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Short range outlook for global steel demand 2020-2012

STEEL TECHNOLOGY

Transition from integrated to electrical steelmaking – secondary metallurgy

QUALITY MANAGEMENT

Advanced optical measuring system to check contour and flatness of heavy plate

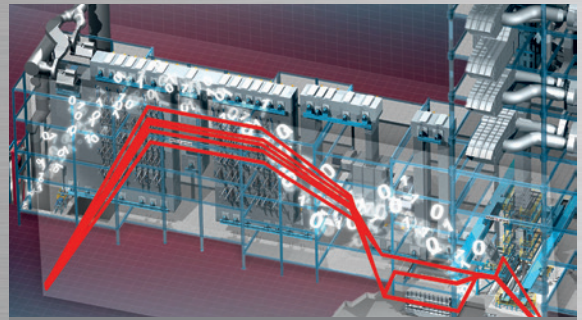
STEEL PROCESSING

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Navigating the unexpected and unprecedented COVID-19 crisis

The COVID-19 pandemic has a dramatic impact on human health in all countries. In many cases the regional lockdown has proved as the most effective measure to combat the pandemic, triggering however, an economic crisis that has not left the steel industry unaffected. The half-year figures published by the steel companies in the meantime reflect this situation. Also the short range outlook of the World Steel Association, which we publish in this issue, paints an unsparing picture. It is true that steel demand is expected to recover next year. But this recovery will probably take place in China first.

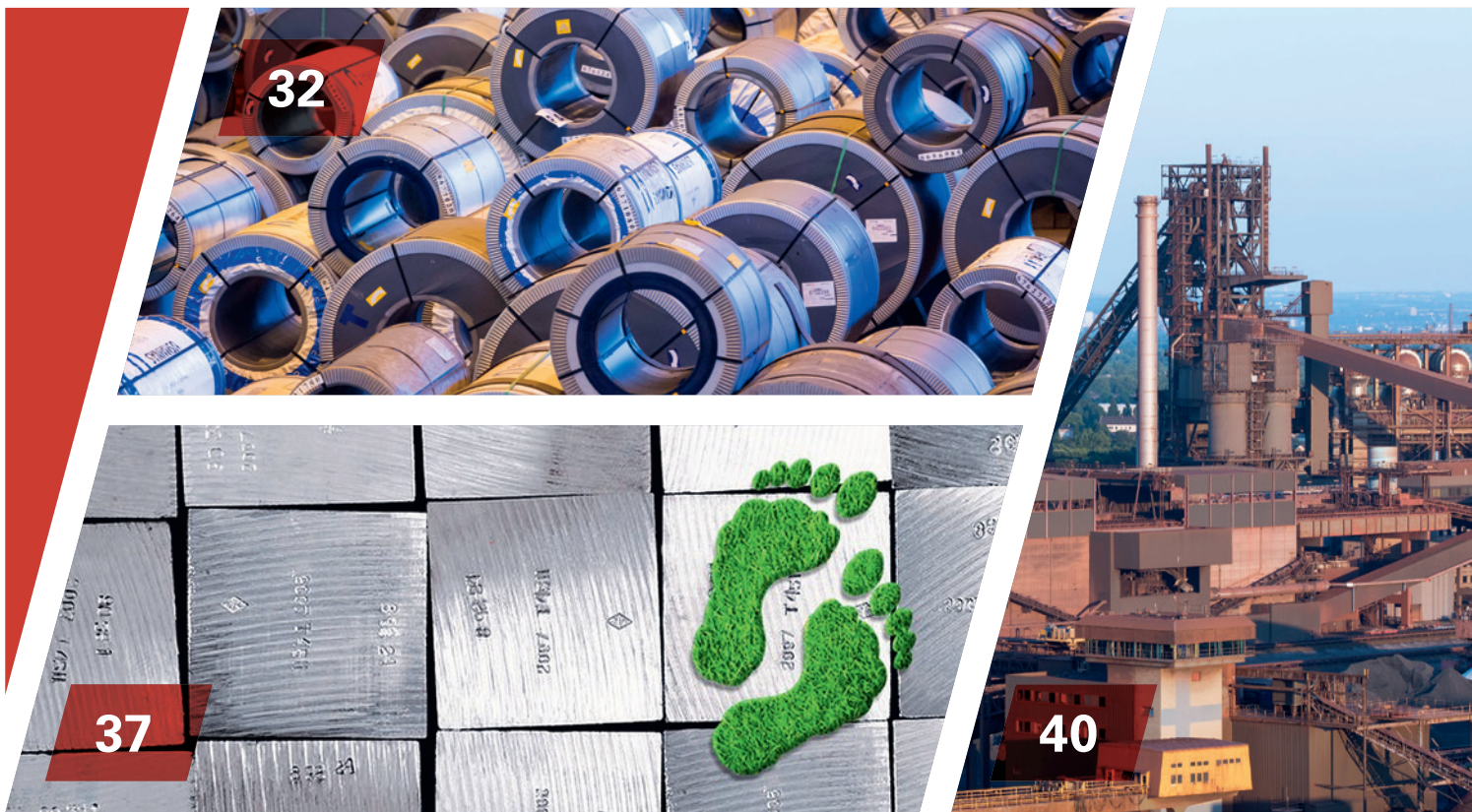
The slump in steel demand comes mainly from the large steel-consuming sectors. What is easily overlooked is that there are indeed areas that have been experiencing above-average growth during the COVID-19 crisis. The entire two-wheeler sector in the developed countries is doing exceptionally well. Many e-bike dealers are confronted with the situation that they have to put off their clients until next year due to a shortage of supply. Sales of motorcycles and scooters in Germany, for example, were almost 50 percent higher in June than in the same month last year. The poor sales in March and April caused by the lockdown were completely compensated by the middle of the year. In fact, the world motorcycle industry as a whole is booming. People postponing big purchases and travelling abroad not being an option can be considered as catalysts for growth in this sector.

The EU steel industry is characterised by two major trends. First, the European Commission has maintained safeguards in place to defend the European steel industry in times of crisis. At the end of June, the European Commission published the result of its second investigation reviewing the safeguard measures on imports of steel products. The comprehensive package – which took effect as of 1 July – applies all available legal means to defend the European steel industry in the current difficult market situation. Second, the EU steel industry has been intensifying the pursuit of its low carbon roadmap – the “pathways to a CO₂ neutral European steel industry”. ArcelorMittal Europe, Europe’s largest steelmaker, has set out its path to net zero by 2050, which will take the company to 30% lower CO₂ emissions by 2030, and carbon neutrality by 2050. Other major players of the industry have been adopting similar packages of measures – some examples of which are featured in this issue. We will certainly continue observing this exciting trend and keep you updated on the technological and economic developments in future issues of STEEL + TECHNOLOGY.

Arnt Hannewald



Arnt Hannewald, Dipl.Ing.
Editor



Companies

- 32** worldsteel: short range outlook for global steel demand 2020-2021 – steel demand to recover faster in China than in the rest of the world
- 35** Roland Junck to spearhead CN30 programme at GFG Alliance – with ambition to become the world's largest carbon-neutral steel producer by 2030
- 37** Deutsche Edelstahlwerke push green steel concept – sustainable measures for carbon-neutral steel

Steel technology

Ironmaking – Steelmaking

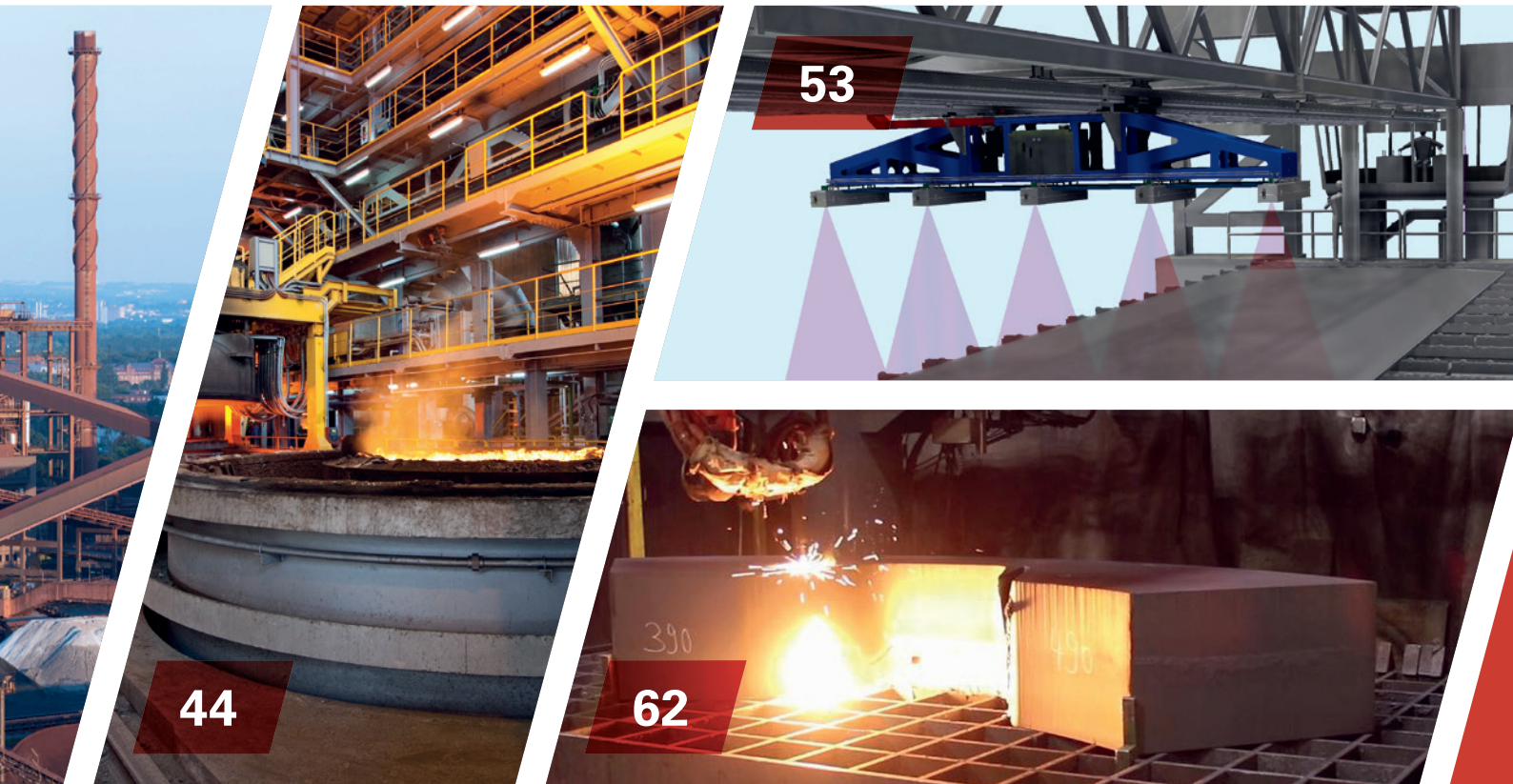
- 40** Oxygen technology with great potential: thyssenkrupp implements sequence impulse process at a blast furnace
- 41** Temperature measurement in the stove dome: reduction of the amount of purge gas by eighty per cent
- 43** Successful reline of the slag granulation plant at Rogesa, Germany
- 44** Transition from integrated to electrical steelmaking: the importance of secondary metallurgy

Long steel production

- 51** Sophisticated open-die forging: high-speed press commences operation at German stainless steel forge

Flat steel products

- 53** Advanced optical measuring system to check contour and flatness of heavy plate
- 58** Protect plant equipment against overload: self-resetting torque limiter installed at a slitting line
- 59** Cold rolling of stainless steel strip: optical thickness measurement proves itself in dense mist of rolling oil



Steel processing

- 62** Haute couture for large sizes: precision manufacturing of curved bevels
- 65** Tubes & pipes: optimal blasting of heavily used pipe connectors
- 67** Servo presses connected to the Industrial Internet of Things (IIoT)
- 69** Born again – like a phoenix arising from the ashes: broadening the range of TRIP grade steels
- 72** Deutsche Edelstahlwerke to adapt a specialty steel grade for additive manufacturing

Steel distribution

- 74** Stainless steel profiles in the chemical industry – no more system failures, production losses and repair costs due to corrosion
- 76** From strength to strength in stainless coil products – customer focused supply of processed products

Columns

- 3** Editorial
- 6** People
- 12** News round-up
- 78** Company publications
- 79** Advertisers' index
- 79** Outlook, imprint



Cover picture:
LOI Thermprocess GmbH

AMEPA names managing director and enhances presence in China

Armin Kempkes has been assigned as managing director of AMEPA, responsible for production, development and finance.

AMEPA, which specializes in the manufacturing of systems for slag detection in the liquid phase, online roughness measuring and oil layer, has named Armin Kempkes second managing director, alongside Martin Fieweger, who will remain in charge of sales, service, engineering and order management, and be responsible for AMEPA's US and Chinese subsidiaries.

In January 2020, AMEPA incorporated AMEPA Trading Shanghai as a Wholly Foreign Owned Enterprise (WFOE). The entity's activities focus on sales, on-site service and spare parts supply.



Martin Fieweger (right) and Armin Kempkes, the two managing directors of AMEPA
(Picture: AMEPA)

AMEPA

Identical executive management for SHS, Dillinger and Saarstahl

As part of the ongoing strategy process, the supervisory board of SHS - Stahl-Holding-Saar (SHS) have decided in favour of identical staffing for the management of SHS - Stahl-Holding-Saar as well as that of the boards of directors of Aktien-Gesellschaft der Dillinger Hüttenwerke (Dillinger) and Saarstahl AG.

Dr. Günter Luxenburger of Dillinger, and Dr. Klaus Richter of Saarstahl, both sales directors for their respective companies, have been appointed as addi-

tional managing directors of SHS. The two sales directors will continue to perform their functions at Dillinger and Saarstahl, respectively. The SHS board of management therefore now consists of Tim Hartmann, chairman; Martin Baues; Jörg Disteldorf (as the designated successor to Peter Schweda); Dr. Günter Luxenburger; and Dr. Klaus Richter.

Albert Hettrich has left his position as chief representative of SHS – Stahl-Holding-Saar and as a member of the manage-

ment board of Dillinger Hütte Saarstahl AG (DHS). He will continue to serve the local steel industry as a member of the board of trustees of the Montan-Stiftung-Saar as well as president of the VDS (Verband der Saarhütten) iron and steelworks association. Martin Baues, technical director of Saarstahl and Dillinger, has been appointed as his successor on the DHS management board.

SHS – Stahl-Holding-Saar

Guido Kerkhoff to succeed CEO Gisbert Rühl at Klöckner & Co.

Klöckner & Co SE has appointed Guido Kerkhoff to the management board, effective as of September 1, 2020.

Guido Kerkhoff shall succeed Gisbert Rühl as chairman of the management board effective as of the close of the annual general meeting in May 2021. Gisbert Rühl has been a board member since 2006 and was appointed chairman in 2009. In connection with the planned separation of the digital platforms segment, Gisbert Rühl will take over the posi-

tion of chairman of the respective supervisory board, and thus he will remain with the group. Guido Kerkhoff is well known in industry. Most recently he was chairman of the management board of thyssenkrupp AG.

Klöckner & Co.

Guido Kerkhoff shall become chairman of the management board of Klöckner & Co.
(Archive photo: thyssenkrupp)



Insteel Industries appoints chief financial officer

Mark A. Carano has been appointed as vice president, chief financial officer and treasurer of Insteel. He succeeds Michael C. Gazmarian, who has left the company by July 31, 2020.

Mark A. Carano joins Insteel from Big River Steel, where he served as chief financial officer. During his career he also served as a managing director with Bank of America Merrill Lynch, and in various roles of

increasing responsibility with Deutsche Bank and First Union Securities.

I *Insteel*

Liberty Steel completes consolidation of global businesses

Liberty Steel Group has formed a new board of directors as it completes the consolidation of its global businesses.

The board will oversee the group's strategy and investments, including Liberty Steel Group's goal of becoming a carbon neutral company by 2030.

The group is to be chaired by Sanjeev Gupta, with executives drawn both from within the GFG Alliance family of companies and beyond with independent non-executive directors appointed, bringing external expertise into the group.

The immediate focus of the board will be to weather the economic storm brought

about by the COVID-19 crisis and to ensure the business is well prepared for the recovery when it comes.

Liberty Steel Group's chief operating officer is to be Arnaud de Weert who, until recently, was chief executive of ALVANCE Aluminium. The group's chief financial officer remains V Ashok, who joined Liberty Steel in 2019.

Two regional presidents will take oversight of international operations. Overseeing Australia and the United States will be Daksesh Patel, who will continue in his parallel role as executive director and chief executive of InfraBuild in Australia. Meanwhile, Roland Junck, will oversee Liberty

Steel in the United Kingdom and continental Europe.

Liberty Steel Group is also appointing two independent non-executive directors to operate to international best practice of corporate governance. Australian businessman and steel industry veteran Ray Horsburgh AM will join the board as an independent non-executive director along with Paul Struijk, a natural resources and mining sector specialist with vast global experience.

I *GFG Alliance*



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Chief executive officer of Metalloinvest dies

Andrey Varichev, CEO of Metalloinvest, passed away unexpectedly on April 27th following a severe illness.

Andrey Varichev headed management company Metalloinvest since 2009.

From 1992, he held senior positions at a number of Russian metallurgical enterprises. In 2005-2006, he headed Mikhailovsky GOK, then, in 2006-2009, he held the positions of commercial director and first deputy CEO of Metal-

loinvest. He was awarded the Order of Friendship and the title of 'Honorary Metallurgist'.

■ *Metalloinvest*

Retirement and promotion of executive vice president at Nucor

Nucor Corporation's executive vice president, Ladd R. Hall retired in June 2020 after more than 39 years of service with Nucor. A month earlier, Allen C. Behr had been promoted to the position of eVP.

Ladd R. Hall began his career with Nucor in inside sales at Nucor Steel-

Utah in 1981. He later served as sales manager of Nucor Cold Finish-Utah, and general manager of Vulcraft-Texas, Vulcraft-Utah, Nucor Steel-South Carolina and Nucor Steel-Berkeley County. He was promoted to vice president of Nucor in 1994 and to executive vice president in 2007.

Allen C. Behr joined Nucor in 1996 as design engineer at Nucor Building Systems-Indiana. Since 2017, he has served as the general manager of Nucor Steel-Texas.

■ *Nucor*

Oryx Stainless expands trading team

International stainless steel scrap processor Oryx Stainless has complemented its management team with newly hired Kurt Wierscholowski, who shall further increase the company's market share and engage in new sectors.

Kurt Wierscholowski joins Oryx Stainless from the ELG-Haniel-Group, where he served most recently as managing director of Eisenlegierungen Handelsgesellschaft based in Duisburg, Germany, and of Jewometaal Stainless Processing B.V. in Rot-

terdam, the Netherlands. At Oryx Stainless, his focus will be the development of new trade segments.

■ *Oryx Stainless*

Outokumpu appoints new president and chief executive officer

Outokumpu's board of directors has appointed Heikki Malinen as president and CEO of Outokumpu and as the chairman of the leadership team succeeding Roeland Baan who left Outokumpu in May 2020.

Heikki Malinen has previously worked as CEO in Posti Group Corporation and in Pöyry PLC. Prior to these, he has held various leadership positions in UPM in the USA and in Finland. Malinen was a member of the Outokumpu board of directors

since 2012, from which he resigned due to his new appointment. This however, is a strong background for his new position.

■ *Outokumpu*

Change in executive board of Schmolz + Bickenbach

The board of directors of Schmolz + Bickenbach has appointed Markus Boening as chief financial officer and member of the group executive board effective October 1, 2020 at the latest. He will report to Chief Executive Officer (CEO) Clemens Iller.

The acting CFO Matthias Wellhausen had decided to leave the company in the course of 2020, after the successful refinancing. Markus Boening is a German citizen holding a PhD degree in economics. He has more than 15 years of international experience as CFO. His career as CFO

led him, among others, to AM/NS, LLC, Calvert, Alabama, USA, and ThyssenKrupp Budd Company in Troy, Michigan, USA.

■ *Schmolz + Bickenbach*

Personnel change in the board of management of Dillinger and Saarstahl

Jörg Disteldorf is the new chief human resources officer and labor director of AG der Dillinger Hüttenwerke (Dillinger) and Saarstahl AG, and as a managing director of SHS - Stahl-Holding-Saar.

He succeeds Peter Schweda on these posts who has decided to resign and retire. Jörg Disteldorf has been employed in the human resources department at Dillinger since 2003, in addition to serving as head of human resources and social affairs at Saarstahl and Dillinger since 2015. He has

also been managing director and labor director at Saarschmiede GmbH Freiformschmiede since 2019.

■ *SHS - Stahl-Holding-Saar*

Jörg Disteldorf has taken over the positions from Peter Schweda at Dillinger, Saarstahl and SHS. (Picture: SHS - Stahl-Holding-Saar)



Stelco appoints new chief financial officer

Paul Scherzer is the new chief financial officer of Stelco. Prior to joining Stelco, Paul Scherzer spent close to 25 years as a metals and mining investment banker.

With progressive roles focusing on the steel industry, including as head of

Americas Metals & Mining, and most recently heading the Industrial Materials & Services team in the investment banking group of BNP Paribas in New York, Paul Scherzer has been involved with some of the most significant steel-related transactions in North

America's capital markets over the last 25 years.

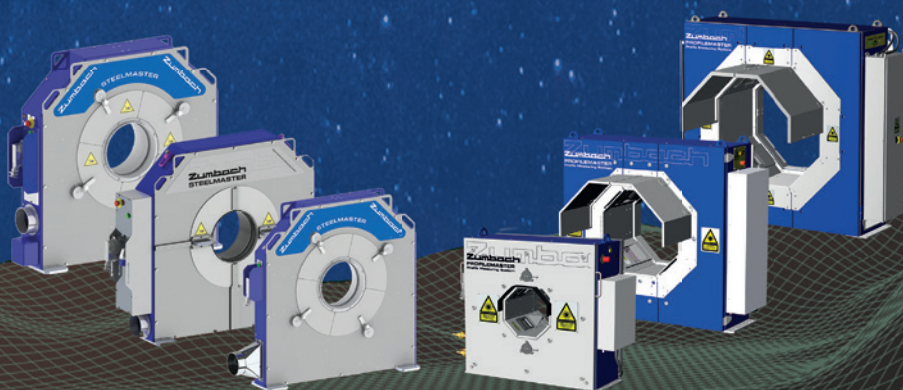
■ *Stelco*

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New member of executive board of Sikora

Jörg Wissdorf has been appointed as a new member of the executive board of Sikora, succeeding Harry Prunk, who is going to retire after 45 years with the company.

Jörg Wissdorf will be responsible for the areas sales, marketing and service after a transition period together with Harry Prunk. The graduated aerospace engineer brings experience as managing director of various national and international companies to Sikora, manufacturer and global supplier of innovative measuring, control, inspection and sorting technology.



Jörg Wissdorf is going to be a new member of the Sikora executive board (Picture: Sikora)

■ Sikora

SunCoke Energy appoints new board member

Arthur F. Anton has been appointed to the board of SunCoke Energy. This decision is part of an ongoing process of director succession and refreshment to ensure an optimal mix of skills, experience and tenure on the board.

Arthur F. Anton will act as an independent director. He will add substantial experience in manufacturing operations, business development, finance and planning to the board's expertise.

Peter B. Hamilton has decided to retire from service on the board of the company,

and will not stand for re-election as a director at the company's 2020 annual meeting of shareholders.

■ SunCoke Energy

Chief executive of Tata Steel Nederland steps down

Theo Henrar has stepped down as chairman of the management of Tata Steel Nederland B.V. (TSN).

The resignation was by mutual agreement. Theo Henrar joined the company 33 years

ago, then still under the name Hoogovens. He has been chairman of the management of the Dutch branch of Tata Steel since 2008. Henrar has also stepped down as sales director. Hans van den Berg, vice-chairman Tata Steel Netherlands

(TSN) in IJmuiden, will step into the shoes of the former chairman Theo Henrar as the company's new chief.

■ Tata Steel

Management change at Tenova LOI Thermprocess

Tenova LOI Thermprocess, leading global company in the field of heat treatment plants based in Essen, is undergoing a change in its management organization.

End of June 2020, managing director Erik Mícek left the company after almost three decades of services for the company. Christian Schrade fully assumes Mícek's responsibilities. Torsten Koepchen has been appointed CFO with responsibility for the commercial departments.



Christian Schrade and Torsten Koepchen are now heading Tenova LOI Thermprocess in Germany (Picture: Tenova)

■ Tenova

Tenova assigns new CEO as part of business and governance reorganization

The role of Tenova CEO has been assigned to Roberto Pancaldi, previously CEO of the Metals Division, while Andrea Lovato, the former Tenova CEO, will assume the role of TAKRAF CEO.

These changes result from Tenova's decision to reorganize its business and review the gov-

ernance structure accordingly. "The extraordinary situation caused by the outbreak of COVID-19 at a global level has accelerated the rethinking of our business model and the definition of a new structure to better fit the complexity of the current business scenario, with a leaner structure and a clearer definition of roles", commented Andrea Lovato.

This change will leave more autonomy to the respective CEOs in developing their businesses and in building their long-term sustainability while they concentrate on short-term consolidation and continuity.

■ *Tenova*

Supervisory board member of Wuppermann retires

The supervisory board of Wuppermann has complied with C. Peter Jongenburger's request to leave the company for reasons of age.

In his position on the executive board, C. Peter Jongenburger was responsible for the flat & tube production and research & development. As managing director, he particu-

larly shaped the successful development of Wuppermann Staal Nederland B.V. (WSN). His responsibilities will be transferred to the spokesman of the management board, Johannes Nonn. Karsten Pronk will take over the function of the managing director of WSN's technical department.

C. Peter Jongenburger will remain closely associated with the company. In

January 2020, he joined the supervisory board of Galva Metal, representing the interests of Wuppermann as a 35% minority shareholder. This mandate will remain in force even after his retirement from the executive board.

■ *Wuppermann*

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NIGERIA

Kogi Iron to become Nigeria's first integrated steel producer

Kogi Iron Limited, listed on the Australian Securities Exchange, has been working on a plan since 2012 to establish an open pit iron ore mine using Australian expertise.

But the fall in the iron ore price in recent years has caused the company to pivot from a steel billet producer with a cast steel feedstock plant in Nigeria to supply local industry.

The company now aims to raise about 13 million Australian dollars (US\$ 8 mil-

lion) following the COVID-19 crisis to fund a feasibility study for the Agbaja Cast Steel Project, which has been declared a "Project of National Significance" by the Nigerian Government. Kogi's 100% owned Nigerian subsidiary KCM Mining Limited has mining and exploration leases in the Agbaja Plateau region of the Kogi State in Southern Nigeria. The Agbaja Project will potentially produce 1 million t/year of cast steel feedstock using the locally-mined iron Nigerian coal. The project has a three-to-five year timeline

with major joint venture and equity partners required after the feasibility study is completed.

According to International Monetary Fund statistics, Nigeria is Africa's largest economy and No. 26 in the world. However, having a population of almost 200 million, Nigeria does not produce its own steel and relies on imported scrap steel construction industry.

■ *Kogi Iron*

REPUBLIC OF SOUTH AFRICA

Duferco Steel Processing upgrades galvanizing line

Cold-rolled and galvanized coils producer Duferco Steel Processing has chosen Danieli Kohler zinc-pot wiping technology to upgrade its galvanizing line located in Saldanha, Western Cape province.

The selected solution incorporates the Danieli Electromagnetic strip Stabilizer (DES™)

and automatic closed loop control, which will complement the Danieli Kohler X-Jet system. The X-Jet with integrated DES™ technology allows low-thickness uniform coatings to be applied at very high speeds. Galvanized coatings down to 60 g/m² for both sides will be achievable at 160 m/min line speed. The supply includes air-knife rigs

with automatic gap-width adjustment, elevator/positioners, non-contact edge baffles, roll equipment and maintenance equipment, together with associated electrical and automation equipment by Danieli Automation.

■ *Danieli*

BRAZIL

ArcelorMittal Sul Fluminense refurbishes cold-shear

Danieli do Brasil Service Center carried out an extensive overhauling for the cold shear of the long products hot rolling mill of ArcelorMittal Sul Fluminense in Barra Mansa, RJ, including job planning phase and on-site assistance.

Supplied by Danieli as part of the rolling mill and in service since 2006, the cold shear had operated continuously for 14 years, cutting bars and profiles to commercial lengths at the exit of the cooling bed. The overhaul was carried out in just twelve days during the annual

maintenance shutdown. The cold shear was completely dismantled, inspected and the required mechanical refurbishment executed.

■ *Danieli*

Gerdau starts up new electrodes regulation system via remote commissioning

Covid-19 did not slow down the start-up of the new electrodes regulation system supplied by Danieli for the ladle furnace at Gerdau's Divinópolis plant.

Communication and I/O tests were executed using remote connection to safe-

guard as much as possible everyone's health during the commissioning. Excellent cooperation between the Gerdau and Danieli Automation teams made a very fast and effective technological upgrade possible, including an automation and hydraulic systems upgrade. Two

weeks and only one specialist were needed to achieve the Final Acceptance Certificate.

■ *Danieli*

CANADA

Algoma Steel secures iron ore supply

Algoma Steel has signed a new four-year iron ore pellet purchase agreement with United States Steel Corporation.

The new agreement replaces contracts that expire at the end of this year and provides Algoma Steel with surety of supply

of quality iron ore pellets through to the close of the 2024 shipping season. Based in Sault Ste. Marie, Ontario, Algoma Steel

Hot Material Transport Conveyors

is a fully integrated steel producer of hot and cold rolled steel products including sheet and plate, with a production capacity of an estimated 2.8 million t/year.

■ *Algoma Steel*

Tenova to participate in manufacturing supercluster

Tenova Goodfellow Inc. has entered a collaborative new project titled Digital Transformation of Secondary Metallurgy Facility.

This project is focused on ArcelorMittal Dofasco secondary metallurgy facility that includes a ladle furnace, a degassing tank, their auxiliaries and transfer cars. The goal is to demonstrate how digitalization technologies can improve production by: minimizing manual intervention, reducing process variation and improving final steel properties. The new sensors will be based on an array of Tenova's proprietary technologies, including two pioneering technologies not previously used in ladle furnace operations plus one optical technology never previously used in vacuum degassing. Tenova will adapt Tenova's Advanced Sensor Technology for use on other oxygen and electric steelmaking furnaces. In addition, Tenova will develop a technologically advanced sensing network capable of providing critical real-time process measurements that are currently not available.

■ *Tenova*

MEXICO

Nucor-JFE Steel Mexico starts producing on new hot-dip galvanizing line

Nucor-JFE Steel Mexico, located in Silao, Guanajuato, has begun operating its continuous galvanizing line, which will produce hot-dip galvanized sheet steel for the automotive market.

The hot-dip galvanized sheet steel production facility has a production capacity of 400,000 t/year. It can pro-



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duce sheet thickness from 0.4 mm to 2.6 mm and widths of 800 mm to 1,850 mm. Nucor-JFE has begun trial production and will move towards full-scale sales and production once

customer approvals have been obtained.

“We are excited to expand our presence in Mexico and to use our local sales network to increase our sales into this

important automotive market,” said Leon Topalian, President and CEO of Nucor.

■ *Nucor*

USA

CMC Steel California completes rolling mill upgrade

Automazioni Industriali Capitanio has successfully completed the commissioning of the drive project in the rolling mill at CMC Steel California in Rancho Cucamonga.

AIC's scope of supply included the replacement of the drives for shear 1 and stands 5-6 using ABB DCS800. Also, the existing automation and control system was upgraded in order to properly include the interfaces with the new ABB DC drives. In particular, the upgrade of the existing control systems included such

activities as modification of the existing communication interface into the PLC, adaptation of HMI functions to the new drives, retuning of impact compensation and tension control. The commissioning was performed from 22 to 25 February 2020.

