant price fluctuations of alloys make the prediction of steel production costs unstable, and the possibility of the mechanical properties increase has been

adopted through the refining of the microstructure with a thermomechanical treatment. Some Chinese plants have been designed or modified according to this purpose.

The Lianxin #1 project

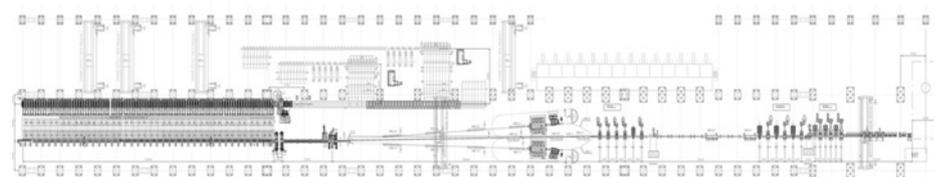
In the following sections there are the main results achieved in the first plant supplied by SMS group in China, expressly designed to accomplish the new Chinese standard, with the aim of obtaining an ultrafine microstructure starting from billets of controlled chemical composition with a lower quantity of micro alloying elements. The layout of the Lianxin plant is shown in **figure 2**.

The TMbaR mill for Lianxin Steel is designed for an annual production of

1,000,000 tons of rebar in diameters ranging between 8 and 40 millimeters. Nominal hourly production is 200 t/h.

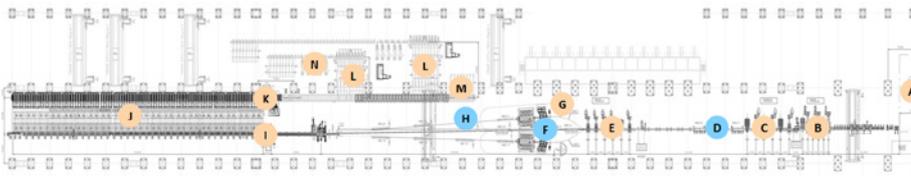
Rebars with diameters between 8 and 22 millimeters can be thermo-mechanically rolled in two strands by slitting at a maximum speed of 45 meters per second and discharged onto the HSD® (High Speed Delivery) system.

The supply includes all rolling mill stands for the roughing, intermediate and finishing mills, two six-stand MEERdrive® finishing blocks, shears, water boxes as well as the double HSD® system. Additionally, the complete package of electrical and automation systems as well as supervision of erection and commissioning are present in the scope of supply. The rolling mill consists of the technological units shown in **figure 3**.



DESIGN DATA			
Yearly productivity	1,000,000 TPY	Bar finishing speed	45 m/sec HSD System 17,6 m/sec Roller table with aprons
Hourly productivity	200 TPH	Bundles dimension	6 to 12m (2,000 to 4,000 kg)
Starting material	150&165x12,000 mm (max. 2,500 kg)	Reference Temperature	950 to 1,100°C Billet RHF exit side 760°C MEERDrive inlet side (min.)
Steel grades	Low Alloys		
Finished products	8 to 22mm rebar on HSD 25 to 40mm rebar on aprons		

Figure 2. Lianxin project layout (Picture: SMS group)



A	Re-Heating Furnace 200 TPH	H	Final Water Cooling Line
B	Roughing Mill Area	I	Bar Brakers & Rotating Channels
C	Intermediate Mill Area	J	Cooling Bed
D	Intermediate Mill Water Cooling line	K	Cold Shear
E	Pre-finishing Mill Area	L	Double Bundling Station
F	Main Water Cooling Line	M	Short Bar Recovery
G	Loop Line, Repeater and MEERdrive Blocks	N	Tying Machines and Collecting Area

Figure 3. Lianxin technological units (Picture: SMS group)

The mill is designed for a nominal output of 200 t/h, with a walking beam-reheating furnace. The furnace is connected to the continuous casting machine for billets hot charging. Emergency benches and shear, before stand 1H, are provided in case of troubles during rolling. A high-pressure water descaler unit is installed downstream the reheating furnace.

The continuous roughing and intermediate mill consists of 12 HL (housingless) stands, in H and V configuration, with one crank shear after stand 6H.

The first cooling line is located after stand 12, and consists of two water boxes, **figure 4**. The aim of this cooling line is controlling the bar temperature, after intermediate mill.

The six finishing housingless stands, with another shear in front of them, are placed in a suitable distance from the intermediate mill, in order to allow the bar to have enough time for a proper temperature equalization, before final rolling. This ensures better temperature uniformity across the rolled sections, before entering in the next group of stands.

After stand 18 a multiline system feeding the material into the finishing 6-stand MEERdrive® blocks (one each line), to roll rebar from 8.0 up to 22.0 in case of bigger sections, directly onto the cooling bed. The maximum speed of the bars is up to 45 m/s delivered through the HSD® high speed delivery system supplied by SMS group.

Roll pass design

The roll pass design gives the base for the high productivity of the Lianxin rolling mill. The main sequence is standard round/oval/round and the reductions taken along the mill are balanced to optimize rollers and guides life, reduce cobbles and subsequent downtimes, maximizing the plant yield.

All the products can be rolled in 2-strand, capable of delivering the bars into the two separate lines. Slitted products is always performed at stand 16H, and the subsequent passes, with oval/round sequence designed to optimally size the bar, to proper feeding the finishing blocks.

The mill configuration permits to roll all the products in one strand, limiting the production in case of smallest sections, just to give the possibility of producing also in case of troubles in one of the two finishing lines.

Standard temperature rolling is used with billets with high content of Manganese (i.e. 1.4-1.6%) and small amounts of micro-alloying elements, such as Vanadium.

Low temperature rolling (750°C as a minimum temperature at finishing blocks entry side) is needed for the reduced manganese content billets (i.e. 0.7-0.8%) with the absence of micro-alloying elements. In both cases, the aim of the process is to obtain a uniform ferrite and pearlite structure, without any martensite, that is no longer allowed by the new Chinese rebar standard. All the products in Lianxin are made in two strands, with a slitting process. An optimal balance of Mn content and temperature rolling on final passes can be set-up, to produce all grades of rebars, from 400 up to 600 MPa.

TMbaR – thermomechanical rolling at Lianxin

The rebars from 8.0 to 22.0 mm are produced with the thermomechanical rolling process with min. 750°C to obtain the best results. Design of the MEERdrive® is covering this request without compromise. The main features of the proposed layout are:

- intermediate mill cooling,
- double-LOOP technology,
- MEERdrive® blocks for thermomechanical rolling at lowest temperatures,



Figure 4. Intermediate cooling line with water cooling box (Picture: SMS group)

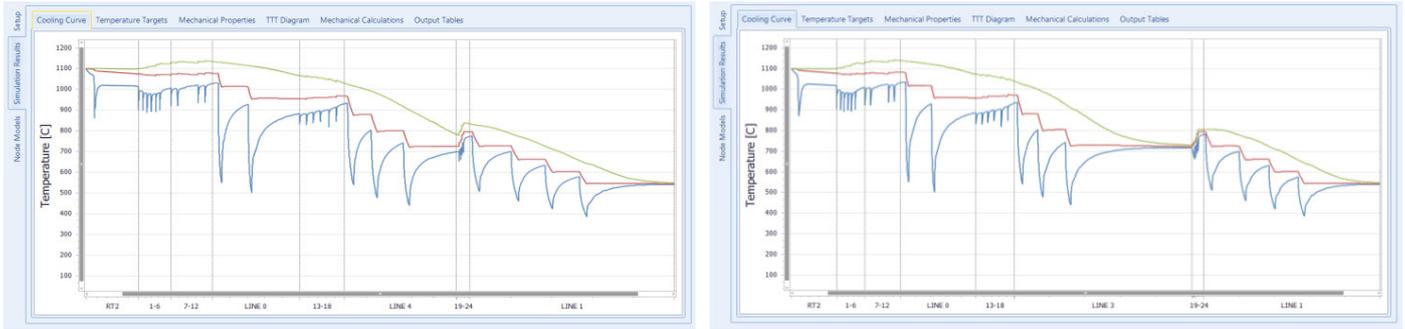


Figure 5. Effect of LOOP equalization on bar temperature (dia. 12.0mm; rolling speed 45 m/s) (Picture: SMS group)

- soft cooling,
- integrated automation with Controlled Cooling Temperature system.

Intermediate mill cooling. Bar temperature in high productivity rolling mills is higher than normal due to the increased amount of deformation energy in shorter time by the higher rolling speed that is transformed in thermal energy compared to the losses due to bar heat exchange with the surrounding air and cooling water. A set of water boxes has been provided to control this temperature increase, between intermediate and finishing mill, to avoid excessive austenitic grain grow during rolling and reach then the desired TMR temperature at finishing passes.

Double-LOOP technology. With the SMS group LOOP technology, it is possible to reach the proper material temperature, in order to obtain the required metallurgical and mechanical properties on the final products for any size rolled.

The long equalizing path guarantees temperature uniformity over the cross-section of the bar, **figure 1**. The bar entry temperature into the finishing block is designed for minimum 750°C. The temperature deviations obtained is up to 20-30°C on the small diameters and 50°C on the larger ones. Normalizing or thermomechanical rolling of rebars is always possible, optimizing the mechanical and metallurgical properties for the whole range of products.

Figure 5 shows the difference of temperature distribution at the core, middle and surface, with and without LOOP technology rolling, for a 12.0 mm rebar produced at 45 m/s. The great advantage in using the LOOP path compared to direct rolling is underlined onto the red circle in the temperature profile in **figure 5**.

MEERdrive® blocks. The MEERdrive® technology was introduced into the market by SMS group for wire rod rolling mills in the 2000s, and was a revolutionary challenge in the field of high-speed finishing blocks, enabling to set pass reductions without the limitation of fixed gear ratios, with the aim of simplifying roll-pass design (based on single family principle) and energy-saving, **figure 6**.

This innovation has been applied also to the high-speed bar mills, particularly for low temperature or thermomechanical rolling. The flexibility of the process with “one motor for every single pass” allows in terms of rolling schedule and reduction a great advantage to choose the best low temperature according to the desired final microstructure.

The next-generation blocks designed for Lianxin and future projects are capable of rolling up to 25 mm rebar at 750°C temperatures.

Soft cooling. After the bar rolled at the finishing stands with a temperature of 750-

780°C, to perform grain refinement, the next important aspect in process design is to freeze the microstructure before its discharging onto the cooling bed.

To avoid the benefits of the fine structure achieved, partially vanished by a long permanence of the material, setting the discharging temperature in the range of 550-600°C is required.

The product is cooled down by several water cooling-boxes to permit temperature equalization and avoid the formation of hardened structures (i.e. martensite or even bainite), no longer allowed by the new Chinese standard for construction purposes. This process is known as soft cooling, and it is definitely different from the standard quenching process.

The bar temperature control is performed using multi-cooling pipes configuration in the water boxes. Each pipe can be controlled via automatic on/off valves, and each water box is set via a pressure controlled valve bench. The automation with HMI overview software, CCT (Controlled Cooling Technology) allows a repro-



Figure 6. MEERdrive® block (Picture: SMS group)

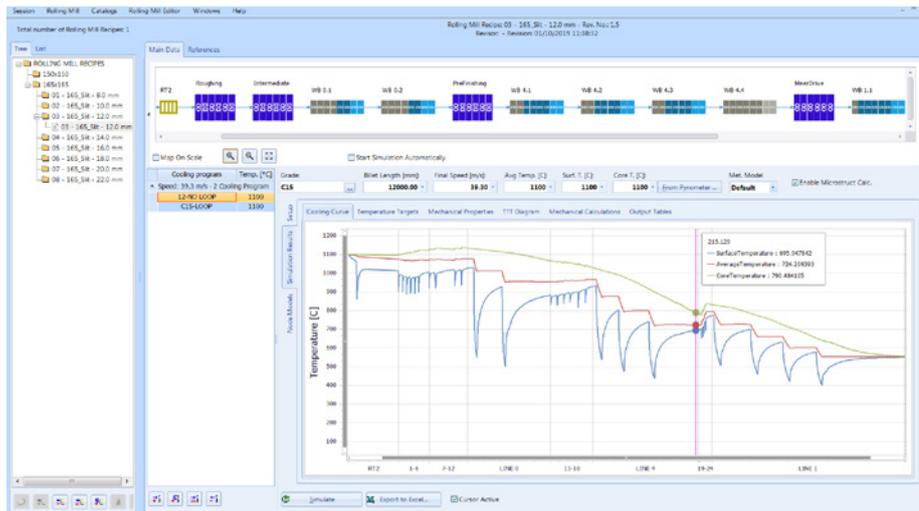


Figure 7. New CCT Program interface (Picture: SMS group)

ducible and reliable setup of the whole line.

Controlled Cooling Technology (CCT) software. SMS group as a leading supplier of long products and flat rolling mills has achieved a long tradition in developing process-integrated software.

The first model of temperature simulation dates back to the 80s and since then, great steps have been made in order to renew, update and improve algorithms and interfaces, adapting tools to new customer needs.

SMS developed the first version of CCT (Controlled Cooling Technology) and CRCT (Controlled Rolling and Cooling Technology) program back to the 90s, with the aim of helping steel producers to continuously improve the process control and increase the profitability of the mill. Now the latest release of CCT 4.0 is available with a new user-friend-

ly interface and the complete integration in the L2 automation system, **figure 7**.

The CCT program integrates all the different modules available in a rolling mill, as stands, induction furnaces, water cooling boxes, LOOP Cooling Conveyors (LCC) with fast or retarded cooling etc. to predict the temperature profile of any rolled shape from the furnace to the final product storage area.

In order to calculate the temperature losses and gains during rolling, the program takes care of the entire heat balance of the rolling process, including temperature gain.

CCT can be used as a stand-alone tool in off-line condition, to simulate the production process and obtain key determinations in plant positions, resulting in a complete presetting of several functional units, such as water boxes, cooling conveyor fans or tunnel furnaces.

This tool is a “predictor” integrating the microstructural composition to the expected grain size, the main mechanical characteristics of the finished product (i.e. hardness and yield strength). With CCT off-line all the products can be simulated and saved in a database, in different layout configurations, i.e. with high temperature rolling or thermomechanical rolling, importing the material data from a built-in steel database containing a thousand of different steel grades.

The same calculation tool can be used by the final customer to deepen his knowledge of the process even before commissioning, avoiding the considerable loss of time that normally occurs at the start-up of a new rolling mill, to create experimental knowledge on the different production methodologies.

The target of the CCT system is working with an on-line configuration and in this specific case, it becomes part of the rolling mill control system.

Starting from the billet temperature, the CCT program calculates the temperature evolution during rolling up to the finishing stage. In real time it is possible to modify products temperature acting on the controlling devices, (i.e. cooling boxes and LOOP Cooling Conveyor fans), to meet the desired final microstructure and mechanical properties.

First results during plant commissioning: rebar 8

The first thermomechanical rolling production campaign started in April 2019, with rebars 8.0 produced in two-strands, with the 20MnSi set as standard material for rebars production in P.R. China.

The starting billet is 165 mm square, 12 meters long and a resulting weight of 2,500 kg. Billets are discharged from the reheating furnace, surface-cleaned through a high-pressure water descaler and then conveyed into a 18 H and V housingless stands rolling mill, to obtain a 2x 15.0 mm feeder, for the finishing blocks.

Rebar 8 is rolled in 6 passes on the MEERdrive® finishing blocks, with a total area reduction of 74%. The stock material is firstly cooled in the intermediate cooling line, (100°C temperature decrease) then in the LOOP cooling lines, to reach the desired final entry temperature of 750-780°C.

After the finishing pass, the material is homogeneous cooled down to 550-

Table 2. Chemical composition and mechanical properties obtained for rebar 8

Billet chemical compositions of Grade HRBF400E rebar steel [%]										
C	Si	Mn	P	S	Cr	Ni	Cu	V	Nb	
0.23	0.56	1.43	0.021	0.016	0.059	0.064	0.016	---	---	
0.22	0.44	1.26	0.018	0.017	0.095	0.056	0.020	---	---	

Rebar 8 property	Values achieved	Standard HRBF400E requirement
Yield strength R_{eL}	470 MPa – 510 MPa	not less than 400 MPa
Tensile strength R_m	610 MPa – 665 MPa	not less than 540 MPa
R_m / R_{eL} ratio	1.28 – 1.35	not less than 1.25
Uniform elongation ϵ_u	11.5% – 13.9%	not less than 9.0%

600°C in order to properly discharge on the cooling bed. The target of soft cooling process after thermo-mechanical rolling is to avoid subsequent grain grow, promote formation of fine lamellar pearlite after the finishing pass and to limit the red scale formation on the rebars. The chemical composition and mechanical property results of rebar 8 produced during the first trials are summarized in **table 2**.

