Issue October 2024

STEEL+ TECHNOLOGY

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On the way to fossil-free production of sponge iron and steel

Arnt Hannewald,
Dipl.-Ing., Editor

The green transition of steel and the industrial transformation from coke-based plants to fossil-free production routes has become a prominent topic of our editorial scope, which we are used to covering in every issue. But this time we have gathered some articles in a special section on direct reduction technology, because hydrogen-based direct reduction is still a matter of research and development.

First, the materials. Apart from lump ore, the optimal but rare raw material for ironmaking, steelmakers used to agglomerate fine ore to feed the blast furnaces. However, sintering or pelletising with coal as part of the binding substrate is hardly conceivable for the fossil-free production route. A technology for briquetting ore has been developed by the global mining company Vale (**page 45**). Tata Steel Netherlands is taking a different approach with its pellet research programme. The company will implement a new test facility for the working pellet plant – where raw materials can be tested faster, more efficiently and with less environmental impact to achieve an optimal and high quality raw material mix (**page 46**). This programme is part of the planned direct reduction process for the production of "green" iron and for future testing using hydrogen.

Secondly, technologies. Like blast furnaces, direct reduction furnaces use hot blast, which now has to be produced without CO_2 emissions. Electric process gas heaters have been developed and pilot units will be tested at a DRI plant in the Middle East (**page 44**). Completely new concepts for fossil-free iron production are also under development. POSCO, together with Primetals Technologies, will implement a HyREX demonstration plant. This new technology combines a hydrogen-adapted FINEX direct reduction process with an electric smelter to produce low-CO_2 hot metal (**page 43**).

Despite ongoing research, hydrogen-based direct reduction technology has completed its pilot phase. In Sweden, the Hybrit initiative has presented the results of six years of research. During this time, more than 5,000 tonnes of hydrogen-reduced iron have been produced at the large-scale pilot plant in Luleå. The research results and findings pave the way for fossil-free sponge iron production and downstream steelmaking on an industrial scale (**page 42**). In China, an industrial-scale DRI plant at Baosteel passed the performance test, achieving a milestone of 168 hours of continuous full-load production using mainly hydrogen (**page 48**). From now on, green DRI is not only feasible, but producible.

The greening of steel continues to be a hot topic at conferences. This year's HÜTTENTAG, the annual technology event of the steel industry in the heart of Europe, is entitled "Sustainable energy sources and artificial intelligence – the new success factors for steel". The conference and exhibition, which takes place on 19 November in Essen, Germany, will assess the current state of these trends. Tickets are still available. You are welcome to register online at: www.huettentag.de

Let us meet again there.

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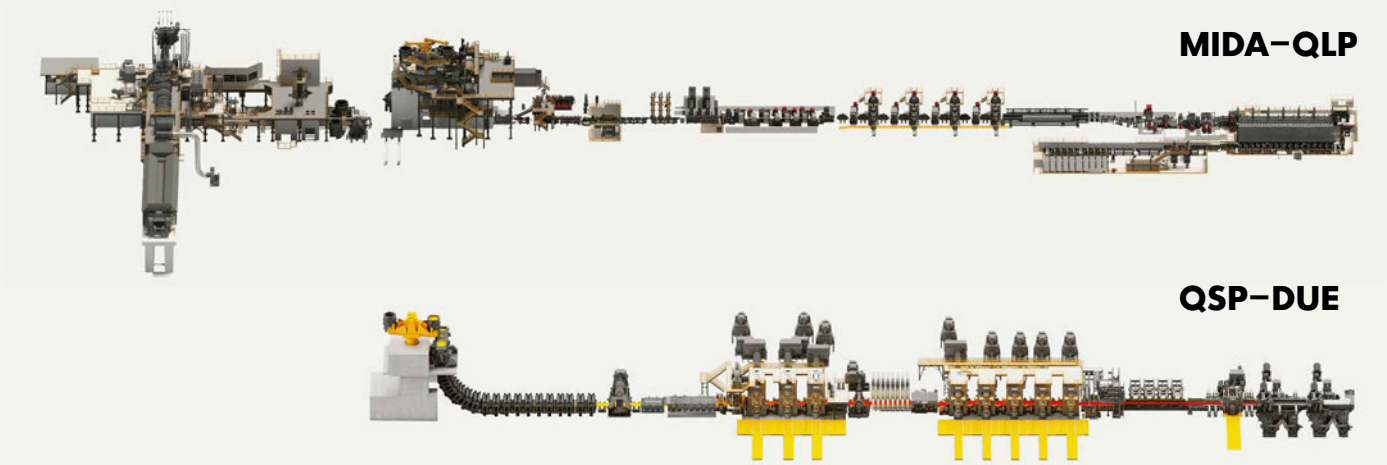
STEEL TECHNOLOGY

STEEL PROCESSING



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GIANPIETRO BENEDETTI
CHAIRMAN OF THE BOARD OF DIRECTORS

Cleveland-Cliffs appoints new senior vice president

Michael Hrosik, Vice President, Flat-Rolled Steel Sales for Cliffs, has been promoted to Senior Vice President, Commercial, of the company. Michael Hrosik has over 30 years of steel industry experience in commercial functions. In his new role, he will oversee all responsibility for Cliffs' commercial operations, including sales, marketing, and customer service. His extensive experience, primarily with Cliffs and its legacy companies ArcelorMittal USA, ISG, and LTV, will play a critical role in driving Cliffs' strategy forward.

To succeed Michael Hrosik in his previous role, Michael Cooney has been appointed Enterprise Director, Flat-Rolled Steel Sales. He will oversee Cliffs' commercial relationships with service centers and nonautomotive end users.

Cleveland-Cliffs

New President and CEO of Outokumpu takes over

Kati ter Horst (MBA, M.Sc. Econ.) has been appointed the new President and CEO of Outokumpu Corporation. She succeeds Heikki Malinen, who left his position as President and CEO on September 30, 2024. Kati ter Horst will be located in Outokumpu Corporation's headquarters in Helsinki, Finland. She has been a member of the Outokumpu board of directors since 2016 and vice chairperson since 2022. As a consequence of the appointment, she has resigned from her positions on the board of directors.

Kati ter Horst joins Outokumpu from Belgian company Aliaxis S.A., specialists in fluid management systems, where she has held the position of Divisional CEO EMEA since 2022.

Outokumpu

Kati ter Horst has taken over as the new President and CEO of Outokumpu Corporation (Picture: Outokumpu)

Head of SSAB Europe announces retirement

Olavi Huhtala, head of SSAB Europe and a member of SSAB's group executive committee since 2014, has announced to retire during winter 2025. Olavi Huhtala has been employed by the company since 1987, starting at Rautaruukki which combined with SSAB in 2014. He has held several leading positions including as executive vice president and head of Ruukki Metals.

"I have had amazing years at SSAB and the benefit of working together with engaged and competent colleagues," says Olavi Huhtala. "Together we have built a modern company with a better product mix and improved safety. I am proud of having contributed to important events such as the combination of SSAB and Rautaruukki and in recent years the transition toward fossil-free steelmaking. Now it's time for me to do something else in life and manage my own time." A successor of Olavi Huhtala is still to be determined.

SSAB

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Outokumpu selects new president advanced materials

Outokumpu has appointed Rolf Schencking (M.Sc. Eng.) to start as President, business line Advanced Materials and member of the Outokumpu leadership team. Rolf Schencking joins Outokumpu from VDM, where he has held the position of chief technology officer since 2018. Prior to that, he worked at various metal companies in the aluminium industry. He will report to the President and CEO of Outokumpu and be based at Outokumpu's office in Krefeld, Germany. Rolf Schenking succeeds Thomas Anstots, who has decided to retire at the end of 2024.

Outokumpu

Rolf Schencking is the new President of the Advanced Materials business line of Outokumpu (Picture: Outokumpu)

SSAB appoints new President and CEO

Johnny Sjöström has been appointed President and CEO of SSAB, succeeding Martin Lindqvist who previously announced that he is leaving the company for a board career.

Johnny Sjöström has been Head of SSAB Special Steels since 2019. Previously, he has been CEO of Uddeholm and held different management positions at Outokumpu Stainless Oy. Johnny Sjöström will start his new position on October 28, 2024. "SSAB's board and I are very happy that Johnny Sjöström has accepted the position as President and CEO of SSAB," says Lennart Evrell, Chairman of the Board at SSAB. "He has solid technical knowledge and extensive experience within the industry in the Nordic region and internationally."

SSAB

Martin Lindqvist, left, will be succeeded by Johnny Sjöström, middle, as President and CEO of SSAB. On the right, Lennart Evrell, Chairman of the SSAB Board (Picture: SSAB)

Tata Steel Nederland announces management and supervisory board changes

Tata Steel Nederland has announced two personnel changes: Hans Turkesteen will be the new Chief Financial Officer (CFO), and Herman Dijkhuizen a new member of the company's Supervisory Board. Hans Turkesteen takes over the role of Chief Financial Officer (CFO) from Martijn Plaum, who decided to leave the company. During his career, Hans Turkesteen has fulfilled several roles as CFO in other companies. In his role as CFO of Tata Steel Nederland, Hans Turkesteen will work closely with Tata Steel Limited's Executive Director and CFO, Koushik Chatterjee.

Herman Dijkhuizen has been appointed to the Supervisory Board upon the recommendation by the central works council of Tata Steel Nederland. He succeeds Marius Jonkhart, who has been a member and Vice-Chairman of the board since 2006 and Chairman of the audit committee since its establishment. Herman Dijkhuizen will also become the new Chairman of the audit committee.

Tata Steel

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Management crisis at thyssenkrupp Steel over

At the end of August, three members of the Executive Board of thyssenkrupp Steel Europe, Germany's largest steel group, unexpectedly decided to leave the company. CEO Bernhard Osburg, COO Dr. Heike Denecke-Arnold and CHRO Markus Grolms resigned from their respective positions due to irreconcilable differences between them and the Chairman of the Executive Board of thyssenkrupp AG, Miguel Ángel López Borrego. This series of developments also led four members of the Supervisory Boards of thyssenkrupp Steel Europe to resign their mandates.

Chief Technology Officer Arnd Köfler had already left the company at the end of June 2024. His successor, Dennis Grimm, was appointed Spokesman of the Executive Board of thyssenkrupp Steel Europe at short notice. CFO Philipp Conze was appointed as successor to CFO Carsten Evers earlier this year.

Finally, at the end of September, the company announced the new management team: Ilse Henne was appointed Chairman of the Supervisory Board, Dennis Grimm was confirmed as CEO and Philipp Conze as Chief Financial Officer. Marie Jaroni was appointed to the Executive Board as Chief Transformation Officer.

Dennis Grimm is the new Spokesman and CEO of thyssenkrupp Steel (Picture: thyssenkrupp)

The editors

New managing director at Vollmer

Thorsten Wünsch, an acknowledged expert in the rolling mill industry, is the new Managing Director of Friedrich Vollmer Feinmessgerätebau GmbH. After many years as Sales and Division Manager Electric and Automation at Andritz Sundwig, Dipl.-Ing. Thorsten Wünsch has taken over as sole managing director of his former supplier, Vollmer. He knows both the industry and the processes and has the technical expertise to optimise Vollmer's solutions to meet the needs of the customers and to further advance the company and its products.

He has set himself the goal of continuing, accelerating and perfecting Vollmer's transformation from a traditional manufacturer of mechanical measuring systems to a provider of mechatronic measuring and control systems for rolling mills: "We will perfect our products ... not only by optimising individual solutions such as the VTLG laser thickness gauge or further developing our shape measurement (BFI roll) and shape control as digital products, but also by improving the quality of our customers' products through cross-process rolling mill control systems and further expanding our position on the market. This also includes the more comprehensive integration of our systems into our customers' complex data environments. We are also working intensively on platforms for digital after-sales service."

Thorsten Wünsch is the new Managing Director of Friedrich Vollmer Feinmessgerätebau GmbH (Picture: Vollmer)

Friedrich Vollmer Feinmessgerätebau

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EUROPE – FINLAND

FOSSA enters into second project phase

The second phase of the joint FOSSA (Fossil-free Steel Applications) project coordinated by SSAB Europe has received a positive financing decision from Business Finland. The FOSSA project has three main themes: the fossil-free steel value chain, advanced steels and applications, and the virtual manufacturing of steel products.

Together with partners in the FOSSA consortium, SSAB aims to create fossil-free or low-carbon value chains for the Finnish mechanical engineering and metal industries. The FOSSA project will enable the development of properties for fossil-free, high-strength steels based on the needs of key customer segments in collaboration with other parties in the value chain.

Phase I of the FOSSA project consortium consisted of four companies, SSAB Europe Oy, Hiab Finland Oy, Fortaco Ostrobothnia Oy and Indalgo Oy, three research organizations and in-kind companies. New companies have joined as partners in the second phase of the project, e.g. John Deere Forestry Oy and Ponsse Plc. The first phase started in 2022 and led to the development of a number of new products, such as metal-coated SSAB ZeroTM products and the first Finnish application of fossil-free steel, Hiab's Multilift Ultima 18S FFS hooklift.

"The financing of the second phase enables large-scale development of new products in cooperation with customers and universities, as well as the expansion of fossil-free value chains to the Finnish engineering and marine industries, for example," says Pasi Suikkanen, Product Development Manager at SSAB Europe. The project supports Finland's goal of being carbon neutral by 2035.

SSAB

Ovako to upgrade heavy bar mill

Ovako, a subsidiary of Sanyo Special Steel and member of Nippon Steel Corporation, is going to modernize the heavy bar mill at Imatra. As a result of this investment, the mill's production capacity will increase by 16,000 t/year.

The upgrade of the first and second rolling stand of the heavy bar mill will include new transformers, motor drives, motors, and mechanical power lines. These rolling stands are highly critical parts of the manufacturing process: they roll hot blooms into billets for the medium bar mill, as well as large dimension round and square bars for direct delivery to customers. "The new equipment will increase productivity and quality and at the same time, further improve safety," says Kari Välimaa, Director of the Product Unit Steel and Rolling. The main equipment installations and commissioning of the new power lines will be carried out during the maintenance break in summer 2025.

The blooming stand of the Imatra heavy bar mill will undergo a major revamp (Photo: Ovako)

Ovako

EUROPE – FINLAND

Blastr Green Steel takes next steps in establishing low-CO_2 steel value chain

Blastr Green Steel has successfully executed a financing round with strategic partners to advance development planning for a facility for the production of high-quality low-carbon DR pellets feedstock as well as a new steel plant in Northern Europe. Primetals Technologies has recently been chosen as technological partner for the project.