■ *AIC*

New control cabinet for shear 1 at the CMC Steel California rolling mill (Picture: AIC)



Lhoist North America expands lime production capacity

Lhoist North America has received permit approval for construction of a new energy efficient lime kiln at its Marble Falls, Texas facility. Lhoist expects to increase its local workforce as a result of the expansion.

The regulatory approval from the Texas Commission on Environmental Quality paves the way for Lhoist to begin construction on the significant expansion at the facility. The new vertical kiln, which is expected to be operational in 2021, is pri-

marily driven by growing demand for Lhoist's high purity dolomitic lime products in the steel industry.

■ *Lhoist*

U.S.-based steel producer signs non-binding letter of intent with NioCorp

NioCorp Developments Ltd. has signed a non-binding letter of intent with a large, integrated U.S.-based steel producer outlining the steel producer's interest in purchasing up to 25% of NioCorp's production of ferroniobium over the first ten years of production from the company's Elk Creek Superalloy Materials Project in southeast Nebraska.

The non-binding letter of intent does not obligate either NioCorp or the steel producer until a binding commercial sales offtake agreement is finalized. If such a binding agreement is reached, it would effectively sell out NioCorp's Elk Creek Project for its ferroniobium production over the first decade of its estimated 36-year mine life.

NioCorp previously entered into an offtake agreement with ThyssenKrupp

Metallurgical Products GmbH for roughly 50% of NioCorp's planned ferroniobium production over ten years, and a separate offtake agreement with New Jersey-based CMC Cometals for roughly 25% of the project's ferroniobium production over ten years.

■ *NioCorp*

Nucor orders meltshop and caster cranes for plate mill

Nucor Corporation has ordered handling equipment from Danieli for the melt shop of the new plant under construction in Brandenburg, Kentucky.

The electric overhead traveling (EOT) cranes that will deliver scrap buckets to the furnace and transfer liquid steel to the caster ladle turret will be supplied by Danieli Centro Cranes. In detail, the supply will

consist of one charging crane, two teeming cranes and one caster-bay crane. The equipment will be designed according to American CMAA-70 standards and will include a full, mechanical and electrical

redundancy system for hoist mechanisms and horizontal movements.

The ordered cranes will feature a semi-automatic positioning system suitable to assist operators to optimize production cycle time and safety. A regenerative-drive control system will make it possible to recover the dissipated energy during the braking time.



Electric overhead traveling cranes of the type to be installed in the new plate mill of Nucor Brandenburg (Picture: Danieli)

■ Danieli

Nucor places follow-up order for reheat and heat-treatment facilities

Nucor Corporation has awarded SMS group a follow-up order for the supply of slab and ingot reheat facilities and two heat-treatment lines for plate.

The new equipment will be part of the new plate mill being built in Brandenburg, Kentucky, for which SMS group had already received the order in 2019 to supply the slab casting machine. The new casting machine will produce slabs of 200 to 305 mm thickness and up to 3,150 mm width. The follow-up contract now received by SMS group is for all of the new plate mill's slab and ingot reheat equipment, for a heat-treatment line for heavy plate of up to 356 mm thickness and for a continuous heat-treatment line with MultiFlex-Quench® technology for plate between 4.8 and 102 mm thickness and up to 4,267 mm width.

SMS group is also going to supply a continuous heat treatment line for plates.



The Nucor and SMS group teams at the Brandenburg, Kentucky, site (Picture: SMS group)


The incorporated MultiFlex-Quench® will provide Nucor extremely great flexibility in terms of cooling strategies. The integrated leveler will be designed for plates of 4.8 to 25 mm thickness and a maximum plate temperature of 300°C. SMS group will supply all equipment complete with the associated electrical and automation sys-

tems. This includes the motors and converters, all sensors and technological measuring systems, the complete Level 1 automation, and Level 2 process models. Commissioning is scheduled for 2022.


■ SMS group

The Bainidur®-Portfolio


From additive manufacturing to serial production



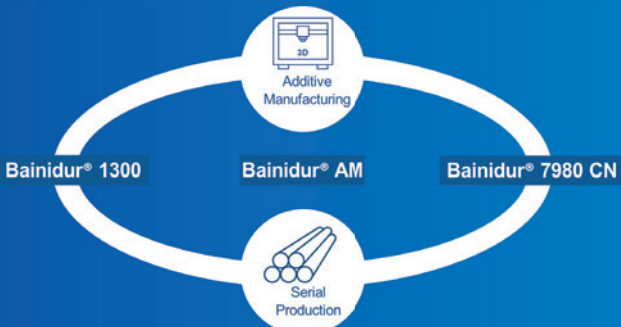
customized



efficient




sustainable



Suitable for 3D printing and CO₂-saving in series production

The new bainitic steels Bainidur 1300 and Bainidur 7980 CN don't only expand the large-scale production via the electric arc furnace, but with Bainidur AM also the portfolio of metal powders. With **Bainidur AM**, initial samples or spare parts with the same properties as the original from series production can be additive manufactured without changing drawings. You benefit from a shortened process chain and permanently reproducible high quality. The material properties often allow the component to be used without further CO₂-emitting heat treatment. Learn more: <https://www.dew-powder.com/bainiduram/>.

SCHMOLZ + BICKENBACH GROUP
DEUTSCHE EDELSTAHLWERKE 

USA

Nucor Steel Sedalia starts production in new endless casting-rolling minimill

Nucor Steel Sedalia, Missouri, has signed the provisional acceptance / commercial start-up certificate for the Danieli MIDA plant.

From a few days after the first heat, the MIDA-ECR minimill installed at Nucor Steel Sedalia has been operating in steady, endless casting-rolling mode, achieving the design casting speed on day five, while producing a billet more than 1 km long.

Meanwhile also the commissioning of the water treatment plant, engineered, manufactured and installed by Danieli, has been completed. To expedite construction and installation, the components of the water treatment plant were assembled on skids at the Danieli workshop, with pre-assembled and installed valves and instrumentation.



Electric arc furnace of the new MiDa endless casting-rolling minimill at Nucor Steel Sedalia (Picture: Danieli)

| Danieli

Steel Dynamics plans acquisition to secure ferrous scrap volume for new flat rolling mill in Texas

As part of its raw material procurement strategy to support its new Texas flat roll steel mill, Steel Dynamics, Inc. has entered into a definitive agreement to acquire 100% of the equity interest of Zimmer, S.A. de C.V.

Zimmer is headquartered in Monterrey, Mexico, and operates a ferrous and non-ferrous scrap metals recycling business. Zimmer's primary operations are comprised of six scrap processing facilities strategically positioned near high-volume industrial scrap sources located throughout Central and

Northern Mexico. The company also operates several third-party scrap processing locations. SDI's new steel mill in Sinton Texas, is currently under construction and expected to begin operations mid-year 2021.

| Steel Dynamics, Inc.

Stelco enters into two milestone agreements with U.S. Steel

Stelco is to acquire interest in an iron ore mine and enter into a long-term extension of a pellet supply agreement with U.S. Steel.

Stelco has signed a new eight-year pellet sale and purchase agreement with United States Steel Corporation, which runs until January 31, 2028. The pellet agreement provides for the supply of 100% of Stelco's

anticipated requirements of iron ore pellets at Lake Erie Works over the term of the agreement, including volume required to support the expansion in production projected after the upcoming blast furnace upgrade project. The agreement supersedes and replaces the current agreement with U.S. Steel, which was set to expire on January 31, 2022. Concurrently, Stelco entered into an option agreement with

U.S. Steel granting Stelco a long-dated option to purchase a 25% ownership interest in a to-be-formed Joint Venture that will own 100% of U.S. Steel's iron ore mine located in Mt. Iron, Minnesota, and related infrastructure including the pellet plant.

| Stelco

BANGLADESH

Abul Khair Strip Processing orders high-speed continuous Galvalume line

Danieli will supply a continuous Galvalume line to Abul Khair Strip Processing for the Chittagong facilities. Equipment delivery is scheduled during 2020.

Designed for a total capacity of approximately 200,000 t/year strip from 0.12 to 1.0 mm thick and up to 1,350 mm wide, the line will process products for construc-

tion applications and, in future, white goods.

The horizontal, Non-Ox annealing furnace from Danieli Centro Combustion

will be able to process CQ and FH grades at up to 40 t/h. The final thickness of the zinc-aluminium coating will be controlled by the Danieli Kohler X-Jet air-wiping system. The new line will enable Abul Khair Steel to achieve production of GL coating down to 50 g/m² for both sides

at 210 m/min, with a maximum deviation of $\pm 2.5\%$.

A skin-pass and tension-leveller line will guarantee elongation up to 2% (with an accuracy of $\pm 0.1\%$), and roughness and flatness improvement (up to 5IU). The software packages and the integrated

functionalities will be developed by Danieli Automation to guarantee high-precision process control by the automation systems, minimizing manual interventions.

■ Danieli

CHINA

Baosteel equips continuous caster with new integrated control center

Baoshan Iron and Steel has equipped the CC3 two-strand continuous caster at its steelworks No. 1 in Shanghai with an integrated control center in collaboration with Primetals Technologies.

The objective of the project was to reduce the number of personnel working in the hazardous liquid steel area and to relocate the work to the airconditioned integrated control center. Primetals Technologies equipped the new control center with HMI touch panels and the plant itself with modern automation software and innovative technology packages such as LevCon mould level control, DriveCon for controlling the withdrawal drives and DynaGap soft reduction for improving the internal quality of the slabs. Work at the casting machine has been made easier by the installation of two casting platform robots, while operational security has been improved by a new access system using facial recognition.

The new control center now permits centralized control and monitoring of the



The new integrated control center of the Baosteel CC3 continuous caster at steelworks No. 1 in Shanghai increases both productivity and safety at work (Picture: Primetals Technologies)

entire plant from the ladle transfer at the turret right through to the exit section. This means that operating personnel now only have to be present at the caster itself in the initial casting phase and for maintenance operations. Two LiquiRob casting platform robots in the ladle and tundish

section are now used for ladle shroud manipulation, temperature measurement and sampling, application of tundish powder, and for lancing.

■ Primetals Technologies

BaoWu to upgrade bloom caster

BaoWu, Baoshan, has commissioned Danieli with the installation of new, hard-reduction modules in its bloom caster.

The four-strand casting machine built in 2008 initially produced 320 mm x 425 mm

sections. In a revamp by Danieli in 2014 round sections of up to 380 mm diameter were added. The caster originally included nine soft-reduction modules per strand. With the addition of more demanding grades and ever-increasing requests for higher quality from the market, BaoWu

contracted Danieli to upgrade the modules from soft to hard reduction to achieve a greater total squeezing effect, leading to better porosity and segregation control.

■ Danieli

For the steel and metallurgical works

► **Injection plants for fine coal and lime**

► **Spraying machines for refractory repair**

► **spray manipulators for hot repair**

CHINA**HBIS Shijiazhuang signs contract for steel rod mill**

A Morgan Stelmor conveyor in operation during rod production (Picture: Primetals Technologies)

Shougang Jingtang starts up continuous pickling line

A continuous pickling line supplied by Primetals Technologies started up at Shougang Jingtang in December 2019.

The pickling line is designed to process around 1.5 million t/year of hot rolled strip. It is part of the second phase of a new production plant in Caofeidian, Hebei Province, and designed to process ultra-high strength steel (UHSS) grades for high added-value products to be used in automo-

tive, bus, truck production, and for all heavy industrial applications.

The CPL will pickle hot rolled strip with thicknesses ranging from 0.8 to 7.0 mm, and widths from 750 to 1,630 mm, and handle coils weighing up to 33.6 t. The strip speed upon entry is 650 m/min, the pickling itself runs at 320 m/min, and speeds of up to 400 m/min are reached in the exit section.

Primetals Technologies was responsible for engineering and manufacturing, and

To comply with environmental regulations and improve production, HBIS Shijiazhuang Iron & Steel has signed a contract with Primetals Technologies for a new steel rod mill in Shijiazhuang, Hebei Province.

The plant, which is being relocated from within Shijiazhuang City limits because of environmental protection rules, will feature high-capacity Morgan Reducing Sizing Mill (RSM) technology for thermo-mechanical rolling of larger diameter products. It will include a high-speed rod outlet with "V" pre-finishing mill, shear, 8-stand Morgan Vee no-twist mill, the RSM, pinch roll/laying head, an eleven-zone Morgan Stelmor conveyor and a stepless reform station. The plant will have an annual capacity of 400,000 t and be designed for output speeds of 115 m/s.

Rods ranging from 5 to 25 mm in steel grades including alloyed structural, bearing, spring, free cutting, tire cord, welding wire, cold heading quality and tool steel will be manufactured from billets of 200 and 150 mm square. Start-up is expected in late 2020.

Primetals Technologies

supplied all core equipment for the line. A heavy scale breaker was installed upstream of the pickling station, which has five flat turbulent pickling tanks fitted with an acid recirculating system. Downstream there is a rinsing tank with five compartments, water recirculation system and strip drier. A flying shear is installed in the exit section. Primetals Technologies also supplied the electrical and automation equipment and provided supervision of erection and commissioning. Shougang Jingtang took care of the associated civil works and the erection of the line.

Primetals Technologies

Continuous pickling line designed to process ultra-high strength steel (UHSS) grades (Picture: Primetals Technologies)



CHINA

Luzhou Xinyang to install high-speed bar mill

The new 1.4 million t/year high-speed bar mill for Luzhou Xinyang, currently in the engineering phase at Danieli, will feature split rolling to finish small- and large-diameter products.

The mill will be designed to produce rebar products in the range from 12 to 40 mm diameter, for grades HRBF 400E - 500E. Starting from 165 mm diameter billets weighing up to 2,500 kg, the new mill will operate at speeds up to 240 t/h.

The main equipment to be installed by Danieli includes four housingless stands followed by a split-rolling arrangement for finish rolling of different product ranges. For product sizes between 12 and 22 mm diameter, there will be two lines, each with four-pass blocks operating at finishing speeds of up to 45 m/s. Larger-diameter products will be rolled on a central line through two housingless stands. A dual, high-speed twin-channel arrangement will complete the supply, to perform the fast discharge of the

bars on the cooling bed. The plant will be equipped with a water-cooling system for on-line cooling of bars, in order to obtain a final product with ultra-fine grain structure.

The high-speed technological equipment will be manufactured at the Danieli headquarters and integrate equipment manufactured by Danieli China. First billet rolling is planned for the end of 2020.

■ Danieli

MaSteel produces record-breaking beam blank

On its new Danieli combicaster, MaSteel produced BB7, a 1,300 mm wide beam blank with 510 mm flanges, a 140 mm web and weighing almost 2.7 t/m.

During the very first cast after a two-month break due to the COVID-19 pandemic following its start-up in December 2019, MaSteel's combicaster reached its maximum design productivity of 97 t/h per strand. The plant start-up was efficiently supported by Danieli personnel operating on site and from Danieli technological offices, using remote connections and advanced tools such as Q-SPACE.

The new, two-strand 12-m-radius continuous casting machine can also produce BB5 beam blanks measuring 900 mm x 510 mm x 130 mm; BB6 beam blanks of



Beam-blank production on the combi-caster at MaSteel (Picture: Danieli)

1,030 mm x 440 mm x 130 mm, and small slabs of 550 mm x 280 mm in twin-mould configuration. The twin-mould configuration enables production of a lighter mini-slab section without loss of productivity,

casting four slabs simultaneously on two strands.

■ Danieli

Shougang Qian'an orders six-stand tandem cold mill for electrical steel

Primetals Technologies has received the order to supply a 6-stand tandem cold mill for a new plant of Shougang Qian'an Electric Vehicle Electrical Steel Co. Primetals Technologies will design the new mill as a Hyper Universal Crown Control mill (Hyper UC-mill).

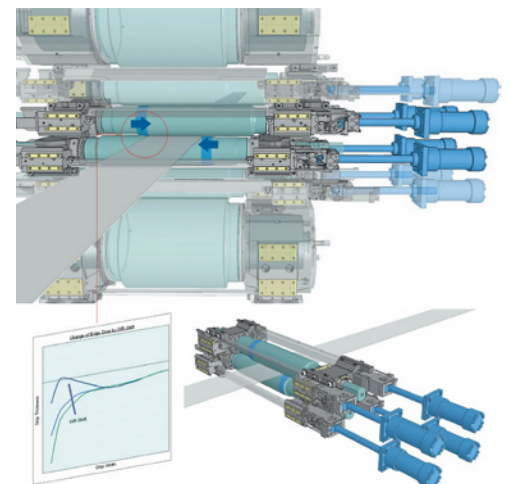
Mills of this design, developed by Primetals Technologies, employ smaller diameter work rolls, thus reducing rolling loads. This allows for the production of harder and thinner materials with improved product quality. All six stands of the Hyper UC-mill will be equipped with a work roll shifting function to enable precise edge profile control of high-grade

electrical steels. In addition, the mill concept saves investment and maintenance costs.

The new mill will produce electrical steel grades, AHSS grades, tin grades etc. in thickness between 0.18 and 2.5 mm with widths ranging from 750 to 1,320 mm. Primetals Technologies is responsible for engineering and supply of the mill as well as for supervision of erection and commissioning. Start-up is expected for mid-2022.

■ Primetals Technologies

Work roll shifting mechanism to be employed in the 6-stand Hyper UC-mill for Shougang Qian'an Electric Vehicle Electrical Steel Co. (Picture: Primetals Technologies)



Work Roll Shift Mechanism

INDIA

JSW revamps high-speed bar mill

JSW Steel contracted Danieli Service to improve the performance of the bar mill at its Vijayanagar Works.

Danieli added two rolling modules to an existing fast-finishing block, also supplied by Danieli and designed for the

future expansion from six to eight passes. The teamwork between JSW and Danieli Service made it possible to install the additional passes along with an automation upgrade and achieve a 40 m/s finishing speed for 10-mm-dia bars in just one week from production stop.

JSW is now able to produce small rebars, while increasing production flexibility.

| Danieli

JSW Steel places order for reheating furnace upgrade

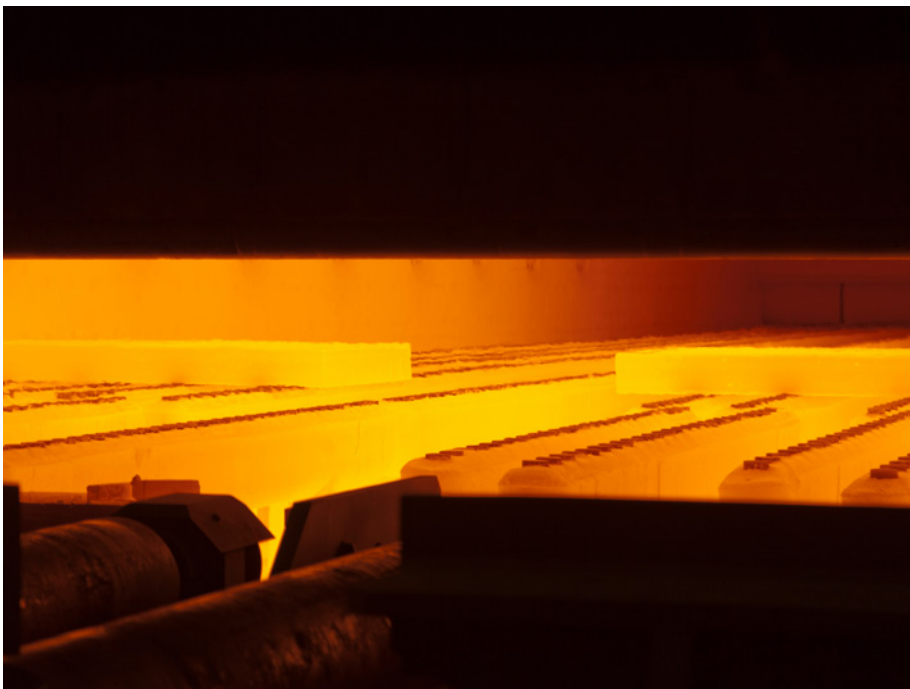
JSW Steel has entrusted Fives with an upgrade project of the reheating furnaces at its Vijayanagar Works.

Fives will be responsible for the modernization of two reheating furnaces to increase their efficiency and capacity from

250 t/h to 295 t/h and meet the new requirements of the No. 1 hot strip mill. The two walking beam furnaces were supplied by Fives in 1994 and 2003 respectively.

The modernization aims to optimize the overall furnace heat distribution by integrating a new combustion zone. It will ensure homogeneous heating of slabs throughout the furnaces and will enable to increase their capacities. Therefore, the furnace roof level will have to be raised and the furnace casing will be modified. For each furnace, Fives will replace some existing burners with AdvanTek® long flame burners which will substantially improve crosswise and lengthwise temperature profiles of the products, as well as reducing NO_x emissions and energy consumption. Virtuo® Edge-R, a process optimization system for Level 2, will be implemented for both furnaces to enable control of the slab temperature profile in a real time mode.

| Fives



Reheating of slabs in a walking beam furnace (Picture: Fives)

JSW Steel completes general overhaul of converter gas recovery system

At its works in Vijayanagar, Jindal South West Steel has resumed operation of the converter gas recovery system after a complete overhaul by SMS group.

Over the past 15 years, the gas recovery system supplied by SMS group has recovered more than 360 million Nm³/year of high-energy gas from the oxygen blowing process of the 120 t converter and efficiently converted this volume into electricity in the in-house power station. Without such a recovery process, the gas would have been burnt at the flare stack and the energy contained in the

gas would have been lost. The overhaul became necessary since the gasholder seal had to be replaced as it had reached its end of life after 15 years of safe operation.

SMS group's scope of supply comprised the delivery of all crucial components and the supervision of installation activities. The plant is now ready again for efficient gas recovery, thus saving millions of tons of carbon dioxide from being emitted into the atmosphere.

| SMS group



A general overhaul was performed on JSW Steel's converter gas recovery system (Picture: SMS group)

INDIA

JSW Steel issues final acceptance for modernized rolling mill

Primetals Technologies has received the FAC for the modernized rolling mill for long products installed at JSW Steel Ltd. in Salem.

The core of the modernization project was the installation of the new reversing roughing group with Red Ring stands, enabling the processed bloom size to be increased to 220 mm. This consequently enables to extend the range of rolled products, both in terms of size and grade.

The new reversing roughing group consists of one horizontal and one sliding vertical Red Ring stand of the fourth generation. The processed grades consist of special steels for mechanical construction, tool, spring and bearing applications. Primetals Technologies also supplied the mechanization of the roughing group, the guide systems, a hydraulically-operated shear for cropping after the roughing group, a convertible dividing shear after the existing finishing train, the Level 1 automation with mechatronic packages as well as consulting services for the installation and commissioning.



Modernized mill with new reversing roughing group at JSW Steel (Picture: Primetals Technologies)

■ *Primetals Technologies*

Tata Steel orders inspection and grinding plant for slab conditioning

Tata Steel has ordered a SuperGrinder-based inspection and grinding plant for slab conditioning from Danieli Centro Maskin.

The new equipment will be installed at the Kalinganagar plant, Orissa, and used for the conditioning of slabs of low/medium carbon

and exposed automotive steel grades. The processed slabs will be 250 mm thick, 2.15 m wide, 250 mm thick and up to 11.5 m long. The core part of the new plant will consist of a SuperGrinder HGS600 in dual grinding-table configuration, with an installed grinding power of 630 kW and a capacity over 400,000 t/year in full skin-grinding mode. Hi-Grind,

E-Cube and CastGrind technological packages will be part of the supply. The automation platform, including an IntelliGrind system for surface inspection, will be designed and supplied by Danieli Automation.

■ *Danieli*

Tata Steel India orders slab conditioning line

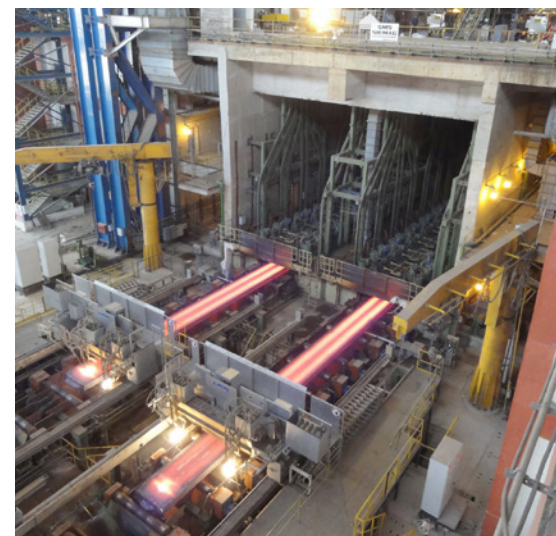
Tata Steel India has awarded SMS group the order to supply a scarfing line for slab conditioning to be installed at its Kalinganagar works.

Full-surface scarfing is a surface removal process used for eliminating surface and subsurface defects in slabs. Several car manufacturers specify this treatment as a requirement for steel used in car body applications. The

new scarfing line will enable Tata Steel to open a new market segment for its Kalinganagar works by meeting the requirements of the automotive industry in the future.

The line will comprise a two-side scarfing machine – for the simultaneous

Slabs from a two-strand caster from SMS group will be processed on the new conditioning line (Picture: SMS group)



processing of the upper and lower slab sides – and an in-line slab inspection system. Hot or cold slabs charged into the line will be scarfed in two passes. Subsequently, they will run through a surface inspection system which checks them for any imperfections or defects.

An interface linking the X-Pact® level 1 automation system of the slab conditioning line with the production planning system assures the receipt of feedback on every slab that leaves the line after the treatment and before any further processing. The slabs to be processed will come from two SMS

group-supplied continuous casters: a two-strand slab caster commissioned in 2016, and a brand-new two-strand slab caster currently under construction.

■ *SMS group*

INDONESIA

PT Krakatau completes revamping of skin-pass mill

PT Krakatau has signed the Final Acceptance Certificate for Danieli for the electric and automation revamping of its hot skin-pass mill.

The turnkey modernization by Danieli Automation included new AC drives and a new automation control system to

ease and reduce maintenance requirements and enhance the line's performance.

The line rolls low- and medium-carbon, and high-strength, low-alloy hot-rolled strip within a thickness range from 1.2 to 7.0 mm. The new drives are more user-friendly and introduce power-recovery capability,

which improves mill performance and reduces power consumption. The mill achieved contractually specified maximum speed in just ten days from restart of the line.

■ *Danieli*

THE PHILIPPINES

Real Steel to build high-speed rolling mill

Danieli is going to supply a new high-speed rolling mill to Real Steel in Panganga, San Simon province, for the production of deformed bars in 10 to 32-mm-dia range.

Starting from 150-mm square billets weighing up to 2,000 kg, the new plant will operate at finishing speeds of up to 48 m/s for 10-mm-dia bars. It will com-

prise 14-housingless stands followed by a six-pass multidrive high-speed twist-free finishing block. An in-line quenching and self-tempering process will improve the mechanical properties of deformed bars, in particular the yield strength, aimed to reduce costs for micro-alloyed elements.

A single high-speed twin-channel system will discharge the bars onto the

102-meter-long cooling bed. The finishing area will be designed to meet the requirements of the local market in terms of length variations and number of bars per bundle. The complete mill will be controlled by a Danieli Automation process control system.

■ *Danieli*

SOUTH KOREA

Posco rolls first bar on new reducing & sizing block



Kocks supplied an RSB® 5.0 reducing & sizing block to Posco (Picture: Kocks)

Posco has successfully commissioned its bar mill No. 2 incorporating a Kocks reducing & sizing block (RSB®).

Posco uses the Kocks RSB® 5.0 to finish round dimensions of 14 to 55 mm diameters and to produce all feeder sizes for the wire rod line. The new RSB® replaces an existing Kocks block which had been successfully operating since 1995, producing more than 125 million t of round SBQ grades for the automotive industry. For the new block, Kocks also supplied the size control system (SCS®), which enables real time adjustments of the rolling block's operating parameter, and a light section measuring gauge.

■ *Kocks*

VIETNAM

Hoa Phat orders long product rolling mill

Hoa Phat has ordered a new wire rod mill from Danieli. The 1 million t/year rolling mill will be installed at the Dung Quat complex.

Fed by 12-m-long, 150 mm square billets produced on the upstream Danieli continuous casting machines, the new mill will roll 5.5 to 25-mm-dia wire rod coils in low-, medium- and high-carbon grades. The roll-

ing line will consist of a high-speed free-rougher followed by a two-strand intermediate mill. From there, bars will continue on two independent rolling lines consisting of pre-finishing cantilever stands followed by 10-pass wire rod blocks adopting semi-multidrive technology for improved management of rolling rings and reduced spares inventory. Hi-Profile measuring devices, water cooling lines

and 95-m-long cooling conveyors will provide the desired final mechanical characteristics. Pinch rolls and oil-film bearing laying heads will guarantee the best coil shape and surface quality. Danieli Automation will supply the complete electrical and automation system for the mill.

| Danieli

BELGIUM

NLMK La Louvière receives first major equipment for hot strip mill upgrade

Flat steel coils producer NLMK La Louvière has received the first major equipment from Primetals Technologies for its hot strip mill upgrade.

Two 100 t mill housings for the first finishing mill stand, one of the three stands to be replaced by the end of the year, were delivered to La Louvière in May. The extensive upgrade includes installation of

a state-of-the-art automation system, three new and three upgraded roll mill stands, new drives and motors as well as new run-out table, modernized cooling and water systems, and a new down-coiler.

The project will enable the mill to expand the production of high-strength thin hot-rolled coil (as thin as 1.2 mm), increase the range of high-strength prod-

ucts beyond 1,000 MPa yield strength and provide customers with best-in-class surface and dimensional tolerances.

The first phase of the mill transformation is scheduled for completion by the end of 2020, and a second phase will be completed in 2021.

| NLMK

FRANCE AND SPAIN

Celsa places furnace supply and revamping contracts

Celsa has placed two contracts with Fives: one for a new Stein Digit@I Furnace® and one for a furnace revamp.

The first order is for a new Stein Digit@I Furnace® to be installed in the Celsa France plant located in the municipalities of Boucau and Tarnos, New Aquitaine region. This plant is specialized in the production of steel billets from the recovery of scrap. The walking beam furnace with 120 t/h capacity will reheat billets of different sections and length to feed a new rolling mill. The Stein Digit@I Furnace® features the best available technology, including complete digital on/off control and heat curve control for optimum combustion, as well as AdvanTek® burners. Commissioning is scheduled in autumn 2020.

The second project covers the revamping of the existing Stein Digit@I Furnace® at Celsa Barcelona in Spain. The walking beam furnace of 250 t/h capacity is designed to reheat beam blanks for a medium section mill located in Castellbis-



The discharge end of a reheating furnace from Fives in operation (Picture: Fives)

bal. The revamping aims to extend the product range by processing larger and heavier beam blanks from the original weight of 7.5 t to 10.5 t. The project includes replacement of mechanical equipment: new roller tables, kick-in and kick-off machines on the charging and discharging sides together with all the ancillary equip-

ment. Fives is also responsible for the modifications of electrical equipment. The work will start in summer 2020, during a scheduled maintenance shutdown of the plant.

| Fives

GERMANY

Overhaul of research rolling mill after severe fire damage

The research rolling mill seriously damaged by a major fire at the Helmholtz Materials Research Center in 2017 Geesthacht is going to be fully refurbished by Danieli.

After the fire, the mill had been fully dismantled and then stored. Supplied by

Danieli Fröhling in Geesthacht in 2011, the mill was part of the core research equipment of the Magnesium Innovation Center for developing magnesium alloy sheets. Recently, the institute decided to fully rebuild the casting and rolling shop. The overhaul of equipment will be con-

ducted in Danieli's workshops in Germany, with final re-installation and commissioning at Helmholtz Center scheduled for 2021.

■ *Danieli*

Joint project with thyssenkrupp wins innovation prize for "Steel bee"

The joint project delivAIRy between doks. innovation GmbH and thyssenkrupp Steel Europe AG has won the Reg-

ulatory Sandboxes Innovation Prize of the Federal Ministry for Economic Affairs in the category 'Insights'.