The microstructure is ferrite and pearlite, with a medium grain size N°11, in the middle part of the bar, and finer in the surface, as shown in **figure 8**.

Results for rebar 10 and 12

After the good results of rebar 8 as a commissioning size, further trials have been carried out with bigger dimensions such as rebar 10 and 12, with similar good results.

Rebar 10 is rolled in two strands, at 45 m/s, in 6+6 passes MEERdrive® finishing blocks, with similar area reduction of rebar 8, (72% instead of 74%) while rebar 12, being rolled at 38.5 m/s in 4 passes, has lower overall reduction, 60%. The final blocks entry temperature is 750-780°C for both sections.

Figure 8 shows the central part, middle and surface area of the three sizes rolled during the commissioning phase. Due to different rolled stock diameters, it should be noted that there are little differences in microstructures related to deviation in cooling conditions.

Medium grain size increases according to the bar size, but it remains always smaller as per what recommended by ASTM standard, (Grain size N° 9) for all the products, also at the bar core.

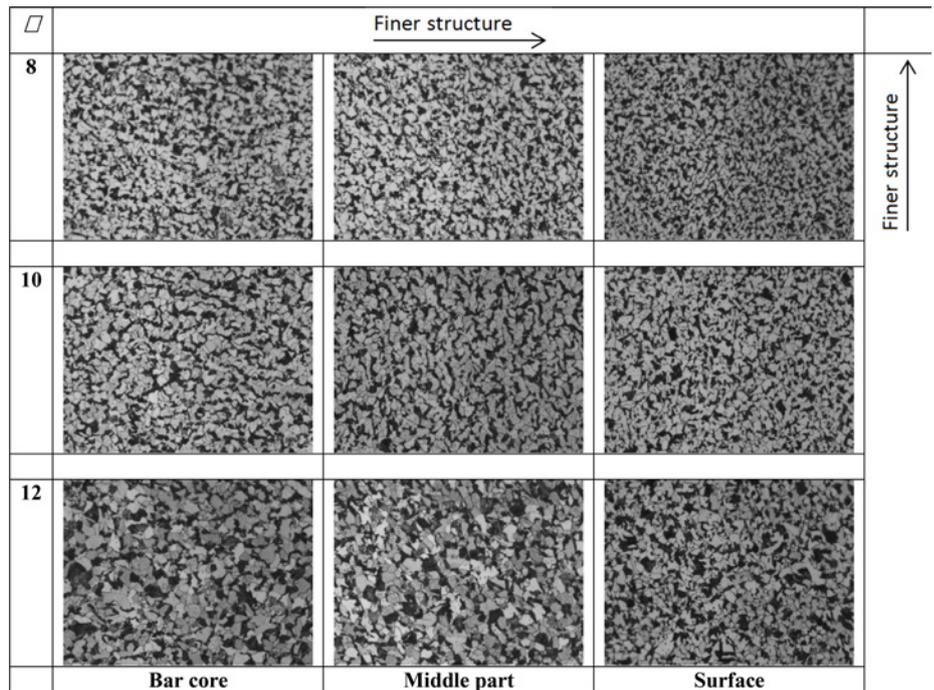


Figure 8. Rebar 8 – 10 – 12 comparison microstructures [500x] (Picture: SMS group)

Grain size ranges from 11 μm (grain size N° 10) in the surface of rebar 8, up to 14 μm (grain size N° 9.5) at the core of the rebar 12.

The average final mechanical properties are summarized in the following graphics (**figure 9**).

Conclusion

After first tests with rebar HRBF400E for diameter 8, 10 and 12, it can be summarized that thermo-mechanical rolling to produce fine grained rebars in full ferritic-pearlitic structure, has been successfully applied, and the results of the first trials show that all the mechanical properties of yield strength, tensile strength, elongation and TS/YS ratio were easily obtained.

For all three rebars produced in Lianxin, the obtained results followed Chinese standards. The grade HRBF400E showed an ultrafine (grain size always higher than 9) and weldable microstructure. Elongation and TS/YS ratio satisfied the more stringent requirements of seismic application rebar.

Mechanical characteristics are considerably higher than the standard limit, YS = 400 MPa and TS = 540 MPa, due to the Manganese contents, in the range 1.2-1.4%. Further implementations will be applied to reduce Mn content to < 0.9%, with the aim of decreasing production costs, still maintaining all the mechanical and microstructural characteristics of grade HRBF400E.

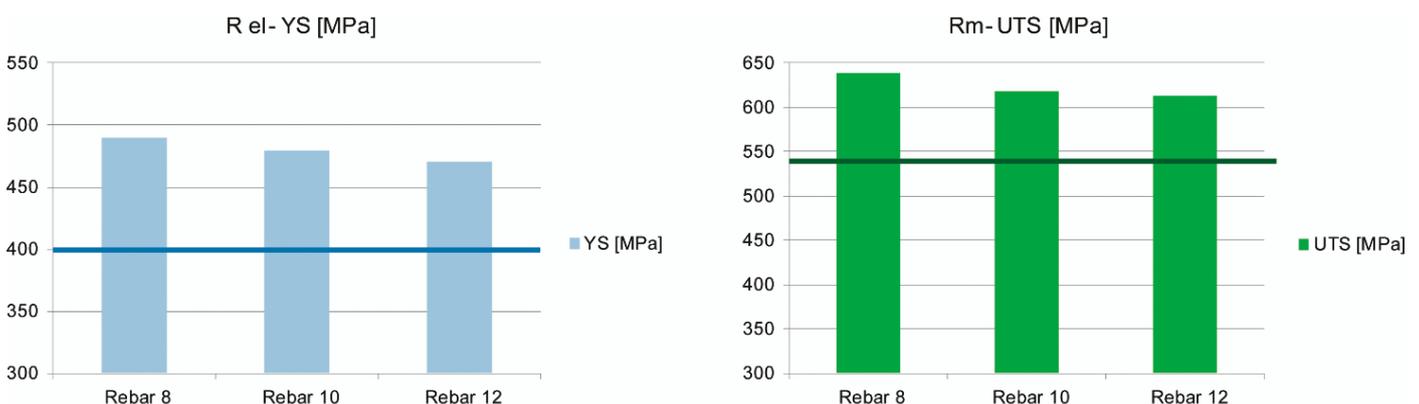


Figure 9. Comparison of average mechanical properties (Picture: SMS group)



Smart Core Pro enables the deep integration of geometrical data in the increasingly networked rolling mill production environment, making it available for cross-process data applications in the smart factory (Picture: LAP)

In-line contour measurement during rolling of long products

Geometry data networked factory-wide

LAP is presenting for the first time its new “Smart Core Pro” software for measuring the contours of long products. It enables the deep integration of geometrical data in the increasingly networked rolling mill production environment, making it available for cross-process data applications in the smart factory.

With its new “Smart Core Pro” software package, LAP introduces a system that makes the intensive, factory-wide use of long-product contour data possible, both directly in the process line and in the data structures of a networked Industry 4.0 production environment.

Its high connectivity opens up the way for the exchange of data between people, machines and processes, and the use of comprehensive contour-measurement data.

With Smart Core Pro, the results from the Contour Check Shape contour measuring system can be used directly to con-

trol the rolling process, as well as for further analysis in cross-process production control and quality assurance. The data is also available for use in MES or ERP systems, delivering comprehensive input for further use in big-data analysis or for future applications in supply-chain optimization.

In the digital factory, machines organize production autonomously, exchange information automatically, initiate actions, and control each other. Industry 4.0 in the rolling mill starts where data from measuring systems is intelligently linked with superordinate systems. Smart Core Pro makes the geometrical data of the rolled product available factory-wide in highly networked manufacturing processes. With it, users can improve processes at a higher level, and precisely evaluate quality and output.

Martin Pabst, head of the Industry Systems business unit at LAP

Contour measurement with Contour Check Shape

The systems of the Contour Check Shape series measure the contours of round products like bar, tube, ribbed steel bar, and flat, hexagonal, and octagonal profiles in-line, using laser light-section technology. They detect shape deviations like over- and underfill on one or both sides, surface defects, and roll offset and wear.

A unique feature of Smart Core Pro is the unambiguous automatic detection and classification of profile deviations and surface flaws, which allows the causes to be remedied. The software differentiates between different convex and concave contour deviations, and categorizes them into five different length classes.

As a result, the adjustment of the rolling stand no longer depends on subjective estimates, and the software gives specific information on how to set the stand. For example, the measured values for a roll offset can flow directly into the roll-adjustment target value.

That means that the rolling stand can be trimmed faster and more accurately after product changes, raising the certainty of producing within specified tolerances again within a short time, and so increasing rolling-mill output.

For two- and three-roller stands, it is important to reliably detect the orientation of the profile. An algorithm specially developed for Smart Core Pro compensates for any twisting of the material between the rolling stand and the measurement point. As a result, the contour is always detected and presented in the correct position.

This makes it possible to clearly assign the core dimensions, like gauge base and groove, shoulder, and seam size of the stand setting and the rollers causing it, which is a basic requirement for the automatic control of the rolling process.

LAP is one of the world's leading suppliers of systems that increase quality and efficiency through laser projection, laser measurement, and other processes. LAP's laser-based non-contact measuring systems are the leading solution for quality assurance in rolling mills. The company's laser systems measure the contour, thickness and straightness of steel products such as wire, tube, bar, profile and strip, during the rolling



The systems of the Contour Check Shape series measure the contours of round products in-line using laser light-section technology (Picture: LAP)

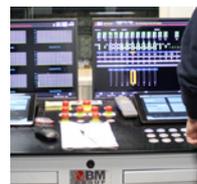
process. They are integrated in the rolling mill and detect the dimensions during ongoing operations to provide recommendations for the optimum adjustment of the rolling stand. This enables real-time quality control and ensures production dependability. The user can react immediately in the event of deviations, saving time and material. LAP's laser

systems thus reduce downtime and boost productivity. For over 30 years, measuring systems by LAP have helped improve production quality in the steel industry.

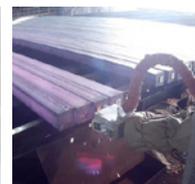
LAP GmbH Laser Applikationen, Lüneburg, Germany



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Cold finishing of tubes

Sandvik adds new tube line at Indian steel mill to boost capacity and local service

To achieve the highest straightness, low eccentricity and tight dimensional tolerances, Sandvik employs its own patented cold pilgering technique. The new cold finishing line will focus on heat exchanger tube sizes in austenitic, duplex and nickel-based alloys.

Sandvik Mehsana is a high-tech tube mill that produces advanced corrosion-resistant tube, pipe and hollows for heat exchangers and process equipment across a wide range of industries, including petrochemical, oil and gas, chemical and fertilizer. Grades range from austenitic stainless steel to duplexes and austenitic high nickel alloys. Standards fulfilled include ASTM, ASME, EN, NACE 0101/0175 and other customers specifications.

With the addition of this new high-tech line, Sandvik aims to increase the availability of its high-quality seamless stainless tube, add flexibility for introducing new grades and strengthen regional service.

The new line is mainly aimed at the production of heat exchanger tubing and for other demanding industrial applications,

“Many customers know about our austenitic and duplex programs but are surprised to learn that we have a growing range of nickel alloy grades”

Nitin Chaudhari, Production Unit Manager of PU Mehsana

and will double Mehsana’s cold-working capacity, thus allowing swifter delivery times across the Asia Pacific (APAC) region.

The cold forming process, which involves drawing and shaping of the tube, is used to impart higher strength than found in the initial annealed condition. To achieve the highest straightness, low eccentricity and tight dimensional tolerances, Sandvik employs its own patented cold pilgering technique. The new cold finishing line will focus on heat exchanger

tube sizes in austenitic, duplex and nickel-based alloys, which can be supplied straight or U-bent for shell-and-tube heat exchangers – cleaned and plugged.

“We’re delighted to announce the added annual capacity for cold finished tube,” says Sharath Satish, President of the Business Unit Tube APAC, Sandvik. “It’s part of our ongoing commitment to customers in India and the Asia Pacific region to improve the availability of our top-quality products, broaden the portfolio and become the most reliable, one-stop-shop in the region. Together with fabricators and end users, we are expanding new opportunities to boost productivity and extend the lifecycle of their equipment with the help of predictable, high-precision tubing – delivered when they need it.”

The Mehsana manufacturing facility has been successively expanded and modernised in recent years. The focus has been on boosting capacity, adding new grades and sizes, and constantly improving to meet the highest global quality standards.

“Mehsana is a key pillar in our strategy of being a reliable global supplier of advanced corrosion resistant alloy products, with a focus on materials expertise, innovation and setting the standard in our niches,” said Michael Andersson, Head of the Tube Division at Sandvik Materials Technology.

Sandvik maintains a highly integrated and sustainable manufacturing process, with tube products made from 84 percent recycled metal using efficient manufacturing processes. Driven by a “zero defects” philosophy and ambitious targets, the mill



The new line will double Mehsana’s cold-working capacity, thus allowing swifter delivery times across the Asia Pacific (APAC) region (Picture: Sandvik)

secures full traceability from melt to final tube. This means that individual heat exchanger tubes can be traced in every step of the production process back to the individual melt, heat and lot. Every tube undergoes a battery of chemical and mechanical tests, including positive material identification (PMI), so customers always know the material is what they ordered.

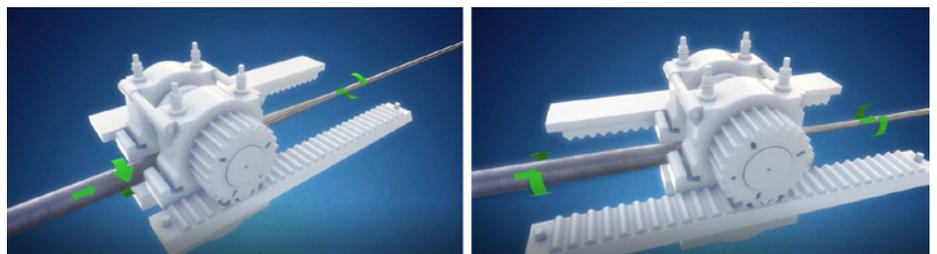
Developed and manufactured in the new facility, customers can anticipate all-new superaustenitic grades that will in many cases bridge the properties gap, at higher temperatures, between standard duplex/austenitic grades and more costly nickel alloys.

“Many customers know about our austenitic and duplex programs but are surprised to learn that we have a growing range of nickel alloy grades,” says Nitin Chaudhari, Production Unit Manager of PU Mehsana. “Many of these products fall under our Sanicro® brand, such as Sanicro® 30 (Alloy 800), Sanicro® 41 (Alloy 825), Sanicro® 70 (Alloy 600) and Sanicro® 625 (Alloy 625), to name a few. All of these alloys will be manufactured in our new facility increasing our range and local service offer to our customers,” concluded Chaudhari.

■ Sandvik Materials Technology, Sandviken, Sweden



U-bent tubes for heat exchangers (Picture: Sandvik)



Principle of the cold pigering technique (Picture: Sandvik)

Joint venture between Porsche and Schuler orders blanking line for press shop in Germany

Smart Press Shop, a joint venture between Porsche and Schuler, has ordered a Schuler laser blanking line equipped with two cutting heads.

Porsche’s new and fully-networked press shop, currently under construction as part of a joint venture with Schuler in Halle (Saale), will employ a laser blanking line 2.18, equipped with two cutting heads, for processing strip material of up to 1,880 mm width. Blanking lines with lasers do not require expensive and heavy blanking dies, which is why they are particularly suitable for the production of small batch sizes with frequent product changes. High strip speeds of the continuously moving coil material enable a cor-



The Schuler laser blanking line produces blanks from the continuously moving strip (Picture: Schuler)

respondingly high output, while ensuring gentle transport of sensitive materials such as aluminium.

The Smart Press Shop in Halle will focus on the production of aluminium exposed parts in small batch sizes. It will

supply the blanks for a Schuler servo press line, installed at the same press shop. Operations are scheduled to start in 2021.

■ Schuler

100 percent control in tube production

Lasers measure the complete geometry of tube ends

LAP has developed the "Tube End Check" measuring system for capturing the geometry of tube ends. Using sensors mounted on a robot arm, it measures the entire geometry of each tube end in-line and in time with production, making it possible to check each individual tube instead of doing spot checks.

Tube End Check is a modular system that can be configured to meet the user's needs. Depending on the setup, it measures the inside and outside diameter, wall thickness and ovality, as well as the form of the chamfers and the perpendicularity of the saw cut. LAP developed it for use in adjusting and final checks of seamless or welded tubing with outside diameters up to 1500 mm or more.