Cargill Metals, Germany-based steel trader Interfer Group, Finland's state-owned venture capital investment company Tesi, and Blastr's founder Vanir Green Industries participated in the equity financing round. Blastr Green Steel, founded in 2021 and based in Oslo, Norway, is creating a low-carbon mine-to-gate steel value chain by using hydrogen instead of coal in the iron production process and feedstock made with carbon-free energy. This mine-to-gate model enables a differentiated and profitable business model with a low carbon footprint.

Primetals Technologies has recently been chosen as Blastr's technological partner for the development of a new 2.5 million t/year steel production complex to be implemented in Inkoo, close to the city of Helsinki, Finland. The project will include a Midrex H_2 plant, powered by up to 100% green hydrogen and provided by a consortium of Midrex and Primetals Technologies. The plant will produce hot DRI for direct charging to the steel mill, as well as hot briquetted iron (HBI), enabling Blastr to decarbonize other value chains by providing ultralow-carbon iron feedstock for customers.

Primetals Technologies will also supply an electric arc furnace-based meltshop with a 300 t EAF designed for direct hot DRI charging. Comprehensive secondary metallurgy facilities are planned as well, comprising a ladle furnace and an RH plant. In addition, Primetals Technologies will supply an off-gas treatment system and a waste heat recovery plant for the electric steelmaking plant, ensuring the most efficient reuse of energy.

The partnership also includes an Arvedi ESP thin slab casting and hot-rolling line as well as a continuous pickling and galvanizing line to produce a variety of hot-rolled steel products including coated steel sheets. Primetals Technologies is also responsible for the full electrics and automation scope including the complete process automation systems as well as digitalization solutions for optimized production and energy management and comprehensive quality-control systems.

Blastr Green Steel has secured funding and selected the technology partner for its low-carbon steel plant in Inkoo, Finland. (Photo: Primetals Technologies)

Blastr Green Steel / Primetals Technologies

EUROPE – FRANCE

ArcelorMittal completes acquisition of strategic stake in Vallourec

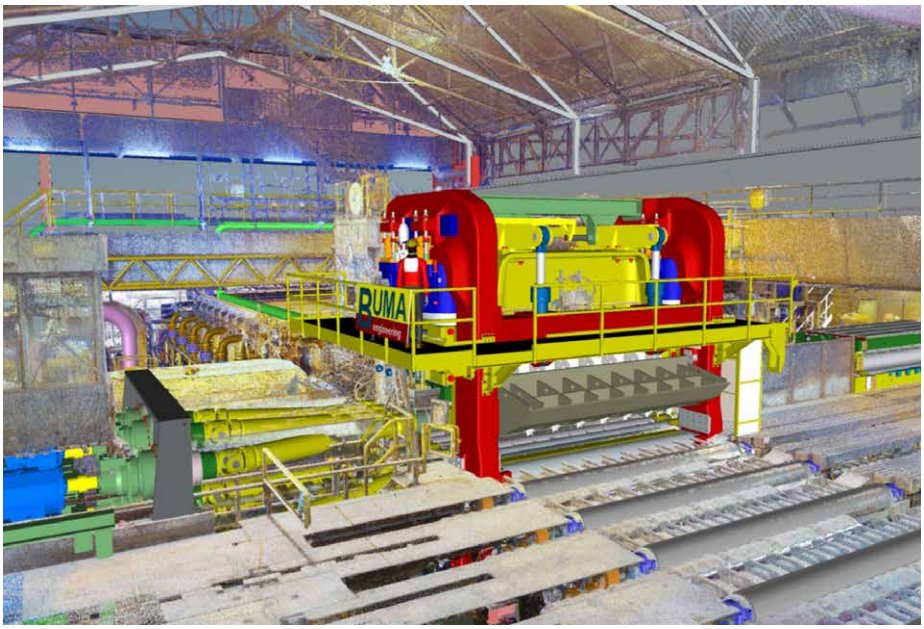
ArcelorMittal has completed the acquisition of shares, representing slightly more than 28 percent equity interest, in Vallourec.

Following completion of the transaction, the appointment of Genuino Magalhaes Christino, Chief Financial Officer, ArcelorMittal, as director of Vallourec will become effective, Keith Howell, Chief Operating Officer, ArcelorMittal USA, will be appointed as director of Vallourec, and Aditya Mittal as observer of Vallourec, subject to successful completion of the settlement. ArcelorMittal does not intend to launch a tender offer for Vallourec's remaining shares over the next six months and will inform the market should this intention change.

ArcelorMittal

EUROPE – GERMANY

Salzgitter Mannesmann Grobblech invests in new hot leveller



Graphic representation of the new hot levelling machine (Photo: Buma Engineering & Anlagenbau GmbH)

A new hot levelling machine will enable Salzgitter Mannesmann Grobblech to produce sheets for energy infrastructure applications such as offshore foundation structures. The leveller will be supplied by the Austrian company Buma Engineering & Anlagenbau.

The new leveller will expand sheet metal processing capabilities at Salzgitter Mannesmann Grobblech and improve access to new applications and markets. The new hot levelling machine is scheduled for commissioning in the summer of 2026. Hans-Jaan Rachner, Managing Director Technology Salzgitter Mannesmann Grobblech GmbH, commenting on the investment decision by Salzgitter AG: "Thanks to this investment, we at Salzgitter Mannesmann Grobblech will be able to establish a further foothold in the wind sector."

As a result of optimized sheet metal logistics, the company can even now produce sheets of up to 24 meters length for the construction of wind towers and has already secured a first project for a renowned wind tower manufacturer. "The energy transition cannot succeed without high-performance steel products. With its heavy plate specialists Ilsenburger Grobblech and Salzgitter Mannesmann Grobblech, the Salzgitter Group ranks as a full-range supplier in the wind sector," says Gunnar Groebler, Chairman of the Executive Board of Salzgitter AG.

Salzgitter AG / Buma Engineering & Anlagenbau

Salzgitter Group signs green PPA with electricity provider

Salzgitter Group aims to cover all of its electricity needs from renewables by 2030. One important step towards this objective is the power purchase agreement recently signed with German electricity provider RWE.

Salzgitter Group and RWE Supply & Trading have entered into a long-term power purchase agreement (PPA) for the supply of green electricity of up to 64 GWh/year. The contract will run for seven years and begin in 2027. The green electricity will come from the 180-MW-peak Boitzenburger Land solar park in Brandenburg. Covering an area of around 170 hectares, it is one of the largest PV systems in Germany. The park has been in operation since autumn 2023 and is jointly owned by Solarenergie Boitzenburger Land GmbH, the GP JOULE Group and Mainova AG; the latter is responsible for marketing the electricity.

With the SALCOS® – Salzgitter Low CO_2 Steelmaking transformation programme, Salzgitter Flachstahl will gradually convert its steel production to electricity and hydrogen-based processes from 2026. The aim is to achieve almost completely CO_2-free production from 2033, replacing the traditional blast furnace route with production processes using direct reduction and electric arc furnaces.

Salzgitter AG / RWE

EUROPE – GERMANY

HÜTTENTAG 2024 – The place to be for stakeholders of the steel industry

This year's HÜTTENTAG Conference, organized by DVS Media GmbH and trade fair organizer Messe Essen, will focus on "Sustainable energy solutions and Artificial Intelligence – the new success factors for steel". The event will be staged on 19 November 2024 at the Congress Center East of Messe Essen.

The organizers invite stakeholders of the steel industry and anyone interested in getting first-hand information about the current challenges of the steel industry to join this year's HÜTTENTAG Conference. Keynote speakers representing the steel producing, plant engineering and hydrogen production sectors will look at the challenges impacting the steel industry and innovative development trends from their respective angles. Panel discussions, a broad range of conference sessions, a technical exhibition and, last but not least, the get-together "Hüttenabend" will provide the attendees plenty of opportunities to exchange information and ideas. The HÜTTENTAG Conference has been organized by DVS Media GmbH and the fair organizer Messe Essen GmbH since 2019. It enjoys the patronage of the Mayor of the City of Essen. For full details of the programme, ticket prices and to register, please visit https://www.huettentag.de

DVS Media

Salzgitter Flachstahl completes modernization of blast furnace A

SMS has successfully commissioned the new Bell Less Top® (BLT) installed in blast furnace A of Salzgitter Flachstahl. The parallel hopper BLT from Paul Wurth offers an array of technical and operational enhancements, such as improved access and dismantling aids.

Material hoppers installed as part of the blast furnace modernization (Photo: SMS group)

As part of the modernization of the top charging system in blast furnace A, SMS overhauled and integrated key components such as the spherical maintenance valve, valve actuator, material hopper, and distribution rocker. The upgrade also included a new primary equalizing system with reconfigured pipework, valves, silencer, and a state-of-the-art hydraulic and greasing station, which was supplied in a turnkey container.

Noise emissions have been substantially reduced with the installation of a new silencer, contributing to more environmentally friendly operation. The equalizing system's piping has been simplified, streamlining the process. The new construction provides a higher level of sustainability and significantly lowers environmental impact, as less dust is produced and less blast furnace gas discharged into the atmosphere. Additionally, the newly constructed hydraulic room provides more space, better access, and an optimized system layout.

SMS group

EUROPE – ITALY

Acciaieria Arvedi to upgrade vacuum degassing plants

Acciaieria Arvedi has awarded Primetals Technologies the order to upgrade its two vacuum degassers (VD) at the steel plant in Cremona to VOD technology.

Arvedi has ambitious plans to expand its product portfolio to encompass both electrical and ULC/IF steel grades. Traditionally, these steel grades are manufactured through the LD converter (BOF) – ladle furnace (LF) – RH-degasser route. Arvedi plans to produce electrical steels with the electric arc furnace (EAF) – LF – VD-OB route.

Therefore, Arvedi will now upgrade its VD plants to vacuum oxygen decarburization (VOD) systems capable of handling the vacuum degassing and oxygen blowing process under vacuum conditions for the manufacture of silicon steel. Primetals Technologies will supply key mechanical components, including water-cooled copper-plated ladle covers, oxygen lance systems, gas coolers, vacuum control systems, and waste-gas burners. The VOD plants, equipped with oxygen blowing lances, are designed for handling extra-low-carbon steel grades together with the addition of aluminium and/or silicon during the process. Arvedi's new equipment will feature copper-cladded, water-cooled ladle covers from Primetals Technologies, designed to avoid skull formation. These ladle covers will also reduce the need for maintenance-related work and, in addition, enhance occupational safety at the plant. The project is scheduled to be completed in the second half of 2025.

The upgrade of the VD plant to VOD technology will enable Acciaieria Arvedi to produce electrical steel. (Photo: Primetals Technologies)

Primetals Technologies

Cogne Acciai Speciali to modernize continuous casting machine

Cogne Acciai Speciali has contracted Danieli Service for a caster modernization project at the works in Aosta. The target of this modernization is to improve machine efficiency and facilitate maintenance.

The focus of the project will be on revamping the cooling chamber of the continuous casting machine for special steel blooms. The scope will include a new, stainless steel cooling chamber to be placed in the mobile curved zone in order to cover the wet zone affected by secondary sprays. This design will significantly reduce the volume of saturated air to be aspirated, leading to substantial electricity savings for the fans and a notable reduction in maintenance time.

A new, central structure will support all the fixed curved sections of the caster. Since all mechanical components will be located outside the wet zone of the chamber, their operational and maintenance management will be simpler and more effective, while extending their overall lifespan. The support structure of the oscillating benches will be optimized to increase oscillation performance.

Danieli

EUROPE – ITALY

Danieli and Nalco Water partner on water treatment research

U.S.-based Nalco Water, an Ecolab company, and Danieli have signed a strategic cooperation agreement to utilize shared research and development capabilities to improve industrial water treatment for the metals industry.

By combining the chemical and service expertise of Nalco Water with the technology experience of Danieli, the collaboration will help steel makers and metals producers to enhance production processes and support reduced carbon and water footprints.

The development initiative will leverage digitally enabled technology to help increase plant performance and reliability, enhance total water-management solutions to reduce water use, and lower capital expenditures and operating expenses. It will help drive reduced greenhouse gas emissions, enhanced scale control, and reduced maintenance costs. The cooperation will also help extend plant life and support more efficient plant commissioning.

Danieli / Nalco Water

Acciaieria di Verona to upgrade wire rod mill with bar finishing facility

Acciaieria di Verona has placed an order with Danieli for upgrading its two-strand wire rod mill with a new bar finishing facility.

Bars ranging from 8 to 36 mm dia, in bundles of up to 5 t and lengths from 6 to 18 m will be added to the current production of 5 to 25-mm-dia quality wire rod on the Danieli mill in operation at the Verona site. This mill will be used to feed both the new bar line and the existing wire rod mill, which will also be able to operate simultaneously. Hot start-up of the bar line is planned by end 2025.

A new compact Danieli-patented direct rolling bundling station will allow high-speed delivery of the bars into the cooling bed. The Danieli Automation process control, extensive use of servo-drives, time-critical applications and sensors will ensure high performance in terms of operational speed, product quality, efficiency, and maintainability.

Danieli

EUROPE – NORTH MACEDONIA

Makstil to upgrade reheating furnace

Makstil AD has selected Danieli technologies to revamp the reheating furnace serving its plate mill in the Skopje plant in North Macedonia.

The revamp will consist of a completely new set-up of the reheating process, supported by a newly developed simulation tool and enhanced furnace components. The project will allow Makstil to reduce the consumption of natural gas by up to 10%, decreasing the mill's carbon footprint. This will be achieved by installing new Danieli Centro Combustion proprietary flameless and radiant burners along with a high-efficiency heat recuperation system and new, high-insulation refractory lining. The contract scope includes the plant startup and personnel training. The upgrade is scheduled to be implemented by mid-2025.

Danieli

EUROPE – THE NETHERLANDS

Tata Steel Nederland adds new sampling line to hot strip mill

Tata Steel Nederland has expanded its hot strip mill in IJmuiden with a sampling line. This line enables rapid testing of steel properties, as well as the inspection and certification of each steel coil.

The commissioning of the sampling line is the latest in a series of investments in the hot strip mill. The new line will be designed to fully automatically sample the entire production spectrum, from normal to ultra-high-strength steel, with strip thicknesses of up to 25 mm. Samples can also be taken hot, substantially increasing the capacity of the number of coils that can be sampled and shortening lead times in both the development of new steel grades and the delivery of steel to customers.

Tata Steel

EUROPE – SPAIN

Hydnum Steel and Euroports to collaborate in logistics solutions

Hydnum Steel and port and logistics operator Euroports have signed an MoU to develop integrated logistics solutions that will optimize the steel supply chain across Europe.

Both companies will work closely in the design and implementation of an efficient and sustainable logistics network, focused on improving the transportation, storage, and distribution of the steel coils that Hydnum Steel will produce at its Puertollano plant. The collaboration also considers efficient and reliable logistics solutions for key steelmaking raw materials such as ferrous scrap, green metallics, and iron ore from various sources and different origins.