The "steel bee", delivAIRy® delivery drone, regularly takes off to deliver samples across the Duisburg steelworks site to the lab for further processing. It is part of a joint project by Kassel-based start-up doks. innovation GmbH and thyssenkrupp Steel to test drone delivery processes on the plant site. Project manager Dr. Thomas Lostak, team leader Innovation at thyssenkrupp Steel, is optimistic about the future: "If the automated flying robot now proves successful for the transportation of lab samples, it could also be used in other areas of internal logistics in the future. Time-critical deliveries on our plant site in Duisburg can now be fully automated and digitized."

The automated drone (no pilot required) delivers samples across the plant site, flying over main roads and railway lines. As soon as the transport box is attached to the drone by a patented gripper mechanism, it can be sent to its destination at the push of a button.

■ *thyssenkrupp Steel Europe; doks. innovation*



Saves time and protects the environment: Once the transport box is attached to the drone with a patented gripping mechanism, it can be sent to its destination with the push of a button (Picture: thyssenkrupp Steel Europe)

HUNGARY

Wuppermann Hungary produces milestone tonne of products

The site of Wuppermann Hungary in Győr-Gönyű with direct port access
(Picture: Wuppermann)



Earlier this year, Wuppermann Hungary produced the one millionth tonne of hot-dip galvanized strip.

In September 2017, Wuppermann opened its new facilities for flat products in the Hungarian port of Győr-Gönyű. This marked the commissioning of an ultra-modern combined pickling and hot-dip galvanizing plant. Wuppermann Hungary supplies hot-dip galvanized wide and slit strip to customers

throughout Europe – by ship, train or truck. Its customers include the automotive and construction industries as well as hardware, pipe and tube production and component manufacturing. Strip widths range from 600 to 1,650 mm and thicknesses from 1.0 to 6.0 mm. In addition, zinc coatings up to Z600 can be produced.

■ *Wuppermann*

ITALY

Acciaieria Arvedi signs long-term contract for price quote platform

Cloud solutions provider In Mind Cloud has entered into a long-term contract with Acciaieria Arvedi for the implementation and operation of its Configure Price Quote platform.

Acciaieria Arvedi values In Mind Cloud's platform for its rich capabilities in empowering efficient management of product configuration and quotation processes, including advanced costing and seamless ERP integration. In Mind Cloud's certified

integrations into front- and backend will enable the company to create streamlined sales processes, reducing costs and delivering an excellent customer service.

| In Mind Cloud

Ecoacciai completes first phase of revamping project

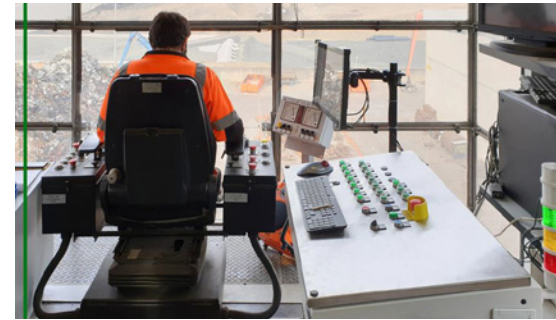
Automazioni Industrial Capitanio has completed the first part of the revamping project of the control system at Ecoacciai in Pontedera.

The project scope for AIC included replacement of the automation system of the scrapping mill, the hardware integration and the software security installation.

As part of the solution, AIC has replaced among others local commands with the latest generation of radio controls, internal

hardware of the board with a safety logic. The second step of the modernization will include the installation of the safety boxes, activation of the entire security system and installation of a coded key system for the area access. The security system is visible from the main control room, the local offices and remotely from the office in Odolo.

| AIC



Newly installed control station at Ecoacciai (Picture: AIC)

FAM Ferriera Alto Milanese to upgrade the special profiles rolling mill

FAM Ferriera Alto Milanese has contracted AIC to perform the automation upgrade of the special profiles rolling mill in Caronno Pertusella (VA).

After the first project for reheating furnace handling in 2017, the scope of the second project for AIC includes the installation of

new stand drives, Rockwell ControlLogix PLC, control pulpits and HMI. AIC will also be involved in the software development, site installation and commissioning phases, start-up support and remote assistance.

The project will reduce maintenance costs, convert the obsolete system to a more reliable and state-of-art system con-

figured for Industry 4.0, improve and optimize troubleshooting, and increase the efficiency and flexibility of the control system. Commissioning is scheduled to be performed during the summer 2020 shutdown.

| AIC

AM InvestCo signs amendment agreement with Ilva Commissioners

AM InvestCo and the Ilva Commissioners have signed an amendment to the original lease and purchase agreement for Ilva.

The amendment agreement outlines the terms for a significant investment by Italian state-sponsored entities into AM InvestCo, thereby forming the basis for an important new partnership between ArcelorMittal and the Italian government. The equity invest-

ment by the Italian Government in Ilva, to be captured in an agreement to be executed by 30 November 2020, will be at least equal to AM InvestCo's remaining liabilities against the original purchase price for Ilva.

The amendment agreement is structured around a new industrial plan for Ilva, which involves investment in lower-carbon steelmaking technologies. The core of the new industrial plan is the construction of a

DRI facility to be funded and operated by third party investors and an EAF to be constructed by AM InvestCo.

In the event that the investment agreement is not executed by 30 November 2020, AM InvestCo has a withdrawal right, subject to an agreed payment.

| ArcelorMittal

Marcegaglia to upgrade plate mill

Increasing market requirements led Marcegaglia to revamp its four-high plate mill in San Giorgio di Nogaro. The Danieli Automation service team will

implement a solution that includes both automation and mechanical modernization. A dedicated tracking system will provide real-time tracking for plates.

On the mechanical side, new hydraulic cylinders will be installed to support conventional electromechanical screw-down gears, thus improving response speed and

position accuracy. Danieli Automation will supply its advanced gauge control with powerful, real-time HiPAC controller to easily integrate the existing controls with new technological functions. A new Level 2 process control system, including an

online mathematical model for pass schedule calculation, mill set-up and reports will enable high process quality and repeatability. A dedicated tracking system will provide real-time tracking for plates from initial handling to finished ser-

vices. The contract also includes the upgrading of the furnace automation system.

■ *Danieli*

Final shut-down of blast furnace plant at Ferriera di Servola

During the five years of ownership of the Trieste plant, Acciaieria Arvedi has been investing there over 250 million euro.

These investments involved the putting back to life iron production following the requirements of the environmental authorization, fulfilling all its obligations stipulated in the agreements with local and central

authorities concerning plant operations, starting up in the same plant a new cold rolling and processing plant and finally keeping and improving the employment level of the Servola site.

Following a formal request of local institutions, Acciaieria Arvedi started a process of decarbonization of the site and of industrial conversion of the operations: the final

shut down of the blast furnaces. This represents the first step of this complex journey undertaken by Arvedi Group with great sense of responsibility and with the coordination of the Italian Ministry of Economic Development (MISE).

■ *Arvedi*

THE NETHERLANDS

SMS group and Semiotic Labs sign collaborate agreement

Semiotic Labs, a scale-up company based in Leiden, Netherlands, and SMS group have signed an agreement under which the two companies will cooperate in the field of predictive maintenance.

The innovative AI-based (Artificial Intelligence) technology developed by Semiotic Labs uses electrical signals and the data fingerprint of AC motors and other rotating equipment to monitor and analyze the condition of critical plant assets, and enable reliable and early prediction of developing faults. In contrast to traditional, vibration-based solutions, the SAM4 system developed by Semiotic Labs operates based on sensors installed directly in the control cabinet – not on the asset itself. This solution is particularly useful for the monitoring of equipment in service under rough operating conditions as typical in the metallurgical industry.

“We continuously aim at expanding and enhancing the functionalities and capabilities of our Genius CM® condition



SMS group and Semiotic Labs are going to cooperate in AI-supported condition monitoring (Picture: SMS group)

monitoring system for the metallurgical industry,” says Christoph Häusler, Vice President Comprehensive Service Products, SMS group. “The integration of SAM4 into our portfolio is a very important step towards this end. As part of the

agreement with Semiotic Labs, SAM4 will be integrated as an App into the MySMS platform.”

■ *SMS group*

RUSSIA

Mechel grants FAC for modernized LD (BOF) converter

Mechel has issued the final acceptance certificate (FAC) for a LD (BOF) converter modernized by Primetals Technologies

in the steel works of the Chelyabinsk Metallurgical Plant – the third converter modernized by Primetals here.

The project aims were to replace worn-out equipment, to further increase capacity by raising the tapping weight to 160 t and to

optimize tap-to-tap times by cutting the blowing time. At the same time, Mechel installed a new cooling stack and the associated offgas cleaning plant to reduce converter emissions. This equipment was supplied by Rosenergostal, Belgorod.

The project was part of an expansion program that includes increasing the annual production capacity of the converter steel works. Primetals Technologies was responsible for the basic and detail engineering, and supplied core components, including the vessel, trunnion ring, slag shields and the maintenance-free vessel suspension system Vaicon Link. It also replaced the tilting drive, together with its AC motors, implemented the associated basic automation and handled the supervision of the installation and commissioning work on site

■ *Primetals Technologies*



The modernized LD (BOF) converter at the Chelyabinsk Metallurgical Plant (Picture: Primetals Technologies)

MMK orders technological package for EAF steelmaking

Danieli will supply a new EAF technological package to Magnitogorsk Iron & Steel Works (MMK).

The Danieli Q-MELT package will enable a further decrease in operating expenditure

for the 180 t No. 2 electric arc furnace at MMK, which is currently already operated with a charge containing 40% of hot metal. The package will consist of an electrode regulator, laser off-gas analysis and heat optimization tool. The order also includes

an oxygen injector and a set of post-combustors for optimized chemical energy utilization.

■ *Danieli*

MMK completes commissioning of upgraded mill as planned

In 2018, Magnitogorsk Iron & Steel Works (MMK) awarded SMS group an order covering the extensive modernization of the mechanical equipment of the finishing mill and the fundamental revamp of the electrical and automation system of hot strip mill 2500 at the Magnitogorsk site.

The revamping activities had been planned to be implemented during several shutdowns until mid-2020. The current COVID-19 pandemic placed extreme demands on all parties involved. MMK reacted to the

lower sales volume to be expected due to the crisis, deciding at the end of February 2020 to have the main shutdown for the revamping activities earlier than originally scheduled, despite the adverse circumstances and while respecting all of the imposed health protection measures. Existing travel restrictions in Russia and the European Union presented additional obstacles. However, at the end of March, the CEOs of both companies agreed per video conference to initiate all necessary steps to procure, by means of special permit, visas for a group of selected experts

and grant them entry to the region by charter flight. The group was joined by a team from GE Power.

Within the modernization scope, SMS group equipped the finishing stands with new hydraulic adjustment and work roll bending systems, and installed new equipment for changing the work and backup rolls. In addition, a new X-Pact® automation system was part of SMS group's supply scope.

■ *SMS group*

NLMK improves environmental performance of BF and BOF operations

NLMK Lipetsk has completed performance testing of new air purification systems installed on basic oxygen furnace No. 2 and blast furnace No. 6, two facilities that underwent capital repairs in late 2019.

Gas exhaust ducts at basic oxygen furnace No. 2, which has a capacity in excess of 3 million t/year of steel, have been over-

replaced with new air purification systems.

hauled and a highly efficient system for the capture and purification of fugitive emissions has been installed at the BOF shop. At the upgraded blast furnace No. 6 complex, with a production capacity of 3.4 mil-

lion t/year of hot metal, new air purification systems have been integrated at the feedstock supply and slag processing areas, and at the cast house. Measurements taken at the new gas purification systems

have confirmed that their performance corresponds to design targets.

■ NLMK

NLMK begins commissioning and start-up of upgraded continuous casting machine

NLMK Lipetsk has completed the assembly of the main process equipment at its continuous casting machine No. 9, with commissioning and start-up being in progress.

The upgraded No. 9 continuous casting machine will enable NLMK to fully mas-

ter the production of 'heavy' slabs with increased chemical purity and structural homogeneity, a one-of-a-kind product mix in Russia. The casting machine will produce semis weighing up to 70 t, up to 400 mm thick and up to 2,800 mm wide, for processing into thick plate. Such plates can then be used to pro-

duce large-diameter pipes, wind turbine parts, marine vessels, and oil drilling rigs.

■ NLMK

OMK orders new special bar and light sections mill



Rolling stands of a bar and light-section mill (Picture: Danieli)

OMK has awarded Danieli the order for a new rolling mill for bars and light sections to be installed in Chusovoy.

The new mill will produce a wide range of long products, including high-quality spring steel flats. The purpose of the investment is to ensure and increase the production of existing downstream lines for crossbows for truck, including rounds, rebar and light profiles, to cover the demand in the Perm region.

The Danieli supply will cover engineering and mechanical systems from the reheating furnace through to rolling and finishing services, including Danieli Automation's fully automatized process control. Plant start-up is scheduled to take place in 2021.

■ Danieli

Zlatoust Metallurgical Plant commissions integrated forging complex



Forging press and forging manipulator in operation at Zlatoust Metallurgical Plant (Picture: Danieli)

A new integrated forging complex supplied by Danieli Breda has been successfully commissioned at the Zlatoust Metallurgical Plant (ZMZ) in the Chelyabinsk region.

The plant consists of a 25 MN open-die forging press and two integrated manipulators operated by the DanForge® automation system. The press can operate at a frequency of up to 80 strokes/min with a daylight of around 3,500 mm, automatic

top-die clamping and an automatic tool-changing device. The manipulators can lift ingots of 20 t with a load torque of 60 t/m. With the new plant ZMZ can produce high-quality forged parts with diam-

eters of 100 to 800 mm and lengths of 10 m.

The open automation system provides complete coordination between the press and the forging manipulators. Only one

person is needed to operate the complete forging plant.

■ *Danieli*

TURKEY

Atakas grants final acceptance for bell annealing furnaces

The six bell annealing furnaces supplied by Danieli and now in operation at Iskenderun are based on Danieli Olivotto Ferrè technology for recrystallization annealing of coiled strip in 100% hydrogen atmosphere.

Danieli's supply scope consisted of the addition of six new bases (three furnace bells and three cooling bells) to the existing bell annealing furnace line installed and started-up by Danieli in 2018, along with the complete cold-strip complex.

The upgraded facility is capable of processing prime-quality annealed sheet products of cold-rolled carbon steel for the general and automotive markets – CQ, DQ, DDQ and EDDQ quality, according to the related international standards. Maximum coil diameters of 2,000 mm can be handled, with the strip thickness ranging from 0.3 up to 2.0 mm. Up to five coils can be charged on each treatment base. All



New bell annealing furnaces installed at Atakas in Iskenderun (Picture: Danieli)

process parameters, as well as safety functions, are managed by a Danieli Automation control system.

The installation and commissioning phases were optimized so that the plant

stoppage for the integration of the new bases could be reduced to two weeks.

■ *Danieli*

Çemtas-Bursa starts up multiline roller hearth furnace

The new roller hearth furnace from Danieli achieves excellent hardening and tempering results in alloyed-steel bar.

Using an innovative concept for heat treatment of alloyed steel for automotive markets, the furnace processes bars in dia. 15 to 100 mm, with an overall output up to

30,000 t/year. Hardening, tempering, normalizing, soft annealing and stress relieving are performed in continuous mode.

The equipment is designed according to a new concept of multiline inclined and shaped rolls. Covered by a Danieli patent, this specific solution is based on the concept of continuous rotation of selected bars

during their handling inside the austenitizing furnace and the subsequent quenching system, in order to improve bar quality in terms of mechanical/metallurgical properties and excellent straightness.

■ *Danieli*

Çolakoglu to modernize manufacturing execution system

The Turkish flat and long steel producer Çolakoglu Metalurji has awarded PSI Metals with the modernization of the existing Manufacturing Execution System (MES) to PSImetals Version 5.20.

This will enable Çolakoglu to further digitalize its production and quality manage-

ment processes. PSI will also provide a midterm scheduling solution integrated in the MES to optimally schedule the order book across the facility. The upgraded system will accelerate decision-making processes due to optimized planning and scenario analysis capabilities. Reductions in slab movements,

increased hot charge ratios and longer roll cycles are among the targeted KPIs. The new solution is expected to go into operation in 2021.

■ *PSI*

UNITED KINGDOM

British Steel modernises entire payroll system

British Steel has successfully implemented a payroll solution from MHR within five weeks, meeting the requirements of the company's acquisition by Jingye Group.

MHR's iTrent system completely replaces the previous legacy system at

British Steel. The core elements of the MHR solution became fully operational in March, enabling all of British Steel's about 3,500 employees to be paid and the final signing of the landmark deal to proceed. "We were very impressed with the speed and professionalism of MHR, enabling us to hit a

critical deadline," said Derek Scott, HR Director at British Steel. "Now we have a payroll system that is fit for the future."

■ *British Steel; MHR*

Tata Steel and ABP sign long-term Port Talbot agreement

Tata Steel and Associated British Ports (ABP) have entered into a new ten-year agreement in respect of the supply of raw materials to the integrated steelworks via the deep-water harbour at Port Talbot.

The new agreement will provide additional opportunities for use of the north side of the jetty and facilitate improved access to port development land on the northern side of the port. It is envisaged that, taken together, these factors can help facilitate investment and create a number of new employment opportunities in the region.

Additionally, ABP will be working jointly on new projects with Tata Steel to build upon the forward-looking commercial relationship between both parties. Tata Steel has owned the steelworks in Port Talbot since 2007, a site which supports more than 4,000 jobs locally.

As well as supporting steel production in South Wales, the port of Port

Talbot supports the regional economy by handling project and heavy lift cargoes, but also building aggregates and cargoes to support the offshore energy sector.

ABP is the UK's leading ports operator with 21 ports and other transport related businesses.

■ *ABP*

Aerial view of the port of Port Talbot

(Picture: ABP)



WORLD

worldsteel announces 2019 Steel Sustainability Champions

Now in its third year, the Steel Sustainability Champions Programme commends those steel companies that are most clearly demonstrating their commitment to sustainable development.

The 2019 Steel Sustainability Champions announced by the World Steel Association

are ArcelorMittal, BlueScope Steel Limited, China Steel Corporation (CSC), JSW Steel Limited, Nippon Steel Corporation, Tata Steel Europe, Tata Steel Limited, Tenaris and Ternium. BlueScope, China Steel and Nippon Steel are recognised as Champions for the first time. JSW Steel Limited and Ternium are recognised

for the second, and ArcelorMittal, Tata Steel Europe, Tata Steel Limited and Tenaris for the third consecutive year.

■ *worldsteel*



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Steel demand to recover faster in China than in the rest of the world

Short range outlook for global steel demand 2020 – 2021

worldsteel forecasts that steel demand will contract by 6.4% in 2020, dropping to 1,654 million t due to the COVID-19 crisis. In 2021 steel demand is expected to recover to 1,717 million t, an increase of 3.8% over 2020. This year's reduction in global steel demand will be mitigated by an expected faster recovery in China than in the rest of the world.

In early June, the World Steel Association (worldsteel) released its short range outlook for 2020 and 2021. The forecast assumes that most countries' lockdown measures continue to be eased during June and July, with social distancing controls remaining in place, and that the major steelmaking economies do not suffer from substantial secondary waves of the pandemic.

Commenting on the outlook, Mr Al Remeithi, Chairman of the worldsteel Economics Committee said, "The COVID-19 crisis, with its disastrous consequences for public health, also represents an enormous crisis for the world economy. Our customers have been hit by a general

freeze in consumption, by shutdowns and by disrupted supply chains. We therefore expect steel demand to decline significantly in most countries, especially during the second quarter. With the easing of restrictions that started in May, we expect the situation to gradually improve, but the recovery path will be slow.

However, it is possible that the decline in steel demand in most countries will be less severe than during the global financial crisis as the consumption- and service-related sectors, which have been hit hardest, are less steel-intensive. In many developed economies, steel demand was already at a low level, having still not fully recovered from 2008.

Let me underscore that this forecast is presented at a time of high uncertainty. As economies are reopening without a vaccine or cure in place, significant downside risks exist. If the virus can be contained without second and third peaks, and if government stimulus measures are continued, we could see a relatively quick recovery."

Prospect of recovery

As most countries have been gradually reopening from their lockdowns since mid-May, recovery of economic activities is expected in the third quarter. Even though all steel-using sectors are affected by the lockdown measures, the mechanical machinery and automotive sectors are highly exposed to a prolonged demand shock, as well as to disruption in global supply chains. Changes in working procedures in the steel-using sectors to fulfil the requirements of social distancing have been carried out. This change in the working environment will potentially lead to lower productivity and an extended production cycle.

China. Coming out of the lockdown ahead of other countries, China's economic recovery started in late February. Its economy is fast approaching normalisation, except for the hospitality and tourism sectors. The deep freeze in economic activity during February resulted in a decline of 6.8% in GDP and 16.1% in fixed asset investment in the first quarter. Industrial production fell by 8.4%, with the automotive sector showing the worst decline of 44.6% in the first quarter.

By the end of April, all major steel-using sectors were back to near full productivity, even though the full operation of the man-



worldsteel forecasts that steel demand will contract in 2020 and not fully recover in 2021 (Picture: worldsteel / Javier Bernal Revert)

ufacturing sector is hindered by the collapse in export demand. Following the lifting of the lockdown in Wuhan on 8th April, the construction sector has already reached 100% productivity.

The recovery of steel demand will be more visible in the second half of 2020. It will be driven by construction, especially infrastructure investment, as the government has put forward several new infrastructure initiatives. Recovery in manufacturing will be slower due to a severe recession in the global economy, but the automotive industry will get some support from incentive measures.

Chinese steel demand is expected to increase by 1.0% in 2020. The benefit from infrastructure projects initiated in 2020 may carry over and support steel demand in 2021. A substantial stimulus programme as seen in 2009 is not expected as this might work against the government's desire to continue rebalancing the economy. However, if the global economic environment affects the recovery of the Chinese economy more profoundly, the government might need to provide a further boost to the economy, implying an upside risk to steel demand.

Developed economies. Steel demand in the developed economies is expected to decline by 17.1% in 2020. Although the downturn is led by consumer and service sectors, massive dislocations in spending, labour markets, and confidence are fueling broad-based declines in steel-using sectors. A spillover from substantial job losses and bankruptcies, weak confidence and continued social distancing measures suggest only a partial recovery of 7.8% in 2021.

EU steel demand suffered a contraction of 5.6% in 2019 due to the sustained manufacturing recession. The manufacturing sector, which was forecast to enter a recovery phase in early 2020, was pushed back into a deeper recession as lockdown measures led to a massive fall in orders. The automotive sector is expected to be the worst hit, whilst the construction sector could remain relatively resilient.

In the US, COVID-19 is causing a sharp manufacturing recession, which is expected to reach its nadir in the second quarter. The fall in oil prices has placed additional downward pressure on energy sector investment, which was already distressed prior to the crisis. Surging unemployment is

World crude steel production in the first half of 2020

World crude steel production was 873.1 million t in the first six months of 2020, down by 6.0% compared to the same period in 2019. Asia produced 642.0 million t of crude steel in the first half of 2020, a decrease of 3.0% over the first half of 2019. The EU produced 68.3 million t of crude steel in the first half of 2020, down by 18.7% compared to the first half of 2019. North America's crude steel production in the first half of 2020 was 50.2 million t, a decrease of 17.6% compared to the first half of 2019.

- China produced 499.011 million t of crude steel in the period, 1.4% up on previous year.
- India produced 43.127 million t of crude steel in the period, 24.2% down on previous year.
- Japan produced 42.209 million t of crude steel in the period, 17.4% down on previous year.
- South Korea produced 32.592 million t of crude steel in the period, 9.5% down on previous year.
- Germany produced 17.457 million t of crude steel in the period, 15.7% down on previous year.
- Italy produced 10.075 million t of crude steel in the period, 19.7% down on previous year.
- The United States produced 36.198 million t of crude steel in the period, 18.3% down on previous year.
- Production in the C.I.S. is estimated to be 48.919 million t in the period, 4.1% down on previous year.
- Turkey produced 16.280 million t of crude steel in the period, 4.1% down on previous year.

■ *worldsteel*

leading to reduced income and confidence, impairing residential construction. Although non-residential construction is faring relatively better, it is expected to face a decline in 2020 and a slight recovery in 2021.

Japanese steel demand has been weakening since the second half of 2019 and will continue to contract by double digits in 2020 as reduced exports and stalling investments weigh heavily on their automotive and machinery sectors. Despite the halt in some construction projects, construction will see a relatively small contraction due to the continuation of public works.

In Korea, major steel-using sectors are expected to see a double-digit decline because of falling export markets and a weak domestic economy. The shipbuilding sector is expected to be the hardest hit, while the contraction in construction activity will record a milder decrease due to public infrastructure projects.

Developing economies (excluding China). The developing economies are less well equipped to tackle COVID-19 than the developed economies, with inadequate health capacity leading to stricter lockdown measures in some countries.

Limited fiscal space to support the economy, a fall in commodity prices, capital flight and currency depreciation render the decline of steel demand in some developing countries as severe as that in developed economies. Steel demand in the developing economies excluding China is expected to fall by 11.6% in 2020, but will see a substantial recovery of 9.2% in 2021.

India has implemented the most stringent nationwide lockdown measures in the world, bringing industrial operations to a standstill. Construction activity was halted entirely at the end of March, and recovery is expected to remain slow due to the slow return of labour. Supply chain disruption coupled with slower demand recovery will hit the automotive sector

hard. The machinery sector is expected to see a continued decline, with weak private investment and supply chain disruption.

Supported by government stimulus, recovery in construction will be led by infrastructure investment such as railways. The government's support to rural income, as well as expected consumption related to the upcoming festive season, will help a substantial recovery of demand for consumption-driven manufacturing goods in the second half. As a result, India is likely to face an 18.0% decline in steel demand in 2020, which will rebound by 15.0% in 2021.

In the first quarter the ASEAN countries were hit hard by the lockdown in China and are subsequently experiencing extended disruptions in their supply chains and in tourism. Despite the lock-

In the CIS, the economy will be slow to come out of recession. Combined with the collapse in oil prices, the COVID-19 crisis will push steel demand into a severe contraction in 2020, with a mild recovery in 2021.

The oil-producing countries in the MENA region are among the hardest hit due to the double shock of the COVID-19 outbreak and the plunge in oil prices.

Development of the steel consuming sectors

Construction. The construction industry in some countries suffered an abrupt halt of projects due to supply chain disruptions and a shortage of workers during the lockdown period. However, the decline in the construction industry will

due to a bleak outlook for investment. However, sectors like agricultural and construction machinery will recover faster.

Automotive. The automotive industry is the biggest victim of the COVID-19 crisis among the steel-using sectors. In 2020 the automotive industry is expected to experience a loss of sales of 20% on top of the losses in the past two years. Recovery to pre-crisis levels will take several years due to income growth and remote working, but safety concerns might boost demand for passenger cars in the short term. Furthermore, the supply disruptions may continue beyond the lockdown period as liquidity problems will deter the restart not only of car producers, but also of auto part suppliers. The transition to electric vehicles will continue and likely accelerate post-pandemic.

It is possible that the decline in steel demand in most countries will be less severe than during the global financial crisis as the consumption- and service-related sectors, which have been hit hardest, are less steel-intensive.

Al Remeithi, Chairman of the worldsteel Economics Committee

down, some infrastructure projects are continuing, making the fall in steel demand less acute. Growth in Vietnam is foreseen thanks to the early containment of COVID-19. In 2021, a renewed focus on infrastructure investment is expected to boost steel demand.

The COVID-19 pandemic has brought a perfect storm to Latin America and will undermine the prospect of any recovery in Latin American countries during 2020. Latin America is particularly vulnerable because of its accumulated domestic structural problems, political instability and high exposure to commodity prices. The region is expected to see a substantial decline in steel demand in 2020 and only a weak recovery in 2021. As the region seems to be lagging in the COVID-19 curve, the outlook may deteriorate further. The prospect of pushing forward with reform agendas and infrastructure plans is being hampered, pointing to a possible long-lasting impact from COVID-19 for the region.

be less severe than during the financial crisis. In the construction sector, social distancing measures seem to be more challenging to put in place, hindering post lockdown resumption of work. Prospects of new construction projects have also worsened due to the deteriorated balance sheets of consumers and businesses. Governments might try to put a focus on new construction projects in an effort to support demand, but significantly worsened government balance sheets may confine the ability to carry out public infrastructure investments.

Mechanical machinery. The mechanical machinery sector, where supply chains are some of the longest in manufacturing, has experienced significant logistical bottlenecks and supply chain issues. At the same time, mechanical machinery will experience a substantial decline in demand in 2020 as investment projects are put on hold or cancelled. The sector will face challenges in demand recovery in the longer term

The World Steel Association (worldsteel) is one of the largest and most dynamic industry associations in the world, with members in every major steel-producing country. worldsteel represents steel producers, national and regional steel industry associations, and steel research institutes. Members represent around 85% of global steel production.

The SRO includes presentations, estimates and other information that are forward-looking. While these forward-looking statements represent our current judgement on what the future holds, they are subject to risks and uncertainties that could cause actual results to differ materially. Readers are cautioned not to place undue reliance on these forward-looking statements, which reflect worldsteel's opinions only as of the date of this release.

| World Steel Association (worldsteel), Brussels, Belgium

The ambition to become the world's largest carbon-neutral steel producer by 2030

Roland Junck to spearhead CN30 programme at GFG Alliance

Liberty Steel executive Roland Junck will be the new global lead for the group's ambitious programme to become carbon neutral by 2030 (CN30)

Carbon Neutral by 2030 (CN30) is a wide-reaching programme by the GFG Alliance that aims to transform industrial manufacturing for a truly sustainable future. The CN30 programme implements low carbon initiatives such as hydrogen steel making, metals recycling, energy efficiency and renewable power across its three core industry brands - LIBERTY Steel, ALVANCE Aluminium and SIMEC Energy – to become carbon neutral by 2030 and create more flexible, competitive operations.

The new role of Roland Junck, which sits alongside his existing duties as President, LIBERTY Steel Group Europe & UK, will co-ordinate GFG Alliance's CN30 strategy and activities globally across R&D, technology, partnerships, commercialisation, supply chain, and public policy.

The key pillar in the CN30 programme is GFG's GREENSTEEL strategy to transform steel making through increased use of steel recycling in electric arc furnaces (EAF), application of low carbon and renewable energy sources to power industrial processes and use of hydrogen instead of coking coal as a reducing agent for iron ore through Direct Reduced Iron (DRI) plants to remove CO₂ emissions from steel making.

Low-carbon transformation in Australia, Czech Republic and Romania

In the nine months since GFG made its CN30 pledge the group has made significant progress under its GREENSTEEL strategy. GFG announced major GREENSTEEL investments in new DRI and EAF facilities at its Whyalla plant in Australia and its Galati plant in Romania where it signed MoUs with local partners and the Romanian Ministry of Economy, Energy and Business Environment to support delivery. These investments will replace

GFG Alliance port to be used for ship scrapping

SIMEC Mining is an arm of the GFG Alliance that bought the Whyalla Steelworks in South Australia along with its associated mines and is now pushing ahead with plans for the new enterprise to deconstruct, scrap and recycle (DSR) ships. This process could also align with GFG Alliance's broader GREENSTEEL strategy – creating scrap that can be recycled through the Whyalla Steelworks or GFG's other Australian scrap businesses. The company has prepared the port slipway for the arrival of the first ship, the ex-HMAS Success. HMAS Success was the Royal Australian Navy's longest serving ship, decommissioned in 2019 after 33 years of service. Work on deconstructing the vessel is expected to take about three months with some of the steel to be recycled through the steelworks.

aging industrial plant with modern low carbon technologies that can quickly integrate green hydrogen into its processes as it becomes available at scale and economically viable.