Since the system is completely integrated into the production process, it can accurately measure the ends of each individual tube. This in-line measurement obviates the need for manual offline random sampling previously used, which could often only be applied to a small percentage of the tubes.

With 100 percent checking, the quality of the tubes, for example to the

standards of the American Petroleum Institute (API), can be clearly documented. In addition, the system detects all tubes in-line that do not meet specifications. This eliminates the high costs of transporting faulty tubes back and forth if deviations are discovered only by the end user.

The results also allow conclusions to be drawn about important production process parameters. For example, when rolling seamless tubes, the rolling stand settings can be optimized.

When building pipelines that will be subjected to high pressures, it is important that the ends of tubes are perfectly aligned for welding. Perfect roundness and precise adherence to the specified diameter and wall thickness are critical here. Tube End Check delivers all the necessary

measurement values from a single pass of the sensor head.

The technology in detail

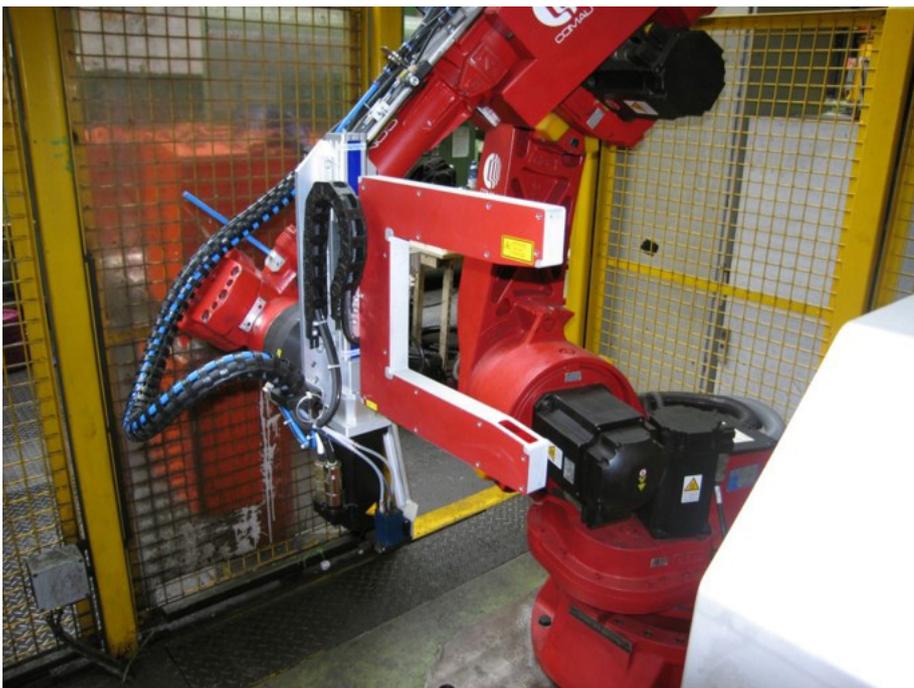
For measuring, the tube is held in the measuring position. The robot to the side of the roller conveyor extends its arm with sensors from the protected parking position into the tube end, and scans the entire tube circumference through 360°. Upon completion of measurement, the robot arm returns to the parking position. The tube then moves forward until the other end reaches the measuring position, at which time the process is repeated.

The interior and exterior contours are measured with laser triangulation sensors, and the system derives the wall thickness by comparing these two contours. An optional light-section sensor can also measure the perpendicularity of the tube and the contour of the chamfers.

Since the robot can move in multiple axes and is freely programmable, the system can be used with longitudinal as well as transverse tube advance. With transverse advance, two robots can be used to measure both ends of the tube simultaneously.

The time needed for the measurement cycle at the two tube ends is significantly less than the tube-to-tube sequential time in the production line, which typically runs 0.5 to 2.5 minutes. Measurement does not hinder the production flow in any way.

The measurement results are shown graphically at the control stand. If a tube exceeds a defined tolerance parameter, the operating personnel can immediately intervene, for example reworking the tube ends.



The robot to the side of the roller conveyor extends its arm with sensors from the protected parking position into the tube end, and scans the entire tube circumference through 360° (Picture: LAP)

■ LAP GmbH Laser Applikationen,
Lüneburg, Germany

Quality inspection of bars and tubes

Straightness measurement integrated into the production process

sema has unveiled its new “Straightness Check X-Line” gauge for inline laser-optical measurement of the straightness of bars and tubes. The new system enables 100 percent inspection without slowing the production cycle. Thanks to its modular design it can be custom-configured to meet an extraordinarily wide range of requirements and applications.

Straightness Check X-Line measures the straightness deviation in mm/m over the complete length of the product. It measures non-contact and in real time, displays the results immediately and stores the measured values for documentation purposes. A complete measuring cycle from the feeding of the product into the gauge and its discharge after the measurement takes just about two seconds. This means, the measurement does not interfere with the production cycle.

At the Tube 2020 trade fair at the latest, sema will showcase a system that measures the straightness over the complete product length with three sensors. A thus configured system would be the perfect solution, for example, for users wishing to assure that the material is within a defined minimum circumscribed circle (MCC) over its complete length.

sema’s product range also includes solutions with much higher resolution relative to the product length. Up to 16, synchronously measuring sensors can be distributed along the length of a product – arranged 500 mm apart, for example. Systems of this design even detect deviations existing only over a certain stretch of the product length – for example, bends at bar ends.

Unlike random – and extremely time-consuming – tactile measurements, automatic inline measurements enable the quality inspection of each individual bar or tube. In this way, it is even possible to decide at a very early stage of the production chain, whether it would be economically rational to further process products detected as out-of-spec. The software identifies material that does not comply with the specified quality requirements and triggers signals for the automatic bar sorting system arranged downstream to react accord-



Rounds roll through the measuring frame over a slide; the lasers are arranged in the upper part, the receiving optics in the lower part of the measuring frame (Picture: sema Systemtechnik)

“The earlier in the production chain our systems are used, the earlier the operator will be able to decide whether or not it would be economically rational to leave a product in the production chain. Thanks to the measuring frame’s small width of only about 30 cm, the gauges can be easily retrofitted to existing production lines.”

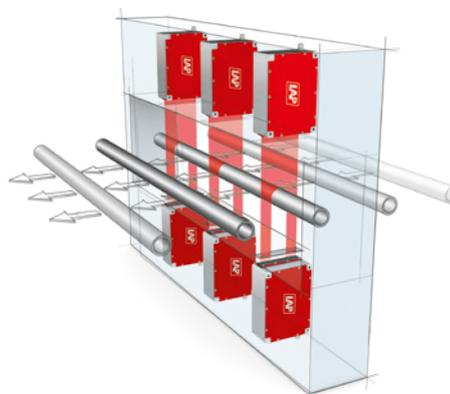
Michael Braetz, Managing Partner of sema Systemtechnik



A gauging system ready for shipment to the customer; the measuring frame is only 30 cm wide (Picture: sema Systemtechnik)



The gauge can be equipped with up to 16 sensors, as requested by the customer (Picture: LAP)



The measuring principle: The lasers (top) produce a light curtain, which is interrupted by the bar to be measured. The receiving optics (below) measures the width of the shadow cast (Picture: LAP)

ingly. This results in higher plant efficiency and less scrap.

Staightness Check X-Line can handle tubes and bars with diameters of up to 140 mm and lengths of up to 8,000 mm. Also customized solutions are available.

The gauges are usually arranged at the entry end of production lines where they check the quality of the feed material. Or they may be positioned at the end of the process chain – downstream of drawing machines, for example, or after straightening or cut-to-length lines. In either case, they enhance process security and the efficiency of the production plants. The gauges operate with a measuring accuracy of up to 0.1 mm/m.

According to Michael Braetz, Managing Partner of sema, optical straightness

measurement provides great potential for efficiency improvement: “The earlier in the production chain our systems are used, the earlier the operator will be able to decide whether or not it would be economically rational to leave a product in the production chain. Thanks to the measuring frame’s small width of only about 30 cm, the gauges can be easily retrofitted to existing production lines.”

The technology in detail

In the Straightness Check X-Line system, sema combines its competence as a full-line plant and equipment supplier with LAP’s expertise in laser technology and in the analysis of measured values.

The new gauge is based on LAP’s METIS Laser Scan micrometers, which measure the position of profiles while they roll through the measuring field over a slide.

The software calculates the straightness from data acquired during a minimum of three sectional planes. The straightness – given in mm per one reference meter – is displayed in numerical and graphical form.

As rounds are in a rotational movement during the measurement, the sensors capture their entire circumference. From this, the system calculates the minimum and the maximum diameters, and the ovality.

Thanks to the wide measuring range, the gauges can handle complete product ranges without having to be reset for product changes.

The data is stored by order numbers and retrievable for additional future analyses. In the charge statistics, for example, the total number of measured bars and the number of out-of-spec bars are separately shown.

For more than 35 years, sema systemtechnik has been a leading supplier of machinery and equipment for customers in the semi-finish-machining and packaging industries. The company manufactures and markets technologies for the straightening, inspection, sawing, end finishing and packaging of bars, tubes and other semi-finished products as well as complete finishing lines.

■ **sema Systemtechnik GmbH, Hüllhorst, Germany**

High degree of flexibility in the manufacture of spoke blanks

Rolling of variable-diameter wire

The booming electric bike market requires new manufacturing processes for bicycle spokes. The new reducing machine DD-350 from Amba achieves a much higher efficiency than conventional machines

Double thick-end spokes, i.e. spokes that are thinner in the middle than at their ends, are predominantly used in high-end bicycles. They save weight and reduce windage. The blanks for this type of spokes cannot be manufactured by drawing or upsetting.

The new spoke-blank reducing machine developed by AMBA reduces the spoke diameter between the ends by rolling to a defined smaller diameter over a freely adjustable length. The machine achieves roundness tolerances as low as two to three hundredths of a millimeter.

Background: electric bikes

The booming demand for electric bikes results in bicycles operating at higher speeds and more heavier-weight riders. As a result of these trends, the spoke ends connecting with the hub have to cope with increasingly higher loads, especially during braking. At the same time the opposite ends of the spoke may have the same diameter as common in non-electric bikes because the connection with the rim is not affected by the extra load. Consequently, there is a growing demand for spoke blanks with ends of different diameters.

The technology in detail

The new AMBA machine is servo-controlled. The length and position of the area with reduced cross section can be changed while the blank passes through. The user only enters the geometry of the blank into the CNC control unit. The machine adapts the rolling parameters automatically. All the operator needs to do is enter the data for the blank geometry into the CNC panel. The machine will automatically adjust the rolling parameters.

Manfred Houben, one of the Managing Directors of AMBA, sees great

potential for the new DD-350 machine and the various models of this product line. "The machine is servo-controlled. This allows us to respond to the requirements of the spoke manufacturers extremely flexibly – not only in terms of highest precision and performance efficiency, but also with a view to potential new applications. For example, we can design the machine with such a high power rating that it is no problem to produce spoke blanks of much larger diameters."

Cold forming of pinned joints for bicycle rims

AMBA is also offering machines for rolling and knurling pinned joints for bike rims. Whereas these parts used to be manufactured by subtractive machining, AMBA's all-in-one machine only requires one process step to form finished pinned joints directly from the cut wire rod. The finished parts are gravity-discharged from the machine.

Aachener Maschinenbau GmbH - AMBA, Alsdorf, Germany



The new machine produces double thick end spokes with a diameter of only about 1.5 mm in the middle (Picture: AMBA)

Manufacturing of cores for distribution transformers

Truly cost-efficient lamination cutting and stacking

GEORG is going to introduce its new product “precisioncut TBA300 robotline” – a machine designed for automatic cutting and stacking of core laminations for distribution transformers. An affordable addition to GEORG’s robotline series, this machine is made for handling sheets up to 300 mm wide.

Machines of GEORG’s “precisioncut robotline” series cut and stack transformer cores by means of a robot in a fully automatic process. The machines can produce complete closed and open cores, with or without top yoke. Available in different sizes and configurations, the machine series covers the full range of distribution transformers from 100 kVA to 10 MVA and up to 2,000 mm center length.

The new “GEORG precisioncut TBA 300 robotline” is designed for the cutting of laminations of up to 300 mm width and up to 1,250 mm or 1,700 mm length. The machine’s “bigger brother” – GEORG precisioncut TBA400 robotline – has already been successfully in operation at leading

transformer core manufacturers for the cutting of laminations up to 440 mm wide and up to 2,000 mm long.

Alexander Tschoeltsch, Head of Sales at GEORG’s Transformer Lines division, sees new perspectives for manufacturers of distribution transformers who still use separate cutting machines and manual

“While stacking with the same high precision as the TBA400 model, the new TBA300 robotline is a lower-cost, high-efficiency variant for the cutting and stacking of smaller-width laminations.”

Alexander Tschoeltsch, Head of Sales at GEORG’s Transformer Lines division

lamination stacking processes. “While stacking with the same high precision as the TBA400 model, the new TBA300 robotline is a lower-cost, high-efficiency variant for the cutting and stacking of smaller-width laminations. As both operations – cutting and stacking – are combined within one unit, robotline machines operate with short cycle times, generating a correspondingly high output. Another important aspect is that a robot’s performance is always the same – it works with the same high precision and speed day in, day out.”

Like all the other GEORG TBA machines, the new TBA300 robotline can operate within different digital set-ups and integrates perfectly with Industry 4.0 environments, enabling highest degrees of automation in connection with supporting logistics solutions, such as the automatic transport of the coils and the finished cores by means of autonomously operating transport platforms.

Tschoeltsch adds: “Today we are not only machine manufacturer. Beyond that, we work closely with the users of our machines in optimizing their complete process chains in order to achieve maximum profitability for our customers – our partners.”



The robot removes the cut laminations from the punching and cutting unit, transports them to the stacking area and stacks the lamination cores fully automatically and with highest accuracy of repetition (Picture: GEORG)

Heinrich GEORG GmbH Maschinenfabrik, Kreuztal, Germany



A truck manufacturer produces blanks for truck cabs on a high-tech line (Picture: Schuler)

Blanks for truck bodies

High-tech cut-to-length shear with new control and innovative stacking unit

A truck manufacturer has produced blanks for cabs on a Schuler line for almost a year now. The high-tech cut-to-length shear produces blanks from a coil. As one of the first Schuler systems, the line not only features the new uniform visualization, but also an innovative concept for stacking the blanks.

A truck manufacturer has been using a Schuler line for the production of blanks for cabs directly from the coil. The blanking line is characterized by a high degree of digitized and networked components. On the sheet metal strip of the coils, which are conveyed on a 30-meter-railroad track from the side hall to the de-coiler, there is a barcode with information from the steel manufacturer. The Schuler line matches it automatically with the stored data in the system and ensures by plausibility check that it is also the right material.

If a particularly high edge quality is required, the trimming shear at the beginning of the line can remove the left and right edges of the metal strip. This also reduces the coil diversity. An optical sensor ensures that the coil has as central a course as possible, so that the system can guarantee the necessary precision. In the next step, the circular blades of the slitting shear can cut two to four strips of different widths out of it, if smaller parts are required. The correct setting of the blades can be checked beforehand by the operator by means of a coded magnetic strip on the carrier shaft.

With two different sets of blades, the following cut-to-length shear separates the blanks from the belt. As a result, up to four blanks can be produced in one step. For a roof piece above the windscreen, for

example, an accurate cut is also possible. Both the slitting and the cut-to-length shear can be pre-equipped during operation to avoid any unnecessary standstill.

Four magnetic conveyor belts separate the blanks before they are finally stacked. With the so-called multipiling stacker, the operator is able to pile different blanks next to and behind one another on the same carrier. Up to 16 types of blanks can be transported in this way with one lift truck – an enormous gain in productivity and flexibility.

The production parameters are recorded by the system continuously from beginning to end and stored – together with the information from the rolling mill – in a barcode on the stack of blanks. In this way, the manufacturer can prove at any

time that he has produced the blank under optimal conditions.

■ Schuler Group, Göppingen, Germany

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More precision, less time and expenditure

Innovative weld-edge preparation for a huge steel arched bridge

The 296-metre-long Thomassentunnel Bridge in the Port of Rotterdam will incorporate the staggering sum of 4,200 tons of heavy plate. In cooperation with Dillinger's Heavy Fabrication Division, the Dutch construction company Hollandia Infra B.V. developed a new design for weld-edge preparation for the steel construction. Thanks to this innovation, Dillinger was able to deliver 188 heavy plates measuring up to 120 mm thick and 17 metres long – ready for installation and just in time.