Hydnum Steel / Euroports

EUROPE – SWEDEN

Ovako continues to invest in the Smedjebacken steel mill

Ovako is set to further its commitment to innovation and efficiency with a new investment in the Smedjebacken steel mill. This new funding will ensure continued production efficiency and modernization.

The announcement follows previous significant investments, including a new exhaust gas filter, continuous casting machine, and a vacuum tank degassing system. The next investment round will include the replacement of the 50-year-old phase compensation system with an SVC Light® Statcom system from Hitachi Energy. The upgrade will ensure compliance with current industry standards for power quality and flicker levels. It is expected to deliver significant savings in energy and electrode consumption while also enhancing the productivity of the electric arc furnace. The new facility is scheduled to be operational in the second half of 2026.

Ovako / Hitachi Energy

SSAB launches new framework for green and sustainability-linked finance

SSAB has launched a new combined green and sustainability-linked finance framework that will support SSAB's transformation to fossil-free steelmaking and investments in more efficient and flexible production systems.

The combined framework provides SSAB with an opportunity to issue both green and sustainability-linked financing instruments, as well as a combination of the two. It integrates SSAB's updated and more ambitious greenhouse gas emission reduction targets, which have been certified by the Science Based Targets initiative (SBTi), to bring them in line with the Paris Agreement's aim to keep the global warming rise to 1.5°C. The framework also defines the criteria for green finance projects and the purpose for which the proceeds may be used. "With our new finance framework, we are taking a pivotal step in our transformation toward fossil-free steelmaking and reduced carbon dioxide emissions. The framework contains ambitious, science-based emission reduction targets and sets clear guidelines for our green investments going forward," says Leena Craelius, CFO at SSAB.

SSAB

EUROPE – SWEDEN

H2 Green Steel changes name to Stegra

The industrial scale-up H2 Green Steel is changing its name to Stegra. The company was launched in 2021 to reduce emissions in the steel industry on a very ambitious timeline.

Being well on its way to building the world's first large-scale green steel plant – with start of production in 2026 – the company now starts a new chapter with a new name: Stegra, a Swedish word which means to 'to elevate'. "As we continue our journey, we leave our more descriptive project name behind, and take on the name Stegra, which reflects our long-term ambitions", says Henrik Henriksson, CEO, Stegra.

Since its launch, the company's purpose has been reshaped to be the accelerator of decarbonization in hard-to-abate industries. Over the long term, Stegra will explore the potential for growth, making use of the competence and experience being developed in the flagship plant in Boden, Sweden. Stegra has a solid funnel of potential projects outside of Sweden that are being explored as part of a longer-term outlook. They are characterized by locations where the company's customers need help to decarbonize their value chain and which offer abundant access to renewable electricity and strong grid connections. Locations under consideration include Portugal, Canada and Brazil.

Stegra

EUROPE – UNITED KINGDOM

Cremer Erzkontor founds company for the distribution of kyanite and minerals

Cremer Erzkontor, based in Lübeck, Germany, has announced the handover of the representation of Kyanite Mining Corporation in the UK from Peter Skinner Ltd. As a strategic move, Cremer Erzkontor will continue its sales activities in the UK by establishing its own company: Peter Skinner Minerals Ltd.

Cremer Erzkontor has a long history of supplying materials to the refractory, foundry, automotive, construction, food, chemical and allied industries. "The establishment of the new company, Peter Skinner Minerals Ltd., represents a significant milestone in solidifying our business presence in the UK", says Mathias Tiede, Managing Director of Peter Skinner Minerals Ltd. and Head of Region Western Europe, Africa & Middle East at Cremer Erzkontor.

Peter Skinner Ltd. had served as the agent for Kyanite Mining Corporation for over 50 years. "Cremer Erzkontor is a company that will uphold my father's business principles", says Philip Skinner, owner of Peter Skinner Ltd.

Cremer Erzkontor

Tata Steel continues restructuring with 'heavy-end' closure at Port Talbot

30 September 2024 saw the last liquid iron tapped from blast furnace 4 and the last steel from the traditional ironmaking route cast into slab as Tata Steel UK starts its transition to scrap-based, low CO_2, electric arc furnace steelmaking.

Rajesh Nair, CEO of Tata Steel UK said: "Today marks a significant event in the history of iron and steelmaking in the UK as the legacy steel making assets in Port Talbot close, having reached their end-of-life. It is important at this juncture, to pause, recognise and credit the huge contribution of the many thousands of people and the technologies that have sustained our industry and communities here for generations."

Tata Steel ceased operations at the blast furnaces along with other associated iron and steelmaking assets at Port Talbot, the UK's largest steel plant, bringing an end to ironmaking at the site. The Port Talbot site's sinter plant, blast furnace 4 and steelmaking operations were brought to an end calmly and safely, along with the associated energy systems and internal

On 30 September 2024, the last hot metal was processed into steel at Port Talbot (Photo: Tata Steel)

logistics infrastructure. These last of the 'heavy-end' asset closures followed the end of operations at Morfa coke ovens (20 March), blast furnace 5 (4 July), continuous caster 2 (12 July), the deep water harbour (2 September) and the site's ore yards (13 September).

The remaining two continuous casters have been paused in advance of a significant investment and will resume operations in line with the commissioning of the new melt shop in late 2027 / early 2028. Steelmaking at the site will then resume through EAF-based steelmaking, using UK-sourced scrap steel. Tata Steel's planned £750 million investment in low-CO_2 'green' steelmaking will be augmented by the £500 million Grant Funding Agreement signed recently with the UK Government.

There will now be an extensive period of decommissioning while customers continue to be serviced through the Port Talbot rolling mills and downstream business units using imported slab and hot rolled coil.

Tata Steel

EUROPE – UK

Tata Steel's Llanwern galvanising line breaks production record

Tata Steel UK's Llanwern steelworks has set a new output record of 14,077 t in a week, following the implementation of a new technology system on its ZODIAC galvanising line.

Llanwern's new technology system allows for the complete automation of the line including seamless transitions between shifts. The trial has demonstrated that the plant's aim of producing 600,000 t of high-quality zinc-coated steel strip this year is more than achievable. The zinc-coated steel made in Llanwern is used to make car body parts and building components that supply leading manufacturers across the UK.

Tata Steel

EUROPE – TURKEY

Diler Demir Çelik enhances production with new spooler line

Diler Demir Çelik has been successfully operating the new Danieli-supplied spooler line installed at its Izmit plant.

Equipped with new spooler machines specifically designed to maximize the productivity of small sizes diameters, the new spooler line gives Diler Demir Çelik the capability to produce 500,000 t/year of twist-free spooled bars in coils, ranging from to 8 to 25 mm in diameter. The benefit of spooled bars is that they do not require coil unwinding and rewinding before use in downstream lines. Danieli supplied a six-pass fast-finishing block, a water-cooling line and Sund Birsta strapping machines. The entire process is controlled by a Danieli Automation system.

Danieli

Scrap yard at the Outokumpu site in Avesta, Sweden (Picture: Outokumpu)

WHITE PAPER

Climate clock is ticking for steel as geopolitics put the industry into spotlight

The green transition is one of the primary drivers of industrial transformation in the 21st century. In 2023, the steel industry, both carbon and stainless, reached a market value of US$ 928 billion, producing approximately 2 billion tons of steel. Currently, the steel industry accounts for 10% of global greenhouse gas emissions – yet our society will require significant amounts of energy and steel also in the future. By 2050, steel industry emissions need to be reduced by 90% compared to 2022 levels, a monumental change that requires a deep transformation of steel actors from around the world.

Outokumpu, the global leader in sustainable stainless steel, has published a report* on the future of steel – identifying five critical shifts to accelerate the green transition and the needed industrial transformation. The report builds a clear view on how the steel industry needs to evolve, encompassing the growing need to decarbonize and go beyond carbon, the significance of a stable and long-term regulatory environment, the need to move up the circularity value chain, the shared responsibility of the green investments – and the necessity for a repositioning of the green transition to gain public support.

"The strategic importance of steel and other resources is once again in the spotlight, as nations grapple with the challenges of ensuring industrial resilience and navigating the green transition. And, while today's focus for steel is carbon emission-centric, tomorrow's challenges will demand a holistic approach, likely increas-

> Recognizing which phase of change an organization is in is crucial for initiating the change that goes far beyond improving materials or reducing emissions.
>
> *Johann Steiner, Executive Vice President for Sustainability, Strategy and People at Outokumpu*

ingly encompassing more planetary boundaries and higher social requirements. Recognizing which phase of change an organization is in is crucial for initiating the change that goes far beyond improving materials or reducing emissions. The organizations that succeed will be the ones who boldly adopt new strategies aligned with 21st-century business philosophy", says Johann Steiner, Executive Vice President for Sustainability, Strategy and People at Outokumpu.

A shared responsibility and a rebrand needed to accelerate the development and ensure competitiveness

For some of the shifts identified, early progress has been promising as industry forerunners are taking steps towards decarbonization and increasing circularity. Steel is an industry closest to circularity with nearly 85% of end-of-life steel being collected for recycling globally – though with only 30% of it used to produce new steel, there is still room for improvement. Arguably, much remains to be done to transform the industry and to turn the green transition into a new competitive advantage ensuring green growth. New threats are also looming on the horizon, not least with rising geopolitical challenges. According to the report, ambitious, long-term policies and government support are needed to accelerate the green transition. To gather public interest and support, the report also calls for a rebrand of the green transition to make it more tangible and visible to the public in the form of a more everlasting way of consuming.

"Virtually everything we humans do today has a compounding impact on the physical world. Our challenge for the 21st century is drastically reducing that impact – which requires a fundamental transformation in how we produce and consume. It is clear that carbon steel and stainless steel will have a central role to play in that transition, both as a material and as a defining aesthetic feature of a society that needs to build products designed for longevity", says Olivier Rostang, lead researcher for the white paper at Kairos Future.

"Outokumpu have rightly highlighted that cooperation and immediate action are essential to speed up the global net zero steel transition. Getting the industry to net zero is one of the critical challenges of our time. We can achieve this. But we'll only drive sector transformation fast, if we have effective collaboration and action from all parts of the value chain – not just steel users, but steelmakers, policymakers, and investors alike", says Jen Carson, Head of Industry at Climate Group.

Outokumpu

**) Outokumpu commissioned the research that was conducted by a Swedish consultancy Kairos Future, between June-September 2024, utilizing a blend of desk research, AI, data analysis, and C-level interviews across the steel industry value chain. The report has focused primarily on EU/USA markets.*

Climate Week New York City

Outokumpu took part in the Climate Week NYC in September 2024, to activate global climate discussion, to share key future insights from the white paper and to take responsibility in accelerating the needed change. Climate Week NYC is the time and place where the world gathers to showcase amazing climate action and discuss how to do more. Run by the international non-profit Climate Group, in partnership with the United Nations and the City of New York, Climate Week NYC annually brings together voices from across the spectrum to debate and implement climate action. With over 500 events taking place as part of the official events program and hosting the most significant leaders from business and government, Climate Week NYC is one of the largest annual climate summits of its kind attracting global awareness and participation.

EU ECONOMY

ArcelorMittal Europe calls for a firm action plan for steel in the EU

On the occasion of the 20th anniversary of ArcelorMittal Poland, Geert Van Poelvoorde, CEO of ArcelorMittal Europe, calls for the support of the European Union for emergency trade measures and a firm action plan for steel to keep the steel industry alive in Europe.

It is 20 years since Mittal Steel acquired Polskie Huty Stali in 2004, when the business was put up for privatisation by the Polish government. Since then, the business has been transformed and modernised through significant investment. Today in Poland, ArcelorMittal has one of Europe's most modern hot rolling mills, in Kraków; the heavy section mill in Dabrowa Górnicza is in the elite group of mills able to produce 120-metre-long rail. Carbon dioxide emissions have been reduced by 42 percent, dust emissions by 90 percent, and energy consumption by 40 percent. According to the latest report from the Warsaw School of Economics, in 2023 ArcelorMittal was the second largest foreign investor in Poland. The company's achievements gain even more importance at a time when many steel companies in the central and eastern Europe region are facing serious challenges concerning their future.

Speaking at the 20th anniversary celebrations in Sosnowiec, Poland, Geert Van Poelvoorde, CEO ArcelorMittal Europe said: "As in the rest of Europe today, Polish steelmakers are under intense pressure, due to the high costs of making steel in Europe and the volume of subsidised, cheap imports flooding the market. As a result, the European steel industry will continue to shrink. But with the right policies in place to support us, we can thrive – and our industry can continue to be the foundation of European industry – in a new era."

Van Poelvoorde called on the Polish government for its support as it prepares to hold the Presidency of the European Council. This will be a critical time for determining the future of European steel, as the Carbon Border Adjustment Mechanism (CBAM) legislation is finalised, which will determine European steelmakers' ability to continue to produce steel competitively while also being able to make the investments needed to decarbonise.

Geert Van Poelvoorde speaking in Sosnowiec on 26 September, on the 20th anniversary of ArcelorMittal Poland (Photo: ArcelorMittal)

"With Poland due to hold the presidency of the European Council for the first half of next year, I am sure that we can count on Poland's support to translate the Commission's ambitions into an effective policy to support the industry's decarbonisation, and to introduce much-needed emergency trade measures for the steel sector. Next year, more specifically the first six months of 2025, will be crucial to define the Commission's steel and metals action plan, the Clean Industrial Deal and to bring the measures necessary to create the level playing field that we need for Europe, on track. It is not an exaggeration to say that the decisions that Europe and its member states will take next year, will decide on the future size of European industry and the steel industry".

Van Poelvoorde also spoke positively about the recently proposed European Commissioner appointments, and what they mean for the industry: "The mission of the proposed Commissioner for Pros-

perity and Industrial Policy, Mr. Stephane Séjourné, includes the development of a steel and metals action plan. This has never happened before, and we look forward to seeing the detailed plan to understand how it will support us. I am happy to hear that our cries for a new Industrial Deal for Europe seem to have been listened to and I will continue to advocate for strong, faster action to safeguard our industry against the threats it faces. Indeed, there were many positive signs in the new European Commissioner nominations made last week. But these remain words on the page – an ambitious wish-list written at the start of a new mandate".

Closing his speech, Geert Van Poelvoorde said that considering the growth of protectionism around the world, and the world order coming under pressure, Europe has to define which role it wants to play in the future. "The understanding is now increasing that remaining an economic powerhouse is impossible without a strong industry and specifically, a strong steel industry. Decarbonising by de-industrialising is not a solution for Europe, not for the world and certainly not for the climate and our planet".