Similar transformation plans have been announced at GFG's primary steel operations in Ostrava, Czech Republic, including the introduction of Europe's first hybrid furnace that will allow the business to utilise higher volumes of local steel scrap to reduce the reliance on imported natural resources, which will lower CO₂ emissions and enable greater flexibility by switching or blending blast furnace and electric arc furnace steel-making. GFG's recycling facility in the UK has announced plans to double GREENSTEEL production at its Rotherham EAF to produce GREENSTEEL construction products for domestic infrastructure, and is working with leading plant provider Danielli on future low carbon production developments in the UK.

As part of the company's GREENALUMINIUM strategy, ALVANCE Aluminium's smelters are fuelled from low-carbon sources – by hydroelectricity in



GFG Alliance has appointed Roland Junck as its new global lead for its CN30 programme (Picture: GFG Alliance)

GFG Alliance's CN30 programme is sector leading and will transform our industrial businesses with advanced low carbon technologies. Roland's vast operational experience and passion means he's perfectly placed for this role as we move from planning to implementation to create a truly sustainable future for our industries and the communities we operate in.

Sanjeev Gupta, Executive Chairman GFG Alliance

Lochaber, Scotland, and by nuclear power in Dunkirk, France. This complements aluminium's properties as a 'green metal' for the construction and automotive

industries. GFG is actively involved in exploring collaboration opportunities with its industry partners on breakthrough technologies and in further developing

the market conditions for green aluminium.

Despite the COVID-19 crisis, GFG's SIMEC Energy portfolio of projects in solar energy, wind energy and energy from end-of-life waste continue to make progress towards completion. When complete these projects will provide the renewable and low carbon energy sources to help reduce emissions from GFG's industrial processes by replacing carbon intensive fuels sources such as coal and gas. SIMEC's renewable power sources open up the opportunity for green hydrogen production for steel, underlying the strength in GFG's model of combining industry and energy.

■ *GFG Alliance, London, UK*

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Picture: Deutsche Edelstahlwerke

Deutsche Edelstahlwerke push green steel concept

Sustainable measures for green steel

One of the pioneers in the manufacture of green steel is Deutsche Edelstahlwerke (DEW). The company in the SCHMOLZ + BICKENBACH group offers its customers solutions that are low on CO₂.

No material is as sustainable as steel. All the more reason why green steel is one of the main topics for the steel industry in the new decade. However, competences and technical capabilities have reached different levels of development across the sector.

The key question is: what contribution do “green” long steel products make to the circular economy and to resource efficiency? In order to answer this question in depth and continue to develop corresponding solutions, DEW are working closely with their customers – also to develop sustainable recycling concepts. Producing steel in a sustainable manner and significantly reducing the CO₂ footprint is the aim.

Fundamental to this is the use of renewable energy, such as green electricity. In this way, by using 100% electrical energy from purely renewable sources, it is possible for DEW to produce a tonne of crude steel with only 107 kg of CO₂. In comparison: the worldwide average CO₂ emissions for a tonne of steel is 1,850 kg.

“At Deutsche Edelstahlwerke we have been working for years on reducing our CO₂ emissions,” says Max Heumann, Head of Plant Engineering at Deutsche

Edelstahlwerke. “Even today, due to the process, the steel produced by DEW is much better than the worldwide average in terms of its carbon footprint. In addition, CO₂ emissions are being reduced by various projects. Ultimately, not only will our production become more sustainable, but the end product made by our customers itself will leave behind a much lower ecological footprint.”

DEW are achieving this by means of the following methods and concepts, among others:

Scrap metal and scrap concepts

The production of green steel starts with the selection of the scrap metals to be used. Because as a recycled material, scrap steel is the basis for the manufacture of steel. Since DEW predominantly uses scrap for the production of steel, the afore-mentioned close working relationship with customers culminates in individual concepts. For example, scrap metal is fed directly from the customer into the scrap cycle. As steel can be recycled 100%, corresponding concepts make an essential contribution to the worldwide conservation of resources. For example,

DEW are constantly putting their concept to the test together with their raw material company, dhi. It is based on an intensive exchange between the steelworks and the raw material company with the aim of optimizing the use of scrap for the steelworks. Over 100 scrap metal groups lead to alloying elements being fed to the steel smelting works in a resource-friendly manner. Further improvements have been achieved through unitization and by means of the “cleanliness” of the scrap: both parameters have been used to lower the energy demand in the steelworks for smelting steel. Further CO₂ savings are being achieved by a national procurement system for scrap metal. A scrap collection system available across Germany means that DEW avoid long transport routes. This makes an additional contribution to preventing CO₂ emissions when transporting the raw materials for steel production. The parts of the puzzle thereby come together to lower emissions permanently and noticeably.

The electric arc furnace

For the production of green steel, the electric steel process is seen as the trailblazer in terms of carbon emissions, as this method causes the lowest CO₂ emissions. DEW have been well positioned here for decades, as only electric arc furnaces are used at all steelworks operated by the

Wolfgang Henstorf, Deutsche Edelstahlwerke, Germany – Contact: wolfgang.henstorf@dew-stahl.com

SCHMOLZ + BICKENBACH subsidiaries (Witten and Siegen). In comparison to the blast furnace route, this type of manufacture is more flexible and environmentally friendly. In 2018, DEW emitted 429 kg of CO₂ during the production of one tonne of crude steel. This value is based on the average production of all materials made by DEW. As described above: as a worldwide average of all steel producers (blast furnace route and electric steelworks), 1,850 kg of CO₂ were released per tonne of crude steel in 2018. DEW was therefore 77% below the average back in 2018. In this context, DEW will push the use of green electricity in future in order to further reduce the CO₂ emissions for the production of all steel solutions. Because the procurement of green electricity can make a significant difference once again in the carbon footprint, as shown by the previously mentioned comparative value of just 107 kg of CO₂ emissions per tonne of crude steel compared to the already low figure of 429 kg at DEW. That means a reduction of 94% compared to worldwide crude steel production.

Special steel solutions for reducing CO₂

The most successful steel developments by DEW include the BAINIDUR® steels, as hardly any other steel grade is able to combine cost efficiency and flexibility in such a way. High strength and ductile components for lightweight automotive construction, for example, can be produced with BAINIDUR® reliably, without distortion and as a result with less machining allowance. This makes the bainitic material a future-oriented alternative to conventionally used steel solutions. Customer benefits are a shortened process chain and a constantly reproducible high quality of high-performance, high strength lightweight components.

BAINIDUR® shows off its strengths especially in the area of green steel, as it demonstrably helps customers to save on CO₂ emissions. The energy efficient BAINIDUR® steels are based on the principle of setting the bainitic structure directly from the forging heat without additional heat treatment, thus saving on process costs for the customer and, in turn, on CO₂. In short: thanks to BAINIDUR®, DEW save their customers an extra heat treatment. The steels can replace conventional

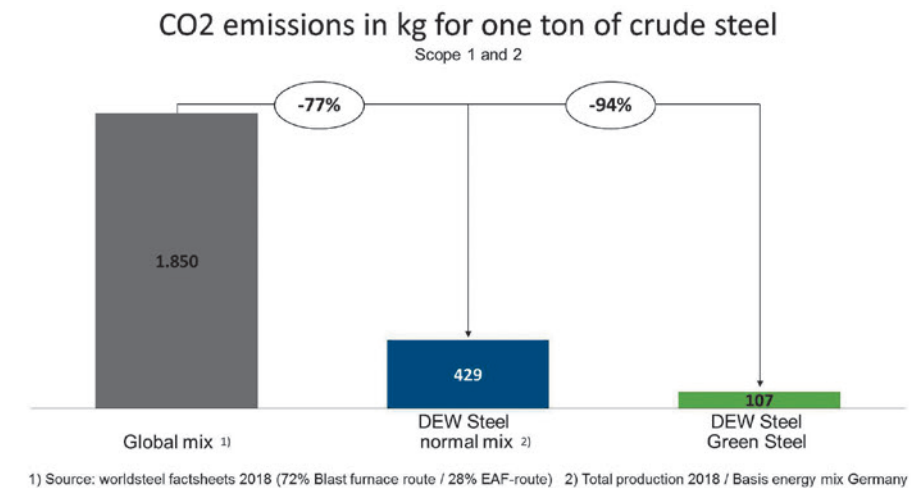


Fig. 2. DEW will push the use of green electricity in future in order to further reduce the CO₂ emissions for the production of all steel solutions (Picture: Deutsche Edelstahlwerke)

heat-treatable steels (with the same or improved properties). By increasing the component strength, both the component size and weight can be reduced.

first phase, the powertrain was determined with 399 kg of steel. With a factor of 2 for using crude steel, it would be possible to reduce approx. 260 kg of CO₂

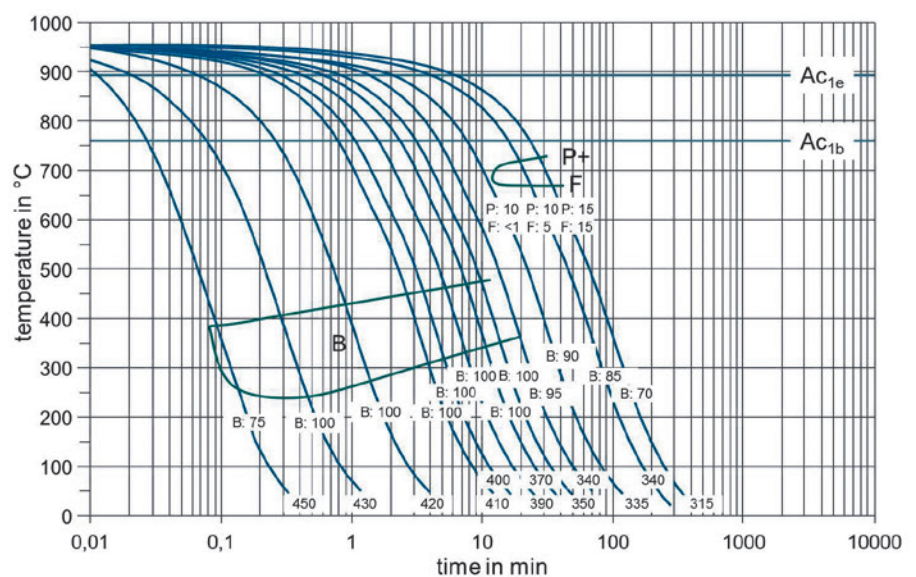


Fig. 3. BAINIDUR® can replace conventional heat-treatable steels – particularly for high strength and ductile automotive components in lightweight structures (Picture: Deutsche Edelstahlwerke)

The initiative "Massiver Leichtbau" (Lightweight Forging)

DEW is a member of the "Lightweight Forging" initiative, which has set the goal of reducing weight on cars and lightweight commercial vehicles and thereby lowering fuel consumption. This also helps to reduce CO₂ emissions. In the

per powertrain with green steel. The new ALUDUR® steels produced by DEW plays a part in this context. These are high-alloyed engineering steels. Compared to conventional steels like 42CrMo4, the high aluminum content in ALUDUR® enables its specific weight to be reduced by approx. 13%. Used in the automotive sector, further CO₂ emis-

We have been working for years on reducing our CO₂ emissions. Even today, due to the process, the steel produced by DEW is much better than the worldwide average in terms of its carbon footprint.

Max Heumann, Head of Plant Engineering at Deutsche Edelstahlwerke

sions can be saved due to the significant weight reduction.

DEW participates in the energy efficiency initiative

Last but not least, Deutsche Edelstahlwerke launched a special program aimed at

energy efficiency back in 2009. It includes more than 75 projects, such as measures to utilize waste heat, a more efficient way of supplying compressed air, measures in the area of lighting and factory heating, and improvements concerning controls/regulations on various facilities. By this means, energy consumption at the com-

pany was reduced in recent years by almost 100 million kWh per year and hence CO₂ emissions were lowered by around 30,000 t per year. Work is continuously being undertaken to improve this energy efficiency. In addition, DEW have introduced an energy management system according to DIN ISO 50001. Measures that have already been acknowledged in the public sector too: As early as 2010, Deutsche Edelstahlwerke received the renowned environmental prize by the Stiftung Arbeit und Umwelt (Work and Environment Foundation).

More information can be found at <https://www.dew-stahl.com/greensteel> and at <https://innovation.schmolz-bickenbach.com>.

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Innovative oxygen technology with great potential

thyssenkrupp implements sequence impulse process at one blast furnace

The new process technology developed by thyssenkrupp is a further contribution to climate protection. The blast furnace in Duisburg is the world's first equipped with this technology inducing shockwaves. It will be a reference plant for this technology.

In Duisburg thyssenkrupp is testing the "sequence impulse process 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 blast furnace Schwelgern 1 and will serve as a reference plant for marketing.

The research, carried out by thyssenkrupp AT.PRO tec GmbH, a company of thyssenkrupp Materials Trading GmbH, and thyssenkrupp Steel Europe, has resulted in an innovative oxygen injection process tailored specifically to the blast furnace process. "Process development work was focused on the "deep action" of the oxygen. The aim is to improve gas and liquid flows in the blast furnace and thus improve efficiency. We based this on our knowledge and the targeted use of various gas-dynamic phenomena in the oxygen injection process," explains Dr. Rainer Klock, Manager Furnace Metallurgy at thyssenkrupp Steel Europe's Schwelgern blast furnace plant. Technically this is realized by fitting each of the 40 tuyeres on blast furnace 1 with an additional lance for oxygen injection. The 40 lances each have their own injection unit or "SIP box".

"Replacing five kilograms of coke with pulverized coal per ton of hot metal in blast furnace Schwelgern 1 would already result in potential annual cost savings of millions of Euros"

Jörg Glebe, managing director of thyssenkrupp AT.PRO tec GmbH



thyssenkrupp is testing the new "sequence impulse process with induced shockwaves" oxygen injection system on the Schwelgern 1 blast furnace (Picture: thyssenkrupp)

The technology is already meeting with wide interest. Talks are currently being held with major plant engineering companies. The aim is to launch the process worldwide and support installation in blast furnaces.

thyssenkrupp is aiming to achieve climate neutrality in its steelmaking operations by 2050. As an initial target the company plans to reduce emissions from its own production and processes and from purchased energy by 30 percent versus the base year 2018 by 2030. Carbon Direct Avoidance (CDA) is one of two routes the company is pursuing with its strategy. In a next step, the blast furnaces are to be converted in part to hydrogen injection. To exhaust all possibilities for optimizing blast furnace technology,

thyssenkrupp Steel Europe

Temperature measurement in the stove dome

Reduction of the amount of purge gas during temperature measurement in stove domes by 80%

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.

In a stove dome, air is heated to approx. 1300°C before feeding into the blast furnace. For this purpose, cold fresh air flows from bottom to top through preheated grating refractory bricks. The temperature of the grating refractory bricks is measured optically using pyrometers. These are mounted on the cupola of the hot-blast stove and are directed to detect the infrared radiation of the refractory bricks from a distance of several meters through a sighting tube (**figure 1**). The pyrometer determines the temperature from the infrared radiation according to Planck's law. For safety reasons, two redundant devices are often used, which are installed in parallel in a protective and a mounting fitting (**figure 2**).

High demands on the measuring system

Due to extreme metrological conditions, high demands are made on the measuring system. The devices are exposed to weather conditions. Depending on the country and geographic region, the ambient air temperature can range between -40°C and +80°C. To protect the pyrometers from extreme cold, a heater with thermostat is installed in the protective cover of the pyrometer and in the switch box. At very high outside temperatures, gas is flushed through the cover for cooling. If the temperature of the electronic devices is out of the permissible exposure range in the event of a fault, the control system of the system releases an alarm. The

internal temperature of the pyrometer is permanently monitored.

High dust concentrations can occur in the stove dome. Therefore, modern pyrometers are used, which work according to the two-colour measurement method. These tolerate such disturbing influences as far as possible. A weakening of the infrared radiation by dust or smoke in the field of view or a contamination of the viewing window would lead directly to a reduced temperature indication if a conventional single colour pyrometer is used. A two-colour pyrometer delivers reliable measured values even with a signal weakening of 90%.

In order to keep the protective glass and the sight tube free of contamination, nitrogen is blown through a nozzle into the



Figure 1. Pyrometers measure the temperature of the grating refractory bricks in the stove dome from the cupola (Picture: Adobe Stock / stefanbi1974)



Figure 2. Mounting fitting consisting of protective hood, flange with pressure-resistant window and purge gas nozzle, pneumatic valves, manual valve and pinhole aperture (Picture: Keller HCW)

Dipl.-Ing. Albert Book, KELLER HCW GmbH, Ibbenbüren, Germany – Contact: albert.book@keller.de

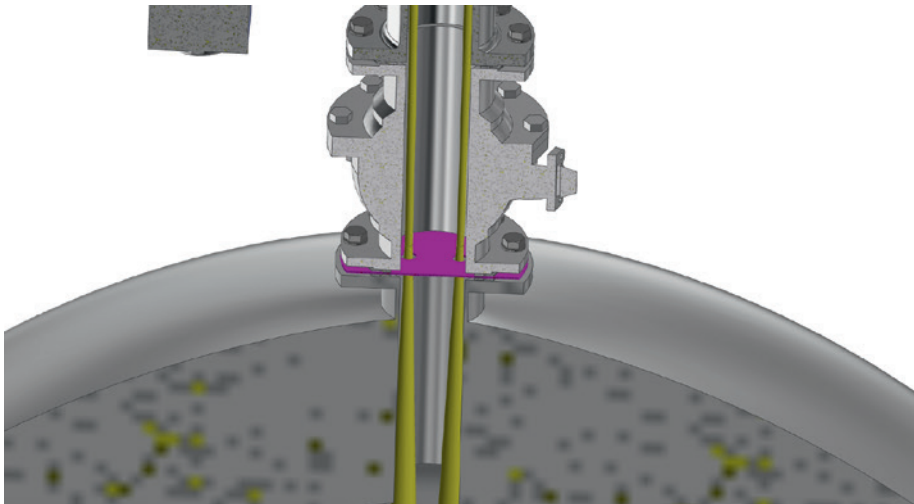


Figure 3. Pinhole aperture with two openings (Picture: Keller HCW)

mounting fitting. Due to the two operating states of the stove dome during the heating of the storage stones and during the generation of hot air, the pressure in the stove dome varies between normal pressure and an overpressure of up to 5 bar. The construction requires an inner diameter of 150 mm for the mounting fitting when mounting the two devices installed in parallel. The nitrogen consumption is correspondingly high in order to generate the necessary counter-pressure. Thanks to an actually simple yet ingenious invention, Keller ITS has succeeded in reducing the amount of gas by at least 80%. For this purpose, a pinhole aperture with two openings is installed between the mounting flange of the stove dome and the mechanical valve (figure 3). The reduction of the free opening also significantly improves the cleaning effect. In the event of a leak in the mounting valve, the perforated screen also allows considerably less dangerous hot gas to escape from the stove dome in the event of a malfunction.

Metrological solution

Prerequisite for the use of the pinhole aperture are high-quality optical pyrometers with a narrow optical field-of-view to measure unhindered through the opening (figure 4). The focus point of the instruments is adjusted to the distance to the pinhole aperture. The exact alignment is achieved by a ball joint. For this purpose, an opening is provided in the mounting fitting, through which the perforated screen is illuminated via an external light source during commissioning. The devices are equipped with a through-the-lens sight to check the focusing and alignment.

A flange with one viewing window per pyrometer is installed for pressure-tight sealing. A pneumatic valve closes the opening to the stove dome in the event of a pressure loss in the purge gas or a power failure or an impermissibly high ambient temperature. This is to prevent the measuring system from being damaged by escaping hot air at temperatures up to 1,300°C. In addition, a non-return valve on the purge gas nozzle closes if hot gas should escape there in the event of a defect in the air hose. A mechanical shut-off valve is provided for maintenance purposes.

A further measure was taken to additionally increase the operational reliability of the measuring system. Modern two-colour pyrometers have a function for monitoring the signal intensity. This signal is used to monitor contamination of the protective window or clogging of the sighting tube. At the same time, it can be used as an indicator of the operating status in the

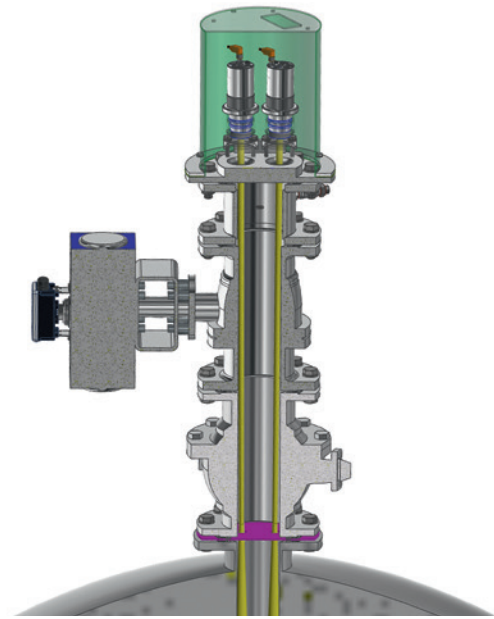


Figure 4. Precision pyrometer with high-quality optics and narrow field-of-view (Picture: Keller HCW)

stove dome. The signal intensity is transmitted via the second analogue output or the digital interface of the pyrometer to the control system of the plant where it is recorded and evaluated. The purge cabinet contains the nitrogen supply unit for purging, cooling and for controlling the pneumatic valve (figure 5).

Conclusion

Sometimes it is not complex but simple inventions that lead to enormous improvements. And afterwards you ask yourself why you didn't think of it before. By using a pinhole aperture in combination with optically suitable pyrometers, the consumption of purge gas for a measuring system to record the internal temperature of a stove dome can be reduced by more than 80% without incurring any significant costs.

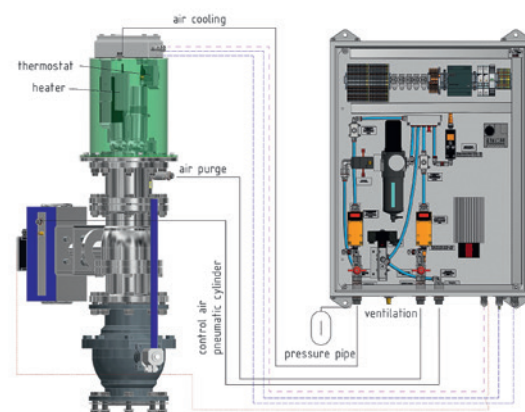


Figure 5. Purge cabinet with electrical and pneumatical control elements (Picture: Keller HCW)

Granulation of blast furnace slag

Successful reline of the slag granulation plant at Rogesa, Germany

German heavy plate manufacturer Dillinger together with Paul Wurth completed the modernisation of the slag granulation plant at the No. 4 blast furnace.

Paul Wurth's INBA® granulation and dewatering technology has been operating at Rogesa – the ironmaking site in Dillingen, Germany, since its initial installation in 2003. It is a cold water system with steam condensation designed for a daily capacity of 1,600 tons of blast furnace slag sand and a maximum slag flow of up to 8 tons per minute.

After 16 years of operation, the plant was relined by Paul Wurth and Dillinger. A special focus of this modernisation was on the cooling tower area as well as on the hot water tank, allocated below the INBA® dewatering drum.

Plant reline while production is running

It was a crucial criterion to minimise the loss of BF slag sand to one monthly production only. Therefore, Paul Wurth came up with the idea to reline the complete cooling tower gradually during uninterrupted, regular production and to use the four granted stoppage weeks in August to modify the hot water tank with a new water recirculation concept, which inevitably demanded a complete shutdown of the granulation operations.

In a first step, the existing water distribution of the complete cooling tower underwent a provisional modification. This was done during a short stoppage of a few days and allowed, for later on, that each tower cell could be shut down individually, while the remaining cells compensated the water losses of the cell under renovation. These consecutive modifications were executed between March 2019 and August 2019. Paul Wurth was in charge of the engineering, supply and erection of the new water distribution system itself, installation of a new pipe collector and its connection to the existing piping as well as of noise reduction panels.

The four-week stoppage in August was used to completely substitute the lower part of the old hot water tank as well as the connected process water recirculation system by a new design. Further works during that time were to finish the reline of the cooling tower, as well as to modernise the water pump reservoir and replace its clogged coke filters downstream the said hot water tank. At the same time, the Dillinger executed in their own responsibility partial replacement of several staircase structures as well as refurbishment of the granulation tank and the hot slag runner. During these 4 weeks, in average 80 workers were present during 24/7 shifts.

Acceptance test passed successfully

Finally, in January this year, Paul Wurth and Dillinger successfully tested the con-

tractual process guarantee parameters of cooling tower performance and plant availability.

Paul Wurth's design represents a new, specific concept of the cooling tower as well as a new process water handling within the hot water tank. This remarkably reduces the amount of suspended solids entering the cooling tower with the process water. Furthermore and up from now, the cooling tower can be flexibly used, which means that Dillinger will be able to use each cooling tower cell independently. This includes the possibility to shut down or by-pass one cell, based on the current production and maintenance needs without reducing any granulation capacity.

Paul Wurth



Paul Wurth's cold water granulation system with dynamic INBA® dewatering technique is an officially recognised Best Available Technology (BAT) in the steelmaking industry (Picture: Paul Wurth)

Transition from integrated to electrical steelmaking process route

The importance of secondary metallurgy

Evaluation of the best available technique for the transition from BOFs to a green EAF steelmaking philosophy cannot be based only on evaluation of the primary melting unit. The capability of existing secondary metallurgy processes to fulfil required steel quality must be evaluated carefully.

Global requirements for CO₂ reduction have strong influence on the changes needed for iron and steelmaking to adopt new technologies that will generate less CO₂. The ability to produce steel grades with ultra-low carbon, ultra-low sulphur, low nitrogen and low hydrogen contents, as well as high degrees of steel cleanliness together with the required high melt-shop productivity and high melt shop utilization rates, are the main questions for steelmakers during the transition from traditional integrated melt shops to steelmaking processes based on the electrical arc furnace as the primary melting unit.

Comparison: BOF versus EAF steelmaking philosophy

The making of high-quality steel (including flat product steel) has always been the

domain of integrated mills operating according to the route: blast furnace – converter – secondary metallurgy – casting. The main reason for low nitrogen contents before tapping from the BOF is a high carbon-removal rate during the oxygen blowing stage, thanks to high specific hot-metal consumption. Because sulphur is removed from hot metal before the BOF process, sulphur contents before tapping from the BOF easily could be below 0.008% with proper scrap selection.

The typical secondary metallurgy configuration as part of a BOF-based melt shop consists of:

- standard argon-stirring stations: steel chemistry homogenization, light alloying and buffering,
- argon-stirring stations with top lance stirring: additional sulphur removal,
- chemical heating station,

- RH vacuum degassing station: carbon and hydrogen removal; and/or
- Vacuum Tank Degassing (VTD) station: carbon, nitrogen, sulphur and hydrogen removal.

Usually, the main reasons to install an RH degassing (instead of VTD) unit as part of a BOF melt shop are:

- product mix (high percentage of ultra-low carbon grades and / or electrical steel grades),
- need for slight nitrogen removal under vacuum or final nitrogen content control is based on nitrogen content at the end of BOF process. Usually, the main target is reduced hydrogen content,
- high BOF productivity (short tap-to-tap time.)

For an electric-arc furnace based melt shop, Best Available Techniques with respect to secondary metallurgy will be selected based on:

- known steel chemistry output from EAF,
- target product mix from quality point of view,
- required melt shop productivity,
- auxiliaries (e. g. available cranes.)

Table 1 shows metallurgical tasks in detail per different secondary metallurgy units.

Steel quality requirements: BOF versus EAF steelmaking philosophy

In recent years customers have steadily increased their requirements for steel quality: lower carbon, sulphur, nitrogen and inclusion content, together with less variation in steel quality from cast to cast [1]. In regard to steel quality, the main difference between the BOF and EAF processes may be summarized as follows:

- The BOF achieves lower nitrogen content before tapping compared with EAF process. Usually, nitrogen content before tapping is aligned with maximum allowed content per grade. Removal of slight quantities of nitrogen



Figure 1. Twin-tank VD station (Picture: Danieli)

Bojan Vucinic, Gandin Franco, Danieli, Italy – Contacts: b.vucinic@danieli.it ; f.gandin@danieli.it

could be required during the vacuum process;

- The BOF achieves lower sulphur contents in case sulphur removal from hot metal is necessary prior to the BOF process, and due to lower scrap consumption compared with EAF process;
- The BOF presents a smaller ratio between FeO in slag versus carbon content before tapping [2].

Best Available Technique evaluation required to make proper decisions needed for a transition from BOF to EAF shall include secondary metallurgy process and equipment evaluation as well, with the aim of keeping the same product mix as the BOF-based melt shop and having the possibility of improving steel quality in future. Thanks to strong experience with more than 110 vacuum tank degassing stations around the world, for different applications (including flat production and stainless steel as well), Danieli has the proper solution for fulfilling quality requirements when operating an EAF as the primary melting unit. **Table 2** presents Danieli's experience with the vacuum tank degassing process, including different applications.

Per process:

- Vacuum Degassing (VD): nitrogen, hydrogen and sulphur removal,
- Vacuum Oxygen Blowing (VD-OB) Degassing: carbon, nitrogen, hydrogen and sulphur removal,
- Vacuum Oxygen Decarburization (VOD) process: stainless steel production under vacuum.

Per type of equipment:

- based on steam ejector pumps (with or without water ring pumps; 4 / 5 stages),
- based on mechanical vacuum pumps.

Equipment application:

- standard pump system (one tank under vacuum, other tank(s) at atmospheric pressure),
- smart pump system (both tanks under vacuum with one pump system.) This solution, while keeping the CapEx reasonably low, is applicable for stainless steel production to reduce total station time and to increase melt shop productivity, or for ULC production in case of a very short tap-to-tap time from primary furnace. This configuration is already confirmed in production of super ferritic,
- smart pump system pre-evacuation: it is possible to pre-evacuate the suction line (to create vacuum in the part of suction line located between the vacuum

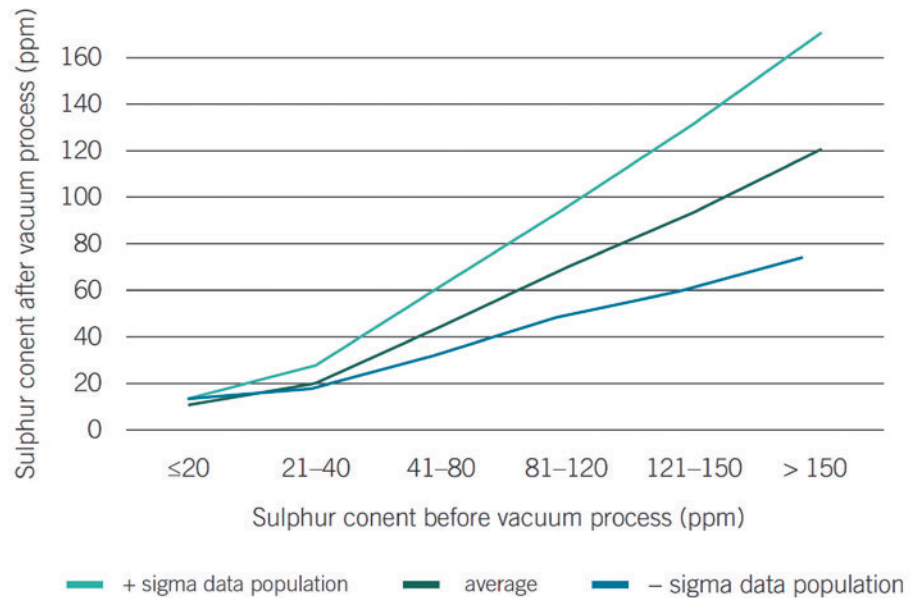


Figure 2. Sulphur removal during vacuum tank degassing process (plant A) (Picture: Danieli)

pump and the main shut-off valve), while in the other tank (of a twin-tank VD station) there is an ongoing vacuum treatment. The purpose of this smart pump configuration is to reduce time between two consecutive heats and to increase melt-shop utilization, having higher melt shop productivity while keeping the investment costs low.