Founded in 1928 and headquartered in Krimpen aan den IJssel, the Hollandia B.V. Group specialises in the development and construction of complex steel structures like bridges, locks or flood protection systems. Its reference list also boasts such prestigious projects as the London Eye, Wembley Stadium, the 162-metre-high British Airways i360 viewing tower in Brighton, and the renovation of the Wuppertal Suspension Railway. But it is the 500 bridges Hollandia has built in Northwestern Europe over the past decades – a quarter of them for rail traffic – that impressively demonstrate its proven expertise in bridge building. For the last ten years or so, Hollandia Infra with its staff of 100 has been responsible for these kinds of projects. Constructing the Thom-

assentunnel Bridge is this company's contribution to a milestone infrastructure project in the Port of Rotterdam. A consortium of five construction companies – one of them being Hollandia Infra – has been commissioned to build the substructure for the so-called Theemsweg Route for rail traffic.

The objective of the project is to redirect rail transport to this new route in order to expand capacity for the ever-increasing flow of goods being transported between the western port area and the Betuwe Route to Germany. Up to now, the transport route has led over the Calandbrug at Rozenburg – a vertical-lift bridge for trains and cars – which is regularly lifted to allow passage of shipping to and from Britanniëhaven. In future, rail traffic will use the

new route along a raised viaduct that will include two steel arch bridges. One of these bridges will be the twin-track Thomassentunnel Bridge, which will lead over the existing road tunnel of the same name.

A challenging construction task

Hollandia faced a complex of challenging tasks associated with the construction of this steel arch bridge, ranging from detailed planning, material sourcing and production of the bridge's components through to section-by-section assembly of the steel arch bridge on a designated assembly site close to its final destination and, finally, installation of the complete bridge in its ultimate location. But – as the responsible Hollandia project manager, Guus Olierook,

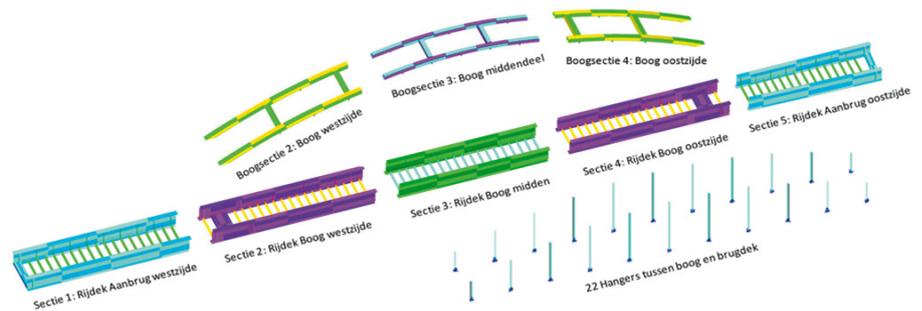


The 3D model of the Thomassentunnel bridge at its final location (Picture: Hollandia Infra)

sees it – the real challenge lay in the preparation of the assembly schedules. “The big question was, ‘How do we get this huge bridge to the assembly site directly next to the tunnel, and from there to its ultimate location?’” In addition, the assembly had to be carried out in the middle of a densely built-up industrial area with a large number of companies operating there – including petrochemical plants with a highly sensitive subterranean cable and piping infrastructure.

Hollandia decided to go for the greatest possible degree of prefabrication at its own yard in order to minimise the number of necessary transports to the assembly site. So the steel constructors divided the bridge construction into five segments that would only be connected to each other after they had been transported to the assembly site. The completely assembled bridge is scheduled to be installed in its ultimate location – in a single, giant transport operation with SPMT’s – in May 2020. When deciding on the dimensioning of the five segments, the steel constructors also had to take the size of their paint shop into account. None of the components could be longer than 60 metres. Hollandia Infra conceptualised three of the five segments as combinations of individual sections of bridge deck and arch. These were produced by first erecting the arch section, then constructing the bridge deck section. Four mobile cranes were then used to lift the arch section onto the deck section for the components to be welded together.

Once assembled and painted, the segment was then transported to the assembly site. But, first of all, Hollandia constructed the bridge’s western approach span. Only then the three combination segments of bridge deck and arch sections were fabricated. The production process was completed with the fabrication of the eastern approach span. Parallel to this, Hollandia produced 22 suspenders for the Thomassentunnel Bridge. All in all, the bridge is 269 metres long – including the two 52-metre-long and 58-metre-long approach spans. Its simple design with an extremely slender arch fits harmoniously to the surroundings. Its total height of 28 metres is made up of the 23-metre-high arch and the main girder. Including the arch, the 14-metre-wide bridge has a span length of 157 metres – and a considerable weight.



Hollandia divided the bridge construction into five segments that would be connected to each other after they had been transported to the assembly site (Picture: Hollandia Infra)

The steel construction is designed to have a maximum load-bearing capacity of 12,750 tons. Alone the heavy plate used in the construction weighs 4,200 tons. Then there’s the 3,550 tons for the concrete surface, the 4,250 tons of ballast and rails, and the maximum variable burden of the trains in the region of 850 tons. To cater

flame-cut and edge-machined components.

A crucial factor in this order was Hollandia’s request for an innovative technology to be applied to the preparation of the weld edges: a machine-produced combination of a very flat tapering and a tulip-shaped edge for very thick and very long plates. In

“With a conventional solution, we most certainly would have lost four to six weeks,”

Guus Olierook, project manager, Hollandia Group

for this enormous weight while keeping vibrations to an absolute minimum, an extremely strong and rigid steel construction was required. To this end, four so-called cross girders were welded between the flanks of the 5.5-metre-high and 1.6-metre-wide main girder for bracing. These transmit the vertical forces through the girder directly into the concrete.

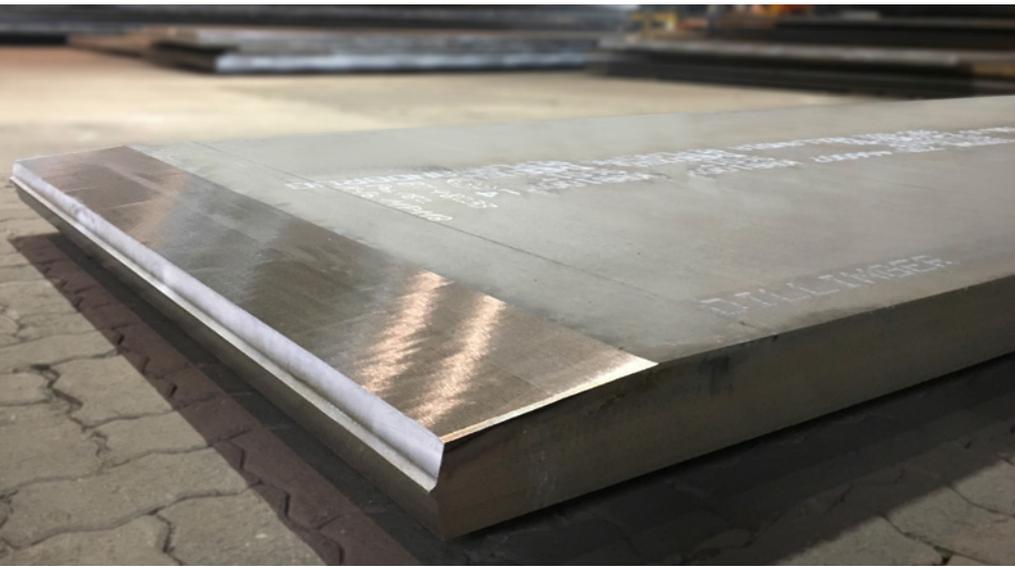
A combination of complex processing methods

For many decades now, Hollandia has relied on quality steel from Europe’s leading producer of heavy plate, Dillinger, and, for this project, it put in an order for 4,200 tons of steel grade S355 heavy plates in the variants S355J2+N, S355K2+N and S355NL. “There aren’t many steel producers in Europe that can deliver this high steel quality in such thicknesses, lengths and unit weights,” says Guus Olierook, explaining Hollandia’s choice of supplier. For the first time, 2,500 tons worth of the order was delivered directly ex works by Dillinger’s Heavy Fabrication Division as

the construction of the Thomassentunnel Bridge, Hollandia was convinced that this method of edge preparation by Dillinger’s Heavy Fabrication Division would make a substantial contribution to cost-efficient production and enable better adherence to tight tolerances and tight timelines.

Normally, the contours of girder plates are flame cut and then given the required edge treatment. Without additional handling and testing expenditure, minor variances in the measurements are unavoidable and, depending on the thickness and length of the components, deviations of three to five millimetres may occur. However, the specifications of the Port of Rotterdam authorities permit a maximum tolerance of only ± 1 millimetre. In addition to direct access to raw plates from the rolling mill, Dillinger’s Heavy Fabrication Division offers flame cutting and milled-edge-preparation under a single roof, so there is no need for intermediate transport.

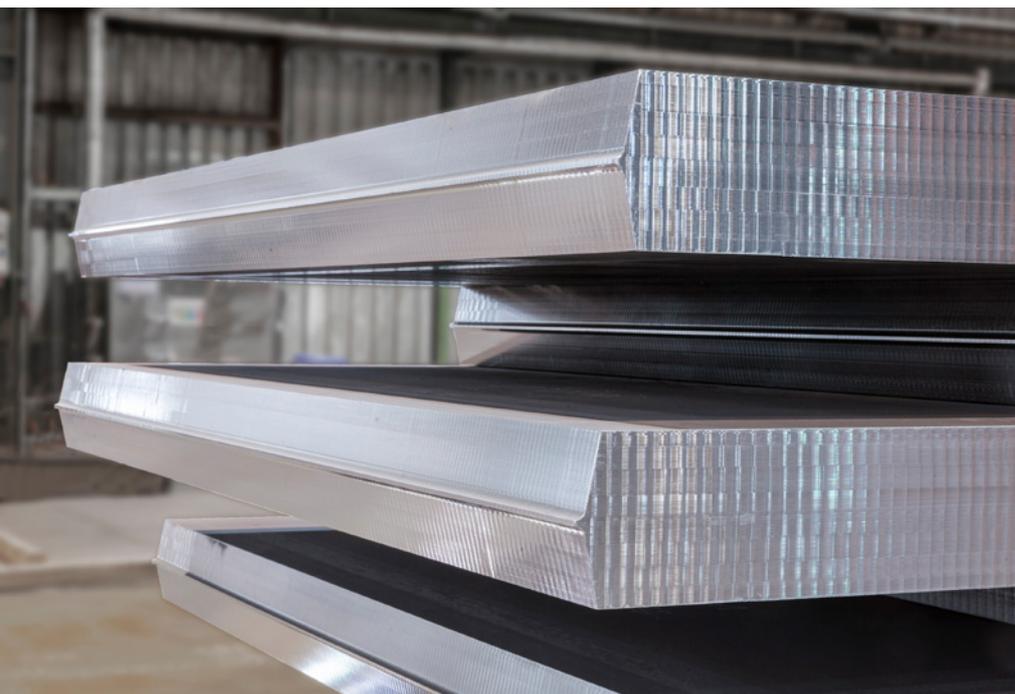
Through pre-production of components for the highly automated processes of offshore wind and offshore oil/gas industries, Dillinger has also accumulated a wealth of



The innovative weld-edge preparation of Dillinger's Heavy Fabrication Division combines a very flat tapering and a tulip-shaped edge for very thick and long plates (Picture: Dillinger)

experience with complex flame cutting and high-precision weld-edge preparation. However, in bridge construction projects, other parameters apply. In view of increasing automation in the field of welding technology, Patrick Regnery, General Manager of the Heavy Fabrication Division, has anticipated an increasing demand for an integrated, highly project-specific approach

to component and weld-edge preparation. For this reason, his division has already made a timely start on the development of a suitable procedure, and has invested in new machine technology. Sample plates produced on the basis of this new technology met with the spontaneous approval of technicians from Hollandia when they were visiting Dillingen during the enquiry



For the construction of the steel arched bridge Dillinger's Heavy Fabrication Division delivered 2.500 tons of steel as flame-cut and edge-machined components (Picture: Dillinger)

stage of the current project: "We immediately recognised that this new weld-edge preparation would be a perfect supplementary service for the Thomassentunnel Bridge," says Guus Olierook.

Close cooperation between steel construction and heavy fabrication

Intensive communication between Hollandia and Dillinger ensued, in which the detailed wishes of the bridge designers and the technical possibilities at the Heavy Fabrication Division were discussed and negotiated. The outcome: the innovative edge preparation method was applied for the complete main girder. Zoltan Szabo, who manages Dillinger's sales office in the Netherlands, was closely involved in the discussion process. As he recalls: "Compared to the demands involved in monopile production for offshore applications, the weld-edge preparation Hollandia was asking for was a very new challenge.

So, for this application, the Heavy Fabrication Division at Dillinger developed an individual edge geometry that met Hollandia's specific requirements." Project Manager Olierook explains the specifications by citing an example: the job of precisely positioning a 120-millimetre-thick plate on the main girder – at a height of over five metres. "We have to be absolutely sure that all delivered parts have exactly the right size and edge preparation." And he adds, "In this regard, the pre-production work done by Dillinger's Heavy Fabrication Division perfectly fulfilled the requirements of our assembly system."

The edge-milling machinery in Dillingen is designed for fast throughput. A heavy plate can be processed – without the need for intermediate turning – on all four edges at the same time with varied edge shaping and precisely to the required dimensions. This enabled Hollandia, for the first time, during production of the 20 sections of the approx. 27 meter long main girder, for the total main girder length of 2 x 269 meter, to immediately install all the components exactly as they were received from the supplier – already machine-processed on all edges and precision-cut to exact lengths and widths. "To begin with, we still checked all the measurements again," says Guus Olierook. "But we soon realised that we could completely rely on the quality system of Dillinger's Heavy Fabrication Division."



Guus Olierook, project manager at Hollandia (Picture: Hollandia Infra)

So post-processing of the delivered parts was not necessary and, thanks to the innovative weld-edge preparation, welding took substantially less time to complete than would have been the case with the conventional edge geometries used in steel construction. Furthermore, there was no need for time-consuming intermediate transports, or for any switching between typically different processing contractors in the supply chain – something to be avoided if possible in projects where adherence to tight tolerances is crucial. “With a conventional solution, we most certainly would have lost four to six weeks,” Guus Olierook estimates.

And there was yet another benefit for Hollandia through ordering from Dillinger’s Heavy Fabrication Division. Unlike other heavy plate mills, Dillinger can individually tailor the production of components to the customer’s specific requirements. As a result, Dillinger not only ensured punctual delivery of the right components at the right time, but also gave Hollandia more flexibility in production, including the possibility of having last-minute adjustments taken into account during ongoing order processing. When Hollandia suffered minor delays in their schedule, Dillinger was able to provide interim storage and postpone the deliveries. And if they got ahead of schedule, the already finished heavy plates were also available – just in time.

Under these conditions, Hollandia managed – within nine months – to produce all



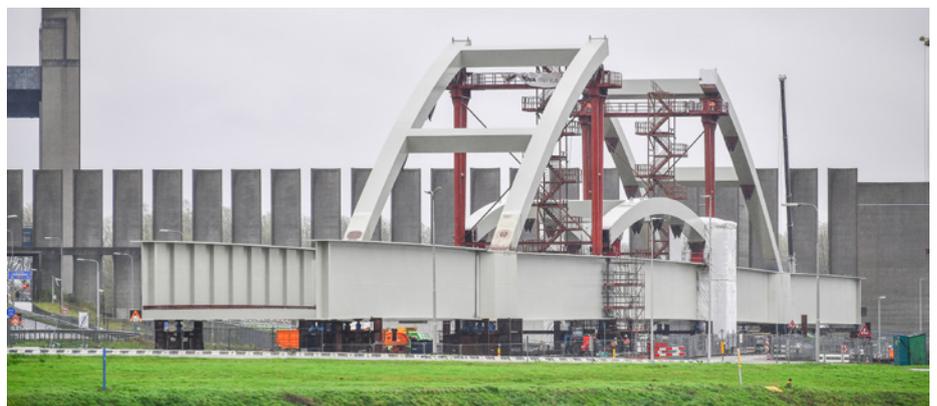
The combination segment of eastern bridge deck and arch section upon arrival at the assembly site (Picture: Hollandia Infra)

the components for the Thomassentunnel Bridge and to transport them all to the assembly site. After the final lift – the middle section of the bridge at the beginning of December 2019 – the suspenders has been installed by the beginning of 2020. Then, in May, the transport of the whole steel construction onto its ultimate location will take place – right on schedule.