> With the right policies in place to support us, we can thrive – and our industry can continue to be the foundation of European industry – in a new era.
>
> *Geert Van Poelvoorde, CEO of ArcelorMittal Europe*

ArcelorMittal

MAJOR STEEL INDUSTRY EVENT

Danieli Innovaction Meeting with prominent global participation

For the fifth time, Danieli invited representatives of the international steel industry to spend a week at the company's headquarters in Buttrio, Northern Italy. The first day was dedicated to topical panels. The second day was entirely devoted to presentations and discussions on various technologies, which were held in parallel sessions. As usual, Danieli Innovaction Meeting concluded with site visits to DRI plants, long product minimills and flat product mills in various countries around the world.

Decarbonisation of steel production was a key topic at DIM 2024 (Photo: Danieli)

Around 700 steel industry professionals from 73 countries representing more than 60% of the world's steel production, producers, experts and media travelled to the Friulian town of Buttrio near Udine at the end of May this year to attend Danieli's flagship event, and STEEL + TECHNOLOGY was invited to join them. The Danieli InnovAction Meeting continues a rich tradition of exchanging ideas and visions for the future of the industry, focusing on market perspectives, sustainability, green and digital steel. First organised in 2000 as the Danieli Open Week and then as the Danieli Technology Forum, and returning every five years, this was the fifth edition of the Danieli Innovaction Meeting.

The first day of the event was characterized by four important panels and one presentation on Macro-economic and geopolitical trends; Raw materials and metallics: present and future opportunities; The best available energies: alternative choices; and Intelligent and autonomous plants to produce competitive green metal.

Macro-economic and geopolitical trends. This panel, moderated by Federico Rampini, Journalist of Corriere della Sera, explored the critical role of decarbonization in the steel industry over the next 50 years and panelists observed:

Peter Maagh, SHS Dillinger, Chief Technology and Production Officer: need for a transformative approach to steelmaking organization, including the production of green hydrogen via electrolysis, despite regulatory challenges.

Peter Matt from CMC, President and CEO: advantages of electric arc furnace technology in reducing carbon footprint; and the importance global steel capacity rationalization.

Vidya Ratan Sharma, Jindal Steel & Power, Vice Chairman: global overcapacity of steel and the necessity for regional self-reliance.

Hassan Shashaa, Emirates Steel Arkan, Group Chief Projects Officer: immediate need to reduce CO_2 emissions from steelmaking, and the potential for collaboration to achieve sustainability. He also described geopolitical factors such as protectionism and the impact of national security concerns on global trade.

Raw materials and metallics. As engaged by Ronald E. Ashburn, Secretary General, AIST, panel #2 focused on the pivotal role of raw materials in decarbonization and the future of steelmaking. Panelists expressed:

Li Jianyu, Hunan Iron & Steel Group, Chairman: there is growing importance of recycled steel and the innovative technologies being developed to utilize low-quality iron ores.

Johannes Rieger, K1-MET, Area Manager: necessity for flexibility in processing different qualities of iron ore and integrating circular economy principles.

Guilherme Reinisch Neves, Vale, Global Director Iron Ore Briquettes: calling for breakthroughs in low-energy iron ore agglomeration.

Intelligent, competitive 'green metal' technologies were intensively discussed (Photo: Danieli)

A few factory halls were converted for the presentations and exhibits (Photo: Danieli)

Daou Rafic, Suez Steel, Vice Chairman and Managing Director: benefits of DRI technology and its readiness for hydrogen integration.

The conversation also covered China's decarbonization efforts, as described by Li Jianyu, and Egypt's potential in green energy as highlighted by Rafic.

The best available energies. Ronald J. O'Malley, Chair Professor, Missouri University of Science and Technology led the panel on alternative energies, and showcased various innovative projects aimed at reducing carbon emissions in the steel industry.

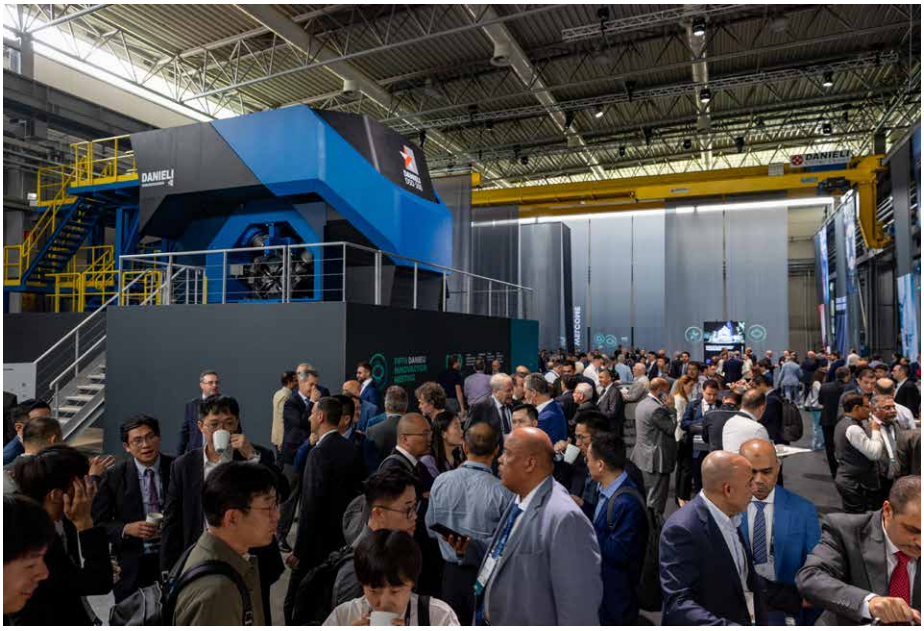
Carl Orrling, SSAB, Vice President of Strategic Technical Development: leader in decarbonization, SSAB claims each project should address the available energy sources to replace coal, and various regulatory conditions. Also, hydrogen storage

is a key factor to capture energy when it's available from the renewable sources.

Stefan Savonen, LKAB, Vice President Energy and Climate: description of the progress towards the use of renewable electricity in Sweden for fossil-free direct reduced iron (DRI) production.

Michael Bott, SHS/Dillinger Huettenwerke, Production Director: challenges and solutions for energy management in Germany, including the transition to DRI and EAF technology to cut CO_2 emissions.

Carlo Beltrame, Beltrame Group, Group Business Development Manager and CEO Romania & France: today I don't see a problem in energy supply in Europe as consumption decreased due to a crisis. Problem will be energy networks rather than production, hence the development of on-site captive energy – photovoltaic and SMR– by Beltrame. If decarbonization will take place, state aids will have to support not only the integrated steel mill, but EAF producers as well.



Around 700 participants from all over the world came to DIM 2024 (Photo: Danieli)

Pre-assembled machines were on display during the tour of the production facilities (Photo: Danieli)

Claudio Filippone, HolosGen LLC, President and CEO: the panel also included discussions on the potential of Small Modular Reactors for energy supply and the broader issues of energy consumption and supply dynamics.

Intelligent and autonomous plants. Process and equipment control with horizontal/vertical integration, and with the support of AI to reduce OpEx for competitiveness and increase global sustainability, for fully automatic steel production. Akio Ito, Senior Partner, Roland Berger handled panel #4 examining the transformative impact of digitalization, automation, and artificial intelligence (AI) on the steel industry.

Andrea Bez, Microsoft, described AI as the "new water", emphasizing its role in enhancing all process areas by providing a continuous flow of data.

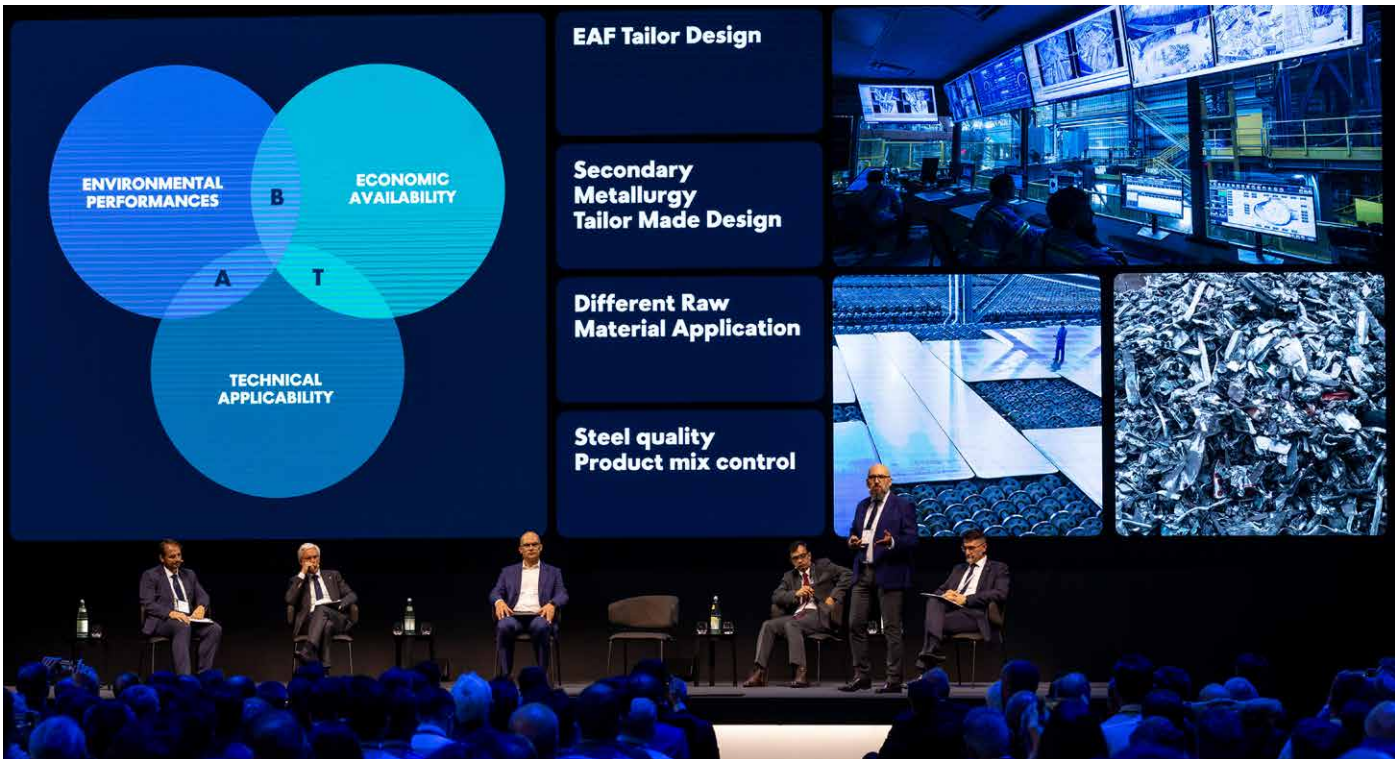
Potential of generative AI to revolutionize work processes by acting as a co-pilot, thus saving time and energy was presented by Alessandro Ardesi, Danieli Automation, CEO.

The panel underscored AI's accessibility and sustainability, envisioning it as a cornerstone of future competitiveness in the industry. The cooperation between ABS steelmaking plant and Agrati, steel end-user was showcased by the CEO of ABS Stefano Scolari and the CEO of Agrati Paolo Pozzi.

The sustainable route from ore to steel. Enriched by the active participation of Martin Zappe, Salzgitter Flachstahl, Program Manager SALCOS®, and Magno Ribeiro, from Vale, Technical Manager Europe, the presentation "The sustainable route from ore to steel" closed Day 1.

Danieli presented its vision on how to have a more sustainable path from ore to steel, starting from the available technologies to substitute for BF+BOF, passing through the availability of iron ores, with the target to move close to net-zero steel production, considering a competitive OpEx. This was made by Marco Lapasin and Massimiliano Zampa, Vice Presidents of Danieli Centro Metallics, Reinoud Van Laar, Senior Technology Manager of Danieli Corus, and Bojan Vucinic, Senior Manager Tech Team of Danieli Centro Met.

Salzgitter Flachstahl, which recently ordered an Energiron DRI plant, confirmed its endorsement to the DRI-EAF route to give continuity to quality steel production in Germany, in a green way.



The second day of the symposium focussed on new technologies and innovations (Photo: Danieli)

Brazilian mining group Vale spoke about iron ore valorization, claiming they will be able to produce any required quality, through the introduction of new processes, now ready for industrial production.

Intelligent, competitive Green Metal technologies

On the second day, the Danieli Innovaction Meeting continued with topical technology sessions. The audience organized in groups of interest attended technology presentations to learn and discuss emerging technologies and innovations in ironmaking, ore direct reduction, electric steelmaking, long and flat product casting/rolling and finishing, and pipe and tube processing.

Attendees had the chance to see some Danieli innovations displayed at the Danieli Research Center including, The Drawer precision sizing mill, new Danieli Automation Intelligent plant control desk pulpits, slab-caster intelligent mould and Octocaster moulds for top-speed, top-quality flat and long product casting. Also on show were the Danieli Corus Q-Compass logistics and process simulator, the VIM vacuum induction melting, billet welder deburring evolution and MH intelligent roller guides.

At Danieli Automation guests could touch the Q-One power feeder modules for digital control of the EAF and no-impact on the grid, medium-voltage inverters to reduce energy consumption during dead times, and M-1 injector with W-Stop (wireless backfire preventing system) for EAF by More (Danieli Group).

Visits to exceptional steel sites around the world

On Day 3, thanks to the kindness of hosting steelmakers, attendees had the possibility to visit top-performing reference plants for flat and long products, i.e. nine reference installations of Danieli. The first visits took place in Italy, at two steel mills and a strip-processing line in the province of Danieli region, followed by a third mill in Padua, near Venice: Acciaieria Arvedi, Ferriere Nord, ABS and Acciaierie Venete. The following day 4 plant tours continued to Austria and Egypt with visits at voestalpine Stahl, Egyptian Steel and Suez Steel sites.

In the USA, CMC Steel and Nucor Steel Brandenburg opened the doors of their innovative plants. The tour started in Brandenburg, Kentucky, to continue in Durant, Oklahoma.

Two more plant tours offered further opportunities to learn more about disruptive technologies: digital electric steelmaking at ABS Sisak in Croatia and flexible, quality hot-rolled coil production at Shougang Jingtang in China.

In tribute of Gianpietro Benedetti

In a very personal presentation, Danieli honoured Gianpietro Benedetti, the former President of the Group, who passed away just a few weeks before the Danieli Innovaction Meeting. For more than 60 years, Gianpietro Benedetti demonstrated an 'endless' passion for work and innovation. This and more than 80 patents resulting from new developments are the most tangible values left by Gianpietro Benedetti – developer of the Danieli Group for plant engineering and steel production.