Removal of non-metallic residuals elements

Nitrogen. When argon is purged into molten steel the gas bubbles start rising in the melt and gradually find their way out to the vacuum atmosphere. During this movement, dissolved nitrogen and/or hydrogen

Table 1. Metallurgical tasks per different secondary metallurgy units

	Heating capability	Sulphur removal	Carbon removal	Hydrogen removal	Nitrogen removal
Argon stirring station	No	Yes ¹	No	No	No
Ladle furnace	Yes	Yes	No	No	No
Chemical heating process	Yes	Yes ²	No	No	No
RH degassing	Yes - with top oxygen lance	No ³	Yes	Yes	Yes ⁴
Vacuum tank degassing	Yes - with top oxygen lance	Yes	Yes	Yes	Yes

1 – Top slag practice and strong stirring process – high temperature losses

2 – Limited process – possible with modified top slag and with strong lance stirring process

3 – Trials with material injection and/or with pre-fused slag application

4 – Possible with ultra-low inlet sulphur content and depending on RH vessel leak-rate amount

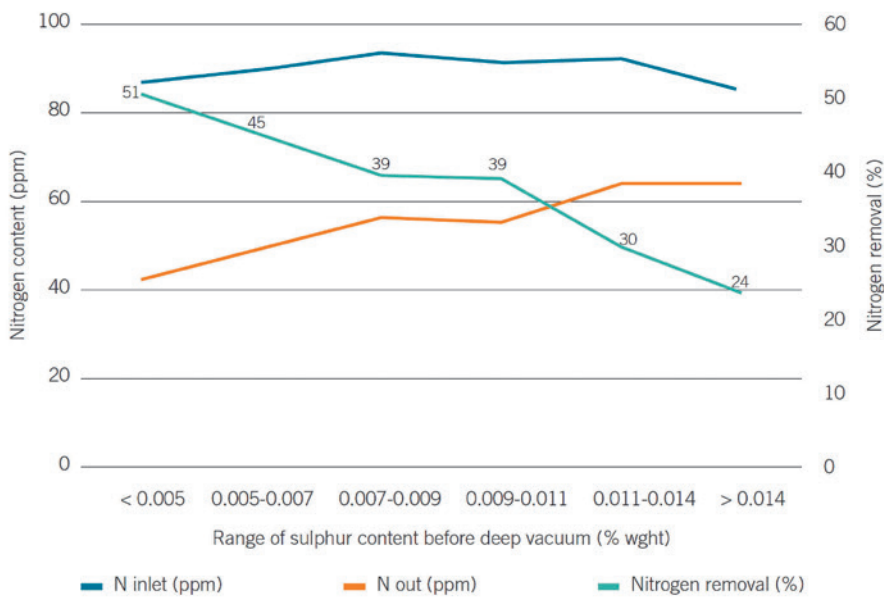


Figure 3. Average nitrogen removal under vacuum per different sulphur level (active surface) element before vacuum tank degassing process (plant A) (Picture: Danieli)

Table 2. Danieli reference with different vacuum tank degassing applications

Process type	VD	VD (OB)	VOD
with mechanical vacuum pump	12	2	11
with steam ejector vacuum pump	52	6	27
total	64	8	38

diffuses into the argon bubbles from the surrounding molten bath. Depending on the rate of diffusion, bubbles pick-up dissolved gases according to the laws of thermodynamic equilibria before leaving the melt. However, the rate of degassing will depend basically on the rate / intensity of purging of the inert gas, keeping constant the vacuum pressure above the molten bath. The possible steps in transport of nitrogen from the bulk of the molten steel to the bulk of gaseous phase may be listed as [3]:

- transport of atomic dissolved nitrogen [N] from the bulk metal to the metal boundary layer (MBL),
- transport of the dissolved nitrogen [N] through the MBL to the gas boundary layer (GBL),
- chemical reaction (formation of molecular nitrogen) at the MBL/GBL interface,
- transport (diffusion) of N_2 molecules in GBL,

- transport of N_2 molecules from GBL to the bulk gas.

The removal rate for nitrogen can be described by a first order differential equation.

Concerning switching from BOF to EAF process route, the starting nitrogen level in the liquid steel to be considered for the secondary metallurgy stations is (depending on the EAF charge mix and process management) slightly to considerably higher compared to the BOF route, and the removal of nitrogen from the molten bath becomes a critical point, especially for the ultra-low N steel such as Extra Deep Drawing grades (EDD) or IF grades, where final N lower than 30 ppm is increasingly in demand by final steel users.

Sulphur. Compared with the RH process, thanks to intensive contact (strong mixing) between steel and slag, during the vacuum tank degassing process it is possible to remove sulphur contents as well. Sul-

phur removal during vacuum process and impact of sulphur content in steel before and after vacuum on nitrogen removal must be considered as part of the EAF application. **Figure 2** shows sulphur removal during vacuum tank degassing process and **figure 3** shows the impact of sulphur content in steel on nitrogen-removal capability.

Sulphur removal during the ladle furnace process is controlled by: temperature, time available for process, slag basicity, oxygen content in steel, argon stirring pattern, molten bath agitation level (intimate mixing between slag and steel is pursued) and slag volume.

Lower sulphur content at the end of ladle furnace process may be achieved in the fastest way by applying pre-fused slag, mainly thanks to a lower slag melting point and tuned slag composition. With injection of powdered material (lime, SiCa...) it is possible to reach ultra-low sulphur content (below 20 ppm) at the end of ladle furnace process. **Figure 4** shows the sulphur removal rate (ppm per minute) during the ladle furnace process with application of pre-fused slag, and **figure 5** shows the results of powder material injection as a result of sulphur removal.

Carbon. Use of vacuum tank degassing to produce ultra-low carbon grades is already confirmed by many authors [4, 5]. It is well known, that due to different degassing methods, carbon removal is slightly faster with RH degassing compared with the carbon-removal rate with vacuum tank degassing technology (the nature of process means that stronger bath agitation is possible due to the presence of higher freeboard given by the tall RH vessel, as well as carbon pickup mainly from ladle refractory caused by strong contact between steel and ladle refractory in VTD decarburization process.) Interstitial Free (IF) steels have different carbon content requirements, from 30 to 50 ppm. Application of RH or VTD technology will be based on product mix grades (participation of ultra-low carbon: < 30 ppm of carbon) on an annual basis, versus nitrogen removal capability (as explained above) versus running costs. It is well known that the operating cost for the RH process is much higher mainly due to higher refractory consumption and very high steam (in a case of steam ejector pumps) or electrical

energy consumption (in a case of mechanical vacuum dry pumps).

Total station time (vacuum station time) during production of IF grades shall be optimized to reduce (control) carbon pick-up and to control spinel-type inclusions.

Carbon content below 25 ppm at the end vacuum tank degassing (with / without oxygen lance application) is already confirmed. Raw material quality, including quality of ladle refractory material for ultra-low carbon grades must be controlled to reduce as much as possible carbon pick-up after vacuum tank degassing. Based on results from different applications, expected carbon pick-up per different types of refractory material (carbon content in refractory material from 5 to 12%) is in a range of 6-12 ppm. Same carbon pick-up is confirmed by many authors [5].

Magnesium-aluminate inclusions are a specific spinel compound with aluminium and magnesium as the respective cations and oxygen as the anion. They are represented by the formula $(MgO \cdot Al_2O_3)$, have a cubic crystal structure and are solid at steelmaking temperatures. It has been shown that MgO pick-up observed in the inclusions can be related to different factors: contamination of aluminium used for deoxidation, reaction of liquid steel with the MgO refractories used in ladles lining, vaporization of Mg from ladle slags due to arc-heating and slag metal reactions during refining operations [7 – 11].

To reduce the amount of spinel-type inclusions generated, corrective actions must be applied:

- To reduce process time: Sulphur and nitrogen contents before vacuum process should be aligned with the maximum allowed content per steel grade, so the main processes under vacuum during IF grade production should be carbon removal, steel and slag deoxidation and homogenization;
- Ladle cycle monitoring: New ladles shall not be applied for IF grades. This corrective action is beneficial for carbon content pick-up as well;
- Best process route: EAF – tapping – ladle furnace – vacuum tank degassing – casting

Hydrogen. Hydrogen content below 1 ppm is easy to achieve with vacuum tank degassing. Target hydrogen content at the end of the vacuum process is set by the

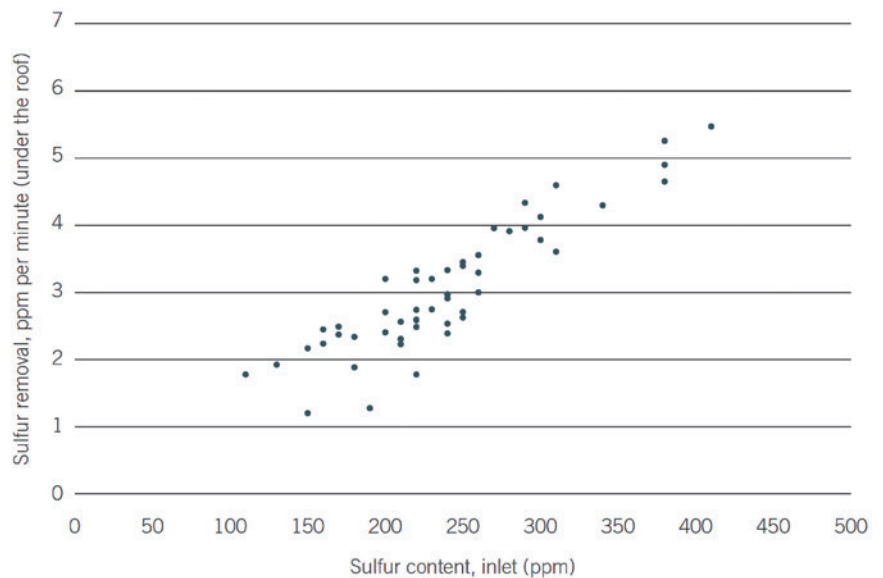


Figure 4. Sulphur removal rate with pre-fused slag application (plant B) – fixed temperature and total process time and fixed final sulphur content in range of 40 ppm – ladle furnace process

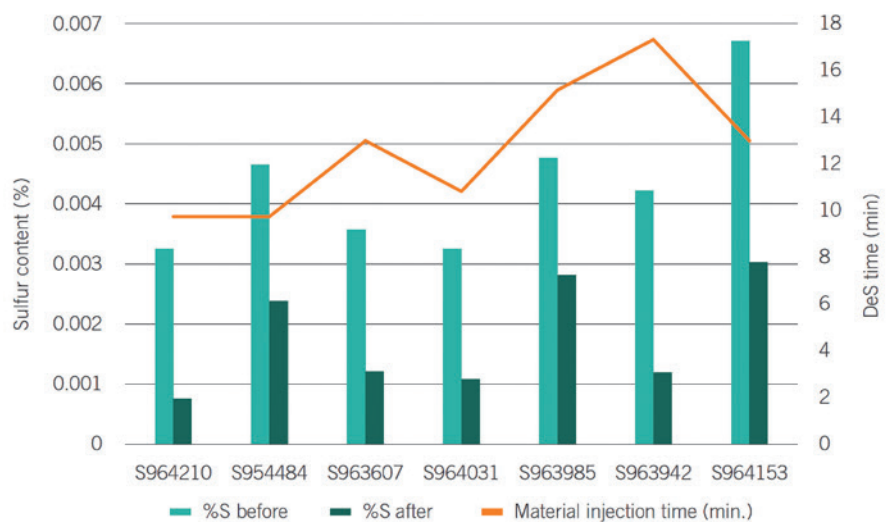


Figure 5. Sulphur removal with injection of powdered material (SiCa) – plant C – ladle furnace process

maximum allowed hydrogen content per grade and based on hydrogen pick-up during rest stage of secondary metallurgy and casting process (caused by lime addition, casting sequence per tundish, etc.) Figure 7 shows hydrogen content before and after vacuum tank degassing (one sigma data population) together with typical hydrogen removal pattern for a heat size of 160 t.

Argon stirring efficiency, exposed steel (to the vacuum), slag thickness, duration of pump down-time and slag thickness, together with equipment designed for

proper suction capacity are key parameters required to reach low-hydrogen content at the end vacuum tank degassing.

High productivity and quality with a modern secondary metallurgy station

As mentioned above, the main reasons to have RH degasser as part of an integrated plant are:

- short tap-to-tap time from the BOF and slightly shorter carbon-removal time at the RH compared with VTD station,



Figure 6. A modern secondary metallurgy plant installed in an electric melt shop should be equipped with state-of-the-art technologies derived from the Industry 4.0 approach (Picture: Danieli)

■ higher proportion of ultra-low carbon grades.
If it is necessary to reduce overall station delivery time (interval between delivery of

two consecutive ladles from the VTD station), a “smart” vacuum station may be installed with a customized suction line and pump system designed to have vacu-

um in both tanks at the same time, with a single pump system. This type of pump and suction line design is already developed and applied for stainless steel production, for ultra-low carbon and nitrogen steel (super-ferritic grades). The suction line is separated into medium- and deep-vacuum parts with the possibility to have medium pressure in one tank and deep vacuum in another tank. **Figure 8** shows the real pressure in both tanks at the same time for two consecutive heats (plant D) [12].

With increasing demands for high-performing and at the same time efficient and low operating-cost vacuum-degassing equipment, dry-mechanical pumps have been confirmed as the proper choice to completely fulfil the expectations of steel-making companies worldwide. As a matter of fact, ahead of the replacement of widespread and renowned steam-ejector pumps technology with technology embodied by the dry mechanical vacuum pumps, well-established metallurgical performances in terms of carbon-hydrogen-nitrogen-Sulphur removal have been repeatedly attained [13]. **Figure 9** shows a “smart” mechanical vacuum pump application (smart: pump system with dual manifolds, specially designed to serve two

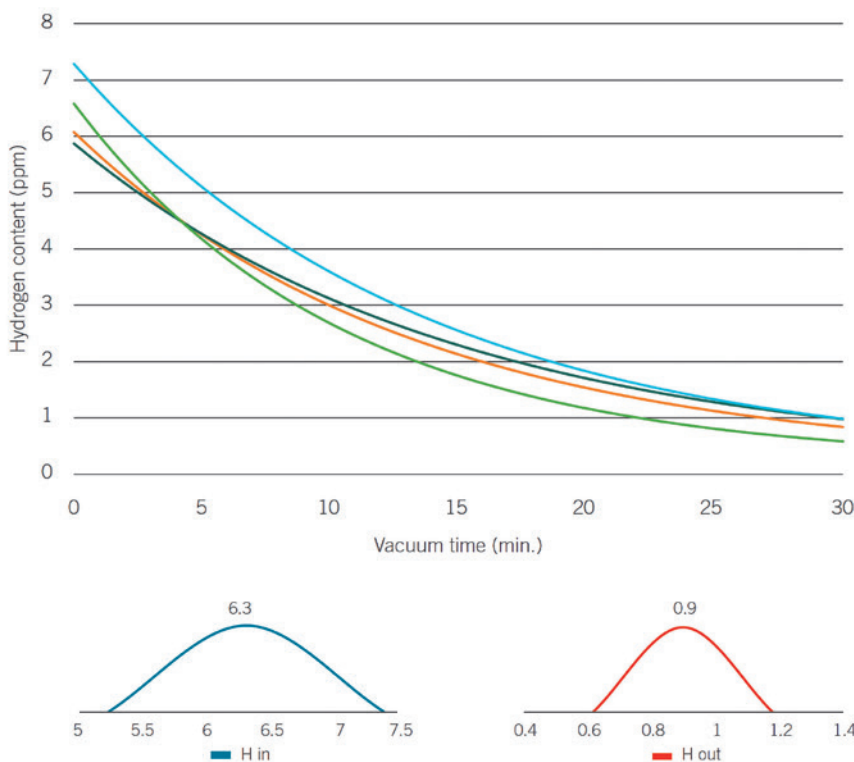


Figure 7. Hydrogen removal pattern for a 160-t heat, together with one sigma data population: inlet versus outlet hydrogen content (plant A) (Picture: Danieli)

independent VD/VOD stations – vacuum degassing and stainless-steel process.)

Secondary metallurgy advanced process control

A modern VTD station installed in an electric melt shop should be equipped with state-of-the-art technologies (derived from the Industry 4.0 approach) that makes it possible to draw the best out of the overall mechanical equipment, such as the VTD, by using innovative sensors that interface with highly advanced adaptive models. Such innovative solutions will help to speed up VTD treatments by minimizing the pump down-time, boosting the N-H-S removal and at all the times keeping under control the main VTD station KPIs.

In recent years Danieli has focused its attention on this topic and developed customized solutions (installed as prototypes and tested-tuned in our owned plant ABS, provided with two twin-VTD stations):

- for minimizing the pump-down time and avoiding slag overflows (Q-AFS = automatic Anti-Foaming slag System),
- for automatically monitoring the molten bath open-eyes (Q-OPENEYE VTD) and accordingly regulating the bottom argon stirring, depending on the specific VTD process phase (deep vacuum or trimming),
- for continuously measuring and estimating the steel temperature without touching the bath (Q-TEMP VTD).

In this way the mass transfer coefficient ($k = m/min$) is maximized at all times under deep vacuum, the N-O-H pickup is minimized during trimming, together with more efficient and faster inclusion removal, and finally, unexpectedly low or high steel temperature at the VTD treatment end are avoided.

Optimal temperature control during all phases of the steelmaking process brings advantages in terms of productivity, quality and cost reduction. Thanks to neural network model application, it is possible to reach target temperatures with acceptable deviation range [14]. The impact of predictive temperature control during the entire process ensures a narrow range of temperature superheat in the tundish during casting, which brings stable casting speed and strong impact on final steel quality. **Figure 12** shows super-heat variation before and after neural network-based temperature

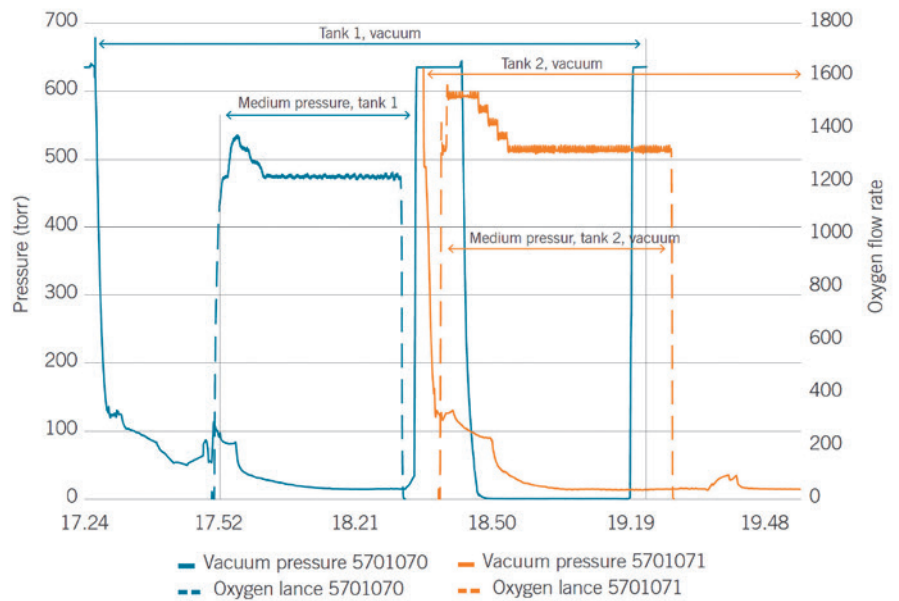


Figure 8. Vacuum process in both tanks at the same time (Picture: Danieli)

control application during vacuum tank degassing [14].

Summary

Application of the electrical steelmaking process route for high-quality grades is already confirmed by the market. Best Available Technology evaluation during transition from integrated to

electrical steelmaking process must include:

- most suitable electric arc furnace as required for the product mix and available conditions (e.g. electrical network),
- raw material quality versus required product mix,
- capability for existing secondary metallurgy to produce required high-quality grades with changed steel conditions.



Figure 9. Smart pump configuration. VD/VOD application with mechanical vacuum dry pumps – plant G (2020) (Picture: Danieli)

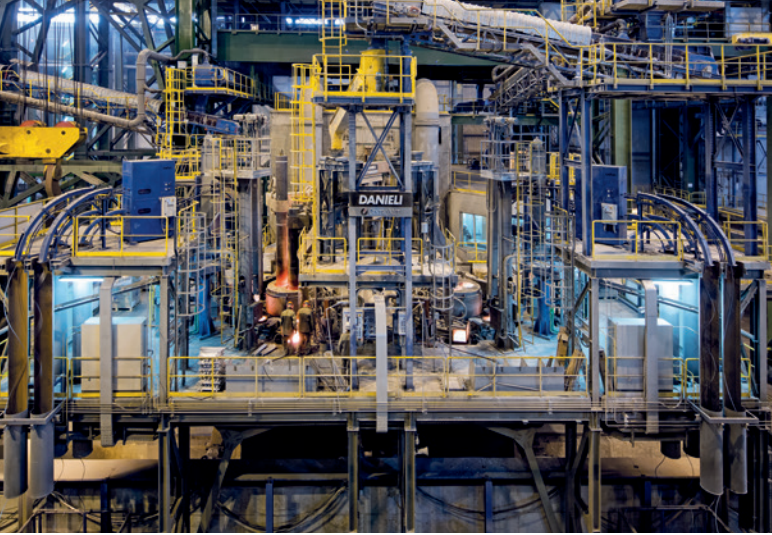


Figure 10. Twin-ladle furnace station (Picture: Danieli)



Figure 11. Advanced process control is indispensable to achieve high productivity and quality with a modern secondary metal-lurgy station (Picture: Danieli)

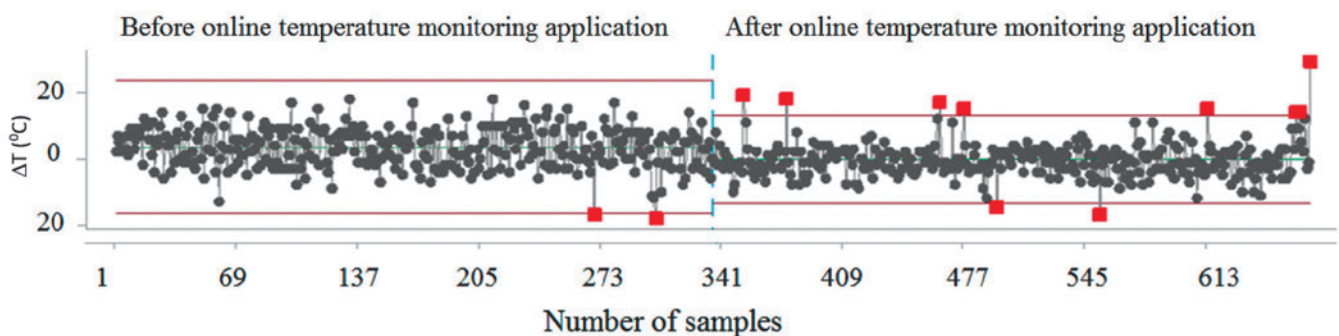


Figure 12: Temperature deviation from the optimal superheat, before and after online temperature monitoring application (Picture: Danieli)

RH degassing is well known as a high-productivity secondary metallurgy process with some disadvantages, mainly caused by required conditions for steel quality prior to the process. Vacuum tank degassing is able to manage most of the grades usually produced via a RH degassing station. Slightly longer required process time in case of VTD

application, compared with the RH process, could be overcome with smart and customized (designed for purpose) equipment design by keeping high both the melt shop utilization rate and productivity.

Thanks to already achieved and confirmed results with multiple projects, Danieli as equipment and metallurgical know-

how supplier offers proper answers to challenges caused by "new" steelmaking tendency – green and high-quality steel. Published results in this article is confirmation for this statement.

■ Danieli

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Open-die forging

High-speed press commences operation at German stainless steel forge

SMS group has put into operation the 31.5/34-MN high-speed open-die forging press at forging company Gustav Grimm Edelstahlwerk GmbH & CO. KG based in Remscheid, Germany. Demolition of the old and assembly of the new press, including the subsequent acceptance tests, were successfully completed during a construction phase of just under eleven weeks.



Fig. 1. Forging of the first bloom on the new high-speed press supplied by SMS group to Gustav Grimm in Remscheid, Germany (Picture: SMS group)

German stainless-steel company Gustav Grimm specializes in the manufacture of forgings in high-alloy materials. The new high-speed forging press not only meets all the relevant requirements for this, thanks to the built-in, state-of-the-art hydraulic and control systems, the forging specialist can reap the benefits of higher process efficiency. With maximum 65 strokes per minute the new high-speed forging press achieves time savings of around ten percent compared to the old press.

First open-die forging press with 3D-printed manifold block from SMS group

For the first time, SMS group has installed an additively manufactured machine component in an open-die forging press. The 3D-printed hydraulic manifold block is lighter and more compact, and has a flow-optimized design.

Hydraulic components with a fluid-conducting function, in particular, are perfectly suited to be additively manufactured due to the high degree of design flexibility that this technology offers.

With the new function-oriented design approach, modelling of the design starts from within the component, i.e. from the inside out. In case of the manifold block, first the fluid volume was simulated and then the required wall thickness generated, so that material is only used where it is actually needed for functional reasons.

The 3D-printed hydraulic manifold block, designed by SMS group and made in an aluminum alloy, weighs just one tenth of the component conventionally designed in steel. The manifold block is used to distribute the hydraulic oil for operating and venting the cylinders. The optimized valve arrange-

ment takes into account the direct, optimized flow of fluid through the individual channels and provides easier access to the manual valves for maintenance. The monolithic component design significantly reduces the number of potential leakage points. Despite its high complexity, the 3D-printed hydraulic manifold block can be delivered in much less time than its steel equivalent.

“This new manufacturing technology enables not only the channels to be engineered for optimized flow but also the installation space and mass to be reduced as a result of the much more compact design”

Nina Uppenkamp, research and development engineer at SMS group

“With our new open-die forging press from SMS group, we can manufacture customized forgings of highest dimensional accuracy for our clients and expand our product mix even further. What impressed us most about the press were the high-quality, state-of-the-art components, the high level of

automation, and the improved process efficiency,” says Götz Grimm, CEO of Gustav Grimm.

Fully digitalized forging process

The high-speed open-die forging press is equipped with a data monitoring system. All target and actual parameters

are captured during the forging process. In the event of a fault, the SMS specialists can analyze the machine condition and operating data, and immediately perform a remote fault diagnosis. The data monitoring system can also be used for process optimization and quality assurance.



Fig. 2. The 3D-printed hydraulic manifold block developed by SMS group is capable of withstanding high loads and comes in an impressive futuristic design (Picture: SMS group)

For quick tool changes, the press is equipped with a hydraulic forging-tool changing device. As the die turning and clamping device now comes with significantly fewer mechanical components, it requires much less maintenance.

■ SMS group

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Optical measuring system for the plate mill of Salzgitter Mannesmann Grobblech GmbH

New system for contour and flatness measurement of heavy plate

A new optical measuring system from nokra has been installed in the heavy-plate mill of Salzgitter Mannesmann Grobblech GmbH. This system measures not only the contour, but also the flatness of the plate with highest precision, 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.

In its heavy plate mill, Salzgitter Mannesmann Grobblech GmbH (SMGB), based in Mülheim an der Ruhr, Germany, produces heavy plate in widths of up to 4.80 metres and lengths of 24 metres. In the hot rolling mill, slabs are rolled down to rough plates according to the customers' specifications. The dimensions of these plates used to be measured manually on the cooling bed, by operators taking the length and width with a tape measure at several positions of the plate. However, that manual method was not suited to measure and document complete plate contours.

The objectives

One of the project targets was to minimize the cutting waste for each customer order by measuring – in a fully automatic process and with high precision – the complete contours of the raw plates and calculate the optimum cutting pattern for each one of them. Another task to be performed by the new system was to measure the plate flatness.

In the context of production digitalization, SMGB wanted to be able to capture and store the complete geometrical data

of each individual plate and generate a grey-scale image of each plate surface. This would enable the company to review the production process at any time in the future and assure 100% traceability of each individual product.

Another feature expected from the new system was to enable systematic analysis of the measured contour and flatness data, and on the effects the various parameters concerned may have on the contour and flatness of the plates. The results from these analyses would be used to continuously optimize the rolling process.

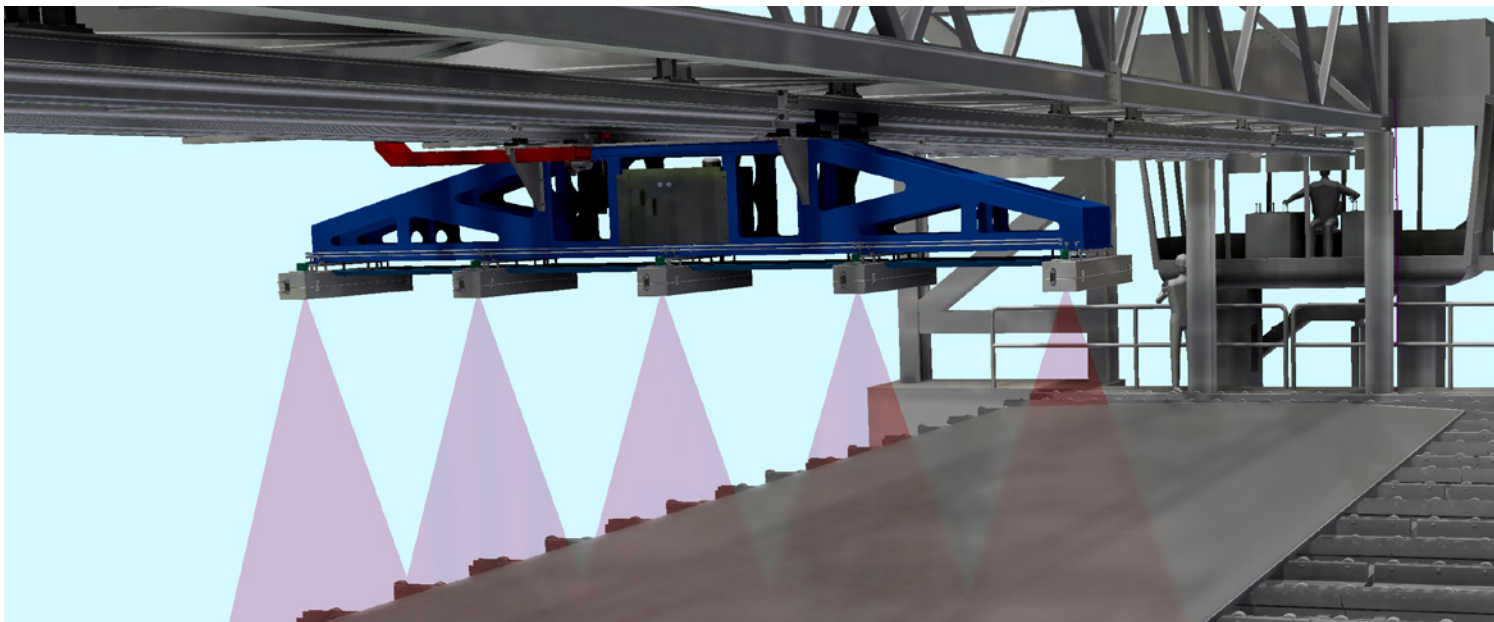


Figure 1. The measuring beam suspends from a steel structure that stretches over the complete length of the cooling bed (Picture: nokra)

Thorsten Ryssy, Project Engineer Technology, Salzgitter Mannesmann Grobblech GmbH, Mülheim an der Ruhr, Germany; Günter Lauven, Managing Director, nokra GmbH, Baesweiler near Aachen, Germany – Contact: glauven@nokra.de

Hence, the overall goal was to establish an automatic measuring process that would not only measure the complete contour of each plate, but also each plate's topology – including product height data – in 3D, store all this data and make it available online to downstream processing stages and the various departments involved.

Unique challenges

Stationary optical contour measurement systems are in use in heavy-plate mills the world over. Those systems operate with sensors arranged above roller tables. The plates are measured while passing underneath the measuring bridge.