For Guus Olierook, the extremely good project flow is also due to the open communication with Dillinger’s Heavy Fabrication Division. “You need this kind of exchange of ideas on an equal level in order to understand the other side’s process.” And this is why Dillinger’s Heavy Fabrication Division, with its enormous expertise and experience in welding and forming technology, was already involved as a technical development partner during

the tendering process. With corresponding success: “In a joint effort, we found this innovative solution,” the Hollandia Project Manager says, praising the constructive cooperation with the processing experts in Dillingen. As an experienced development and implementation partner, Dillinger’s Heavy Fabrication Division successfully facilitated the technical implementation of the desired steel processing “in a living project,” as Patrick Regnery proudly calls it. What has come out of the project is not only the excellence in steel Hollandia was looking for, but also a trustworthy partnership as the basis for a further joint bridge-building project.

■ *Dillinger – Heavy Fabrication Division, Dillingen, Germany*



The assembly of the various sections on the assembly area close to the final site (Picture: Hollandia Infra)

Z Modular expands annual production capacity

Automated production of steel-framed modules for off-site building construction

Z Modular, a leading innovator in off-site construction in North America, has commissioned robotics in its new automated manufacturing facility in Killeen, Texas, about 70 miles north of Austin.

Robotics at Z Modular's Killeen facility place and weld HSS to form steel module frames. The specially developed robotics, never before used in the construction industry, ensure greater precision and accelerate production. It is one of four Z Modular manufacturing facilities building with the open-source Z Modular Building Ecosystem, enabling a total annual production capacity of 930,000 square metre.

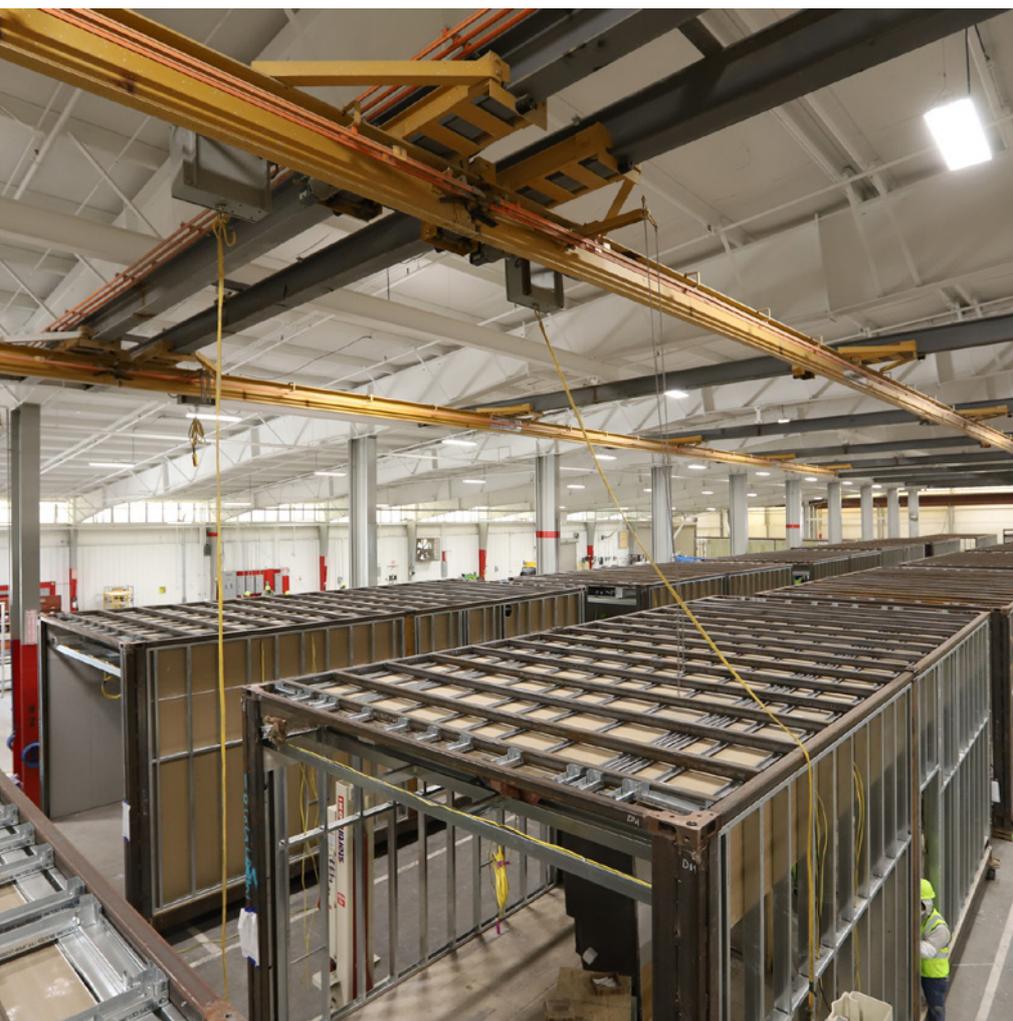
The Killeen facility features over 18,500 m² (200,000 square feet) of manufacturing space and a 185,800 m² production capacity on its own. Specialized equipment includes material-handling robots, welding robots, automated cranes, CNC machines for structural floorboards, conveyors, and 30+ stations for outfitting modules and preparing them for transportation to job sites. The equipment allows a team of

nearly 200 tradespeople, engineers and operations managers to complete up to 80% of the total construction of a project within the factory. The facility is currently producing modules for apartments and hotels.

Z Modular's three other factories are strategically located in Birmingham, Alabama; Chandler, Arizona; and Kitchener, Ontario. Z Modular design offices are located in Chicago, Illinois; Detroit, Michigan; and both Kitchener and Toronto, Ontario. The Kitchener and Chandler factories commissioned robotics in February and March, respectively, to build student housing, hotels and apartments.

"The real value of working with Z Modular comes from cost predictability, speed, quality and scale," said Mickey McNamara, president of Z Modular and executive vice president of Zekelman Industries, the parent company of Z Modular. "The way we manage quality here just can't be done on-site. And we know at the start of the design process how much the project will cost and when it'll be delivered — and we know it'll be done in as little as half the time that's possible with on-site construction."

Z Modular, a division of Zekelman Industries, is a leading off-site construction company delivering steel-framed volumetric modular buildings up to 50% faster and without cost overruns. The open-source Z Modular Building Ecosystem makes it possible by ensuring exceptional precision and project predictability. Z Modular and its affiliates use the ecosystem in facilities across North America to meet growing demand for new buildings in markets including hospitality, multifamily residential and more.



Steel-framed modules at Z Modular's Killeen facility move through the production line from fabrication to finishing before being shipped directly to the construction site

(Picture: Z Modular)

■ Z Modular, Chicago, Illinois, USA

CDP declares ArcelorMittal and thyssenkrupp top performers in climate action

ArcelorMittal and thyssenkrupp have been recognised by the non-profit organization CDP (formerly Carbon Disclosure Project) for their leadership on corporate transparency and action on climate change.

A total of 8,400 businesses took part in the assessment and were ranked on a scale

from A for top performers to F. Both ArcelorMittal and thyssenkrupp scored an A. thyssenkrupp has been named by CDP for the fourth time in a row as a global leader in climate protection. And for ArcelorMittal the 2019 CDP Climate Change assessment is an improvement from C in 2017, which means the company has reached leadership level.

CDP carries out its annual assessment on behalf of over 500 investors. The organization has the world's largest collection of corporate climate data which is recognized as a benchmark by the capital markets.

| ArcelorMittal,
thyssenkrupp

Feintool orders high-speed press for new production site in China

Schuler is going to supply a Smartline EV 3.8 press for the production of electric motors to Feintool.

Feintool has ordered a high-speed press from Schuler for the manufacture of interlocked electric motor cores at its new production site in Taicang. The Schuler Smartline EV 3.8 press processes strip up to 600 mm width and down to 0.2 mm thickness. Schuler has developed a penetration depth control system to provide perfect positioning and repeat accuracy

of the slide. The machine can run the full speed of 250 strokes per minute with the full press force of 3,150 kN and the maximum upper die weight of up to 4 t. Because the laminations' geometry has become increasingly complex, Schuler's Smartline EV 3.8 features a longer table for additional, necessary blanking operations. The press is being produced in Dalian, China.

| Schuler



The Schuler high-speed press will be used for the production of electric motors at Feintool's new facility in China. (Picture: Schuler)

FIMI acquires LAEB and MEC Service

FIMI has taken over automation specialists LAEB and its 100% subsidiary, Mec Service.

This acquisition completes the strategy of FIMI's automation division aimed at providing automation and service for the entire range of its products. With LAEB

incorporated within FIMI Automation, FIMI is now able to design and produce advanced automation systems for its plants and machines, respond in a timely manner to emergencies and provide implementation and updating services for the more than 1,500 lines installed by FIMI worldwide. Additionally, the

acquisition of LAEB's subsidiary Mec Service gives a strong impulse for FIMI Automation's second goal – the establishment of a robotics division.

| FIMI Group

NGK Spark Plug and Mitsubishi Hitachi Power Systems establish joint venture

Japanies companies NGK Spark Plug and Mitsubishi Hitachi Power Systems have concluded an agreement to establish the joint venture company CECYLLS.

The company name is derived from "Ceramic Cylindrical Cell Stacks," which is also the company's core product. The joint venture is to manufacture and sell

cylindrical cell stacks as the power generating elements used in solid oxide fuel cells (SOFC) manufactured by Mitsubishi Hitachi Power Sys-

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tems, utilizing mass production technologies of ceramics at NGK Spark Plug Co.

Solid oxide fuel cells generate electricity using oxygen from the air, along

with hydrogen and carbon monoxide extracted from reformed town gas or other sources. The cell stacks, which are the core component for power gen-

eration, are composed entirely of ceramic.

■ *Mitsubishi Hitachi Power Systems*

NLMK Metalware expands fastener production capacity in Russia

NLMK Metalware has launched a new production line for self-tapping screws.

NLMK Metalware is part of NLMK's Russia Long Products Division. It spe-

cializes in the production of wire and fasteners. The new line, designed for a capacity of 3,400 t/year of self-tapping screws, will enable the company to expand its presence in the Russian fastener market, primarily through import

replacement. The new production line will increase the company's fastener output by 50%.

■ *NLMK*

Schuler expands spare parts warehouse

Schuler has expanded its spare parts warehouse at the company headquarters in Göppingen/Germany to ensure high availability and fast delivery of components for its customers.

When a component on a press fails, it has to be replaced as quickly as possible so that production can be resumed with min-

imal delay. Schuler customers can now be even more assured of an excellent spare part service as Schuler has expanded its warehouse capacity.

"We stock replacement parts, critical machine components and entire assemblies for all of the machines from Schuler and our other brands, no matter when the machine was built or whether it's a hydraulic press, mechanical press or the accompanying automation," says managing director Dr. Martin Habert, who oversees Service at Schuler. Schuler has 250 experienced technicians available worldwide to assist with the



Schuler has expanded its spare parts warehouse at its headquarters in Göppingen. Customers can rest assured that they are getting their parts in a timely manner straight from the manufacturer (Picture: Schuler)

removal and installation of parts, with service companies located in over 40 countries. For customers in Asia and the Americas, Schuler maintains additional spare parts and logistics centers in Dalian (China) and Hastings (USA).

■ *Schuler*

BEAMIT expands additive manufacturing capacities

Italian provider of additive manufacturing services, BEAMIT, has signed a letter of intent for the purchase of 15 selective laser melting machines from SLM Solutions within the next three years.

BEAMIT continues to rely on proven SLM® multi-laser technology. "Through the replacement of single laser products with SLM Solutions' multi-laser technology we are able to increase our productivity and provide competitive pricing to our customers, says Mauro Antolotti, chairman and founder of BEAMIT. The commitment is in line with BEAMIT's intended plant expansion.

■ *SLM Solutions*

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Positive outlook for 2020

Klöckner & Co concluded 2019 with falling sales and earnings in difficult markets

In 2019 the steel distributor generated an operating income considerably below the previous year. However, the group can bank on a strongly positive cash flow from operating activities. The digital share of sales is increasing. Against the background of the impact of the global Covid-19 pandemic on the economy, Klöckner & Co. revised the expectations for the fiscal year 2020.

Falling steel prices and weak demand resulted in a decline of around 7% in Klöckner & Co's sales to €6.3 billion in fiscal year 2019. While operating income (EBITDA) before material special effects was within the guidance range at €124 million (2018: €229 million), it remained substantially below the prior year, as did net income (negative €55 million, compared with €69 million in 2018). Earnings per share consequently amounted to a negative €0.56 (2018: positive €0.68). The negative earnings performance contrasted with a strongly positive cash flow from operating activities of €204 million, mainly driven by strict cuts in net working capital.

In light of the negative net income, the Management Board and Supervisory Board will be proposing to the Annual General Meeting on May 20, 2020 that no dividend be distributed for the fiscal year 2019.

Despite the difficult market environment, the company continued to drive its digital transformation forward. The share of sales generated via digital channels increased again, reaching 32% in the fourth quarter of 2019 (Q4 2018: 25%). The Kloeckner Assistant, a digital application, was also launched, which uses artificial intelligence to automate and significantly speed up the processing of price inquiries and orders received through conventional channels such as fax or phone. This makes virtually every customer a digital customer without having to change their processes.

The XOM Materials open industry platform launched by Klöckner & Co again showed dynamic growth during the past fiscal year. More than 60 suppliers with some 22,000 products and around 700 customers were already registered with XOM Materials at the beginning of the cur-

Thanks to the substantial progress we have made, we are optimistic that Klöckner's digital transformation will deliver an additional contribution to the operating income

Gisbert Rühl, CEO of Klöckner & Co SE (said on March 10, 2020)

rent year. The integration of additional solutions such as eShops and eProcurement services will further enhance the platform's attractiveness, thus additionally boosting growth.

Covid-19 pandemic to burden the business in 2020

Given the upcoming challenges posed by the Covid-19 outbreak, the global crisis measures taken in relation thereto and the unforeseeable developments in the coming weeks and months, the economic impact of the pandemic on Klöckner & Co can neither be adequately determined nor reliably quantified at this stage.

Klöckner & Co has significant liquidity reserves to counter the crisis. The management has reacted immediately on this crisis and taken comprehensive measures to protect the health of its employees as well as to prepare its business for this crisis. This comprises the activation of emergency plans and the temporary reduction of operations (inter alia by way of short time working). The group is intensively dealing with the current situation and its development and will take appropriate further measures, as the case may be. Overall, the measures will generate a positive cash flow from operating activities in the second quarter of 2020.

The share of sales generated via digital channels is to be raised to over 40%

this year and to over 60% by 2022. By that point, the expansion of digital solutions will substantially increase efficiency and market share for Klöckner & Co. The company expects this alone to generate an additional contribution to operating income of at least €100 million by 2022.

■ Klöckner & Co.



Gisbert Rühl, CEO of Klöckner & Co SE, has taken comprehensive measures to prepare the business for this crisis
(Picture: Klöckner & Co)

How B2B companies can benefit from social media marketing

Increase in brand awareness and enhanced customer relationship

The use of social media marketing has become essential for many B2B companies and can be used as an integral part of their marketing communication as well as on the customer journey. Social media platforms, including LinkedIn, Twitter, Facebook and Instagram offer companies the opportunity to distinguish themselves and increase their brand awareness. They allow B2B companies to engage with their target audiences in a variety of ways and to respond to customers' needs. Relevant and valuable content that creates value for the user increases the credibility and trust enjoyed by many companies. Social media marketing has thus become a relevant value-adding factor that B2B companies can use to achieve a positive brand perception.

Social media marketing enables B2B companies to increase their digital visibility and to attract the interest of the target audience. Through informative and valuable content on their own social media platforms, B2B companies can create real value for their customers and thereby increase their brand awareness. A relationship of trust can be developed and a brand authority established through high-quality content. Trust in a corporate brand plays a critical role in the purchasing process. The

networks enable B2B companies to show their personal side and to create a pleasant customer experience. This strengthens the customer relationship and increases the emotionalization of the corporate brand.

Social networks as a source of information

In recent years, social media platforms have gained in relevance as an important

source of information. Nowadays, customers expect companies to keep them informed by being available on social media. Many B2B buyers, prior to making a purchase decision, use social media platforms as a search engine with which to obtain provider information. Social media thus exercises a support function in the B2B purchase decision and acts as an important information channel in the B2B purchase process. Through provision of relevant information, the customer experience can be improved and customer advice made available. Targeted and relevant information enables providers to influence the purchasing decision process in their favour.