Alessandro Brussi, Danieli Group Chairman (ad interim), assured that Danieli will continue on the path. "Our direction is the same as it was in the past, and it will continue in that way. Unfortunately, we suffered the loss of the main driver, but we were aligned with his thinking and so for us it's business as usual. Every day we continue on with this strategic vision. As time proceeds, this strategy is something that families will decide in the future, but for the short term we don't have any concerns or complications."

Danieli

SUSTAINABLE STEELMAKING

SSAB goes ahead with the mini-mill project

Nordic steel company SSAB will implement a highly automated mini-mill solution, consisting of two electric arc furnaces, secondary metallurgy, thin-slab caster and endless-rolling hot strip mill. When completed, SSAB will decommission the existing blast furnace-based production system in Luleå. This transition process will be a remarkable step in decarbonization for SSAB and its end-users.

Earlier this year, SSAB's Board of Directors took the decision to build a state-of-the-art fossil-free mini-mill in Luleå as the next step in SSAB's transformation to fossil-free steel production. The transformation in Oxelösund Sweden is already ongoing.

Danieli has been chosen as technology provider for the fossil-free steel mini-mill project. SSAB and Danieli have signed an Early Service Agreement (ESA) on the pre- and engineering phase for the project. Under the agreement, Danieli will supply a highly-automated technology solution for the new mini-mill, consisting of steelmaking plant, hot strip plant and a cold rolling complex to serve the mobility segment with a broader offering of premium products. The new Luleå mill will have a capacity of 2.5 million t/year.

Quality hot-rolled coils will be produced through electric steelmaking and direct casting-rolling. The upstream part of the mini-mill will consist of

- two electric arc furnaces,
- advanced secondary metallurgy,
- a direct strip rolling mill to produce SSAB's specialty products.

The new mill will process a mix of recycled scrap and fossil-free sponge iron (DRI) supplied from the Hybrit demonstration plant in Gällivare.

Advanced technology solutions

In the chosen solution, Danieli will supply a melt shop consisting of two DigiMelters featuring a Q-One power feeder, continuous scrap charge and a Melt Model suite for dynamic control of the melting profile, plus two twin-ladle refining stations and two twin-tank vacuum degassers. Endless scrap charging improves furnace efficiency and reduces NO_x emissions.

The selected configuration of QSP-DUE Danieli Universal Endless technology – which will allow SSAB to produce a wide range of hot-rolled strip in coil-to-coil and semi-endless modes, resulting in a product portfolio expansion – incorporates a fully electric tunnel furnace to ensure minimum carbon footprint.

This new generation of tunnel furnaces makes use of a combination of induction modules and electrical resistances. The provision of dry rolls in the tunnel furnace also delivers important electrical energy consumption savings, and excellent strip quality. Total quality management using DigiMet solutions and robotics will make the plant highly automated from scrap handling to the coil yard. The configuration will also include Danieli water- and fume-treatment plants, auxiliary plants, and cranes.

Important step in decarbonization

The startup of the new mill is planned for the end of 2028, with full operating capacity one year later. Environmental permits are expected by end of 2024. The investment is an important step in SSAB's strategy to establish a leading position in emission-free special and premium steels. When completed, SSAB will decommission the existing blast furnace-based production system in Luleå. This will reduce Sweden's CO_2 emissions by 7% in addition to the 3% from the Oxelösund mill conversion.

SSAB / Danieli

SSAB and Danieli have signed an agreement on the pre- and engineering phase for the new mini-mill (Picture: Danieli)

RENEWABLE ENERGY FOR SUSTAINABLE STEEL PRODUCTION

ArcelorMittal secures clean energy supply

ArcelorMittal Brazil has signed contracts for the development of two solar energy projects with a combined capacity of 465MW, equivalent to 14% of its current electricity needs. The projects support ArcelorMittal Brazil's objectives to secure and decarbonise its future electricity needs and are a further step towards the company's long-term goal of becoming self-sufficient in electricity.

Construction of Luiz Carlos Solar Photovoltaic Complex began in 2024 (Photo: Atlas)

The first new project builds on ArcelorMittal Brazil's existing relationship with Casa dos Ventos, one of Brazil's largest developers and producers of renewable energy projects, with whom in April last year it signed a joint venture agreement for the development of a 554MW capacity wind power project that is set to be commissioned towards the end of next year. This latest agreement – again a joint venture in which ArcelorMittal Brazil will hold a 55% stake with Casa dos Ventos holding the balance – will see the construction of a 200MW capacity solar power plant on the same site as the wind power project, in the state of Bahia, north-east Brazil, with commissioning also expected before the end of 2025.

ArcelorMittal will acquire 100% of the 2nd project upon completion

The second project is a partnership with Atlas Renewable Energy, the second largest independent renewable energy developer in Latin America, for the development of a 265MW capacity solar energy project in the state of Minas Gerais, east Brazil. The agreement is for an initial 50/50 joint venture, with ArcelorMittal acquiring 100 per cent of the solar park upon build completion. Project commissioning is again expected before the end of 2025.

As part of this partnership, Atlas will invest in the construction of a solar photovoltaic plant within the Luiz Carlos Solar Photovoltaic Complex in Paracatu, Minas Gerais. This new facility will provide renewable energy to power ArcelorMittal's steel plants in South and Southeastern Brazil.

The contract establishes a joint venture between Atlas Renewable Energy and ArcelorMittal to construct a major portion of the Luiz Carlos Solar Photovoltaic Complex. Once the solar plant becomes operational, ArcelorMittal will acquire Atlas' entire shareholding, taking complete ownership of the project.

This model provides ArcelorMittal with access to a large-scale solar project in southeastern Brazil, where solar radiation is abundant. The project benefits from a contract that ensures connection to the electricity grid, guaranteeing a long-term supply of renewable, cost-effective energy for producing green steel.

Both projects are subject to approval from the Administrative Council for Economic Defense (CADE), Brazil's antitrust authority. The projects support ArcelorMittal Brazil's aims to secure and decarbonise its future electricity needs and are a further step towards its long-term ambition to be self-sufficient in terms of its electricity requirements.

These projects build on ArcelorMittal's existing portfolio of renewable energy projects. In India, commissioning of a 975MW capacity renewable power project recently commenced. The US$0.7 billion project, which combines solar and wind power with hydro pump storage, will provide 250MW of uninterrupted renewable power to ArcelorMittal's Indian steelmaking joint venture, AM/NS India, reducing its carbon emissions by 1.5 million tonnes a year. And in Argentina, ArcelorMittal has developed a partnership with PCR for a 130MW solar and wind capacity project. The project is operational and supplies over 30% of ArcelorMittal's local electricity requirements.

ArcelorMittal / Atlas Renewable Energy

THE AMERICAS – BRAZIL

Gerdau instals robot for casting operations

Gerdau has successfully installed a PolyCAST multitool robot for caster operations at its Araçariguama unit.

This state-of-the-art robotic cell represents a significant advancement in the meltshop to enhance the caster operations, contributing to improved productivity and safety standards. The robot's advanced automation capabilities streamline caster operations, reducing cycle times and increasing throughput. The PolyCAST robot's capabilities include precision-controlled operations from opening the slide gate with an oxygen lance to seamlessly placing the ladle shroud. Moreover, its ability to automate temperature readings and sampling in the tundish and distribute flux powder showcases the seamless integration of advanced technology into traditional processes. By automating hazardous tasks, PolyCAST minimizes risks to employees, while ensuring consistent and high-quality output.

The new multitool robot operating at the casting machine under challenging operating conditions (Photo: Polytec)

Polytec

THE AMERICAS – MEXICO

Talleres y Aceros to upgrade caster for SBQ production

Talleres y Aceros S.A. de C.V. (TYASA) is planning to expand its product portfolio to include automotive grades. To this end, the company has awarded Primetals Technologies the order to upgrade its 6-strand billet, bloom, and beam blank multi-format caster to accommodate automotive grades.

As part of the upgrade, Primetals Technologies will implement new strand guides and an electromagnetic stirrer to enhance inner-strand quality. Primetals Technologies will supply key mechanical components as well as electrics and automation systems, enabling TYASA to meet the highest requirements on quality for various special bar grades. The 6-strand caster will have a capacity of 1.2 million t/year and be designed to produce 130 to 450 mm billets or blooms and beam-blanks of 300 x 200 x 80 mm in low-, medium- and high-carbon, special bar qualities (SBQ) and automotive grades.

Primetals Technologies' "Connect and Cast" concept will ensure a fast and trouble-free startup phase by providing defined interfaces between the mechanical equipment and the automation systems. With the right parameters in place, the casting machine can be implemented swiftly, making it possible to roll and sell the first cast products right away, resulting in a quick return on investment.

After the upgrade, multi-format caster of Talleres y Aceros will be able to also produce special bar quality (SBQ) steel grades for the automotive industry (Photo: Primetals Technologies)

Primetals Technologies

THE AMERICAS – MEXICO

Achv Aceros places ERW tube mill orders

Achv Aceros has awarded Danieli Centro Tubes a contract to supply two ERW tube mills for its new facilities in Monterrey.

The new electrical resistance welding mills will be used to produce welded structural tubes with yield strength up to 800 MPa and outer diameters ranging from 19 to 193 mm, as well as equivalent square and rectangular sections with wall thicknesses of up to 7.3 mm. The maximum line speed will be 140 m/min.

The new ERW mills will feature automatic coil loading, on-line metallization, eddy current testing, tube stenciling, a quick-change mill system, bundle packaging lines and a full automation system. Start-up of the two mills is planned to take place by the end of 2025.

Danieli

THE AMERICAS – CANADA

Cleveland-Cliffs acquires Stelco Cleveland

Confirming its commitment and leadership in integrated steel production in North America, Cleveland-Cliffs Inc. has entered into a definitive agreement to acquire Stelco Holdings Inc.

Upon completion of the transaction, Cliffs shareholders will own approximately 95% and Stelco shareholders will own approximately 5% of the combined company. Stelco is expected to continue operations as a wholly-owned subsidiary, preserving the name and legacy of the business.

Stelco is an integrated steelmaker consisting of two operational sites, both located in the province of Ontario: Lake Erie Works, the newest integrated steelmaking facility in North America; and Hamilton Works, a downstream finishing and cokemaking facility. Stelco ships approximately 2.6 million t/year of flat-rolled steel, primarily hot-rolled steel, to service center customers. The acquisition of Stelco expands Cliffs' steelmaking footprint and doubles its exposure to the flat-rolled spot market, with cost advantages in raw materials, energy, healthcare, and currency. Stelco adds capabilities that complement Cliffs' existing operations and product portfolio, while diversifying its customer base across the construction and industrial sectors.

Cliffs' plan is to grow the business in Canada and build on the progress Stelco has made in recent years. Stelco's headquarters will remain in Hamilton and the name and legacy of Stelco will be preserved in Hamilton, Nanticoke, and Canada. Stelco will continue its significant operations in Hamilton and Nanticoke, make major capital investments over the next three years, and plans to increase steel production over current levels from those facilities.

Cleveland-Cliffs Inc.

THE AMERICAS – USA

U. S. Steel to build carbon capture plant

United States Steel Corporation and CarbonFree have signed a definitive agreement to capture carbon emissions generated from U. S. Steel's Gary Works blast furnaces using CarbonFree's SkyCycle™ technology.

CarbonFree is a carbon capture company committed to the decarbonization of hard-to-abate industries and global supply chains. Its SkyCycle technology captures carbon dioxide emissions produced from industrial plants before entering the atmosphere. It then converts them into a carbon-neutral version of calcium carbonate, which is essential to the creation of paper and plastics, as well as personal care, paint, and building products.

Construction on the SkyCycle plant in the U. S. Steel Gary Works facility is expected to commence this year with operations projected to begin in 2026. The definitive agreement has a term of 20 years following its in-service date. The plant will be designed to capture and mineralize up to 50,000 t/year of carbon dioxide per year and will have the opportunity to be expanded in the years to come. The project is the first step in exploring the scalability of this technology for potential future implementation across the enterprise. In addition to capturing carbon dioxide, CarbonFree will use slag produced by the blast furnace operation as part of the calcium carbonate production process.

U. S. Steel / CarbonFree

THE AMERICAS – USA

NLMK Indiana starts up EAF following revamp

The electric arc furnace at NLMK Indiana's steel plant in Portage during the first heat after the revamp (Photo: Primetals Technologies)

NLMK Indiana has started up a 118-t electric arc furnace, after a revamp by Primetals Technologies, at its steel plant in Portage, Indiana.

Primetals Technologies' scope of supply included a new tilt frame, electric conductive arms, a roller bearing, a single-point roof-lifting system with an integrated gantry, a roof, and a hydraulic system, as well as a Level 1 automation system for the hydraulic system. Certain parts of the existing equipment, like the lower shell and the upper shell, were reused. The goals of the revamp were to increase safety and simplify the maintenance procedures. Primetals Technologies tackled these challenges by means of the single-point roof-lifting system and the integrated gantry. Replacing the delta or lifting off the roof has thus become safer because operators no longer have to physically access the furnace roof when disconnecting the chains. The process of replacing the delta now lasts less than an hour. The total shutdown for the revamping activities until the first heat took just six weeks.

Primetals Technologies

Nippon Steel announces additional investments at U. S. Steel facilities

Nippon Steel Corporation has announced additional project investments to be made at Mon Valley Works and Gary Works, as part of its pending acquisition of United States Steel Corporation.

The investments announced represent additional capital spending that will extend the production life of two of U. S. Steel's critical integrated assets and enhance the security of steel supply to American manufacturers. As part of that commitment and following the closing of the transaction, Nippon Steel will replace and/or upgrade the existing hot strip mill at Mon Valley Works and other facilities. At Gary Works, Nippon Steel plans to invest in the revamping of blast furnace No. 14. This is expected to extend the facility's operational life by up to 20 years.

The project investments are subject to the closing of the transaction. Nippon Steel expects the transaction to close in the second half of 2024, subject to the fulfillment of the remaining customary closing conditions, including receipt of required U.S. regulatory approvals.

Nippon Steel Corporation

SDI receives AIST award for continuous galvanizing line

Steel Dynamics (SDI) has received an AIST Project Excellence Award for its continuous galvanizing line (CGL) supplied by Fives.

Steel Dynamics' continuous galvanizing line No. 3 at the Columbus plant in Mississippi has been honored with the AIST Project Excellence Award which recognizes the best practices of project management based on the criteria business success, technical success, safety performance, and project management success.

Fives designed and supplied the line to increase SDI's production capacity and expand its product portfolio at the Columbus plant. The line has a capacity of 400,000 t/year and is dedicated to producing unexposed automotive steel grades, as well as specialized grades for the construction, appliance, and automotive industries.