A key requirement specified by SMGB had been to be able to receive the measuring results at the earliest possible stage of the production chain in order to make maximum use of the results in downstream process steps. This meant that the only suitable position of the new measuring system in the Mülheim heavy-plate mill was at the head end of the cooling bed.

As the plates are placed transversely on the cooling bed, an arrangement with the plates travelling underneath a stationary measuring system was not feasible. Consequently, the solution was to design a measuring beam with sensors that would be travelling above the complete length of the plates while these were lying still on the cooling bed. These considerations led to the new measuring system for the heavy-plate mill of Salzgitter Mannesmann Grobblech being the world's first to not employ the traditional roller-table design.

Compared to measurements performed on roller tables, this innovative arrangement provides a series of benefits: The plates are not moving while being measured. Every measurement can now be related exactly to the position of the plate length where it was taken, based on the position of the measuring beam. Additionally, flatness measurements can be taken while the plates are perfectly still. Therefore the measurements are not influenced by any motion of the plate – not even at its head and tail ends. These benefits have resulted in an overall very high measuring accuracy.

The solution

The core elements of the system are nokra's pre-calibrated laser light-section

Combined measurement of contour and flatness

The sensor units developed by nokra for the light-section process project laser lines onto the plate surface, each one covering a width of 1,150 mm. While the measuring beam is travelling above the product to be measured, the cameras arranged at an angle within the sensor units capture their respective light lines. The plate edges are determined based on the images taken by the cameras and the position of the measuring bridge along the plate length at the time each image was taken. From the measured width and length values, the software calculates the contour.

In the system installed in the Mülheim heavy-plate mill of SMGB, nokra uses lasers of different wavelengths (red and infrared) in two adjacent sensor units. This eliminates the need to offset the lines, makes the equipment more compact and exploits the full length of the cooling bed.

The height information, which is used to calculate the flatness, is derived from the angle at which the cameras capture the lines on the plate surface.

sensor units. Each unit comprises one line laser and one camera. Consisting of five sensor units mounted on the measuring bridge, the system captures approximately 10,000 pixels over a width of 5 m (**figures 1 and 2**), resulting in a resolution of 0.5 mm transversely to the longitudinal plate axis. The measuring range for the height measurements taken to determine the plate flatness is 340 mm above the cooling bed, at a measuring uncertainty of ± 0.05 mm.

A high-precision position encoder system, consisting of a 30-m-long magnetic band fitted along the rail and a measuring head with a spatial resolution of 10 μm , measures the position of the sensor beam along the plate length with an accuracy of ± 1 mm. This data forms the basis for the length measurement of the plate. The thermal expansion of the rail is measured with thermocouples and any deviations in the measured length values due to temperature variations are compensated automatically.



Figure 2. The system as seen by the operator at the pulpit (Picture: Salzgitter Mannesmann Grobblech)

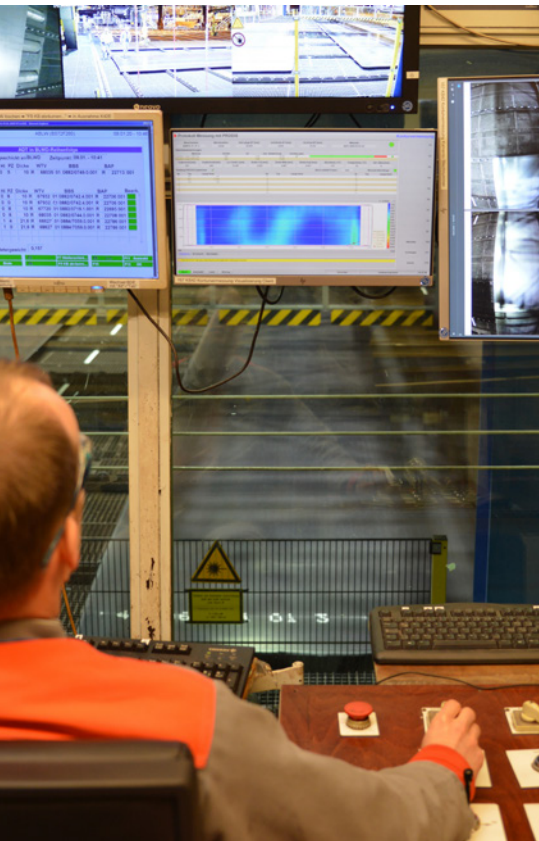


Figure 3. At the control screen, the plate contour and the grey-scale image are shown, in addition to the measured geometrical data (Picture: Salzgitter Mannesmann Grobblech)

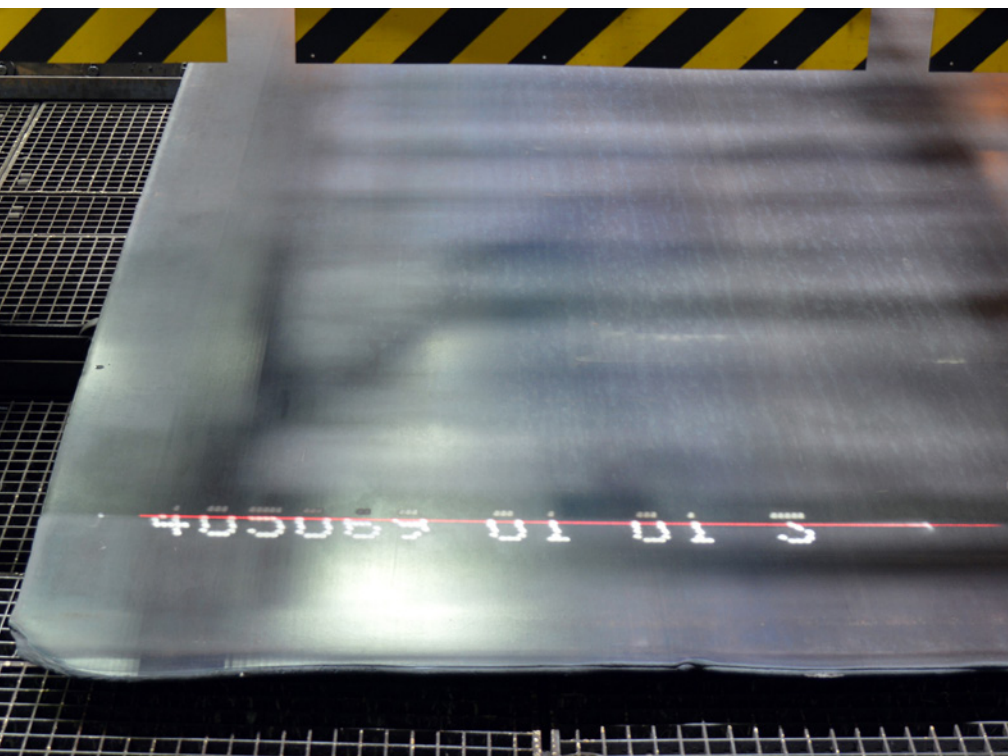


Figure 4. While the measuring beam is travelling above the plate, the laser line becomes visible on the plate surface (Picture: Salzgitter Mannesmann Grobblech)

An encapsulated housing shields the optical equipment from dust ingress. Narrow-band filters in the receiver optics prevent the system from being influenced by extraneous light. The lower side of the measuring beam is protected by heat shields. Excessive heating-up of the laser light-section sensors is prevented by an active cooling system. These precautions enable the measuring system to operate at plate temperatures of up to 150°C.

The nokra system requires no compressed air and no external cooling water. This provides a distinct cost advantage over competitor systems – with regard to both capital and operating costs.

nokra also implemented the safety concept – including CE marking and the integration of the system into the production process – developed in cooperation with the consulting institute BIT e.V.

The system was installed during scheduled downtimes. Consequently, there was no interference with regular production. As nokra supplied the system with the laser source and the camera firmly connected within a common housing and in a pre-calibrated state, no calibration effort was required. This saved much on commissioning time.

nokra's exceptional know-how and longstanding experience as a supplier of optical measuring systems for the steel industry were paramount for the success of the project. This is demonstrated, among others, by the sturdy mechanical design of the steel structure. nokra was also extremely flexible and supportive in customizing the system to the constraints and specific circumstances in the plate mill, and ready to accept the responsibility for the complete project, including the travelling steel structure and the integration of the system into SMGB's infrastructure.

The test run of the nokra system went very smoothly. Since the end of November 2019, the system has been operating as a fully integrated asset of the plate production process.

Operation with the newly integrated system

The plate transfer within the Mülheim plate mill is handled by a warehouse management system. When a plate is placed on the cooling bed, the system enters the plate ID number to assure reliable material tracking during the contour measuring process. The operator at the cooling-bed control station selects the plate to be measured on his screen and sends the specific plate data to the system (**figure 3**). Additionally, in order to rule out the risk of mixing up material, he doublechecks the plate number via images taken by two cameras mounted on the measuring beam (**figure 4**). As soon as the plate has been properly positioned within the measuring area, the plate data is transmitted to the system and the operator starts the measurement with the push of a button. The system starts automatically. While moving along the length of the plate, it measures the complete plate geometry. It stops immediately as it recognizes the plate end and returns to its parking position.

As soon as the measuring process has been completed, the software calculates the plate geometry, length, width and the cropping cuts at the plate head and tale. The complete contour is graphically displayed at the control pulpit (**figure 5**).

Then the measured data is transmitted to the higher-level product data and information system "PRODIS", which calculates the cuts, taking into consideration safety allowances, sample cutting and the plate sizes specified in the customer order.

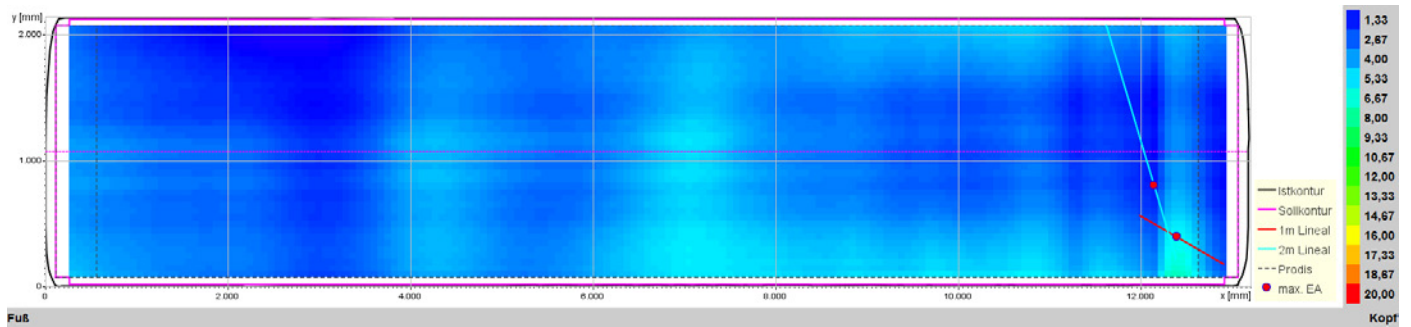


Figure 5. The plate flatness is visualized as a 2D image (Picture: Salzgitter Mannesmann Grobblech)

First experience and conclusions

The new system fully complies with the requirements specified by SMGB and has been performing as guaranteed by nokra. The outside contours of the plates, i.e. width and length, are measured with an accuracy of 3.5 mm and 5.0 mm respectively. The accuracy of both the contour and the flatness measurements is definitely up to expectations. The employees greatly appreciate the way the contours are visualized – how the cutting lines, the safety allowances and the sample cuts are indicated. They immediately accepted the new system.

The cutting pattern data derived from the measured values can also be viewed and used in the downstream processing stages. The availability of digitized geometrical data enhances statistical process control and is extremely useful in performing

detailed evaluations and achieving process optimizations (figure 6). It is possible to systematically analyze the effects of certain materials or geometries on the production process. Also in-depth analyses of historical data can help to further optimize the production process. It is possible to analyze the effects of individual material grades on the rolling process, for example, or whether certain plate dimensions may require special attention.

To enable high-precision alignment of the coordinates of the five sensor units, a calibration block in hard stone has been installed at the parking position of the measuring bridge in front of the cooling bed (figure 7). It has proved useful to perform an alignment once per shift and whenever the ambient temperature changes by a specified value. For the alignment, the laser lines are measured relative to one another and automatically adjusted, if nec-

essary. The alignment is an entirely automatic process.

The measuring bridge is completely encapsulated. Therefore, apart from occasional removal of dust, the optical equipment does not require any other cleaning measures. The maintenance staff greatly appreciates the fact that the parking position of the system is next to – not above – the cooling bed. This means that the measuring bridge is easily accessible even during running production.

In the event of a power supply failure, the control computer of the measuring system is buffered by a UPS system (figure 8). It shuts down automatically after a few minutes without power, and reboots



Figure 6. Grey-scale image of a plate (Picture: Salzgitter Mannesmann Grobblech)

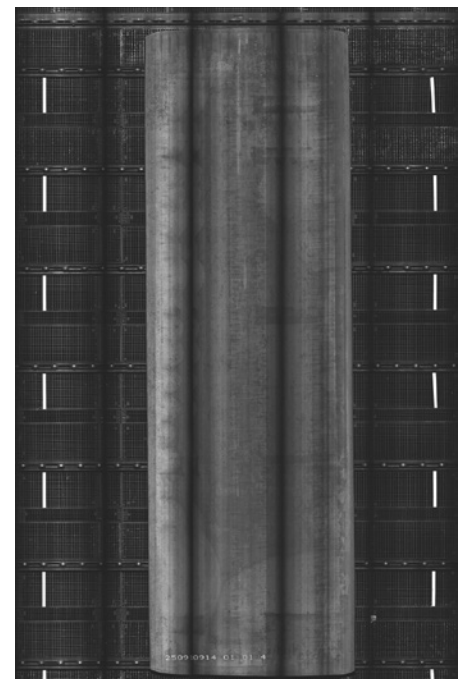


Figure 7. The measuring beam – with the five sensor units – in the parking position. Installed below is the calibration block in hard stone (Picture: Salzgitter Mannesmann Grobblech)

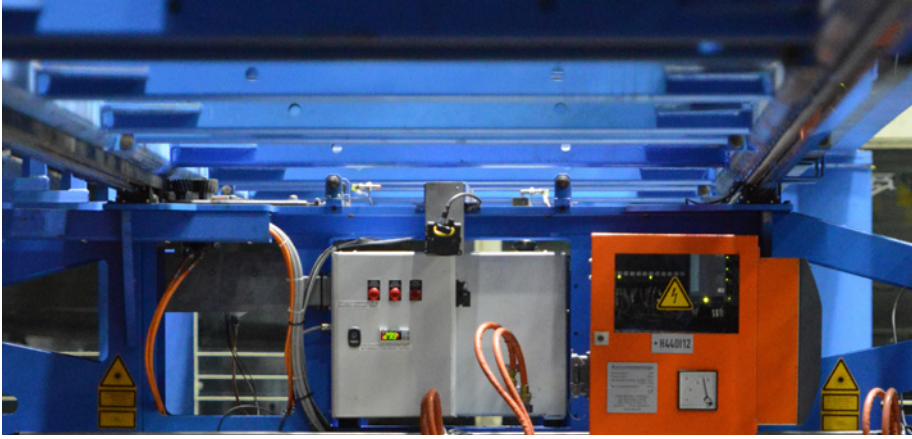


Figure 8. The electrical equipment is fitted below the measuring beam (Picture: Salzgit-ter Mannesmann Grobblech)

and restarts all necessary programs – also fully automatically – as soon as power is back up. All this takes place without any intervention by the maintenance staff.

The first months of productive operation have shown that the contour and flatness measurements of the individual plates work extremely reliably. Availability of the system has been excellent. These results prove that it was the right decision to employ a system that uses a measuring beam that travels above the plates while these are lying still on the cooling bed. Also the algorithm that calculates the cuts has proved highly successful in maximizing the yield and minimizing waste.

RUSSIA

Stoilensky begins hot testing at new additional beneficiation section

Stoilensky Mining and Beneficiation Plant, part of NLMK Group, has started hot testing at three new concentrate grinding lines.

The commissioning of the new additional beneficiation section will enable Stoilensky to increase its concentrate output

from 17.5 million to 20 million t/year and its ore processing capacity from 37 million to 42 million t. The new section will be integrated into a single process chain with three sections of the beneficiation plant. Having passed the medium to fine crushing stages and the high-pressure grinding rolls, ore will be fed into the

three vertical mills for further crushing and beneficiation, before being supplied to the pelletizing plant for the production of pellets or being shipped to NLMK Lipetsk.

■ NLMK

SLOVENIA

SIJ Metal Ravne to install heat treatment plant

Andritz has received an order from SIJ Metal Ravne for the supply of a complete heat treatment plant.

The supply will include two Andritz Maerz® double-chamber furnaces, a charging machine and high-volume quenching tanks, as well as an automation system. Each double-chamber furnace will consist

of a high-temperature furnace (650 to 1,220°C) with recuperative burners and a low-temperature furnace (200 to 830°C) with forced circulation. Both furnace types meet the qualifications for AMS 2750 E classification 2, which requires very high precision in the thermal process ($\pm 6^\circ\text{C}$). The charging machine is designed as a portal-type unit for handling charging

material up to 25 t. The high-volume quenching tanks using polymer and water also comprise the complete water treatment plant and four cooling towers. Commissioning is scheduled for the second quarter of 2021.

■ Andritz

SWEDEN

SSAB to reduce emissions and extend life of coke oven battery

SSAB EMEA AB has chosen Paul Wurth's service team to carry out a revamp of its coke oven battery at the Luleå steel works in northern Sweden.

The modernization project, to be carried out on an EPC basis, will focus on battery life extension and emission reduction. Paul Wurth included its patented technol-

ogy of the Single Oven Pressure Control (SOPRECO®) system for emission reduction, eliminating existing design constraints in relation to the by-products plant. The order placed by SSAB covers the replacement of the entire raw gas system including ascension pipes, goosenecks, gas collecting main and off-takes. Taking advantage of the ovens being empty dur-

ing the replacement of the gas collecting main, Paul Wurth will also renew the battery ovens roof by replacing the rails for the charging machines, the transversal tie rods and some refractory layers.

■ Paul Wurth

Protect plant equipment against overload

Self-resetting torque limiter installed at a slitting line

Compared to conventional shear pins, torque limiters from Malmedie offer several advantages. First and foremost downtime of the line is drastically reduced in case of an overload. Also, the acceptable load can be adjusted at any time. Malmedie has now introduced a new self-resetting torque limiter.

Dillinger is a leading heavy plate manufacturer in Europe. At their Dillinger/Germany facility, Dillinger produces heavy plates for numerous industrial applications, including offshore wind farms.

The main drive of their slitting shear was originally equipped with shear-pin couplings to protect the drive train against overloads. With this coupling type, it is necessary to replace the broken shear pins after disengagement. The consequence is long downtime of the line. Furthermore, the shut-off torque of shear-pin couplings is fixed and cannot be adjusted later – as it is possible with torque limiters from Malmedie.

Some years ago, Dillinger started to replace the shear-pin couplings with torque limiters from Malmedie for many of these applications. The main reason for the exchange was the fact that the torque limiters from Malmedie can be manually reset easily after an overload – without the need to replace any of the coupling parts. The downtimes of the equipment can be significantly reduced due to this feature.

New torque limiter with automatic self-reset

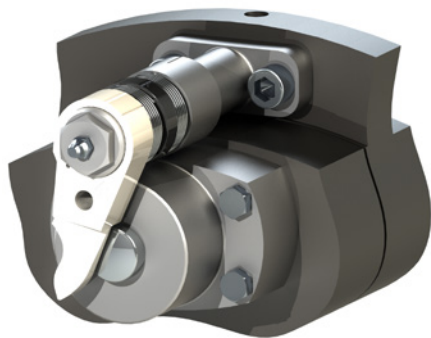
Recently, Malmedie developed and installed a new technology of an automatic self-reset (Patent DE10 2019 110 297 plus further patents pending) of the torque limiter. Dillinger has implemented this new development on their slitting shear. After disengagement, the safety elements of the coupling are automatically reset by a short reverse of the rotational direction. After disengagement of the coupling, the unique design of the reset-levers guarantees a free rotation of the pushed-out pins of the safety elements.

As soon as the driven side of the coupling is at zero speed, the motor's rotational direction is shortly reversed. By slowly running the motor "backwards", the couplings halves (including the safety elements) are automatically centred and then the reset levers push the pins back into their "locked" position. Now, the coupling is ready for full operation again.

The downtime of the slitting shear after disengagement of the torque limiter until full re-engagement is now only 30-60 seconds. This new technology also prevents the requirement for someone to enter the "hazard area" to reset the torque limiter manually.

After a modification of the drive PLC, the re-engagement procedure can be initiated by the master control station or can be made fully automatically.

The retrofit of the shear drive was done in May 2020 and is the first application for this new technology.



Self-resetting torque limiter (Picture: Malmedie)



The shear drive was retrofitted with the new self-reset torque limiter in May 2020 (Picture: Malmedie)

M.A.T. Malmedie Antriebstechnik GmbH, Solingen, Germany

Cold rolling of stainless steel strip

Optical thickness measurement proves itself in dense mist of rolling oil

The "VTLG" laser-optical thickness measuring system from Vollmer has replaced an X-ray gauge at the Dillenburg cold strip mill of Outokumpu. It now simplifies the production processes due to the material independence of the method. Despite the extremely dense rolling oil mist, it operates with μm accuracy.

The Outokumpu Works in Dillenburg, Germany, is a modern cold rolling mill that produces predominantly stainless steel strip. The material satisfies the highest demands on surface quality – for example, as a façade cladding in architecture.

The starting material that is between 2.5 and 6.0 mm thick and comes from the Group's plants in Finland and Sweden, is rolled to a thickness between 0.15 and 4.0 mm and then annealed, pickled, slit and cut to length according to customer requirements.

For over 20 years, a radiometric thickness gauge was in operation on the "Sundwig 1350" 20-high cold rolling mill (**figure 1**). However, the supply of spare parts for this system was no longer assured. Since it is not possible to roll without precise thickness measurement, a defect would have jeopardised the supply security of the entire plant.

Furthermore, operation of the X-ray measuring system involved a great deal of work: Measurement of the thickness is influenced by the material properties of the strips, so that the parameters for each

new alloy had to be entered into the measuring device. In some cases, this meant that the rolling of coils of new materials had to be postponed until the correction factors from the alloy analysis had been input into the radiometric gauge.

Challenging boundary conditions

During the search for an alternative, the project team contacted Vollmer, as the "VTLG" laser-optical thickness gauge had already proven itself in dozens of plants and had significantly reduced the maintenance costs there.

However, multi-roll stands usually produce more rolling oil mist than cold rolling with two-high or four-high stands, and even more so with stainless steel, as the forces involved are particularly high. With a strip speed of up to 880 m/min and high deformation values, a particularly dense oil mist develops at the roll gap on the mill in Dillenburg (**figure 2**).

In addition, the surface of the 3D bright annealed material that represents the majority of the plant's product spectrum is highly reflective. Furthermore, the installation space was very limited, because the mill has a particularly compact design in order to keep the distance between the two coilers – and thus the non-rolled areas – as short as possible.

Overall, the Outokumpu project team had concerns about whether optical measurement could function absolutely reliably and provide accurate results under these conditions.

The project

The specialists from Vollmer, however, were very confident that the VTLG laser-optical thickness measuring system would also work reliably on the Dillenburg



Figure 1. The "Sundwig 1350" 20-high cold rolling mill at the Dillenburg works. The VTLG can be recognised from the light blue indicator light on the mill to the right of the control panel (Picture: Wolfram Schroll / Vollmer GmbH)

Jörg Kazmierski, Andreas Zeidler, Outokumpu Nirosta GmbH, Dillenburg, Germany, Elke Roller, Friedrich Vollmer Feinmessgerätebau GmbH, Hagen, Germany – Contact: roller@vollmergmbh.de

mill. They therefore proposed to initially install a system on only one side of the mill (**figure 3**). In the unlikely event that it did not prove itself, they would replace it with an X-ray gauge from their own production. This created a win-win situation for both sides.

Outokumpu had the possibility of returning to the X-ray technology at any time, and Vollmer had the opportunity to prove that the system works reliably even under the most difficult conditions. The X-ray system on the other side of the mill stand remained in operation for the time being.

The substructure of the existing X-ray gauge could continue to be used for the installation of the VTLG (**figure 4**). Only very minor modifications were required to the mill proper. Vollmer adopted the hardware interfaces to the superordinate systems one-to-one, and only the content of the telegrams was adapted. No constructional measures were necessary with regard to laser protection either.

Thanks to the good preparation on both sides, dismantling of the old gauge and installation and commissioning of the new system were completed on schedule in three days, despite the difficult installation situation. The VTLG went into operation on 20 August 2019.

The technology in detail

The VTLG strip thickness gauge operates on the principle of laser triangulation. It is particularly characterised by its sturdy design: Although it contains optical components, it can be installed in the mill in the immediate vicinity of the roll gap. Even under such tough conditions, it achieves a very high precision. The VTLG thus opens up completely new possibilities for quick and precise thickness control and for quality assurance. With an internal scanning rate of 80 kHz, the scalable analog output provides a signal for the high-speed thickness control within milliseconds.

VTLG measures the absolute thickness of the strip without being influenced by the material properties, but contact-free and from a safe distance. With a measuring accuracy of $\pm 1 \mu\text{m}$, it achieves the same precision as tactile and X-ray gauges.

Vollmer offers different measuring ranges from 0.015 to 12.0 mm thickness. With an air gap of the C-frame of 135 or 205 mm, the sensors are positioned at a safe

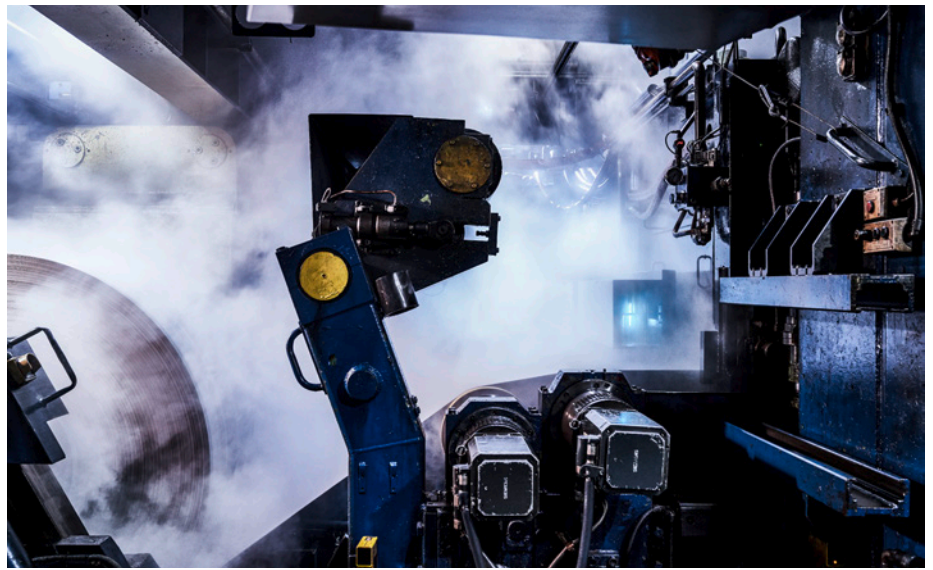


Figure 2. Even dense oil mist does not affect the measuring precision of the VTLG (Picture: Wolfram Schroll / Vollmer GmbH)

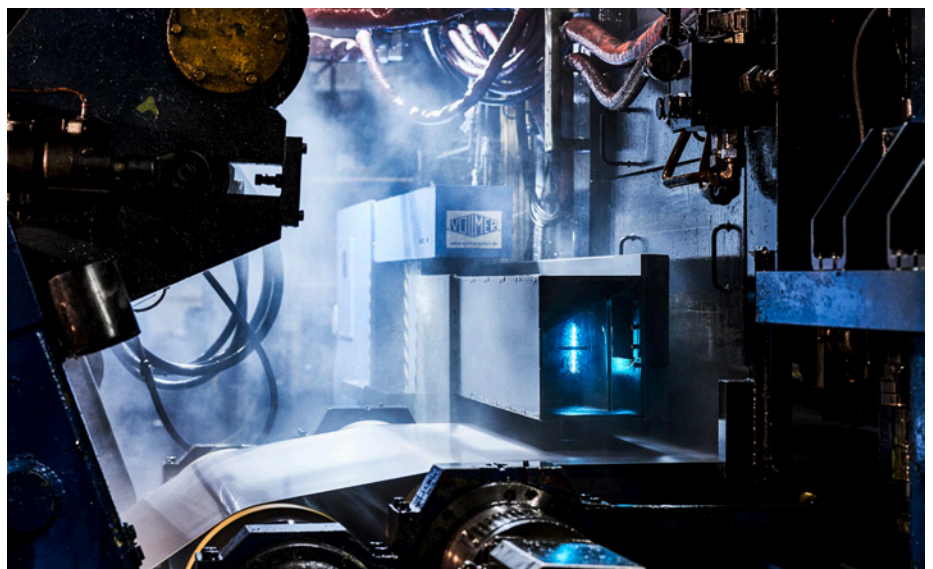


Figure 3. The VTLG is installed just a few centimetres from the roll gap (Picture: Wolfram Schroll / Vollmer GmbH)

distance from the strip. The measuring depth lies between 400 and 1200 mm, depending on the gauge type. The space requirement in rolling direction lies between 170 and 200 mm, depending on the measuring range.

The VTLG is not only suitable for measurement in the mill – it is equally suitable for use on the annealing line, in the finishing shop, on strip millers or in shear lines.

Four design features contribute to the high precision of the system: The temperature stabilisation of the measuring frame, the automatic check of the calibration before each strip, the air cleaning systems

and the synchronicity of the upper and lower laser sensor.

- Vollmer compensates the thermal expansion of the C-frame by means of an intelligent temperature management system. This ensures that the measurement of the strip thickness in the mill, at the exit from a furnace line or on the annealing line is just as accurate as in an air conditioned laboratory.

- Furthermore, the system checks its adjustment using a calibration normal integrated into the C frame before each strip pass: At the start of the measurement, the C-frame moves automatically



Figure 4. The C-frame of the VTLG in parking position (Picture: Wolfram Schroll / Vollmer GmbH)

into the line and on its way there measures the thickness of four captive DAkKS-certified gauge blocks representing the thickness spectrum of the mill. The VTLG thus constantly monitors itself and makes any necessary corrections automatically.

- The fact that the two sensors operate absolutely synchronously contributes significantly to the high precision of the system. VTLG eliminates the influence of the strip movement during the measurement.
- Air cleaning systems ensure reliable operation even under the rough environmental conditions in the mill: Both the entry and exit windows of the transmitting and receiving lenses and the beam path are constantly flushed with clean air so that vapours or mists from the mill do not affect the measurement.

The lasers conform to laser protection class 3B. This means that in most cases, no additional occupational health and safety measures are necessary.

The system has all the common interfaces for communication with the line controller: PROFINET, PROFIBUS, hardware interface or TCP/IP. Operation via a touch panel is simple and intuitive, while extensive diagnostic functions support the operator.

Initial experience

From the first strip that was rolled slowly, the system functioned with the specified precision. The rolling speed could already

be increased to 880 m/min with the second coil. Even the then very pronounced development of oil mist did not influence the measurement results in any way: The VTLG achieved the required measuring accuracy in the μm range under all the operating conditions.

The acceptance by the mill operators was immediately very high, as the gauge functioned reliably right from the start.

Since commissioning, the laser thickness measuring system has operated reliably, and it has not been responsible for any production downtimes – an important aspect considering that it is not possible to roll without thickness measurement.

By contrast with the X-ray method, laser-optical measurement offers high flexibility during rolling thanks to its independence from the material properties: Even grades whose analysis is not yet available can be rolled immediately on arrival in the works. Particularly against the background of the fact that more and more new materials are being developed, the VTLG also has clear advantages in this respect compared with radiometric measurement.