User interaction

Social media channels create an interactive user dialogue which enables B2B companies to respond to customers' needs and to gain valuable insights. The dialogue with customers through social media enables companies to identify needs and react to reported problems. Direct feedback can be obtained and implemented quickly. This engagement strengthens customer loyalty and builds trust in the corporate brand. The versatile points of contact and direct interaction with users create a connection to the company and its employees. Videos make it possible to demonstrate product applications and to address important questions. In the process, prompt assistance can be provided and changed expectations can be addressed. This makes the users feel valued and appreciated. The use of social



Choosing the right social media channel is critical (Picture: Böllinghaus Steel)

Anastasia Kvitkina, Manager E-Commerce, Böllinghaus Steel GmbH, Hilden, Germany – Contact: kvitkina@boellinghaus.de

media marketing helps corporate brands to build a community and to turn users into loyal supporters of the corporate brand. The direct and flexible communication with the customer makes it possible to win out against competitors in the long term.

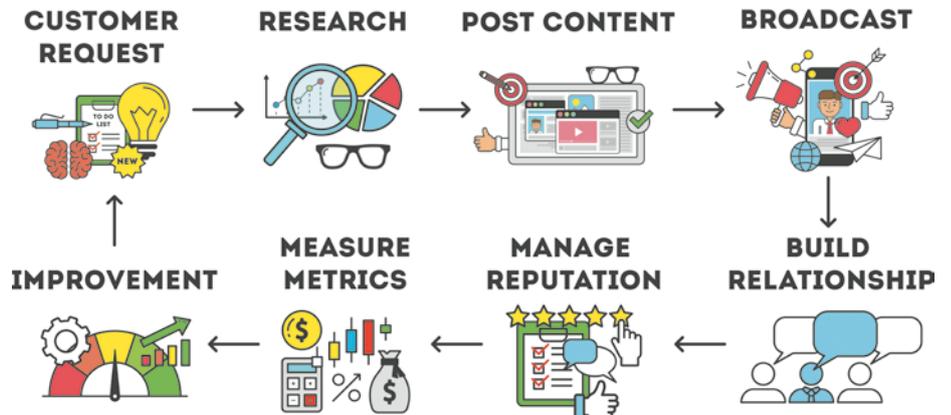
SEO – search engine optimization

The publication of content on social media platforms supports SEO measures and increases visibility in the search engines. Sharing social media posts increases the number of visitors to the website and the inbound data exchange. In this way, the search engines perceive the company website as credible, relevant and legitimate. Popular content is favoured in the search results and leads to a better ranking on Google. Through the release and publication of quality content, new interested parties are made aware of the company. Relevant search terms and keywords should be included in the posts in order to reach the right target audience. Social media marketing should therefore be considered in the corporate SEO strategy, since it also generates relevant backlinks.

Employee recruitment

In this age of scarcity of skilled professionals, social media platforms nowadays serve as reputable recruitment sites for reaching new employees and providing authentic insights into the company. With exciting and relevant content, as well as the participation of employees as brand ambassadors, companies are made tangible and accessible. This communicates corporate values and improves brand loyalty. Potential candidates are given the opportunity to get to know the diversity and digital agility of the company and to consume company-related content. Recruitment campaigns can be implemented on platforms, e.g. Instagram, to target a younger audience and to communicate the company’s personality. Companies can use video and photo content to demonstrate the attractiveness of the profession as well as their own benefits. Potential applicants can get a personal look behind the scenes and thus build a company connection. The perception of the corporate brand can also be strengthened. Social networks offer many opportunities to be remembered by potential applicants and to position themselves well in the “war for talents”.

SOCIAL MEDIA PROCESS



Social media networks offer B2B companies many opportunities (Picture: Böllinghaus Steel)

Communication of industry expertise

Social networks enable B2B companies to establish themselves as opinion leaders in an industry and to convey specialist knowledge through relevant content. Relevant knowledge and expertise can thus be communicated to users. This strengthens the company’s credibility and confidence and supports the B2B buyer in the decision-making process. Industry experts generate more leads on average and create customer trust. The company’s brand authority can be strengthened and a pioneering role can be assumed.

Communication of corporate mindset and purpose

Consumers want to deal with trustworthy and authentic companies that enable flexible communication. Social networks allow companies to demonstrate an attitude on a number of issues and to communicate their own company values and brand messages. The company’s purpose and the meaningfulness of one’s undertaking can be shown through social media networks. Today, the purpose of a company determines the willingness of many decision-makers to buy and influences the stakeholders’ trust.

Target-oriented advertising

Social media allow companies to place sponsored advertising to reach the desired

target audience better and to increase brand awareness.

Paid advertising enables companies to understand the target group better and to generate more customer insights. This makes it easier to respond to the needs and behaviour of the target audience. Advertising campaigns can redirect customers to the company’s website and thus offer the opportunity to attract more potential buyers. Accordingly, social media networks have become an important sales channel for many companies.

Tips for implementing B2B social media marketing

Definition of the target audience and specification of the right platform.

Social media marketing requires a target group analysis in order to better tailor the content to the interests and needs of the users. In the preparatory phase of the advertising campaign, the relevant target group should be defined so as to use the platforms specifically and to develop a suitable communication strategy. The definition of personas can be useful for identifying the right target audience. Many B2B companies, including Böllinghaus Steel, rely on LinkedIn as a relevant social media network to communicate with the target audience.

Concept design and planning. Social media marketing requires systematic and thoughtful planning. Relevant posts have to be shared regularly and interaction with



Social media marketing requires a target group analysis (Picture: Böllinghaus Steel)

users requires coordination, effort and resources. Content that offers value to the target audience must be identified and created.

The frequency of the postings as well as the associated responsibilities should be recorded in a content calendar. At the same time, posting content should be an enjoyable and creative process.

Content that creates value for the consumer. Users want to consume relevant

content that offers them added value and inspiration. The target audience should be given a reason to follow the company's social media account. The content must be based on the interests and needs of the target audience. Böllinghaus Steel, for instance, introduces its employees in its postings in order to create trust and project the company's authenticity, giving it a personal touch and a face. By this means, brand recognition and brand loyalty are created.

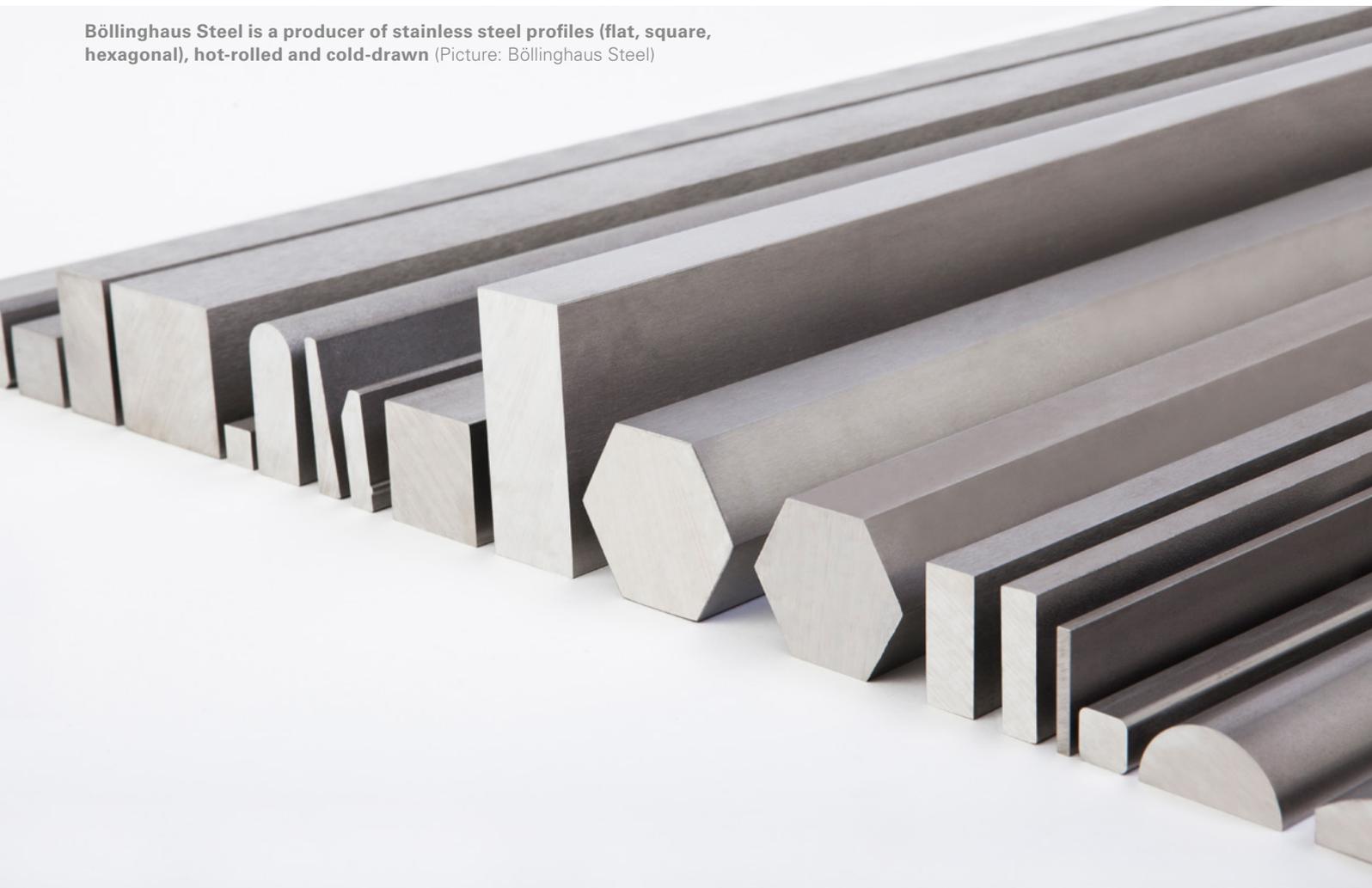
Conclusion

In times of mobility and digitalization, social media offers many opportunities and has established itself as a valuable marketing tool. It increases brand loyalty, facilitates customer-centred communication and consolidates expert status. B2B companies can target potential customers with valuable content and storytelling by using social media networks. This means that customers' needs can be better addressed. The choice of the right platform is crucial.

For Böllinghaus Steel, social media marketing is an important part of the overall marketing communication strategy. The company places its emphasis on relevant content that is tailored to the needs of the target audience. Böllinghaus Steel puts the customer at the centre of its operations and thereby creates customer trust and a true experience.

■ *Böllinghaus Steel GmbH, Hilden, Germany*

Böllinghaus Steel is a producer of stainless steel profiles (flat, square, hexagonal), hot-rolled and cold-drawn (Picture: Böllinghaus Steel)



Coswig: Cast rolls for high-tech solutions

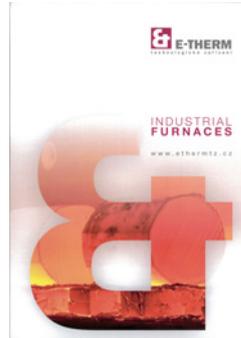


10 pages, English, German, Russian

Walzengießerei Coswig develops and manufactures tailor-made rolls for all applications and requirements: cast profile rolls, edger rolls and rolling rings with first-class surface finishing and high-end, customized machining. For hydraulic press systems, Coswig produces ready-to-install pressure pistons and plungers.

Walzengießerei Coswig, Grenzstraße 1, 01640 Coswig, Germany, fon: +49 3523 950, wgc@walze-coswig.de

E-therm: Industrial furnaces



8 pages, English, German, Russian, Czech

A detailed brochure describing the supply range of Czech engineering company E-therm, specialists in the field of industrial thermoprocessing equipment. Featured in the brochure are the company's furnaces, for example, for batch processing, walking-beam, roller-hearth and pusher-type furnaces, and special equipment for heat stability testing.

E-therm TZ, K Letišti 908, 339 01 Klatovy, Czech Republic, fon: +420 378 603 251, ethermtz@ethermtz.cz

Kranbau Köthen: Hydraulic presses for hot and cold forming of metal

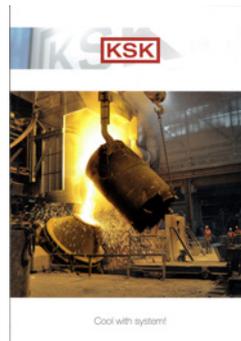


16 pages, English, German

Kranbau Koethen presents its range of special-purpose, process and automatic cranes. The portfolio includes ladle and charging cranes, slab transport and turning cranes, gripper cranes, forging cranes, automated coil storage cranes, complete crane bridges, gantry cranes and traverses with weighing equipment.

Kranbau Köthen, Am Hollaender Weg 5-7, 06366 Koethen, Germany, fon: +49 3496 7000, info@kranbau.de

KSK: Heat engineering and cooling systems



12 pages, English, German, Russian

This brochure sets out KSK's products and services in heat engineering for melting and recycling processes, exhaust gas treatment and waste water utilization. Services provided by the company include analyses, plant optimization, engineering, assembling and commissioning, maintenance, and supply and storage of spare parts.

Kuhlmann – System – Kühltechnik, An der Ziegelei 11, 45721 Haltern, Germany, fon: +49 2364 105390, info@k-s-k.de

MWE – Mill Technologies: Innovative solutions for the rolling mill industry

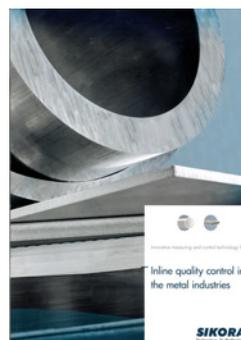


44 pages, English, German

A technical brochure featuring technical data of various mill layouts provided by MWE, e.g. of small and medium section mills, wire rod and bar mills, breakdown mill stands and universal mill stands. Also different types of crank shears and special-purpose machines are presented in this comprehensive brochure.

MWE – Mill Technologies, Schilfbreite 3, 39120 Magdeburg, Germany, fon: +49 391 607 4460, info@mwe-gmbh.com

Sikora: Inline quality control in the metals industry



8 pages, English

In this brochure, Sikora outlines its range of laser, X-ray and millimeter-wave technologies for the measurement of diameter, ovality, wall thickness and eccentricity of products such as metal tubes, pipes, strips and plates. The brochure gives the technical data of the instruments and their measuring principles.

Sikora AG, Bruchweide 2, 28307 Bremen, Germany, fon: +49 421 48900 0, sales@sikora.net

Date set for 2023 Bright World of Metals trade fair quartet

Next GIFA, METEC, THERMPROCESS and NEWCAST trade fairs will take place in Düsseldorf from 12 to 16 June 2023.

The trade fairs' duration of five days has remained the same; however, the week-

days have changed. GIFA, METEC, THERMPROCESS and NEWCAST, the leading trade fairs for metallurgy and foundry technology, will start on a Monday and end on Friday, 16 June 2023. This change takes into account the results of

the exhibitor and visitor survey conducted during the 2019 show.

■ *Messe Düsseldorf*

Gregory Industries launches new tube division

Gregory Industries has launched Gregory Tube, an evolution of its steel tube division, formerly known as Mid-Ohio Tubing (USA).

Gregory Industries purchased a facility in Decatur, Alabama/USA, which will serve as the manufacturing headquarters for Gregory Tube. A legacy Mid-Ohio Tubing facility in Butler, Ohio, will remain in operation for the next few months, but all man-

ufacturing is expected to transition to Decatur by May 2020.

By expanding the company's service area beyond central Ohio, Gregory Tube is able to serve customers throughout the southeastern states with competitive prices, quick turnarounds and reliable support. For current customers, there will be no disruption in service as the changes take effect.

For more than 100 years and five generations, Gregory Industries has served

customers throughout North America with roll formed steel products used in demanding applications. In June 2017, Gregory Industries acquired Mid-Ohio Tubing, expanding its line of galvanized roll formed steel products to include steel tubing and metal building accessories.

■ *Gregory Industries, USA*

Klößner & Co commits to "Business Ambition for 1.5°C"

Klößner & Co steps up to 186 global front runners of climate change engagement and will align its business to the UN Global Compact "Business Ambition for 1.5°C".

Klößner & Co assumes its social responsibility by implementing ambitious climate

goals. The company intends to act even more responsibly and take appropriate and verifiable measures helping to limit the global temperature rise to 1.5°C by reducing its greenhouse gas emissions.

"Business Ambition for 1.5°C" is an initiative by the UN Global Compact. The campaign is calling for businesses to step

up and take their part in limiting global temperature rise to 1.5°C. The call-to-action was announced by more than 25 businesses, civil societies and UN leaders in June 2019.

■ *Klößner & Co*

Salzgitter Mannesmann Staalhandel takes over Statendam Steel Plates

Netherlands-based Salzgitter Mannesmann Staalhandel, a group company of Salzgitter AG, has taken over heavy-plate specialist trading company Statendam Steel Plates B.V.

Both companies operate out of Oosterhout. Statendam Steel Plates supplies

companies in the Netherlands in the sectors of construction, trading, boiler manufacturing, mechanical engineering, metalworking, offshore and ship building. The acquisition enables Salzgitter Mannesmann Staalhandel to extend its product portfolio and strengthen its market presence in the

Netherlands. The company is part of Düsseldorf-based Salzgitter Mannesmann Handel GmbH, the head of the trading business unit within the Salzgitter Group.