The scope of the project supply included entry and exit coil handling sections, a degreasing section, a horizontal annealing furnace, hot dip galvanizing and cooling equipment, a skin-pass mill and strip leveler, and metallurgical assistance for different steel grades and types of coating.

Fives

ASIA – CHINA

Baosteel invests in plant equipment for the production of long and flat steel products

Baosteel has successfully rolled the first bar on the new reducing and sizing block (RSB®) in its also new 600,000 t/year SBQ rolling mill. A new 150-t EAF went on stream, and the Chinese steel company has ordered a further continuous slab caster.

The new Kocks RSB® 300++/4, featuring advanced 3-roll technology, has been integrated as a finishing block in the combined SBQ wire rod and bar mill. It rolls bar in coil and the pre-cross-sections for the wire rod line. The rolled products vary between diameters of 18 to 50 mm for bars in coils and between final diameters of 7.5 to 28 mm for the wire rod line. The Kocks scope of supply also included remote control for stands and guides, which allows operational parameters to be adjusted from the control stand. In addition to the roll shop equipment, Kocks installed the software and hardware that assist operators in stand and guide preparation and support the entire tooling process in the roll shop. The block comes in the further advanced RSB® design, recently premiered with an iF Design Award.

Second, Baosteel has brought on stream its new 150-t Zerobucket UHP electric arc furnace supplied by Danieli. The new EAF features continuous scrap charging and preheating, which adopts continuous charging of hot metal from the slag door side for maximum production flexibility. Intelligent and unmanned operation is enabled by Danieli's mechatronic technology packages, including a dynamic electrode cooling system, automatic sampling and the automatic tapping system with automatic sanding device and slag detection. The project was executed within a period of only four and a half months from shutting down the EAFs 7 and 8 to the hot start of the new EAF.

Third, Baosteel has signed a contract with Primetals Technologies for a two-strand continuous caster with optimized roll geometry for both conventional and silicon steel production.

Primetals Technologies will supply the mechanical equipment and a comprehensive scope of Level 1 and 2 automation systems, and will provide construction and implementation services. Baosteel's new caster – the third caster order from Baowu Group in three months – will feature several innovative technologies. The new two-strand continuous caster will be designed for a capacity of 2.35 million t/year. With a 9.5 m radius and a metallurgical length of 37 m, the caster will be able to produce slabs of 230 x 900 to 1,450 mm.

The ideal caster roll geometry will be determined already at the design stage, using a dedicated model recently developed by Primetals Technologies, to mould level fluctuations stemming from unsteady bulging. The Smart Mold, a high-performance cassette-type mould, will be configured with the DynaWidth online mould-width-adjustment system for flexible and fast slab-width changes. An electromagnetic stirrer is a key part of the mechatronics package and allows for enhanced inner-strand quality. Dynamic secondary cooling and soft-reduction packages will provide quality improvements by calculating thermodynamic effects.

Kocks / Danieli / Primetals Technologies

The new reducing and sizing block rolling the first bar at Baosteel
(Photo: Kocks)

ASIA – CHINA

Jiangsu Yonggang produces billets and blooms on new casters

The newly equipped continuous casting shop at Jiangsu Yonggang (Photo: Danieli)

At Jiangsu Yonggang, the two new special-steel billet and bloom casters supplied by Danieli are in full operation. The total nominal production capacity of the two casters exceeds two million tonnes per year.

Jiangsu Yonggang, located in Zhangjiagang city, processes high-quality steel grades, such as high-carbon, tyre cord, bearing and spring steels on the two Danieli-supplied eight-strand billet and bloom casters. The casters are designed with 10 m and 12 m nominal radii and 1,370 mm strand distance to produce 160 mm × 160 mm, 200 mm × 240 mm, and up to 240 mm × 240 mm sections, respectively.

High product quality is ensured by moulds equipped with external EMS stirrers and radioactive level-control systems, hydraulic oscillators, fixed curved sections with advanced secondary cooling and containment, and movable, final EMS stirring systems with adjustable positions along the strand. The used twin-module withdrawal and straightening system applies mechanical soft reduction. Controlled by the Danieli LPC dynamic solidification model, the system can be adjusted in line to changing casting conditions. The casters operate with Danieli Automation L1 and L2 process control systems. All core equipment was assembled at Danieli China workshops in Changshu.

Danieli

Yantai Walsin issues FAC for stainless steel combination mill

Primetals Technologies has received the final acceptance certificate (FAC) from Yantai Walsin Stainless Steel for a new stainless steel combination mill.

The new mill project, designed to produce 420,000 t/year of stainless steel and nickel alloy products, was completed via a consortium consisting of Primetals Technologies and CERI Long Products. The scope comprised all electrics and automation. The combination bar and rod mill includes three outlets: a straight bar outlet for the production of bar from 40 mm to 130 mm, a bar-in-coil outlet for bar from 18 mm to 40 mm and a wire rod outlet to produce rods from 5.5 mm to 18 mm in coils. The mill train features a breakdown mill, induction heating system, roughing and intermediate mill with no-housing stands that feed a cooling bed equipped with abrasive saws, slow bin cooling, bundle-forming stations and in-line bar straightening. The bar-in-coil outlet uses the latest high-speed pouring reels with direct quenching. The rod outlet includes a Morgan No-Twist Mill, Morgan rod reducing/sizing mill, Morgan Stelmor conveyor, vertical pallet coil handling and a high-speed shear system.

Curved section of the Stelmor conveyor for future in-line direct solution treatment (Photo: Primetals Technologies)

The new mill achieves tighter tolerances and improved surface quality, reducing the amount of peeling after pickling. For the production of martensitic grade bars, the line includes a rapid transfer system to the slow cooling bins. The bar-in-coil outlet is designed to perform in-line quenching of austenitic and ferritic stainless products, decreasing the subsequent annealing effort. Furthermore, the line equipment is design to accommodate an in-line solution for the direct treatment of wire rod products in the future.

Primetals Technologies

ASIA – INDIA

SAIL orders additional hot-blast stove for IISCO Steel Plant

Steel Authority of India Limited (SAIL) has awarded Primetals Technologies the order to design, supply and install a new hot-blast stove for blast furnace No. 5 of the IISCO steel plant at Burnpur, Asansol city, West Bengal.

The addition of this fourth stove will enable IISCO to repair the existing stoves without impacting plant production or efficiency. Implementation is scheduled to take place 17 months from the date of contract signing. Upon completion, the IISCO steel plant will benefit from the operational advantages of utilizing four stoves.

Primetals Technologies will provide the design, engineering, manufacturing and construction of the new stove shell. To accommodate the fourth stove, the hot-blast mains will be extended. The stable refractory design of the "mushroom dome" has been developed for longer equipment lifetime and the vertical ceramic burner will provide efficient mixing and combustion. The supply will also include high-grade refractories, expansion joints, hydraulic systems and valves along with the hot-blast main extension and associated support and access structures.

Contract signing ceremony for the supply of the new hot-blast stove (Photo: Primetals Technologies)

Primetals Technologies

JSP orders blast furnace gas injection system

Jindal Steel and Power (JSP) has placed an order with Primetals Technologies for the engineering of a new hydrogen-bearing syn-gas injection system and site advisory services during the installation and commissioning phase.

Blast furnace No. 1 at Jindal Steel and Power, Angul, India, will receive a new gas injection system (Photo: Primetals Technologies)

The new system will be added to blast furnace No. 1 at the plant in Angul. The blast furnace was originally designed, installed, and commissioned by Primetals Technologies in 2017. By replacing part of the traditional carbonaceous fuels with hydrogen, JSP will reduce the CO_2 emissions from the blast furnace. The new gas injection system will utilize surplus syn-gas generated from the coal gasification plant at the site and as a result reduce the carbon fuel rate. In addition to improving the green credentials of the blast furnace, the operating costs will reduce, lowering the cost per t of hot metal. The order scope also includes the integration of the new system into the existing Primetals Technologies Level 2 automation solution.

Primetals Technologies

ASIA – JAPAN

Kobe Steel awards FAC for plate finishing mill

Primetals Technologies has recently received the final acceptance certificate (FAC) for a plate finishing mill at Kobe Steel's plant in Kakogawa, ordered in 2021.

For this project, Primetals Technologies supplied core mechanical equipment, auxiliary and ancillary technologies, and provided on-site supervision for construction work and implementation. Primetals Technologies managed to deliver and implement the mill on schedule although the project started while supply chains and many other processes were still heavily affected by restrictions and constrains related to the Covid-19 pandemic. The new plant finishing mill processes plates with thicknesses from 4.5 to 360 mm and widths from 1,000 to 4,500 mm. It replaces equipment that had been in operation since 1972.

Primetals Technologies

The new plate finishing mill at Kobe Steel's Kakogawa Works (Photo: Primetals Technologies)

ASIA – TAIWAN

Gloria Materials Technologies produces first heat with new EAF

Gloria Materials Technologies Corp. (GMTC) recently produced the first heat with its new 60 t electric arc furnace supplied by Inteco. This marked an important milestone for GMTC's new special steelmaking complex.

Specialty alloy producer Gloria Material Technology Corp., headquartered in the Liouying industrial zone, Tainan, owns melting, forging, rolling, heat treating and finishing processes. The Inteco range of supply for the new state-of-the-art complex includes the 60-t EAF, a secondary metallurgical complex (LF, VD/VOD, AOD) and expanded casting facilities.

The casting area features conventional ingot production with a teeming car and a complete advanced teeming system. Additionally, the complex boasts the Inteco segment caster capable of producing ingots with diameters of up to 1,200 mm. The start-up of the entire steel mill and its gradual ramp-up to full capacity are expected to occur by the end of this year.

INTECO

ASIA – THAILAND

Siam Yamato Steel to use AI model-based energy management solution

Siam Yamato Steel is going to partner with the SMS group's Brazilian subsidiary, Vetta, to implement the Viridis Performance energy management solution at its production facilities in the Rayong province.

Siam Yamato Steel has two hot-rolled structural steel mills operating in the Rayong province, with a total production capacity of 1.1 million t/year. The Viridis Suite, which includes Viridis Performance, uses advanced AI models to analyze large quantities of real-time data, optimizing the production process, and reducing energy consumption without compromising production capacity. Innovative dashboards, custom-designed for Siam Yamato Steel, will display real-time data against reference targets, enabling operators to promptly respond to any deviations with specific instructions tailored to various production contexts.

SMS group

ASIA – CHINA

Drawer bar precision sizing unit installed for the first time in China

Shandong Shouguang Juneng Special Steel is the first steel producer in China to benefit from Danieli's Drawer technology in the production of SBQ.

As part of Shouguang's 600,000 t/year special steel bar mill, the bar precision sizing unit is installed in-line, immediately after the finishing stands. The mill produces high quality 16-80 mm diameter bars such as alloy structural steels, bearing steels, spring steels and more for industrial applications. The drawer is based on Danieli's patented 4-roll technology and combines high reduction and sizing of the bar with four roll modules in sequence, so that the spread of the rolled product is "zero". SBQ bars processed by the drawer comply with 1/8 EN10060 standards. By operating the Danieli Drawer, Juneng Special Steel is able to respond flexibly and efficiently to small batch production and frequent specification changes.

Danieli

MIDDLE EAST – LIBYA

New steel joint venture Tosyalı-SULB to build integrated iron and steel works

Turkey's global steel producer Tosyalı and Libya United Steel Company for Iron and Steel Industry (SULB) have signed an agreement to establish a joint venture. As a part of the project, the world's largest DRI plants, with a total capacity of 8.1 million t/year will be built.

With this agreement, the two companies established a new company named Tosyalı-SULB in Benghazi. The project includes a series of investments that will contribute to the development of the local industry. The DRI plants to be built will use Midrex Flexi DRI technology, which can be operated using hydrogen. Investments will commence immediately for the first phase of the integrated iron and steel complex, which will have a capacity of 2.7 million t/year.

Tosyalı / SULB

Libyan Iron and Steel Company to invest in a new DRI plant

Libyan Iron and Steel Company (LISCO) has signed a memorandum of understanding with Danieli about the construction of a direct reduction plant.

The new Energiron DRI will be designed to produce 2 million t/year of DRI and hot-briquetted iron (HBI) to be used by LISCO and sold to Italian steelmakers based on an off-take agreement.

The Energiron DRI technology is a joint development by Tenova and Danieli. Hybrid-ready by design, the plants can use natural gas, coke oven gas and/or hydrogen as reduction agents. Standard Energiron plants have carbon-capture units, taking CO_2 from the process and making it available for other applications to further reduce the overall plant carbon emissions and provide an additional revenue stream for the plant operations.

Danieli

MIDDLE EAST – EMIRATES

Emirates Steel Arkan to test electrical process gas heaters for DRI production

Emirates Steel Arkan and Danieli have signed a memorandum of understanding about the testing of a pilot electrical process gas heater.

Emirates Steel Arkan operates two low-emission minimills for quality long products supplied by Danieli, featuring Energiron DRI technology and Hytemp pneumatic charging for hot DRI up to 600°C into the EAF. With a view to further reducing its carbon footprint reduction, Emirates Steel Arkan is studying the possibility of installing an electrical process gas heater at the DRI plant, making use of renewable energy.

"The MoU with Danieli outlines a collaborative project to test a pilot electrical process gas heater at our direct reduction plant No. 1. This technology aims to enhance efficiency and sustainability in our production processes," said Saeed Alghafri, CEO of Emirates Steel Arkan.

Danieli

COMMERCIAL DRI PRODUCTION

Million-tonne hydrogen-based DRI plant

Technology suppliers Sinosteel E&T and Tenova have successfully completed the performance test for the Energiron direct reduction plant at the Baosteel Zhanjiang site in China. The sustainable hydrogen-based plant demonstrated the nominal production of DRI, reducing CO_2 emissions and marking a significant step in the green steel industry.

Sinosteel Engineering & Technology Co., Ltd., a leading industrial technology and engineering service provider offering low-carbon metallurgy full lifecycle solutions, and Tenova, a leading developer and provider of sustainable solutions for the green transition of the metals industry, have recently agreed on the successful completion of the performance test for Baosteel Zhanjiang Iron & Steel Co., Ltd.'s new hydrogen-based 1,000,000 tonnes per year Energiron direct reduction plant. The plant, designed by Tenova using Energiron, the innovative DRI technology jointly developed by Tenova and Danieli, and completed with the engineering by Sinosteel, is installed in the Zhanjiang Economic and Technological Zone, Guangdong Province.

The DR plant at Baosteel Zhanjiang, China, achieved a production milestone during the performance test (Picture: Tenova)

Production milestone achieved

During the performance test, the plant achieved a milestone production of a total of 21,620 tonnes of direct reduced iron, after 168 hours of continuous full-load production, with a metallization rate of more than 94% and using a 70% hydrogen-based reducing gas.