Operation is limited to moving the C-frame in and out. The current strip thickness is displayed numerically, and the supplementary VGraph software from Vollmer shows the thickness profile over the strip length.

Automatic calibration of the system before each pass has also proven to be effective: Before a new strip is threaded in, the VTLG moves a DAkKS-certified set of gauge blocks into the measuring range fully

automatically and thus adjusts itself automatically. This gives the operators the certainty that the thickness measuring system is functioning reliably at each individual strip.

Very little maintenance is required: The inside of the C-frame is so well protected that it is limited to cleaning the optical components accessible from the outside every few days. It can be performed by the operating personnel at any time without the radiation protection officer having to give his approval.

In summary

With the precision in the μm range, the VTLG meets the demands of cold rolling even for thin strips that have to satisfy very tight thickness tolerances. The application in Dillenburg has proven that the optical system offers significant advantages over the radiometric gauges generally used to date, even under tough operating conditions: It operates completely independently of the alloy, significantly reduces maintenance work and thus increases the availability of the mill.

In view of the good experience, Outokumpu placed the order for the installation of the system on the second side of the mill just a few weeks after commissioning of the first system. It is also planned that the other mill in the works should be fitted with the laser-optical thickness gauges.

■ Vollmer GmbH

Haute couture for large sizes

Precision manufacturing of curved bevels

The flame cutting experts at Jebens GmbH master the highest precision: they even cut curved flame-cut parts from 400-millimetre-thick sheet steel with six different bevels so precisely that these components meet the tightest of tolerances.

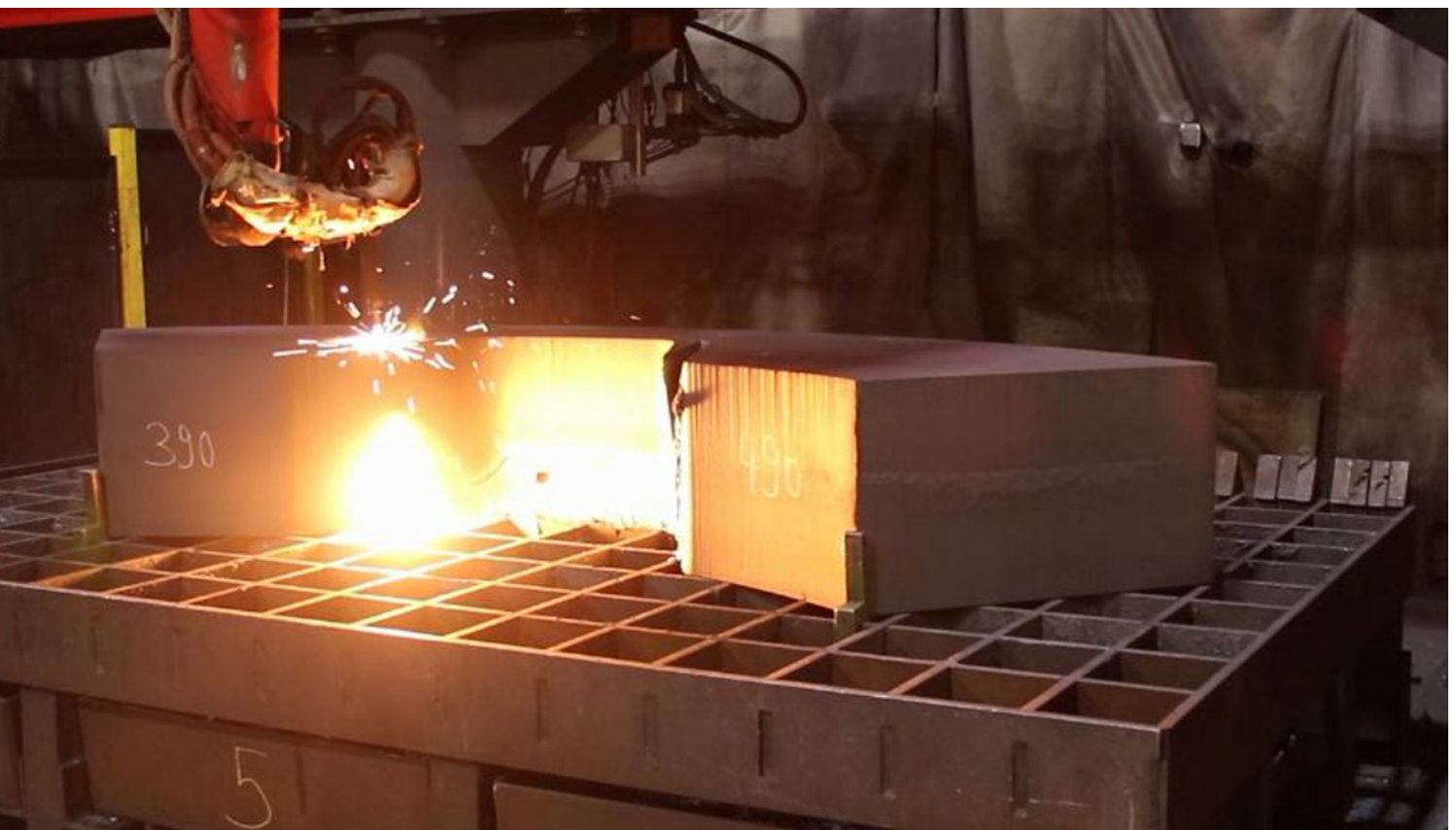
A global market leader in special machines has relied on Jebens' expertise in flame cutting for many years. 2,770 millimetres long, 960 millimetres wide and 400 millimetres thick, with a final weight of 8.5 tons each were the components recently manufactured for him by Jebens. The basis for just-in-time delivery is guaranteed access to material of this thickness – S355J2 + N with APZ 3.1 from German heavy plate manufacturer Dillinger, which is available to Jebens at all times: is itself far from usual in the market. However, as a subsidiary of Dillinger, Jebens has one of the largest stocks of high-quality steels in the thickness range from 100 to 650 millimetres and therefore offers the required delivery reliability.

The flame cutting expert is almost unique in Europe in the production of components with this thickness and with such demanding chamfers: due to a lack of suitable machines and experience, hardly anyone else is able to offer this. In order to process sheet metal of this thickness, particularly complex and precise temperature control is necessary. Jebens preheat the sheet metal with lances – including all chamfers. This requires not only the necessary infrastructure, but also very specific knowledge. Jebens first drilled a recess to prevent the flame from hitting the component with too much energy. Otherwise, even the slightest increase in hardness would cause the jet to slip and create a bevel cut, making the entire component

unusable. By drilling, the expert defined the cutting channel which guides the flame.

Jebens then applied several chamfers at different levels within the arc-shaped component contour according to the drawing: 45-degrees laterally at two levels, 60-degree chamfers on the head sides at one level and a 10-degree chamfer in the inner centre of the arc. In view of the tight tolerances specified for this sheet thickness, the cutting bevel and quality demanded for these chamfers were a fine art.

The flame cutting experts from Kornthal-Münchingen, Germany, achieved the extreme contours of the components within three weeks, and then cut the



Jebens cut curved flame-cut parts with six different bevels so precisely that these components meet the tightest of tolerances (Picture: Jebens GmbH)

chamfers with the required precision. The renowned mechanical engineering company does not have this bundled competence in their own large welding department, so that they put the bespoke production of these parts - true haute couture – in the hands of the virtuoso flame cutting experts from Jebens.

Precision steelwork from Jebens

With its competence in different areas of expertise for products with thicknesses ranging from 8 to 1,100 mm, widths up to 8,000 mm and lengths up to 20,000 mm, the name Jebens stands for precision steelwork. The company's ability to handle unit weights of up to 160 tons makes it the definitive specialist for genuine heavy-weights. This sought-after solutions provider for the heavy-duty mechanical engineering, mobile crane and mining machinery sectors offers all stages of production from a single source: distribution, flame cutting, welding, milling, thermal treatment, and painting. Over 70 years of experience in heavy steel plate processing and an end-to-end supply chain right through to finished welded components are the company's guarantee for consistently high, reproducible quality. Well-established international partners and its membership in the Group Dillinger Hütte / GTS make Jebens the partner of choice for demanding customers who appreciate the value of long-term collaboration and reliable, reproducible quality. Being a subsidiary of Europe's leading heavy plate producer gives Jebens permanent access to ground-breaking technological know-how in steel production. At the same time, the parent company is a stable supply base for heavy steel plates in widths up to 5,000 mm and very large unit weights. Jebens combines these strengths with great innovative drive and market-oriented flexibility. 65,000 tons of steel processed per year indicate the trust that customers from a wide range of sectors place in the solutions provided by this specialist company.

Added value through complexity

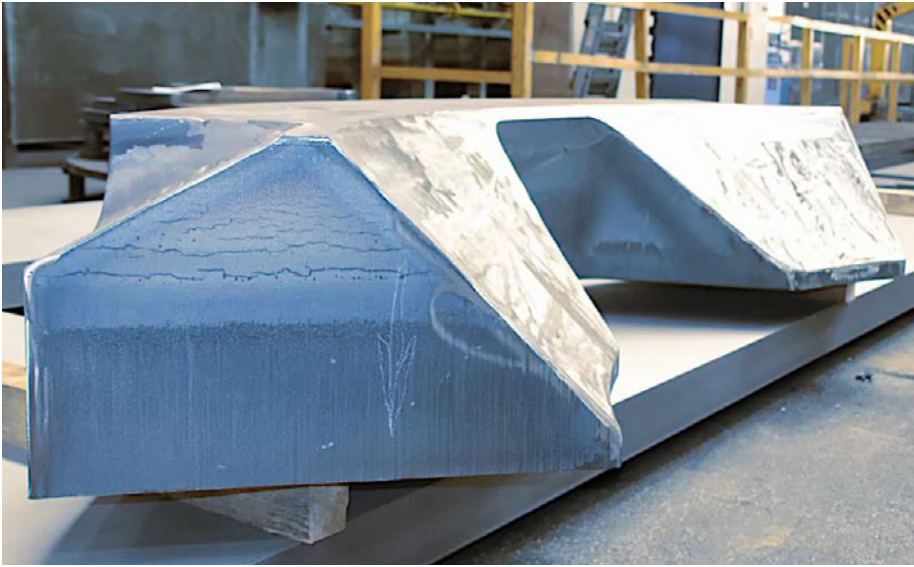
Whether in project orders or short runs, vertical integration, quality and economic added value for customers are all clear evidence of the company's integrated competence. Day in, day out, Jebens keeps things moving on a grand scale. This starts



High flame cutting expertise from Jebens in 400-millimetre thickness (Picture: Jebens GmbH)

with the optimised storage of 30,000 tons of hot-rolled heavy plates and slabs up to 4,000 mm wide and 12,000 mm long – in standard and special materials. State-of-the-art systems like welding and chamfering robots, deburring machines and equipment for mechanical processing make it possible to prepare the edges of made-to-measure flame-cut plates for subsequent welding, no matter how intricate their geometries are. The large format of these

plates makes for particularly efficient assembly of components consisting of very few individual parts and therefore requiring less welding. A wide range of further processing options for these large, heavy components qualifies Jebens as a one-stop provider. The service portfolio ranges from support in questions of construction, through cutting, chamfering of highly complex geometries, drilling, milling, annealing and normalising of complete



2,770 millimetres long, 960 millimetres wide and 400 millimetres thick flame-cut part, with a final weight of 8.5 tons (Picture: Jebens GmbH)



Laterally, 45-degree chamfers were cut in two levels (Picture: Jebens GmbH)

components to sandblasting and varnishing. As a specialist for demanding tasks, Jebens manufactures complete, ready-to-install welded components using its own or purchased parts. The company is driven by its passion for new solutions to regular innovative achievements. These include the hardfacing of steel plates to increase corrosion resistance, or the production and day-definite delivery of complete, pre-commissioned components with integrated cast parts. With highly complex welded components like these, Jebens makes a significant contribution to added value for its customers. Through successive outsourcing of whole processes they can

reduce their procurement costs while enjoying the benefits of improved reliability of supply, adherence to delivery dates, and cost effectiveness. This also makes Jebens exactly the right address for special solutions where complexity, precision and cost-efficiency through speed of processing are crucial to maintaining a competitive edge. One example of this is the provision of contract annealing in one of Southern Germany's largest annealing furnaces. 15 metres long, 5.8 metres wide and 3.8 metres high, it gives exactly the required properties to cast iron and steel components with unit weights of up to 160 tons.

Premium standard as the driver for innovation

The consistent market orientation of its production processes reflects the quality- and innovation-driven corporate vision at Jebens: precision steelwork. The aspiration to be one of the best is the driving force behind constant investment in key technologies and an excellently trained staff. For Jebens, achieving a perfect fit means seeing changes in demands for flame-cut plates and welded components as a challenge, developing forward-looking solutions, and tailoring parts precisely to individual customer requirements. The user comfort and increased operational reliability that result from this approach are the mainspring for the sustainable success of customers' products, and thus a guarantee for maximum customer satisfaction.

Outlook

The real measure of greatness lies in attention to detail. This is just as true for large, heavy flame-cut parts and blanks or ready-to-install welded components as it is anywhere else in life. Sophisticated demands in the heavy-duty machinery and plant construction sector call for first-class workmanship, utmost precision and – with an eye to the added value required in highly competitive markets – a maximum range of production competence all from a single source. The preconditions for optimal solutions are, therefore, profound cross-sector and cross-process know-how, customer-specific construction and state-of-the-art technical equipment. As a leading specialist for complicated, fully processed flame-cut plates and complex welded components, Jebens GmbH regularly sets new standards. Through high investment into latest technologies, this dynamic medium-sized enterprise is transforming itself into a fully-fledged systems provider. Consequently, the well-established German company, headquartered in Korntal-Münchingen near Stuttgart and with a second plant in Nördlingen, is focused on tuning its service portfolio to meet increasing customer demands and to anticipate the requirements of the market in years to come.

▀ *Jebens GmbH – www.jebens.de*

Tubes and pipes

Optimal blasting of heavily used pipe connectors

A broad range of steel parts are necessary for the repair and connection of pipes. With the variety of products, there is one thing in common: corrosion resistance. For the shot blasting technology upstream of the coating two hanger-type blast machines from AGTOS are fulfilling the high demands of the Krausz Industries.

Krausz Industries with its plant in Tel Aviv has been the market leader for more than 90 years and is part of the Mueller Water Products, Inc. – a leading manufacturer and marketer of products and services for the transmission, distribution and measurement of water in North America.

Krausz Industries develops, designs and produces market-leading intelligent products for the repair and connection of different types of pipes for drinking water and wastewater pipe systems. The company offers a comprehensive range in standard sizes from 40 to 1,800 mm as well as customized products.

For example, the REPAMAX repair couplings known under their brand names, HYMAX coupling solutions (some with hinged seals) and HYMAX GRIP sealing couplings are manufactured.

With the variety of products, there is one thing in common: The high demands on corrosion resistance. This means for the blasting technology upstream of the coating, that the required high roughness values (RZ values) must always be the same, to keep the quality of the products constantly high. The parts were heat treated before blasting.

In 2016, AGTOS already delivered a HT 17-17 Hanger-Type blast machine. It replaced the blasting machine from another manufacturer, which was not designed for angular abrasive and whose wear parts nevertheless had a much shorter service life. In addition, there was no uniform coverage of the workpieces during the blasting process.

Perfectly blast components last longer

The AGTOS machine has a blasting chamber with a height and width of



The AGTOS hanger-type blast machine from type HT 17-17 (Picture: AGTOS)



AGTOS turbines with wear parts made of highly wear-resistant hard metal (Picture: AGTOS)

1,700 mm. The hangers can be equipped with many different workpieces. Three high-performance turbines, each with 11 KW, throw the abrasive onto the work-

pieces. Due to the requirement of the high RZ values, angular grain is used in the blasting process. This abrasive is extremely effective, but has the side

effect that the machine must also be very well protected against wear. The body in the area of the blasting chamber is therefore additionally protected with easily replaceable wear plates.

The angular grain does not only attack the walls of the blasting chamber. The wear parts of the high-performance turbines are also heavily used. The machine therefore has high-performance turbines with many parts made of tungsten carbide. This material is extremely resistant to wear. Therefore, long service life of the blades, impeller and guiding sleeve as well as the wear plates make a decisive contribution to the economical operation of the machine.

Another blast machine to increase capacity

Due to increasing capacity utilization, the management decides to relocate to a new building and to defuse the „bottleneck“ of the blasting machine with a second machine of the same size. Due to the good experience, AGTOS was again chosen as the supplier.

This fact enabled the team to further increase the good experience from operating the first AGTOS blasting machine. So practical experience was taken over. In addition, the operator's employees were given training on the many options for fine adjustment of the new machine during the preliminary acceptance at the AGTOS plant. This enables them to adjust the machine so that the fine particles such as undersize and dust are removed from the abrasive. This has great positive effects on the lifetime.

As with the first blasting system, the AGTOS high-performance turbines of the second machine also have frequency converters. These make it possible to continuously adjust the blasting intensity and thus adapt it to all requirements of the many different workpieces. Noam Hendel, production engineer at Krausz: “We are very satisfied with the performance, installation and service of AGTOS.”

■ *AGTOS Gesellschaft für technische Oberflächensysteme mbH, Emsdetten, Germany*

Servo presses connected to the IIoT

Shift towards electromobility boosts business

Alzner Automotive equips their servo presses with the IIoT connector from Schuler. Not only the operating status of the lines can be called up from anywhere and at any time, also possible deviations can be detected early and eliminated quickly.

Alzner Automotive has got a good business in electromobility, both from existing customers and from new ones. Whether it is mechanical components for battery cells and engines, or safety-critical reinforcing panels, the list of potential products in this segment is extremely diverse. The company installed seven Schuler presses in five years.

In April of 2014, Schuler delivered the first 400-ton MSD 400 servo press to Alzner Automotive in the town of Grafenau, located near Stuttgart. An order for an MSD 250 came under one year later, followed by another MSD 400, an MSD 630, and a 500-ton hydraulic HPX press ordered in between. A second 630-ton machine was ordered in July of last year, and an order for a second HPX 500 in late 2019 brought the total to an incredible seven

Schuler presses in a span of just five and half years.

In addition, Alzner Automotive is equipping the presses with the IIoT connector from Schuler. This allows the operating status of the lines to be called up from anywhere and at any time. The password-protected portal "mySchuler" also provides information about the running die, the current stroke rate, the press force, and the lubrication and cooling circuits, among other things. In this way, possible deviations can be detected early and eliminated quickly. The automotive supplier is also considering the purchase of Schuler's camera-supported monitoring system for dies ("Visual Die Protection").

"At the time, both of us were looking for someone, and we managed to find each other," says Managing Director Hans-Martin Tekeser with a grin as he recalls the

early days of his relationship with Schuler. "Since then, we haven't run into any noticeable problems with the presses, and that's a solid indicator of the high level of quality provided by Schuler. They also provide a great cost-benefit ratio for us." Another important factor for Tekeser is service flexibility: "We can't afford a situation where a machine sits idle for three or four weeks at a time, which was the case with one of our presses from another manufacturer."

The company has grown tremendously since 2013, in no small part thanks to its Schuler systems. "We're still producing right up to our limits, and we don't have much extra capacity," notes Tekeser – despite the fact that Alzner Automotive was able to double its production volume using a special die for the 630-ton transfer press, for example.



Alzner Automotive was able to double the output of the MSD 630 using a special die (Picture: Schuler)



Schuler provides high quality and excellent cost effectiveness, says Managing Director Hans-Martin Tekeser (right) (Picture: Schuler)

ucts in this segment is extremely diverse. “Customers are focusing more and more on price,” explains Tekeser. “This means that the press pretty much has to spit the finished parts out – bam, bam, bam – one after another. It’s also why we talk to the auto manufacturers about how parts can be designed more efficiently, for example by using a sheet of metal instead of a tube shape as starting material. This is where our physical proximity and practical approach to getting the job done are extremely beneficial.”

To handle the volume and level of precision demanded, Tekeser not only hired additional employees; he also invested in presses and automation, noting: “You can’t meet the demand with manpower alone.” The company is currently in the process of implementing an automated high-bay storage system for dies.

Shop capacity doubled to two hectares

Over the past five years, Alzner Automotive has doubled its physical shop capacity to a total of two hectares. When the most recent plans for expansion encountered delays, Schuler simply placed Alzner’s first 630-ton press into storage for six months until local authorities in Grafenau finally gave the green light. Another 7,500 square meters of space have been added in autumn 2019.

Aside from his wife, Tekeser’s daughter now also works full-time at the company, with his son on track to join the business soon as well. Tekeser came to Germany from Romania at the age of 21 to obtain a mechanical engineering degree, and later also ended up studying business. At the age of ten, Tekeser (who is now 54) learned to roll up his sleeves and get to work on his parents’ farm, where he immediately became fascinated by the mechanical workings of the tractors.

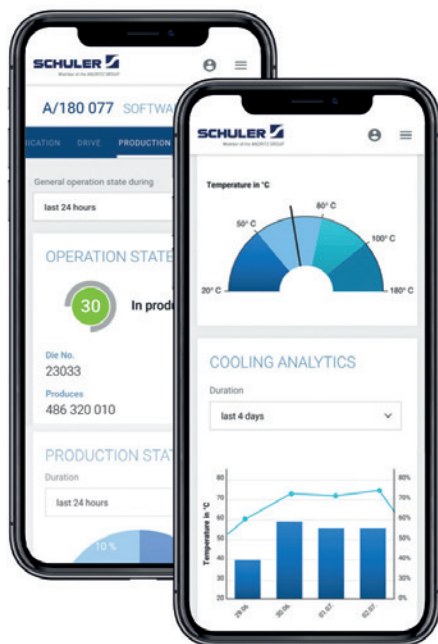
His strong lasting attachment to his hometown of Alzen (Altâna), located in Romania’s Transylvania region, is reflected not only in the name of his company: Tekeser is also a financial backer of Alzen’s local culture and sporting organizations. He is especially partial to the fortified churches typical of the area, which were listed as UNESCO World Heritage Sites, and his donations have helped keep many of the centuries-old buildings from falling into disrepair.

Shift towards electromobility boosts orders

The thriving business at Alzner is being fueled by the shift towards electromobility. For other suppliers, it’s a legitimate reason to worry about losing their customers. But Alzner Automotive isn’t feeling any market slowdown—on the contrary: The company is generating one new order after another. Tekeser adds: “We’re getting a lot of business in electromobility, both from our existing customers and from new ones.”

Whether it’s mechanical components for battery cells and engines, or safety-critical reinforcing panels, the list of potential prod-

Via the “mySchuler” portal, Alzner Automotive can also monitor the seven presses by smartphone (Picture: Schuler)



■ Schuler AG, Göppingen, Germany

Born again – like a phoenix arising from the ashes

Broadening the range of TRIP grade steels

MET/Con-Technological Consulting of SMS group GmbH and its specialists developed a new material with a superior combination of properties that satisfy the requirements of the third generation of advanced high strength steels (AHSS). The newly developed steel grade combines the high strength of a TRIP (transformation-induced plasticity) steel with the elongation at fracture values of an IF (interstitial free) steel, e.g. special deep-drawing grade.

In November 2002, multiphase steels joined the normative ranks of prEN 10336 [1], as the lowest common denominator for European steel producers, in terms of their chemical composition and the minimum requirements for their mechanical-technological properties (technical delivery conditions). At that time, multiphase steels comprised three families:

- Dual Phase steels (DP),
- Transformation Induced Plasticity steels (TRIP),
- Partial Martensite steels (PM),

comprising a total of 13 steel grades at that time.

Just two and a half years later, in May 2005 [2], the product family of TRIP steels was reduced to just two grades, HCT680

T1/T2 and HCT780 T1/T2 (T1: galvanized coils; T2: electroplated coils). Difficulties in the manufacture and further processing of these steels may account for the lack of demand from customers in the automotive industry.

There are currently six families with a total of 34 steel grades [3, 4]. Only one steel grade, CRRA700 (TRIP700, CR400Y690T-TR, CR400/690TR), has gained a significant proportion in automotive applications nowadays.

With the advancements made in plant technology and process engineering, this family is experiencing a revival – like a phoenix arising from the ashes – and re-establishing itself on the market. **Figure 1** shows the excellent potential of

this family of steels. A successful step in this direction was taken with the development of the TRIP600-TH grade as a very new steel grade (family), **figure 2**.

As part of the acceptance tests for certain multiphase steels, the engineers at MET/Con-Technological Consulting of SMS group GmbH developed a new steel, with a combination of properties never seen before, for an Asian steel producer.

The steel that was produced demonstrated the highest degree of strength with an above-average elongation at fracture at the same time. This was achieved using an innovative cooling strategy, which was only made possible thanks to

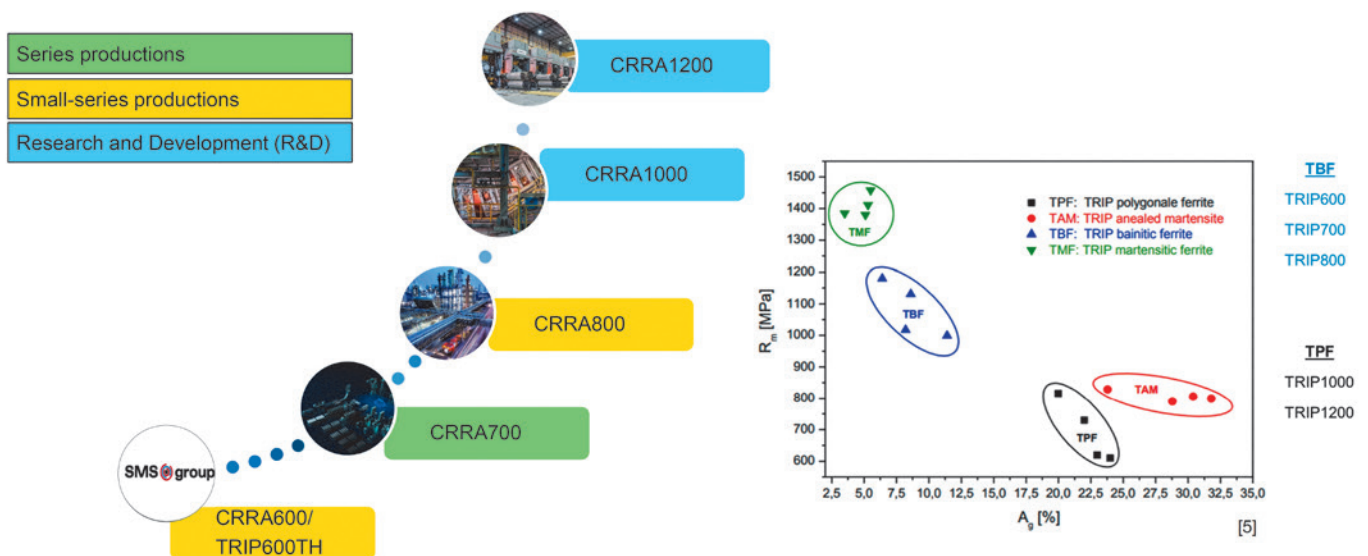


Figure 1. Trends of TRIP steel developments (Picture: Thomas Schulz/SMS group)

Thomas Schulz, Thorsten Müller, MET/Con Technological Consulting of SMS group GmbH, Düsseldorf, Germany – Contact: thomas.schulz@sms-group.com; thorsten.mueller@sms-group.com

Table 1. Mechanical properties of TRIP600 steel grades (overview)

	Steel grade	Yield strength	Tensile strength	Elongation		n value	Bake hardening index
		$R_{p0.2r}$ MPa	$R_{m,r}$ MPa	A_{50r} %	A_{80r} %	n	BH _{2r} MPa
Data sheet MET/Con longitudinal direction	TRIP600	380 - 480	590 - 700	≥ 30	≥ 28	≥ 0.20	≥ 40
Data sheet MET/Con longitudinal and transverse direction	TRIP600-TH	380 - 480	590 - 700	≥ 37	≥ 35	≥ 0.22	≥ 40
MET/Con example longitudinal direction	TRIP600-TH	451	698	41	38	0.23	66
MET/Con example transverse direction	TRIP600-TH	454	699	42	40	0.24	66
Data sheet European manufacturer transverse direction	CR400Y600T-TR	400 - 520	≥ 600	–	≥ 25	–	≥ 40
Data sheet Asian manufacturer #1 longitudinal direction	CR380/590TR	380 - 480	≥ 590	–	≥ 26	≥ 0.20	–
Data sheet Asian manufacturer #2 longitudinal direction	CR380/590TR	380 - 480	≥ 590	–	≥ 28	≥ 0.20	≥ 40

Table 2. Special properties of TRIP600-TH vs. TRIP600 [6, 7]

	Steel grade	$R_m \cdot A_{50}$	$R_m \cdot A_{80}$	Hole expansion ratio	Bending angle
		MPa%	MPa%	Δ (ISO 16630)	α (VDA 2338-100)
Data sheet MET/Con longitudinal direction	TRIP600	≥ 17,700	≥ 16,520	≥ 10%	≥ 30°
Data sheet MET/Con longitudinal and transv. direction	TRIP600-TH	≥ 28,130	≥ 20,650	≥ 50%	≥ 120°
MET/Con example longitudinal direction	TRIP600-TH	28,618	26,524	53%	136°
MET/Con example transverse direction	TRIP600-TH	29,358	27,960	52%	129°

the excellent systems technology from SMS group. The result produced on the continuous annealing line was a steel with outstanding properties, known as TRIP600-TH [6].

Such a grade from other steel manufacturers is not specified neither by European Standards (EN 10346 [3] /EN 10338 [4]) nor by the VDA Standard (239-100).

The steel grade CRRA600 (TRIP600) is available on the market. However, it has far lower elongations at fracture and strain hardening coefficients at a minimum ten-

sile strength of 590 MPa in longitudinal direction vs. 600 MPa in transversal direction (table 1).

With its exceptional elongation at fracture (+ 40%) and excellent strain hardening coefficients (+ 20%), as measured against the bilateral specifications, customers and their suppliers in the automotive industry, steel service centres, the commercial vehicle sector and, not at least, profile manufacturers, now have a steel grade available that is opening up entirely new possibilities.

Back in 2009, a report was published on developments in steel research. A target value for the product comprising a tensile strength and elongation of 29,000 MPa% was quoted for TRIP-RA [8].

The high ductility TRIP steel presented, TRIP600-TH, not only demonstrates the standard tensile test parameters but also special properties, such as guaranteed hole expansion in line with ISO 16630 for edge crack-free forming as well as guaranteed bending angles to VDA 238-100; with its guaranteed tensile strength and elonga-

Table 3. Chemical composition of TRIP600 steel grades

Alloying element	C	Si	Mn	P	S	Al	Cu	V	B	Cr+Mo	Ti+Nb
	mass %										
European manufacturer CR400Y600T-TR max.	0.23	1.80	2.10	0.040	0.010	2.00	0.20	–	0.005	0.60	0.20
Asian manufacturer #2 CR380/590TR min./max.	0.21 0.23	0.07 0.17	1.60 1.70	0.020	0.003	1.35 1.55	0.10	0.020	0.005	0.60	0.20
MET/Con Example TRIP600 Example TRIP600-TH	0.24	0.15	1.64	0.009	0.003	1.47	0.01	0.003	0.000	0.04	0.01
Publication Asian manufacturer #2	0.12	1.45	1.48	0.015	0.007	0.04	–	–	–	–	–
Data sheet MET/Con TRIP600, TRIP600-TH min./max.	0.10 0.24	0.10 2.00	1.55 2.20	0.050	0.010	0.015 2.000	0.20	0.02	0.005	0.60	0.20

tion at fracture, it is a product that stands for a new generation of AHSS (Advanced High Strength Steels), also known as the “3rd generation of steel grades”, showing an MPa% value of 29,358, as presented by MET/Con – Technological (Metallurgical) Consulting (tables 1, 2). The chemical composition comparisons are shown in table 3.