■ *Salzgitter AG*

thyssenkrupp Materials Services to build new logistics centre

thyssenkrupp Materials Services is going to build a state-of-the-art logistics centre in Rotenburg in Lower Saxony.

With the new location, thyssenkrupp Schulte, a subsidiary of Materials Services, is introducing a logistics concept that is new in the industry: The goods will be

transported to the truck, instead of the trucks stopping at various stations within the warehouses. "With the 'goods-to-truck' concept we are taking a completely

new approach in our industry," says Tobias Hegmanns, Chief Operating Officer of thyssenkrupp Schulte. "We expect a significant increase in productivity as a result of optimized logistics processes."

The optimized material flow and the use of driverless transport systems ensure faster and more efficient loading and unloading. The concept offers the greatest possible safety for the employees, as there will be no more cross-traffic in the storage and processing area.

In the new logistics centre, 20,000 t of materials such as aluminium, stainless steel and steel will be kept in stock on an area of around 36,000 m². Materials Services will be using its digital innovations,

including the 'alfred' artificial intelligence platform, which ensures optimum coordination of supply streams for customers. In addition, toii, the propriety IoT platform developed by Materials Services, will assure highly efficient process coordination. The new centre is scheduled to be opened in mid-2021.

| thyssenkrupp Materials Services

Laying of the foundation stone for the new state-of-the-art logistics centre in Rotenburg (Picture: thyssenkrupp Materials Services)



thyssenkrupp Materials Services enhances e-commerce activities

thyssenkrupp group's materials distribution and service provider, Materials Services, has purchased the data model for materials and anonymized product data from Mapudo GmbH, a former online marketplace for steel products.

"Relevant and accurate product data is an important decision-making aid for our customers and an indispensable prerequisite for the further digitalization of the industry", says Volker Hewing, head of IT Foundation responsible for master data management at thyssenkrupp Materials Services.

"There are no standards for metallic materials, such as EAN codes, which are

not specific to any particular trader or producer. Accordingly, materials must be identified by their properties. At Mapudo, we have created a multi-layered product typology that enables efficient and consistent comparison of materials and at the same time enrichment of product data," says Niklas Friederichsen, managing director of Mapudo GmbH. The acquired data contains product descriptions for easier materials identification and mapping in the online shops and portals of thyssenkrupp Materials Services.

| thyssenkrupp Materials Services



The new data model will enhance e-shopping of steel products (Picture: thyssenkrupp Materials Services)



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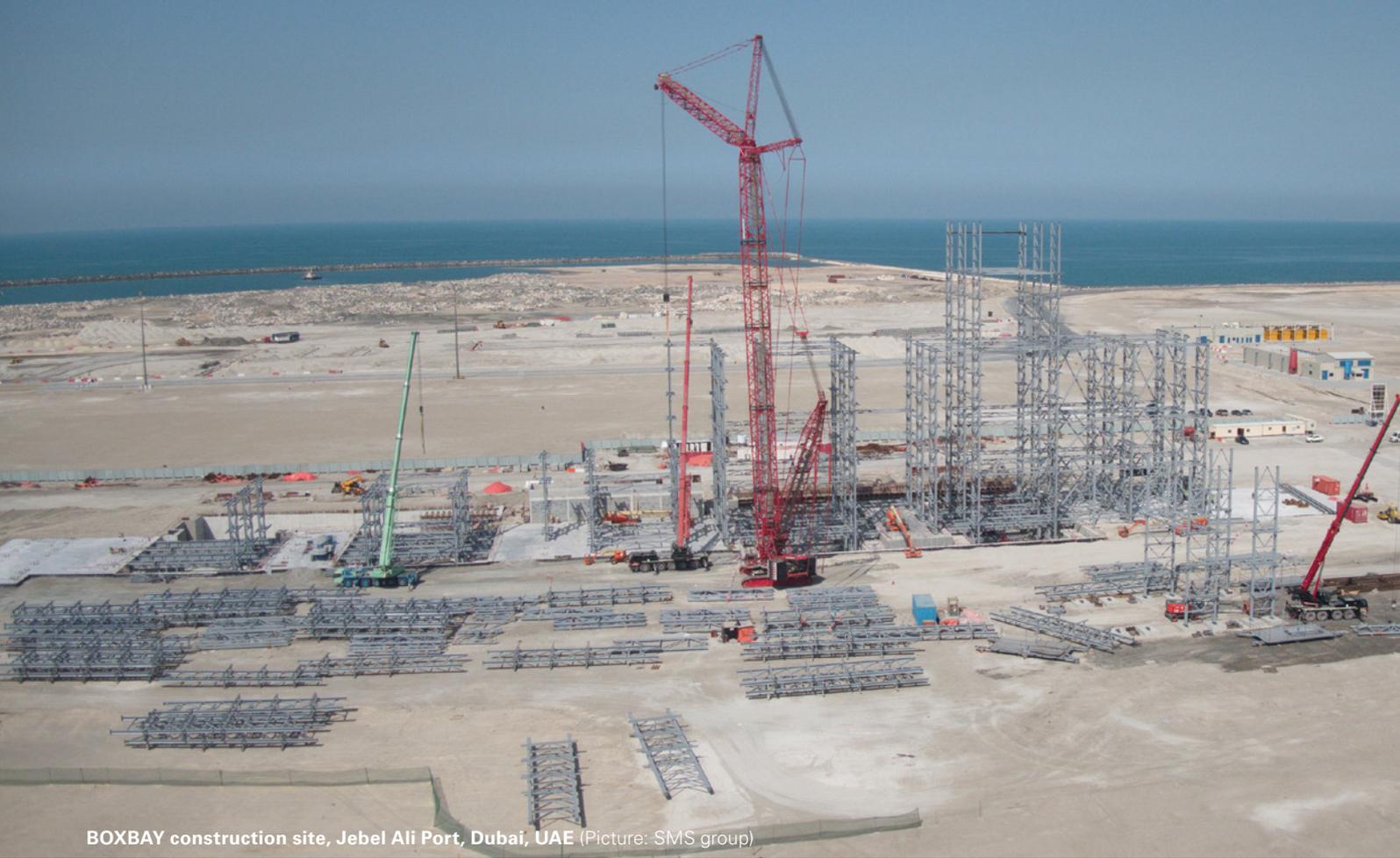
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BOXBAY construction site, Jebel Ali Port, Dubai, UAE (Picture: SMS group)

High bay store system for container ports

BOXBAY – the future is vertical

How a disruptive technology revolutionizes port logistics: BOXBAY – a JV between engineering company SMS group and port company DP World based in Dubai. The very first BOXBAY system is currently under construction at the port of Dubai (Jebel Ali Harbor).

The worldwide turnover of traded goods in sea ports has been rising continuously. Much bigger than aircraft carriers, modern container vessels carry nowadays 24,000 or more standard 20-foot containers. The problem resulting from this is that most of the existing sea ports cannot keep up with this growth, as in many cases the available space behind the quay wall and the overall capacity of container terminals are limited.

Increasing freight capacities result in a corresponding rise in the number of containers to be unloaded from and loaded onto a vessel during berthing. Expanding an existing container terminal is often not possible, simply because the necessary space is not available. Technological enhancements have significantly reduced container cranes need to load and unload the ships at the quays. Still, the most critical bottleneck very often is the down-

stream storage facilities, which often struggle to cope with the constantly growing number of incoming and outgoing containers.

Currently, the containers in the ports are stacked up to six tiers high. Stacking containers higher than that – in order to cope with the growing number of containers to be handled – makes this storage method inefficient because the higher the stack, the more containers have to be re-shuffled to get access to a particular container. In other words, the problem is that the logistics downstream of the RTG yard along the quay is too slow and requires too much space.

Here the new BOXBAY system provides the perfect solution. BOXBAY consists of a fully digitalized, automated 11-tier High Bay Store (HBS) for containers, with 100 percent direct accessibility to each individual container, no matter where in

the store it is positioned. BOXBAY provides more than three times the yard capacity of conventional Big MEA RTG storage systems of the same footprint, achieves a more than 20 percent higher throughput rate at the quay, and requires less than one third of the footprint to store an equivalent number of containers. Another key advantage of High Bay Storage over conventional container stacking is that any container can be directly accessed without any re-shuffling. Thus it is possible to create extra capacity by building higher. In this way, BOXBAY solves one of the biggest problems faced by container ports today: limited space.

Burkhard Dahmen, CEO of SMS group says: "BOXBAY is a disruptive innovation which sets entirely new standards in port logistics in terms of throughput, footprint and digitalization. We and our partner DP World are convinced that our solution will



up new perspectives and create added value for our customers. We are really excited about BOXBAY because it boosts the speed and efficiency of container handling in ports - two key success factors in the port and container terminal business. We believe that this new system is a game-changing development for the global port industry."

The very first BOXBAY system is being constructed at the port of Dubai (Jebel Ali Harbor). It will be commissioned in summer 2020 and be one of the highlights of the World Expo 2020 in Dubai. The prospects for the new technology are very promising. The innovation was first presented to industry experts at TOC Europe, the world's most important trade fair for port, ship and terminal technology, staged in Rotterdam. The technology arose great interest among port experts, last but not least, thanks to the system's maturity and practice readiness.

The BOXBAY system and its basic functionalities

be increasingly replacing conventional container storage systems. BOXBAY not only makes port logistics faster while requiring a much smaller footprint, it also allows any container stored to be directly accessed and moved without any re-shuffling."

Also Sultan Ahmed Bin Sulayem, Chairman and CEO of DP World Group, is convinced that the new system will have a bright future: "We are always keen on discovering new technologies that open

BOXBAY is a High Bay Storage (HBS) system suitable for 20-foot, 40-foot and 45-foot containers, in other words: for all standard-size containers. It can be up to eleven stories high. The throughput and storage capacity of BOXBAY is scalable by increasing the number of aisles and/or the number of stacker cranes used. Being a modular system, it can be expanded step by

step as required. This makes it the system of choice especially for brownfield projects.

The containers are placed in the racks and removed by stacker cranes traveling along the aisles. Each stacker crane serves both racks arranged along an aisle. This provides BOXBAY the flexibility to place or remove the containers on either side of the aisle.

In the basement of the HBS structure, there is a circulating underfloor transport system of rail-bound pallets. The stacker cranes can lower containers removed from the racks all the way down into the basement of the HBS and position them on the circulating pallets. Likewise they can pick containers up from the pallets and lift them up to the racks. The pallet system can transfer incoming containers to the land-side truck interface or transport containers designated for export from the land-side interface to the sea port storage yard.

In a BOXBAY store, two completely decoupled transport systems operate in parallel, but completely independently from each other: the circulating pallet system and the stacker cranes. As a matter of course, the crane and pallet movements are harmonized with utmost precision by state-of-the-art digital technology. This boosts performance, speeds up operations and provides maximum container handling flexibility.

Advanced functionalities for container ports

Volker Brück, Director Business Development at BOXBAY, explains: "We have designed BOXBAY with a clear focus on what is really important for the practical operation in the ports. From the outset, our main concern was to assure smooth operation by means of a straightforward, easy-to-handle concept that would be no more complex than absolutely necessary. With us, port operators do not run the risk of getting a brand new product that has not been practice-proven and may come with teething problems. On the contrary: Our decades-long experience as a supplier of logistics systems, including high bay stores, for rolling mills guarantees that the system will work as expected. Hundreds of successful reference projects worldwide testify to our expertise. In BOXBAY, we use proven technology and reliably engineering solutions. We have deliberately refrained from any experimenting. We have even integrated proven solutions known from port logistics. I'm convinced that combining mature technologies from both areas into a smart and harmonic system is a key factor for the success of BOXBAY."



Video about BOXBAY (<http://t1p.de/o0uw>)



Erection of the high-bay storage (Picture: SMS group)

Key strategic, economic and technological advantages of BOXBAY

BOXBAY systems achieve a three-fold increase of the transshipment capacity of container terminals. They use only one third of the footprint of conventional storage systems for an equivalent number of containers. In this way, BOXBAY solves

capacity bottlenecks in container ports around the world.

Summarizing the key advantages, Mathias Dobner, CEO of BOXBAY, states: “We are not talking about capacity boosts in the 10 to 15 percent range – which, of course, would be remarkable in itself. Instead, BOXBAY increases storage capacities by a factor of three, compared with capacities achieved with common storage

systems using RTGs (Rubber Tyred Gantry Cranes). Additionally, the maximum hourly number of containers handled at the quay will increase by about 20 percent. These figures speak for themselves: BOXBAY is definitely a disruptive innovation and ground-breaking technology. For many ports, the maximum achievable annual number of containers transshipped per meter of quay wall is a key performance indicator because in most of the cases the length of the quay wall cannot be extended. Here BOXBAY opens up entirely new perspectives.”

Interfaces for trucks, rail or ships can be arranged at all four sides of a BOXBAY system. The system can handle 20-foot, 40-foot and 45-foot containers. There is a growing trend towards high-cube 40-foot containers transported by ULCSs (Ultra-Large Container Ships).

These ships can transport more than 20,000 TEU (Twenty-foot Equivalent Unit – a measuring unit commonly used in container logistics. 1 TEU equals one standardized 20-foot container. 40-foot containers, which are becoming increasingly common, would equal 2 TEU).

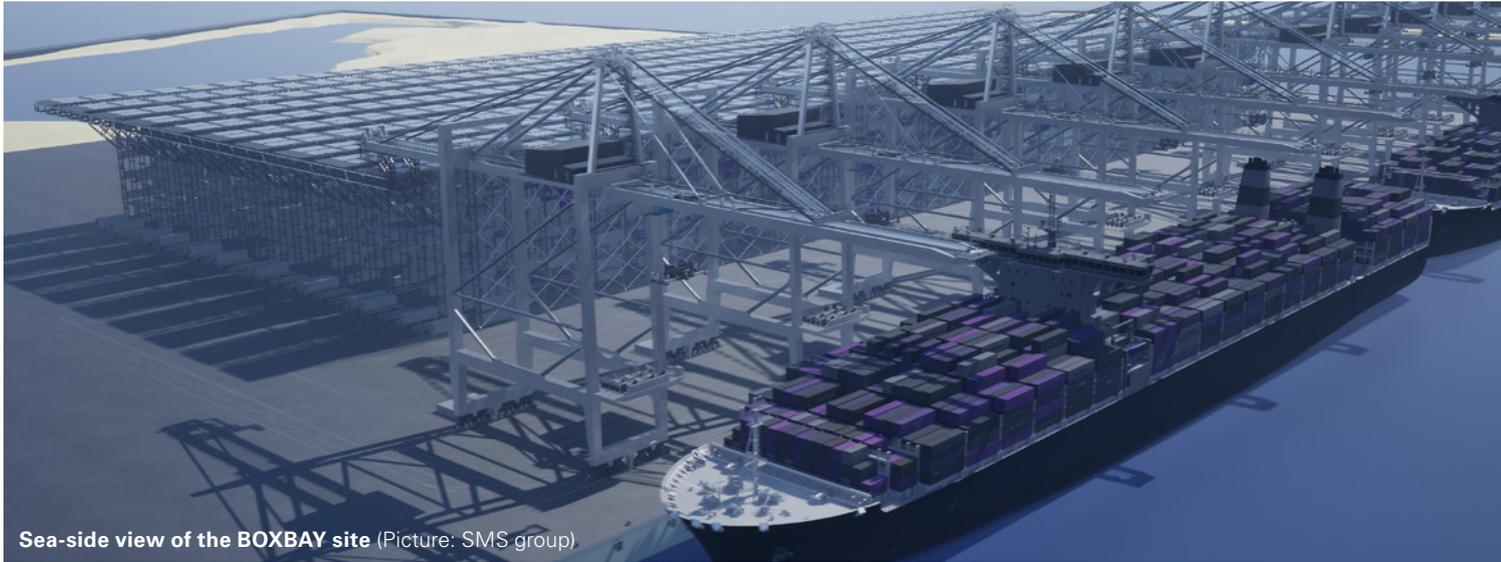
While most of the port storage systems based on RTG technology have annual capacities of slightly more than 45,000 TEU per hectare, BOXBAY reaches 160,000 TEU annually on a footprint of one hectare.

Besides the reduced space requirements and the shorter turnaround times, Volker Brück, Director Business Development at BOXBAY, sees a number of other advantages: “Thanks to our modern digitalization technology, we always know the exact position of each individual container within the HBS – and we can retrieve each one separately. The numerous re-shuffling operations, which cost both time and money, have been a significant drawback of conventional logistics solutions. These alone may account for up to 60 percent of all handling operations in a port. With BOXBAY, these movements can now be completely avoided.”