The Energiron solution is a very flexible direct reduction technology for virgin metallic unit production in terms of make-up gas utilization, and is highly sustainable as it is designed to maximize reduction of CO_2 emissions. The plant installed at Baosteel, a Baowu Group company, has the flexibility to use different reducing gases, like hydrogen (H_2), natural gas (NG), and coke oven gas (COG), in any combination or proportion, using the same Energiron Zero Reformer (ZR) scheme.

The full plant capacity is 1,000,000 tonnes per year, making it the largest and first-of-its-kind hydrogen-based DRI facility in China. It has been additionally designed to capture CO_2 that can be sold commercially, further reducing the plant's overall CO_2 emissions and providing an added revenue stream for the plant operations.

"The successful operation of the Baosteel Zhanjiang million-tonne hydrogen-based shaft furnace stands as a pivotal initiative in Baowu's efforts to promote low-carbon production. Thanks to this project, Baosteel is proceeding towards its path of reducing carbon emissions, paving a new way for green steel production.", stated Liang Lisheng, Assistant General Manager of Baosteel Zhanjiang Iron & Steel Co., Ltd., and Director of the Ironmaking Plant.

"Congratulations to Baosteel Zhanjiang on the successful completion of the 168-hour performance test of the million-tonne hydrogen-based shaft furnace. We are grateful to Baosteel for their support and pay tribute to the relentless efforts of the team. Building on this significant achievement, we will continue to dedicate our technology and engineering expertise to advancing the steel industry towards carbon neutrality goals.", stated Hua Guanglin, Executive Deputy Managing Director of Sinosteel E&T and General Manager of Sinosteel MECC.

"We are really satisfied with this project which confirms the great collaboration among all parties that participated in this achievement. Thanks to our Energiron technology we have provided Baosteel with the first direct reduction iron production line integrating hydrogen, natural gas, and coke oven gas for industrial production", declared Stefano Maggiolino, President and CEO at Tenova HYL, the company center in direct reduction technology.

Tenova

DEMONSTRATION PLANT

Advanced process technology for climate-friendly hot metal production

Korean steel company POSCO and Primetals Technologies sign cooperation agreement for a direct reduction demonstration plant. The HyREX technology comprises a hydrogen-based direct reduction process with direct sinter feed in combination with downstream electric smelting furnace (ESF) used to melt the DRI fines.

Top management representatives from POSCO and Primetals Technologies at the occasion of the cooperation agreement signing ceremony (Photo: Primetals Technologies)

On July 22, 2024, Primetals Technologies and POSCO signed a cooperation agreement to design and implement a HyREX demonstration plant. Based on a memorandum of understanding (MoU) signed in 2022, POSCO and Primetals Technologies are now realizing the plant at POSCO's premises in Pohang, South Korea. A core aim of the plant is to test and verify certain details of the production process while determining the most cost-effective process parameters.

Advancement of the Finex process

HyREX is a new process that combines the FINEX direct reduction process with an electric smelting furnace (ESF) to produce liquid hot metal. POSCO and Primetals Technologies started developing FINEX in 1992. The FINEX process charges iron ore and uses a cascade of fluidized-bed reactors to produce direct-reduced iron (DRI).

While the FINEX process utilized reduction gas from coal gasification, HyREX uses hydrogen as reduction gas. In combination with an ESF, hot direct-reduced iron (hot DRI) is transferred for the final reduction process, melting, carburization, and slag formation, to produce liquid hot metal of similar quality to that stemming from blast furnaces, but with significantly reduced carbon emissions.

Plant overview

The HyREX industrial demonstration plant will consist of the following key units:

- ore dryer,
- fluidized-bed reactors arranged in a cascade,
- hot DRI transport system,
- electric smelting furnace (ESF),
- dedusting system,
- metal tapping, and
- slag granulation.

Designed to replace blast furnace-based hot metal production, HyREX will be fed with sinter feed, eliminating the environmentally intensive sintering process and the need for a coke plant. The HyREX technology is suitable for more than 50% of the world's available iron ore grades.

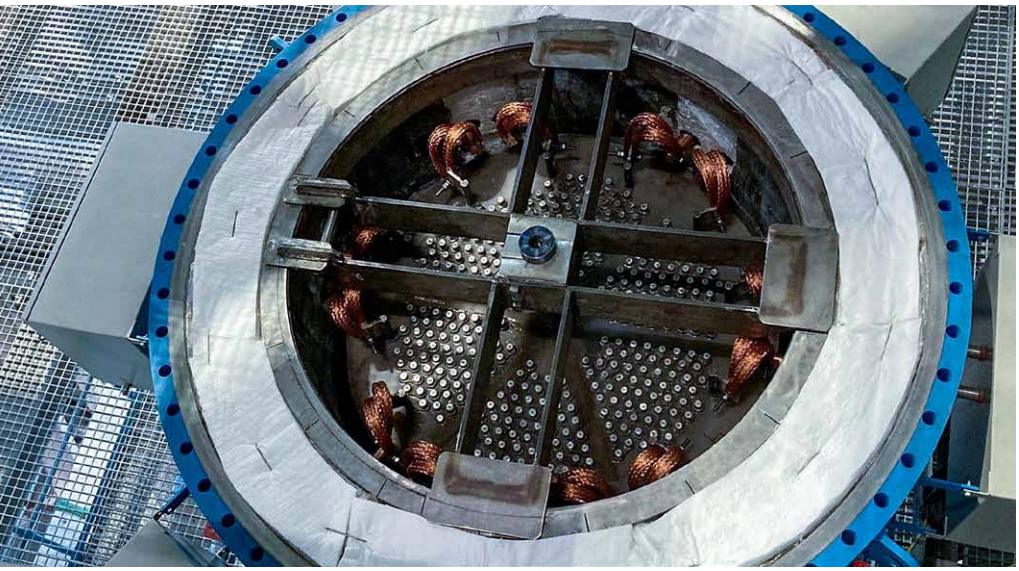
The global iron and steel industry is targeting a reduction of carbon dioxide emissions, and hydrogen-based direct reduction technologies like the HyREX process will allow steel producers to replace carbon-intensive blast furnaces.

Primetals Technologies

GREEN IRONMAKING

Electric process gas heaters

Kanthal and Danieli announce strategic partnership to develop and industrialize full-scale electric process gas heaters for DRI plants, but also blast furnace operations



Electric process gas heater (Photo: Alleima)

Alleima's division Kanthal has signed a strategic partnership with Danieli, a major global supplier of turnkey plants and equipment for the iron- and steel industry, to jointly develop and scale up Kanthal's electric process gas direct-heating solution, Prothal® DH, to full industrial scale. Kanthal – a world leader in electric industrial heating technology – developed, tested and verified in a pilot scale the Prothal® DH direct electrical-heating solution for high-temperature process gas heating.

Under the Kanthal and Danieli partnership, Prothal® DH will be further developed to full scale, which means up to hundreds of megawatts of electricity, and become a new pillar for the decarbonization of DRI plants and blast furnaces. Prothal® electrical-heating solution will be developed for hydrogen, natural gas, and their combination, thereby also enabling retrofitting of existing plants.

"Even for natural gas based DRI plants, you will achieve more than 30% reduction of CO_2 emissions when you electrify the heating system. This partnership allows the unlocking of huge potential for a new technology that will drive Energiron DR plants carbon footprint furtherly ahead in the race of green steel," says Marco Lapasin, Vice President Danieli Engineering Centro Metallics.

Once Prothal® DH has been installed in Energiron hydrogen-ready DRI plants, fully green DRI production will be feasible. The heating solution will be developed for hydrogen, natural gas and combinations, thereby enabling retrofitting of existing DRI plants. (Energiron is DRI technology jointly developed by Tenova and Danieli.) However, the introduction of Prothal® DH technology in the blast furnace operation will reduce CO_2 emissions also in ironmaking.

The ambition is to have a solution ready for commercialization in 2027.

First electric process gas heater trials at Emirates Steel Arkan

Emirates Steel Arkan and Danieli have signed a memorandum of understanding about the testing of a pilot electric process gas heater. Emirates Steel Arkan operates two integrated minimills featuring Energiron DRI technology and Hytemp pneumatic charging for hot DRI into the EAF. With a view to further reducing its carbon footprint, Emirates Steel Arkan is studying the possibility of installing an electric process gas heater at the DRI plant, making use of renewable energy. "The MoU with Danieli outlines a collaborative project to test a pilot electric process gas heater at our direct reduction plant No. 1. This technology aims to enhance efficiency and sustainability in our production processes," said Saeed Alghafri, CEO of Emirates Steel Arkan.

Alleima / Danieli

> By electrifying the heating system, even natural gas-based DRI plants can reduce CO_2 emissions by more than 30%.
>
> *Marco Lapasin, Vice President Danieli Engineering Centro Metallics*

APPLIED RESEARCH

Potential use of iron ore briquettes in direct reduction plants

Global mining company Vale and direct reduction specialist Midrex Technologies, Inc. have agreed to cooperate in advancing a technical solution for the use of iron ore briquettes in direct reduction plants. Initial test results have shown promising results in using iron ore briquettes in the direct reduction process.

Iron ore briquettes (Picture: Vale)

From left: Eduardo Bartolomeo, CEO of Vale, and KC Woody, President & CEO of Midrex Technologies, Inc. (Picture: Midrex)

Executives of the two companies met at the Midrex Research & Technology Development Center in Pineville, North Caroline/USA and signed a Technical Cooperation Agreement, united by a common vision for ironmaking decarbonization. The agreement extends the parties' technical cooperation and test work developed over the last year.

Vale's proprietary briquetting technology enables the production of high-quality iron ore agglomerates from the low-temperature process using a technological solution of binders, which gives the final product high mechanical strength. Initial test results have shown promising results in using iron ore briquettes in the direct reduction process. Once the technology has been successfully demonstrated in MIDREX® plants, both partners plan to evaluate the creation of a joint venture to exclusively provide briquette technology and facilities to the market.

Alternative to the pelletizing

Currently, most direct reduction plants use iron ore pellets as a feedstock. Vale's briquette production process represents an alternative to the pelletizing process with lower production costs, lower investment intensity, and approximately 80% less CO_2 emission.

Through direct reduction technology, direct reduced iron (DRI) is produced. DRI is a critical feedstock to produce high-quality steel with fewer impurities in electric arc furnaces (EAFs). DRI can also be used in blast furnaces (BFs) to supplement and replace iron ore, reducing the need for coke and carbon emissions.

Direct reduction technology has a lower CO_2 footprint compared to other traditional BF-based ironmaking processes, as it uses natural gas as the reduction agent instead of coke – an input obtained from mineral coal. Using green hydrogen instead of natural gas enables the production of green steel with near-zero GHG emissions.

"This agreement is a recognition by one of the world's leading suppliers of direct reduction technology of the briquette's strong potential to decarbonize the global steel industry," said Vale's CEO Eduardo Bartolomeo. "More than a technical cooperation agreement, it is the start of a partnership that will play a crucial role in scaling briquette technology to several markets."

"We are very excited to be working with Vale to find a cost-effective and environmentally friendly solution for using iron ore fines in DR Plants," KC Woody, Midrex President & CEO, said. "And the ability to convert DRI fines and other waste streams into a saleable product presents an even greater opportunity."

Midrex / Vale

PELLETISATION RESEARCH AND TESTING

Advanced pellet pot testing facility for Tata Steel Nederland

Primetals Technologies will design and supply an advanced pellet pot testing facility. The system will provide fast and reliable pot grate test results for various concentrates and pellet-feed mixtures as well as the determination of technological parameters for Tata Steel's industrial pellet plant.

After signing the contract for the supply of a pellet pot testing facility for Tata Steel R&D Technologies (Photo: Primetals Technologies)

Tata Steel Nederland has the ambition to reduce CO_2 emissions by 40 percent by 2030 and to become carbon neutral by 2045. In terms of equipment, the transition will result in a switchover to gas and hydrogen based direct-reduced iron technology along with an electric arc furnace based steelmaking plant.

The implementation of the new ironmaking and steelmaking plants means that Tata Steel Nederland will operate partly with new types of raw materials, while dealing with higher requirements on pellet qualities. As a result, the new state-of-the-art pellet pot testing facility will play a key role both, in ensuring optimal raw material mixes for the industrial pelletizing plant and in optimizing the parameters for the induration process.

Tata Steel Nederland has chosen Primetals Technologies' pot pellet testing solution for its pilot plant. Primetals Technologies will design, supply, and implement the equipment for Tata Steel R&D along with a comprehensive electrical and automation solution. Startup of the new facility is scheduled for mid-2025.

Primetals Technologies has been operating an innovative pellet pot in Leoben, Austria, since 2014 [1]. With the pellet pot testing facility in IJmuiden, Primetals Technologies will take this concept to the next level in terms of capacity, autonomous operation, and special features, which will be designed to replicate the configuration of Tata Steel IJmuiden's industrial pelletizing plant.

"This is one of Tata Steel R&D's largest investments in years," said Vincent Ritman, director of Tata Steel R&D. "In working with Primetals Technologies, we are bringing in a reliable and knowledgeable partner who will help us to make the connection between the pellet plant and the future direct reduction plant possible. The installation can produce high-quality and uniform pellets on a large scale, 65 kilograms, for the current pellet research programmme."

The pellet pot concept enables fast and comprehensive testing of various concentrates and pellet-feed mixtures as well as detailed analysis and determination of optimal temperature profiles tailored to Tata Steel Nederland's pellet quality targets. Primetals Technologies will design Tata Steel Nederland's pellet pot to handle up to six pot grate tests per day and 500 tests annually. The pellet testing facility also features a system for off-gas analysis, which will generate valuable insights on emission levels.

[1] B. Hiebl, F. Penz, L. Petzold: Iron Ore and Pellet Testing. In: Metals Magazine, issue 13 (2024)

Primetals Technologies

Facility for grate testing, simulation and plant design

The pellet pot testing facility functions essentially like a miniature pelletizing plant, all the while measuring and assessing the ore quality, production conditions, production requirements, and emissions. Much like the real process, the pellet pot assesses the agglomeration, drying and firing of green pellets, and the cooling of the fired pellets. These tests simulate the actual conditions for pellet production that can be applied at scale. [1]

GMH Gruppe: We keep the world moving

6 pages, English
This brochure summarizes the portfolio of steel products supplied by GMH Gruppe. The entire production is based on the EAF scrap melting route and includes products as wide ranging as rolled steel bar, bright steel, steering system components, special profiles, forgings, seamless rolled rings, crankshafts and castings.