The very small parameter variations in the strip along and across its rolling direction underline another important and resource-saving special property of the material: quasi-isotropy. This means that, for example, blanks can be cut from a length of strip regardless of the rolling direction (transversal, longitudinal, diagonal, or at an angle to the direction of rolling), thus minimizing the amount of cutting scrap.

Since 2013, MET/Con-Technological Consulting, an organizational unit of SMS group within the Research & Development division, has been providing professional consulting services for all areas of the steelmaking process chain, including, in particular, sophisticated multiphase steels that range from high-strength through higher-strength to maximum strength. The engineers at MET/Con support steel producers with their comprehensive know-how of production facilities, which include the combined pickling line/tandem cold mill, continuous annealing line, and hot-dip galvanizing line.

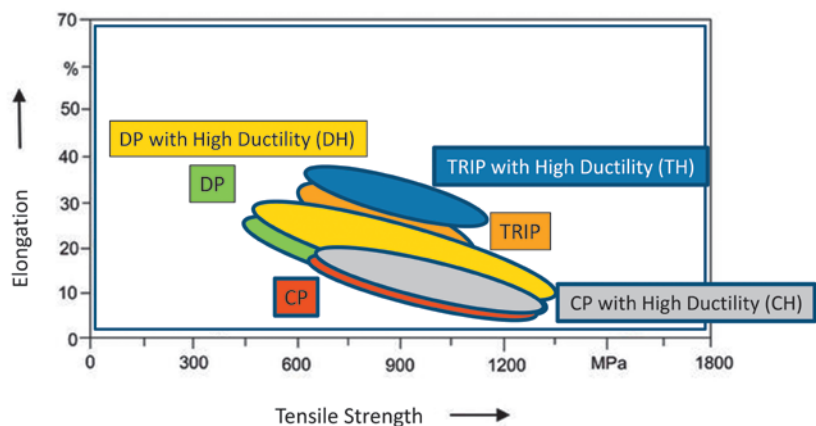


Figure 2. Banana diagram of the steel families (DP, CP and TRIP) (Picture: Thomas Schulz/SMS group)

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Developing flexible materials for the most diverse areas of applications

Deutsche Edelstahlwerke to adapt a special steel grade for additive manufacturing

The established bainitic special steel Bainidur® is now available as metal powder for 3D printing saving time-consuming process steps and resources

At German special steel manufacturer Deutsche Edelstahlwerke (DEW), a company of the SCHMOLZ + BICKENBACH group, additive manufacturing is an omnipresent topic. In contrast to mechanical manufacturing such as milling or turning, the component is built up layer by layer here. In order to meet the increasing demand from its customers in this area, the steel experts from DEW are now producing up to 200 materials using powder

metallurgy. Bainidur®, which is familiar among DEW customers, has now also been optimized for additive manufacturing. This makes Bainidur® one of the few types of steel that can be used both – 3D printing and large-scale production (e.g. automotive parts).

There are currently only a few low and medium alloyed steels on the market that can be processed by additive manufacturing. Bainidur® AM meets this demand and

offers also the advantage, that printed initial samples will have the same material properties as the subsequent components from mass production. The heat treatment and thermochemical surface treatments can be tested and optimized with the same material as is done in serial production.

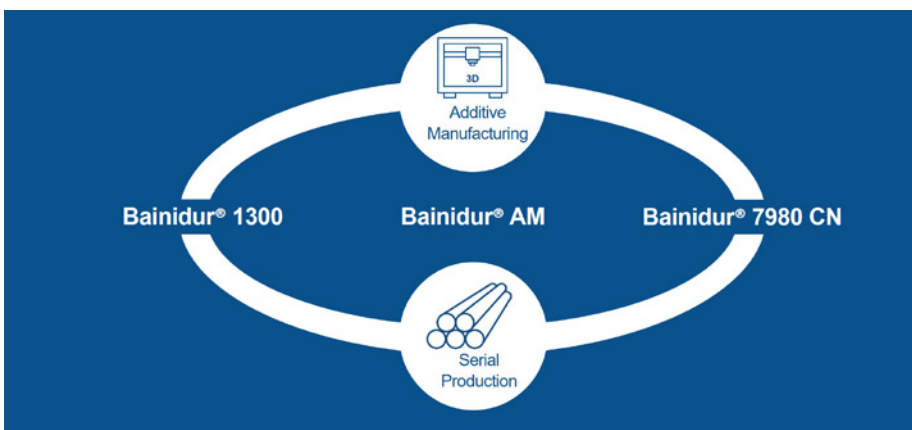
Also: a spare part – additively manufactured when the forging dies have long since disappeared – cannot be told apart from the original either. This is supported by its good transformation behaviour into the bainitic structure. The material is therefore easy to handle during powder production and printing. For example, high strength components for lightweight automotive construction can be produced with process reliability, without distortion and, as a consequence, with minimal machining allowance and reduced heat treatment time and effort.

DEW customers benefit from a shorter process chain and a constantly reproducible high quality. The material properties often allow the component to be used without further heat treatment. The potential of Bainidur® thus goes as far as large-scale production.

Due to the increased component strength, it is possible to reduce the size and thus the weight. A measure that considerably saves on CO₂. Bainidur® AM is therefore the perfect steel to produce higher strength components without additional or only with simple heat treatment. Many parts can be used after printing without any heat treatment at all. This is all combined with the benefits of the Bainidur special steel like good machinability and nitridability. Furthermore, it scores well with a good notch impact strength. These attributes also have a positive effect on the process costs and the component quality.



Within the Bainidur® set of special steels the new AM material has been developed for prototyping and additive manufacturing (Picture: Deutsche Edelstahlwerke)



The new bainitic steels Bainidur® 1300 and Bainidur® 7980 CN are not only expanding large-scale production via the EAF but with Bainidur® AM are also available as metal powder (Picture: Deutsche Edelstahlwerke)

Deutsche Edelstahlwerke – www.dew-stahl.com

ArcelorMittal supplies steel structures and steel floor decking for car park project

A new car park dedicated to car rental services in the city of Lyon was built with steel produced by ArcelorMittal under the coordination of the Steligen[®] team.

The car park is a steel-concrete composite structure, i.e. a steel structure and concrete floors poured on steel floor decking. It includes 721 parking spaces on seven floors. Steligen[®] was the main coordinator of the project and provided to the customer

products from different business units of ArcelorMittal: 400 t of 15-m joists and beams from the ArcelorMittal Steligen[®] fabrication centre, 15,000 m² of Cofraplus[®] 60 composite floor decking from ArcelorMittal Construction as well as additional 1,200 m² steel tray for the roof, including cold rolled profiles produced by Profil du Futur to build the structure of the top floor.

The particularity of this project was the very reduced construction space, as the car park is located between the railway station,

office buildings and rail tracks. The use of prefabricated elements facilitated the construction and shortened construction planning.

The long products supplied for the structure of the car park are made in 100% recycled steel. The galvanised beams are fire-resistant, without any of the usual protections, such as flocking or intumescent paint.

| ArcelorMittal

thyssenkrupp to restructure springs and stabilizers business

Production of stabilizers at the Olpe site will be discontinued by the end of 2021.

The Hagen site will be realigned and converted into a centre of excellence for the development and manufacture of springs and stabilizers. Around 490 jobs will be impacted by the restructuring of the Olpe and Hagen sites in Germany.

Dr. Karsten Kroos, CEO of thyssenkrupp's Automotive Technology division: "The restructuring of the two sites is an unavoidable and right step to return the business to profit. The two plants were no longer competitive in the current setup. Price levels in the respective product segments are too low and overcapacities on the market too high.

Last year the springs and stabilizers business unit was designated by thyssenkrupp as a "business under review". It currently operates nine production sites in Germany, Hungary, Brazil, Mexico and China

| thyssenkrupp
Constellium

SSAB Raabe adds steel grade to maritime range

SSAB Raabe has received approval to supply a new high-strength steel to the maritime industry.

Earlier this year, maritime classification society DNV GL added SSAB Raabe's

high-strength steel grade VL 690 to its product approvals. VL 690 steel can help ships to become lighter, which in turn means greater fuel economy during their useful life. The steel has already been used in demanding trans-

port vehicles and lifting equipment applications.

| SSAB

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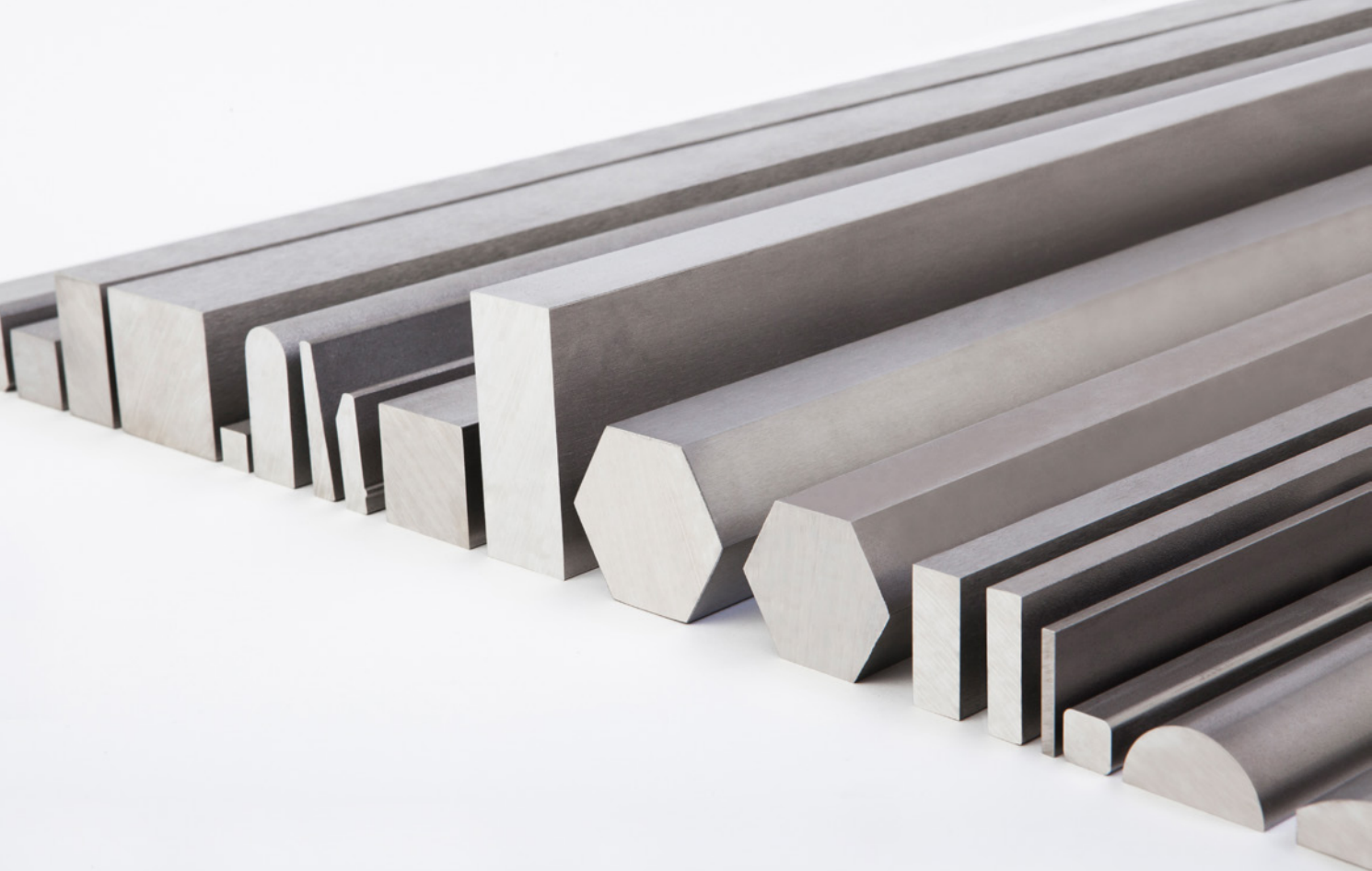
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Böllinghaus Steel produces a variety of stainless steel profiles including flat, square, and hexagonal stainless steel profiles – hot-rolled and cold-drawn (Picture: Böllinghaus Steel)

No more system failures, production losses and repair costs due to corrosion

Stainless steel profiles in the chemical industry

Stainless steel has the property of withstanding attacks from highly corrosive chemicals and is therefore a favorable product for use in the chemical and petrochemical industries. There are austenites, super-austenitic stainless steels as well as duplex, super-duplex stainless steels and nickel-based alloys, which are used in demanding areas of application

The use of duplex stainless steels began in the first quarter of the 20th century. However, its intensive use arose with the rapid development of requirements in the chemical industry in the 1980s.

The high strength of duplex and its greater resistance to chloride-induced stress corrosion cracking compared to classic austenitic steel led to the increase in applications of and demand for duplex. Duplex, which is characterised by a structure of ferrite and austenite, offers improved resistance to pitting in harsh environmental conditions.

It also shows improved crack resistance as well as good weldability and resistance

even in critical temperature ranges and has high strength compared to classic austenitic steels.

Duplex offers an excellent strength-to-weight ratio, so that much weight can be avoided in structures. This is why duplex stainless steels are often used in the chemical industry in the areas of refineries, gas processing plants, paper and pulp factories and seawater desalination.

They are also installed in environments and industries with the high corrosion-resistant requirements found in the process industry (chemical, petrochemical, offshore, and desalination plants, seawater applications, etc.). In addition, duplex stainless steels are often used in chemical tank-

ers and urea plants. The users of these industries require production of components with tight manufacturing tolerances and high surface quality. Whole ship and bridge structures have already been made from duplex stainless steel.

Due to their special corrosion resistance, stainless steel profiles made of duplex are used for valves and measuring devices as well as for flow monitoring systems. They are also often used in a highly corrosive environment (for example, seawater or road salt) and for the production of machine parts that are exposed to cavitation.

Thanks to the very good mechanical properties of duplex stainless steel, smaller components with lower thicknesses can be



The choice of the right duplex alloy depends on the area of application and environmental factors (Picture: iStock)

created because less steel is required. This can reduce carbon dioxide emissions, an important requirement at present. Due to their two-phase structure, duplex steels meet complex challenges with correct hot forming and heat treatment.

Duplex stainless steels have high corrosion resistance and good mechanical properties and are easy to use. Duplex successfully combines the hardness of ferrites with the formability and weldability of austenites. The mechanical properties of duplex are therefore unique. Increased strength with less use of nickel is made possible and costs can be reduced.

Duplex stainless steels simultaneously meet a wide range of technical challenges and offer very advantageous operating properties with a favorable cost-benefit ratio, especially for demanding industries such as the chemical industry.

The super duplex stainless steels offer potential applications in extremely corrosive environments, such as nitric, sulfuric or phosphoric acid. In addition, super duplex stainless steels are two-phase high-alloy steels with excellent resistance to pitting corrosion.

The choice of the right duplex alloy, which is distinct in its comparative corro-

sion resistance, depends on the area of application and environmental factors. The use of stainless steel profiles can offer a permanent and maintenance-free solution to possible corrosion damage to susceptible components in the chemical industry. In order to achieve a long service life of the application components in the chemical industry and thus to guarantee process reliability, the choice of the appropriate stainless steel grade is of great importance and depends on the ambient conditions and the professional manufacture of the desired component.

Taking into account the production of the component and the surrounding media, it is possible to assess whether the use of duplex makes sense in a specific application.

Böllinghaus Steel is a producer of high-quality stainless steel profiles that can withstand use in the demanding environments of plants and machines. Constant customer orientation and commitment to maximum quality are important guidelines in its undertaking. Böllinghaus Steel relies on consistent quality and a high degree of accuracy in order to achieve the highest level of customer satisfaction. Whether standard profile or custom-made, Böllinghaus Steel manufactures custom-made stainless steel profiles of proven quality for the highest customer satisfaction.

■ Böllinghaus Steel, Hilden, Germany

Duplex stainless steels are often used in chemical tankers (Picture: iStock)



Customer focused supply of stainless steel processed products

From strength to strength in stainless steel coil products

Stainless Band has installed a new precision slitting line for “fast track” orders with an impressive 3-day delivery time

Stainless Band is a UK based processor of stainless coil products in various forms, finishes and dressings. Its Bradford manufacturing & sales centre near Leeds in the North of England has the latest production and testing equipment enabling the company to provide polishing and slit blanks in grades 304, along with coil, oscillating/bobbin wound in a range of grades, thicknesses and widths, serving many sectors including automotive, building and petrochemical industries throughout the UK and the world. Equipped with edge rounding, edge dressing facilities and flattening and rolling line – all under one roof – Stainless Band is a real one stop shop for clients.

Over the last 11 years, Stainless Band has gone from strength to strength. Its investment in processing capabilities has never stood still and this combined with its exceptional customer service, has established it as the go-to name in the processing of stainless coil products available in various forms, finishes and dressings.

This year has seen further investment from Stainless Band, with the installation of a new precision Brace 1A and a standard Brace 2A slitting line for “fast track” orders with an impressive 3-day delivery time. Its in-house processing will be further upgraded shortly with a new cut-to-length line capable of 500 mm wide and up to 3 mm thickness.

Customer focused steel services within even shorter delivery times

The new manufacturing capabilities enable the Stainless Band service centre to process customers’ orders within an even shorter lead time. This will enhance its reputation for the highest quality through rigorous testing procedures.

With over 800 t of stainless steel stock, Stainless Band is well placed to promise customers that they will do all they can to assist with orders and delivery times, especially during these challenging times.

With a customer base in most continents around the world, serving the pharmaceutical, oil & gas, construction, heating and ventilation, packaging, spring manufacture, window/door hardware, automotive, cabling, IT and utility industries amongst others, the Stainless Band service is further extended with an on-site team of 32 staff that are knowledgeable and always available to assist, with some staff being multi-lingual.

Ambitious growth path

When asked what does the future look like for Stainless Band managing director Jonathan Hanson says: “Stainless Band like every other organisation in the world is no stranger to how difficult the last few months have been both on an economic and humanitarian level. As a company, we have always approached challenging times in the same way as any other day at work. With a determination to provide the right quality product, in the best timeframe possible and at a fair price.”

“Like many businesses, our customers’ success is vital to our business. The strong relationships we have with our customers is founded on us behaving with integrity and by that, I mean doing and delivering what we promise. I am very proud of the Stainless Band team who during the last few months have been keen to be in work and making sure our customers could keep their production moving. Naturally, we took every step necessary to keep our team safe and these measures are still in place.

Our business plan is to continue with our planned growth, listen to our customers and invest in machinery and people to meet our customers ever-changing needs.”



Stainless Band is doing all they can to assist customers with orders and delivery times, especially during these challenging times (Picture: Stainless Band)

Stainless Band, Bingley, North Yorkshire, UK

dnata to build new airport cargo terminal

AMOVA has received a contract from dnata for the construction of a new cargo terminal. Airport services provider dnata is moving its air cargo handling operations at Manchester Airport to a new purpose-built facility, the “dnata City North” cargo complex.

AMOVA, a company of SMS group, has developed an innovative, future-oriented concept and will supply the entire logistics system for the “dnata City North” cargo complex. The heart of the new facility is a 4.5-meter Elevating Transfer Vehicle (ETV) with a split roller deck. This

universal vehicle can store and retrieve two 1.5-meter ULDs (Unit Load Device) independently and additionally route 6-meter ULDs through the racking system.

A special feature is located on the air-side of the terminal, where the customer uses truck docks, which, thanks to their special design, also enable the use of dolly trains. On the land side, truck docks are planned to serve the Road Feeder Service (RFS). The facility is completed by several motor-driven roller decks, various work stations and cold storage cells for pharmaceutical products.

Besides the complete automation, AMOVA also supplies the warehouse management system, in cooperation with its long-standing partner Unitechnik. The warehouse management system ensures an optimal material flow and coordinates and controls all transport orders of the ETV, the express line, the work stations and the truck docks. In addition, it realizes the backup function of ULD identification should the higher-level cargo management system fail.

■ *SMS group*

Co-marketing project between ArcelorMittal and steel roofing manufacturer

ArcelorMittal Europe – Flat Products has worked with Polish roofing manufacturer BLACHPROFIL 2® to develop a series of animated videos about steel and roofing.

The ten videos in the BP2 SteelStories series are designed to educate distributors, roofers, and end users about the properties of steel, and the extensive services offered by BLACHPROFIL 2®. The

cartoon style of the videos makes them easy to understand while conveying a large amount of technical information.

BLACHPROFIL 2® manufactures steel roofing solutions using a range of organic coated steels from ArcelorMittal Europe – Flat Products. The company’s customers are typically roofers and distributors working in Poland and nearby countries. Technical information for the steel and steel

production videos in the series was provided by ArcelorMittal.

BLACHPROFIL 2® makes extensive use of the Granite® range of organic coated steels from ArcelorMittal and whiteboards using steels from ArcelorMittal’s Estetic® range.

■ *ArcelorMittal Europe*

Metals.com expands inventory in metals product catalogue

Metals.com has expanded its inventory of more than 60,000 products in a vast array of metal types, shapes, sizes, and lengths.

The company is serving an increase of 150% in demand within the industrial metals sector including markets such as aerospace, 3D printing, and robotics. The inventory of the Metals.com industrial catalogue includes aluminium, brass, bronze,

copper, nickel, steel, titanium, and zinc. Its infrastructure enables the company to meet demand and quickly process orders and ship them at the most competitive prices in the industry.

A surge in electric vehicle demand and its heavy reliance on industrial metals have had a significant impact in the industrial metals industry. Also the growing demand for 3D printing metals led to expansive product inventory for

Metals.com. Having this large physical inventory on hand enables corporations to buy on demand instead of ordering and then waiting on inventory to become available. Metals.com is committed to providing high-quality products quickly, efficiently, and at the lowest prices available.

■ *Metals.com*

Tata Steel and Steel Warehouse to launch new abrasion-resistant steel

Tata Steel is introducing a new high-strength, abrasion-resistant steel in North America in partnership with Steel Warehouse.

Ideally suited for use on heavy equipment used in the mining, agriculture, construction, refuse and recycling industries, Tata’s

new hot-rolled Valast® 450 offers vehicle manufacturers a variety of advantages compared to conventional abrasion-resistant plate-steel products.

Steel Warehouse processes abrasion-resistant steel from Tata. Gordon AuBuchon, Steel Warehouse’s executive vice president for product devel-

opment, points out that Valast rolled-steel will be offered in lighter gauges and tighter tolerances than plate, allowing for lightweighting and cost savings.

■ *Tata Steel; Steel Warehouse*

FrigorTec: Cooling systems for crane cabins, control cabins and containers



6 pages, English, German

This brochure features the Cranefrigor™ series of cooling units manufactured and supplied by FrigorTec. Technical data – dimensions, capacities, CO₂ equivalents, air flow rates, etc. - are provided of the cooling units available for containers, control cabinets and crane cabins. The brochure also illustrates the Cranefrigor™ technology.

FrigorTec GmbH, Hummelau 1, 88279 Amtzell, Germany, fon: +49 7520 914 828 0, info@frigortec.de

Küttner Savelli: Competence in foundry and meltshop technology

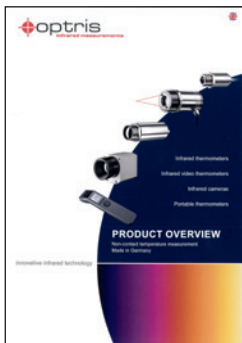


24 pages, English

Küttner and Savelli provide customized, innovative solutions, including on EPC basis, to foundry and meltshop operators. This brochure outlines the range of systems for molding, melting, scrap recycling, including automation, process control, and industrial lifecycle and information management systems.

Küttner Savelli, Via Flero 36, 25125 Brescia, Italy, fon: +39 030 227 95, info@savelli.it

Optris: Non-contact temperature measurement

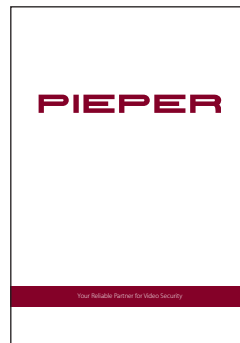


24 pages, English, German, French, Spanish

A very comprehensive overview of infrared thermometers and infrared cameras manufactured by Optris. Detailed technical data are given in clearly structured charts of the full range of spot measurement devices and thermal image cameras, from basic models up to Optris' high-performance series. Expansion and connectivity options are also covered.

Optris GmbH, Ferdinand-Buisson-Str. 14, 13127 Berlin, Germany, fon: +49 30 500 197 0, info@optris.global

Pieper: Your reliable partner in video security

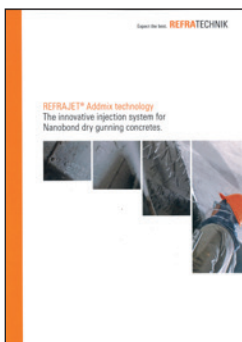


16 pages, English

This brochure outlines the broad portfolio of Pieper video technology for purposes as diverse as visual process observation in temperature ranges of up to 2,400°C, and industrial video solutions for production control. Pieper manufactures systems for digital image processes, access control, outdoor area security, etc.

Pieper GmbH, Binnerheide 33, 58239 Schwerte, Germany, fon: +49 2304 4701 0, info@pieper-video.de

Refratechnik: Injection system for Nanobond dry gunning concretes



4 pages, English, German

A brochure introducing Refrajett® Addmix, an innovative injection system for cement-free dry gunning concretes. This system was developed for the Nanobond dry component, which is free of binding agents and other chemically reactive components. However, it can also be used for other Refratechnik concretes, if the injection method is suitably adapted.

Refratechnik Steel GmbH, Schiessstr. 58, 40549 Düsseldorf, fon: +49 211 5858 0, steel@refra.com

Smart Steel Technologies: Artificial Intelligence in steel production



4 pages, English

This brochure summarizes Smart Steel Technologies' approach to efficiency improvement along the steelmaking route. The company's AI platform components include tapping analysis prediction in metallurgy, incident prediction in rolling, process guidance in finishing.

Smart Steel Technologies GmbH, Am Treptower Park 75, 12435 Berlin, Germany, fon: +49 30 403 673 720, request@smart-steel-technologies.com

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Preview of the November/December 2020 issue:

Steel technology

Automatic dummy bar system for continuous slab casters

The new fully automatic top feeding system executes all necessary steps for the dummy bar insertion into the mould and the takeover of the dummy bar by withdrawal drives, each in one sequence. The operator just has to push one button

at the local pulpit or on the HMI in the main control room to start such a fully automated sequence. This fully automatic dummy bar top feeding system was recently implemented at a two-strand continuous slab caster in China.

Coke oven gas injection at blast furnace started on time

German ROGESA has installed coke oven gas injection systems for the company's blast furnaces. With this new technology, coke oven gas becomes a metallurgical process gas that will par-

tially replace metallurgical coke as reducing agent, thus contributing to lowering the carbon intensity in the blast furnace as well as the carbon footprint of the overall ironmaking operations.

All-renewed and future-proof: tandem cold mill at Severstal

Following a comprehensively modernization of the entry area in 2016, including the rolling stands and the automation system, the recent measures concentrated on the exit area and the stand drives. Installation activities were exe-

cuted within one 42-day shutdown. Severstal now has a completely renewed and state-of-the-art tandem cold mill enabling full exploitation of the maximum rollable strip width of 1,850 millimetres.

Steel processing

Framework for future schools in the UK

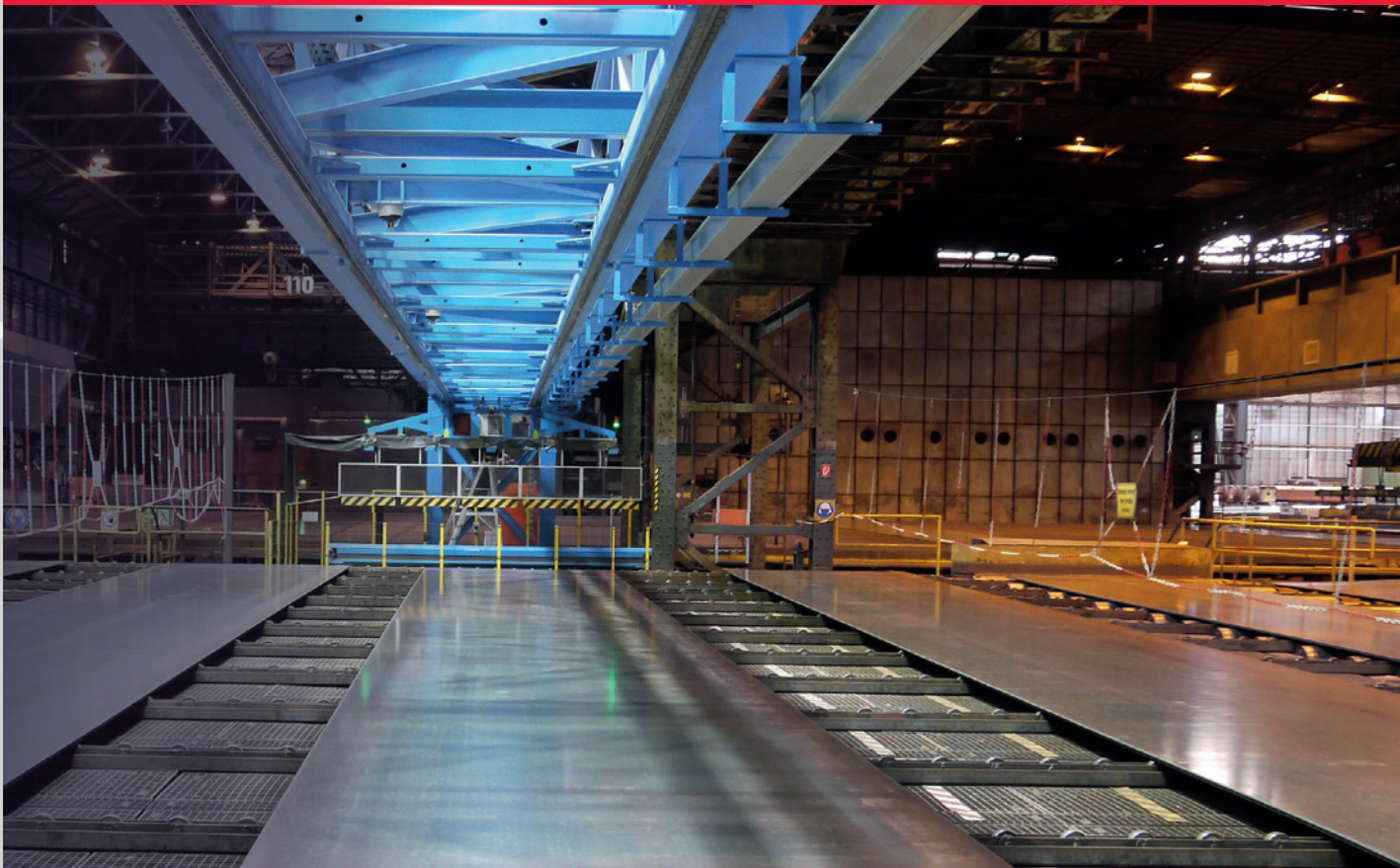
Tata Steel is developing a kit of parts allowing highly energy efficient schools to be built off-site and then shipped to their final location. This will reduce waste cre-

ated during traditional building as well as allowing the buildings to be quick to build, give good value for taxpayers and be 100% recycled at the end of their life.

ASMET research GmbH	52, 73
AUMUND Fördertechnik GmbH	13
Dango & Dientahl Maschinenbau GmbH	7
Deutsche Edelstahlwerke (DEW)	15
DVS Media GmbH	31, 36
Kiro-Nathaus GmbH	11
LOI Thermprocess GmbH	1
M.A.T. Malmedie Antriebstechnik GmbH	39
nokra Optische Prüftechnik und Automation GmbH	80
SMS group GmbH	2
Velco GmbH	17
Zumbach Electronic AG	9

... a passion for precision.

Optical contour and flatness measurement with the new nokra system



The application in the heavy plate mill of Salzgitter Mannesmann Grobblech GmbH (SMGB), based in Mülheim an der Ruhr, Germany.



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