Not only the port operators and the shipping companies benefit from the advantages of BOXBAY. In addition, there are numerous positive environmental effects. All components of a BOXBAY HBS are electrically powered, i.e. no CO₂ is produced. The stacker cranes are equipped with energy recuperation systems and the roof of the store building is completely covered with solar panels. In this way, BOX-



3D scheme – vessel at the back side: containers are placed in the racks and removed by stacker cranes (Picture: SMS group)



Sea-side view of the BOXBAY site (Picture: SMS group)

BAY generates practically all the energy it needs for its operation itself – in a sustainable, clean, efficient and CO₂-neutral way.

Conclusion

Sea ports range among a country's most important economic assets. They play a vital role in our globalized, networked and on division-of-labor-based economies. In many cases, ports grow at a higher rate than the economy due to the increasing volume of goods to be transhipped. In order to improve their market opportunities and boost profitability, port operators are under constant pressure to reduce their operating costs and streamline or automate their processes. With BOXBAY all these requirements can be fulfilled.

BOXBAY is an investment-optimized solution. From the very first container stored in a BOXBAY HBS, the operator saves money compared to conventional solutions. Mathias Dobner, CEO of BOXBAY, explains: "Three times higher storage capacity and throughput per year, no unproductive re-shuffling, powered by electricity, energy recuperation – all this adds up to significant savings. Currently, up to 60 percent of all movements at a port are unpaid. We perform efficiency analyses and ROI calculations for our customers and those interested in the technology. And, believe me, the results are really impressive - making the decision in favor of BOXBAY an easy one."

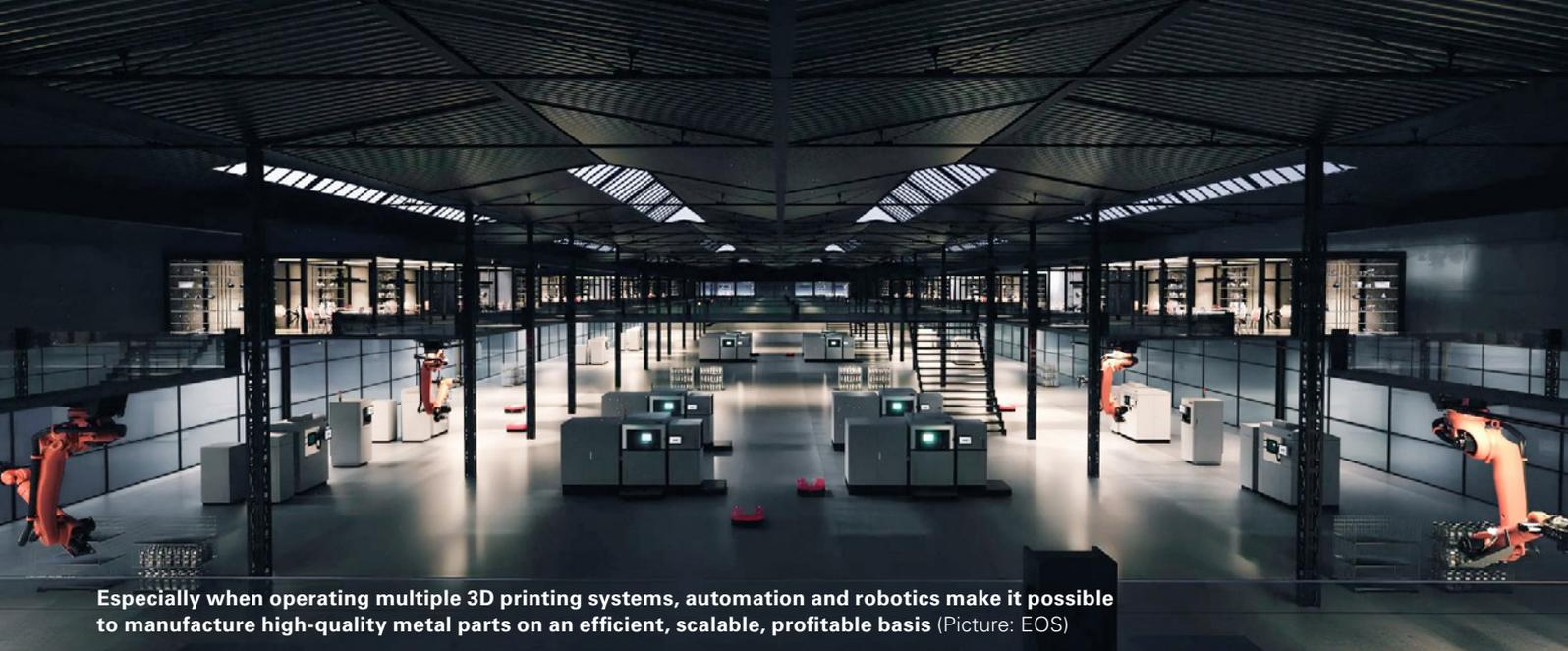
"I think the EXPO is a very good stage to show our system to the public. Everybody will see BOXBAY and how it works. We can prove that the system is worthwhile to integrate in future expansion plans and the EXPO is a good chance for us to show it to the public and to the world, because everybody will be there."

Mathias Dobner, CEO of BOXBAY



Stacker cranes were tested before commissioning (Picture: SMS group)

■ SMS group



Especially when operating multiple 3D printing systems, automation and robotics make it possible to manufacture high-quality metal parts on an efficient, scalable, profitable basis (Picture: EOS)

Additive manufacturing

Production-ready solutions for flexible, automated metal 3D printing

At the formnext trade fair, EOS showcased “EOS Shared Modules” as a production-ready solution. Consisting of various hardware and software modules, the solution simplifies and parallelizes the workflow both upstream and downstream of the build process. Especially when operating multiple 3D printing systems, EOS Shared Modules makes it possible to manufacture high-quality metal parts on an efficient, scalable, profitable basis. EOS Shared Modules is scheduled to be available by the second half of 2020.

At the formnext 2019 trade fair in November, EOS demonstrated its EOS Shared Modules periphery solution for integrated and efficient additive manufacturing (AM) with systems of the EOS M 400 series. The various modules plus transport systems and control center software enable users to implement the equipping, unpacking, transporting and sieving activities parallel to the AM build process. Both a manual and an automated EOS Shared Modules set-up are available for this purpose.

This modularity gives companies a maximum of flexibility to configure their production scenarios: The EOS Shared Modules components are not set up as a combined unit, but individually and thus are available for multiple 3D printing systems simultaneously. The EOSCONNECT ControlCenter software provides users with a continuous flow of key production parameters and seamless part traceability by means of a digital twin. The result is significantly increased efficiency, particularly in series manufacturing: EOS Shared Modules maximizes machine uptime,

boosts productivity and therefore reduces part costs. In future, the Shared Modules concept will also be offered for the EOS M 300 series.

Dr. Hannes Gostner, Senior Vice President Division Metal Systems at EOS, says: “We are proud to have developed EOS Shared Modules from a visionary concept to a mature solution. The interaction of its various elements has already proven itself in the NextGenAM project; now it is commercially ready.” He continues: “Modularity is the big advantage for users, as they decide which degree of automation is ideal for their production. As demand grows, customers can increase the number of EOS M 400 or EOS M 400-4 systems and expand EOS Shared Modules accordingly if necessary.”

Materials for industrial use

As a further innovation in the field of industrial 3D printing, EOS also displayed a range of trendsetting materials, including EOS ToolSteel H13, the only H13 tool steel that is suitable for additively manu-

facturing robust tools. EOS ToolSteel H13 is a hot work steel for both hot and cold work tools that has been specially optimized for industrial 3D printing. The material is known for its high hardenability, excellent wear resistance and outstanding heat resistance. EOS ToolSteel H13 is therefore particularly suited to additively manufacturing die casting, forging, and casting tools for hot work applications.

Furthermore, EOS presented an array of copper materials that, on account of their varying conductivities, have a large number of possible applications, specifically in electronics. The copper materials EOS CopperAlloy CuCrZr and EOS Copper Cu feature a particularly advantageous combination of electrical and thermal conductivity, making them highly suitable for applications such as heat exchangers, electromechanical components, or molds.

EOS GmbH, Krailing/Munich, Germany
Contact: www.eos.info

Additive manufacturing

Global 3D printing metals market advancements

Grand View Research, U.S.-based market research and consulting company, has published a 140 page research report on “3D printing metal market size, share & trends analysis report by form (filament, powder), by product (steel, titanium, nickel), by application (medical, aerospace & defense), and segment forecasts, 2019 – 2025”.

The global 3D printing metals market size is expected to reach USD 3.05 billion by 2025, according to the new market report, progressing at a CAGR of 31.8% during the forecast period. Increasing adoption of 3D printing as a mainstream manufacturing method and rising investments in research & development (R&D) of 3D metal printing are anticipated to fuel product demand.

Technological limitations of additive manufacturing for large-scale production of heavy parts are the primary factors restraining market growth, and so are high-cost of printers and raw materials. However, rising investments in R&D activities by academicians and companies are expected to facilitate cost reduction as well as increased utilization of the product.

Aerospace & defense is anticipated to witness the fastest growth

The aerospace & defense (A&D) industry was an early adopter of the product. This is leading to high utilization of materials such as titanium and steel in this industry. 3D printing grants flexibility to produce complex equipment geometries, which are otherwise difficult to build using a traditional manufacturing.

Aerospace & defense is anticipated to witness the fastest growth at a CAGR of 34.2% over the forecast period, in terms of revenue, on account of reduced lead time offered by 3D printing and increasing demand for highly customizable parts

Form and material. In terms of volume, the powder segment accounted for 92.6% of the market in 2017 owing to superior quality offered by metal powders for manufacturing process of metal parts. The powder segment dominated the market in 2017. It is expected to progress at a higher CAGR in terms of volume over the forecast period. High packing density and spherical morphology of metal



Metal powder and 3D-printed component at the 3D Competence Center of SMS group in Mönchengladbach, Germany (Picture: SMS group)

powders ensure good flowability that leads to consistent and predictable powder dosing and layers.

The titanium segment captured the highest revenue share of 63.0% in 2017 due to its high corrosion resistance, high tensile strength, and low density. Titanium was the largest contributor to market growth in 2017, owing to its significant adoption in aerospace applications. Titanium-based alloys have a very high melting point and are strongly resistant to oxidation and acids. This is necessary for manufacturing critical aircraft parts. Moreover, aircraft designers are able to achieve higher thrust to weight of engine ratio due to high strength and low density of titanium.

Regional outlook. North America emerged as the largest region in 2017 in terms of employing 3D printing metals. Presence of numerous aerospace companies are expected to stoke the growth of the regional market. Moreover, high defense expenditure across the region is anticipated to boost the utilization of the product in aerospace & defense. The U.S. has been a major producer and consumer of 3D printing metals on a

global scale. Presence of key industry players such as 3D Systems Corporation and ExOne GmbH is expected to drive the market on account of innovative product launches and expansion initiatives in the country. Moreover, increasing integration of advanced technologies such as 3D printing with several manufacturing processes has been escalating the growth of the market in the country.

The 3D printing metals market in Asia Pacific was valued at USD 79.7 million in 2017 with China and Japan emerging as major markets.

■ *Grand View Research, Inc., San Francisco, CA/USA*

Note: The studies published in this report were carried out before the outbreak of the COVID-19 pandemic. However, given economic uncertainties caused by the COVID-19 outbreak, as well as potential courses of action that authorities and government bodies may take, it is generally not possible to provide any forecast at this time.

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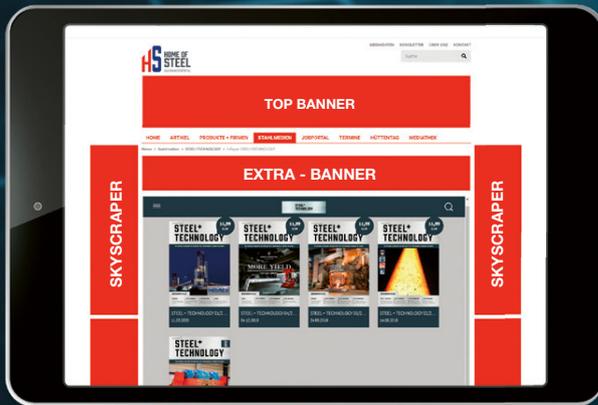
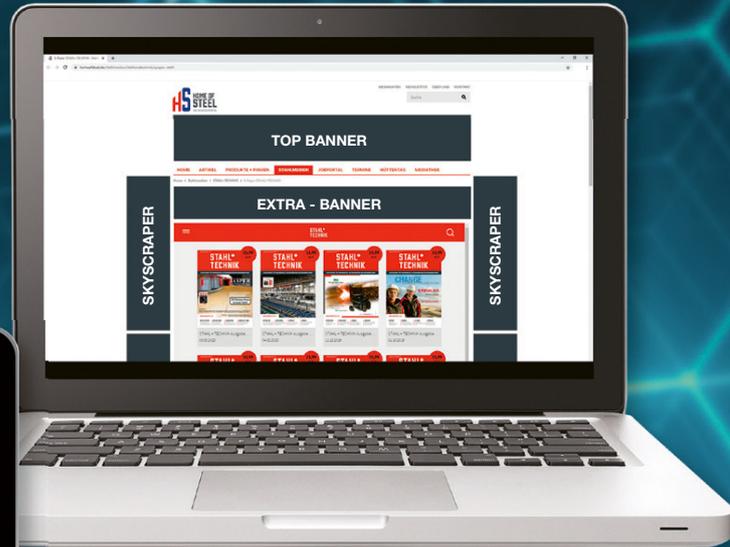
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Future Steel Forum 2020	24 – 25 November 2020 Prague, Czech Republic	Quartz Business Media, Ltd www.futuresteelforum.com

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Metal + Metallurgy China	August 2020 Shanghai, China	CIEC Exhibition Co., Ltd., CIEC Group Corp. www.mm-china.com
MMMM – Minerals, Metals, Metallurgy & Materials	27 – 29 August 2020 New Delhi, India	Hyve group www.mmmm-expo.com
Tube 2020 & wire 2020	7 – 11 December 2020 Düsseldorf, Germany	Messe Düsseldorf www.tube.de – www.wire.de

Seminars

Steelmaking	24 – 25 August 2020 Düsseldorf, Germany	TECademy of SMS group www.sms-group.com
Secondary / tertiary metallurgy	31 August 2020 Düsseldorf, Germany	TECademy of SMS group www.sms-group.com
Continuous casting	3 – 4 September 2020 Düsseldorf, Germany	TECademy of SMS group www.sms-group.com

Update of rescheduled events

In these difficult times many nations have moved to a position of “social distancing” in an effort to delay the spread of the Covid-19 disease. Also, international travel has undergone strict regulations in many countries. Many organizers have postponed major events like trade fairs, conferences and symposia in the first half of 2020. The tables of events have been updated in case rescheduled dates were available.

Preview of the August 2020 issue

Steel technology

Measurement of hot blast temperatur in stove domes

In a stove dome, air is heated before feeding into the blast furnace. The temperature of the grating refractory bricks is measured optically using pyrometers. A large amount of nitrogen is used to keep the optics and the field of view

clean during optical temperature measurement in a stove dome. A simple yet ingenious measure allows the amount of gas to be reduced by more than 80% at no great cost, while at the same time improving operational safety.

Innovative oxygen technology for the blast furnace process

thyssenkrupp is testing the "sequence impulse process (SIP) with induced shockwaves", a new blast furnace technology designed to enhance process efficiency. One of the aims is to help reduce CO₂ emissions – both at the company's own plant and around

the world by marketing the technology globally. Following extensive research and development, the world's first SIP system has now been installed in a blast furnace in Duisburg for the first time It will serve as a reference plant for marketing.

Steel processing

Contour and flatness measurement of heavy plate

Salzgitter Mannesmann Grobblech has installed a new optical measuring system in the heavy-plate mill. This system measures the contours of the hot-rolled plate, delivering data that assures optimum cutting of individual plates from the mother plates with minimum waste. It is the first system in the world to be

arranged above a cooling bed, not above a roller table: While the plates are lying on the cooling bed to cool down, the measuring beam of the system moves above the complete plate length, measuring not only the contour, but also the flatness of the plate with highest precision.

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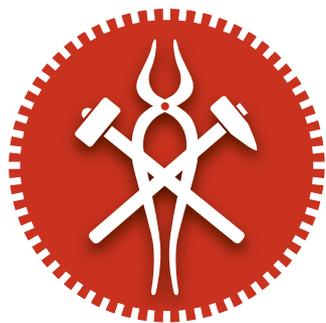
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