GMH Gruppe – Georgsmarienhütte Holding GmbH
Neue Hüttenstraße 1, 49124 Georgsmarienhütte, Germany
www.gmh-gruppe.de

Heine + Beisswenger: Get to the future with our materials, services and ideas

6 pages, English
A brochure outlining the range of products and services provided by steel and metals trader Heine + Beisswenger. The products and value-adding services include machining, product development, material management, digital logistics and a wide spectrum of materials, including a green product line with a reduced carbon footprint.

Heine + Beisswenger Stiftung + Co. KG
Höhenstraße 22, 70736 Fellbach, Germany
Phone: +49 711 5854-0, info@heine-beisswenger.de

Pesmel: Material FlowHow

24 pages, English
A customer magazine published by Pesmel, designer and supplier of automated material flow solutions in industrial handling, packing, storing and logistics. Solutions for the metals industry include high-bay storage racking, automated coil packaging, and a wide range of warehousing solutions.

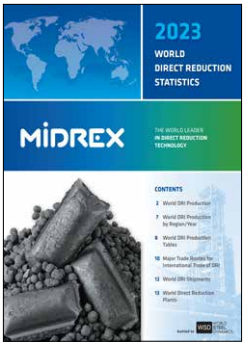
Pesmel Oy
P.O. Box 14, 61801 Kauhajoki, Finland
Phone: +358 20 7009 600, pesmel@pesmel.com

Vollmer: The experts for strip thickness and shape

16 pages, English
This detailed brochure sets out the range of contact-free and tactile technologies and systems supplied by Vollmer for alloy-independent strip thickness and shape measurement, and roll geometry measurement during grinding. The system range also includes tactile thickness measurement systems for plastic films.

Friedrich Vollmer Feinmessgerätebau GmbH
Verbandsstraße 60 b, 58093 Hagen, Germany, Germany
Phone: +49 2334 507-0, contact@vollmergmbh.de

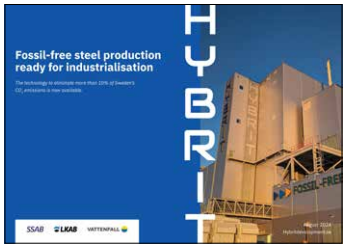
MIDREX: 2023 World Direct Reduction Statistics



16 pages, English
Global direct reduced iron (DRI) production in 2023 was 135.7 million tons, up by 6.5% from the previous record of 127.4 million tons set in 2022. In the last five years, worldwide DRI output has grown by almost 27.6 million tons, or approximately 25.6%. World Steel Dynamics audits the data collection and preparation processes used by Midrex.

Midrex Technologies, Inc.
3735 Glen Lake Drive, Suite 400, Charlotte, NC 28208 USA
Phone: +1 704 373 1600, info@midrex.com

HYBRIT: Fossil-free steel production ready for industrialisation



24 pages, English / Swedish
After six years of research the HYBRIT initiative provides facts and milestones of the project. Besides the processing of iron ore pellets with hydrogen the brochure highlights the new sponge iron product with unique properties, the characteristics of the iron ore pellets, melting of the sponge iron, hydrogen production and storage.

Hybrit Development AB
Box 70359, 107 24 Stockholm, Sweden
Phone: +46 76 110 46 76, fossilfree@ssab.com

PROOF OF TECHNOLOGY

HYBRIT process completes pilot phase

Six years of research paves the way for fossil-free iron and steel production on an industrial scale

Iron ore pellet (left) and Hydrogen reduced sponge iron from HYBRIT's pilot plant (Photo: SSAB)

So far, more than 5,000 tonnes of hydrogen-reduced iron have been produced at HYBRIT's pilot plant in Luleå, Sweden (Photo: SSAB)

The HYBRIT initiative now presents the results of six years of research in a final report to the Swedish Energy Agency. The report shows that direct reduced iron produced with the HYBRIT process has superior characteristics compared to iron produced with fossil fuels. HYBRIT has applied for and received several patents based on the successful results, and the project is now continuing in the next phase where the process is to be implemented on an industrial scale.

The project is the first in the world to demonstrate that the fossil-free value chain – from iron ore to steel – works on a semi-industrial scale. So far, more than 5,000 tonnes of hydrogen-reduced iron have been produced at HYBRIT's pilot plant in Luleå. Customers such as Volvo Group, Epiroc, Peab and many more are already using the fossil-free steel in vehicles, heavy machinery, buildings and consumer products, and interest in the technology is high.

"I am incredibly proud of everything HYBRIT has achieved since its launch in 2016. Thanks to the successful results of the pilot project, we are well on our way to fundamentally changing the iron and steel industry. At SSAB, we are now investing heavily to convert the entire Nordic production system to fossil-free steel production and have already started delivering fossil-free steel to customers on a smaller scale," says Martin Pei, Chief Technology Officer at SSAB and Chairman of the Board of Hybrit Development AB.

Results from six years of research prove fossil-free process

The research results now presented in a final report to the Swedish Energy Agency span from 2018 to 2024, with a focus on scaling up technical solutions from the laboratory to industrial scale, developing an industrial process practice and achieving an integrated value chain for hydrogen-based iron and steelmaking. Examples of results from the pilot phase are:

- the development of a new hydrogen-based technology for efficient fossil-free iron and steel production with 0.0 tonnes of CO_2 emissions per tonne of steel,
- the development of a new fossil-free iron product (sponge iron) that has significantly better properties than iron reduced with fossil gases such as natural gas,
- the successful long-term operation of alkaline electrolysers for the production and storage of hydrogen, and
- the development of an efficient process practice for melting fossil-free sponge iron into crude steel in an electric arc furnace.

"The focus of HYBRIT's technical development has been to build up expertise and create technical conditions for the implementation of a fossil-free process in a full-scale production. We are very pleased that we as a team have been able to deliver successful results that have met or exceeded the set project goals. The knowledge and experience we have developed during the project will now be focused on continuing the process development, primarily to support the owners´ industrialisation projects," says Ulf Spolander, General Manager of Hybrit Development AB.

Martin Pei, Chief Technology Officer at SSAB and Chairman of the Board of Hybrit Development AB (Photo: SSAB)

Project moving into the next phase

The results from the pilot phase pave the way for implementing the HYBRIT process on an industrial scale. Hybrit Development AB will continue to conduct research and development to support the industrialisation of the technology together with the owner companies, including delivering solutions to LKAB's planned demonstration plant in Gällivare. The pilot project for storing fossil-free hydrogen in Svartöberget in Luleå will continue until 2026.

"It has been a groundbreaking journey in a short period of time. The results from the pilot phase show that the process works and that we are ready for the next stage, where the demonstration plant that LKAB plans to build in Gällivare will be the first step towards industrial production of sponge iron. Our high-quality iron ore combined with good access to fossil-free energy provides unique conditions for establishing a competitive value chain for future fossil-free iron and steel production," says Jenny Greberg, Vice President Technology at LKAB and board member of Hybrit Development AB.

"It is very gratifying to see the positive results of our targeted collaboration, partnership is a recipe for success. The next step is to scale up to an industrial scale where fossil-free electricity and hydrogen enables the transition to a future where it is possible for everyone to transport, produce and live fossil-free," says Andreas Regnell, Head of Strategic Development at Vattenfall and board member of Hybrit Development AB.

"The path towards net-zero emissions in industry requires investment in innovative and technology-shifting solutions. This is where The Industrial Leap plays an important role. The ambition is that the knowledge from the various initiatives will spread and accelerate the industry's transition," says Klara Helstad, Head of the Sustainable Industry Unit at the Swedish Energy Agency.

The HYBRIT project has been awarded funding by the EU Innovation Fund and by Industriklivet. It is also part of the European IPCEI project Hy2Use (Hydrogen), which involves a total of 35 projects from 12 countries to support rapid transition and increase the competitiveness of the European industrial sector.

SSAB

Extract of research results from the pilot phase 2018-2024

- Development of a new hydrogen-based technology that enables efficient fossil-free iron and steel production with less than 0.05 tonnes of CO_2 emissions per tonne of steel (scope 1 and 2).
- Development of a new iron product, sponge iron, which has significantly better properties than iron reduced with fossil gases such as natural gas.
- Direct reduction with hydrogen and melting in an electric arc furnace produces 42 kg of biogenic CO_2 per tonne of directly reduced iron, compared to 383 kg of fossil CO_2 per tonne in a conventional natural gas process where the heating of the reduction gas is excluded from the comparison.
- Development of a new fossil-free and competitive industrial process where 175 process modes have been tested to identify the most favourable way to produce iron with hydrogen.
- Successful long-term operation of alkaline electrolysers for hydrogen production and storage. Tests using stored hydrogen in real time against the electricity market show that the variable cost of hydrogen production can be reduced by up to 40 percent.
- Development of an efficient process practice for melting fossil-free sponge iron into crude steel in an electric arc furnace, carried out in collaboration with the Swerim research institute.

ON THE WAY TO ZERO WASTE AND ZERO EMISSIONS

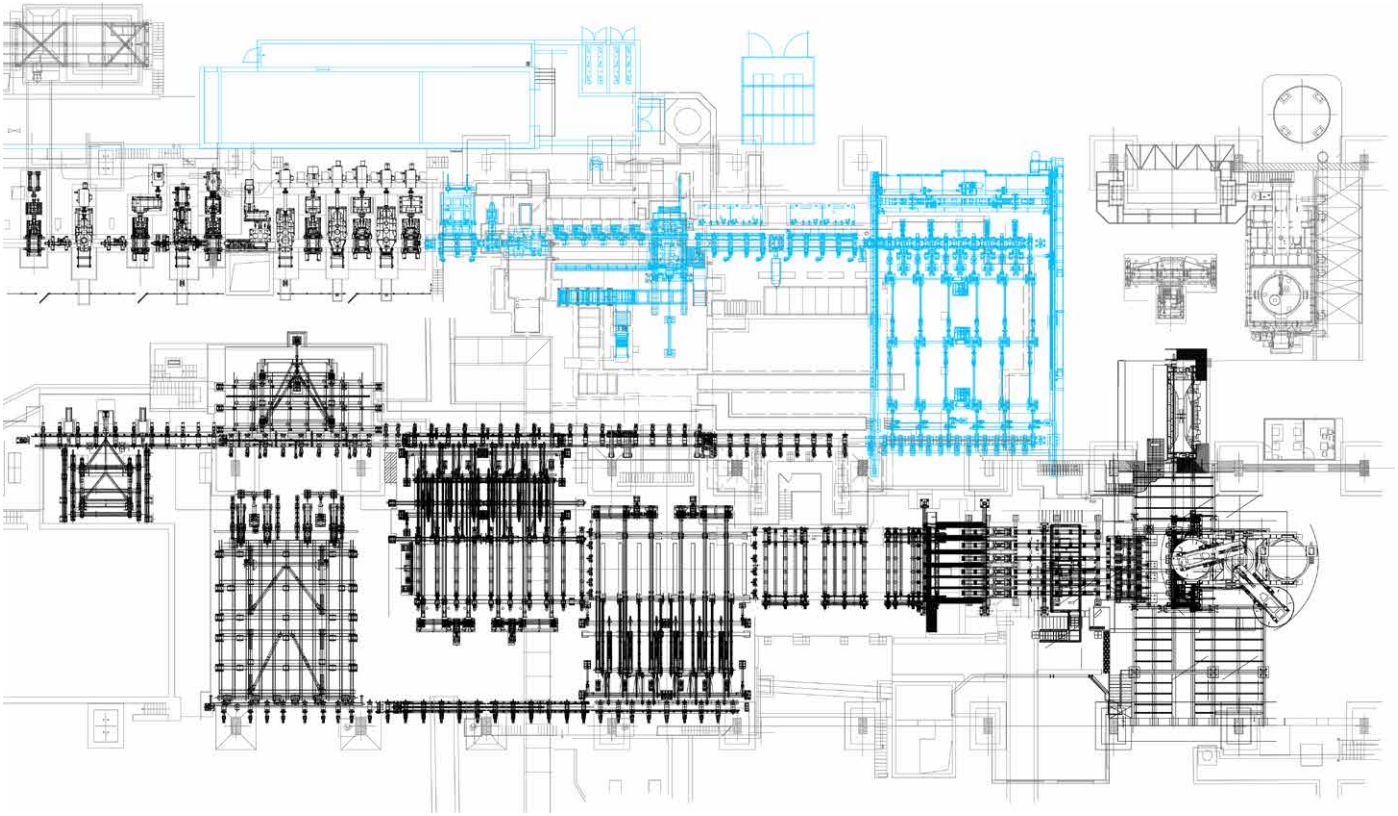
Feralpi's approach to environmentally sustainable steel production

Feralpi Siderurgica in Lonato del Garda (Brescia, Italy) is modernising its long products rolling mill. The company is implementing a "hot charge", i.e. a direct link between the continuous caster and the rolling mills. The hot charging technology is complemented by the welding of the billets before they enter the rolling mill, thus allowing the continuous rolling of a single billet instead of several billets. Besides reduction of CO_2 emissions, the additional benefits of this approach are reduced waste, increased productivity and higher plant utilisation.

The original Feralpi Lonato cold/hot charge system with RHF and rolling mill #1 (Picture: SMS group)

Producing and growing in respect of human beings and the environment – this is the motto of Feralpi's founder, Carlo Pasini, who as early as 1968 laid the foundations of that corporate social responsibility that today still remains at the core of the Group's development strategies. In other words, this means the translation of a vision into an ESG (Environmental, Social, Governance) strategy, that focuses on a gradual reduction in direct and indirect emissions. Feralpi has mapped out an ambitious roadmap with an action plan whose timing and activities are dictated by the 2023-2027 industrial plan, that includes, among its technological pillars: the electrification of processes, the reduction in the use of fossil fuels and waste, and the maximization of circular economy.

Lorenzo Angelini, Marco Taesi, Andrea Landini, Feralpi Siderurgica S.p.A., Lonato del Garda, Italy; Andrea Taurino, Mauro Odorico, Francesco Paternoster, SMS group S.p.A., Tarcento, Italy



The Feralpi Lonato RM#1 layout after modification (Picture: SMS group)

In fact, it is precisely within this path – with particular attention paid to the reduction of direct CO_2 emissions – that new foundations have been laid at Feralpi Siderurgica, in Lonato del Garda (Brescia – Italy), thanks to a long-standing collaboration with the SMS group, one of the most strategic and long-term partners that are able to support the project in Italy. Once modernized, Feralpi's Lonato plant will be one of the most competitive and efficient rolling mills in Europe.

The background

Especially regarding the developments involving the implementation of a "hot charge", namely the direct connection between continuous caster and rolling mills, SMS can boast experience dating back to the early 2000s with the aim of achieving the decarbonization goal in the fight against global warming. The results have led to the adoption of this solution by the first plants in Asia, the Middle East and Europe.

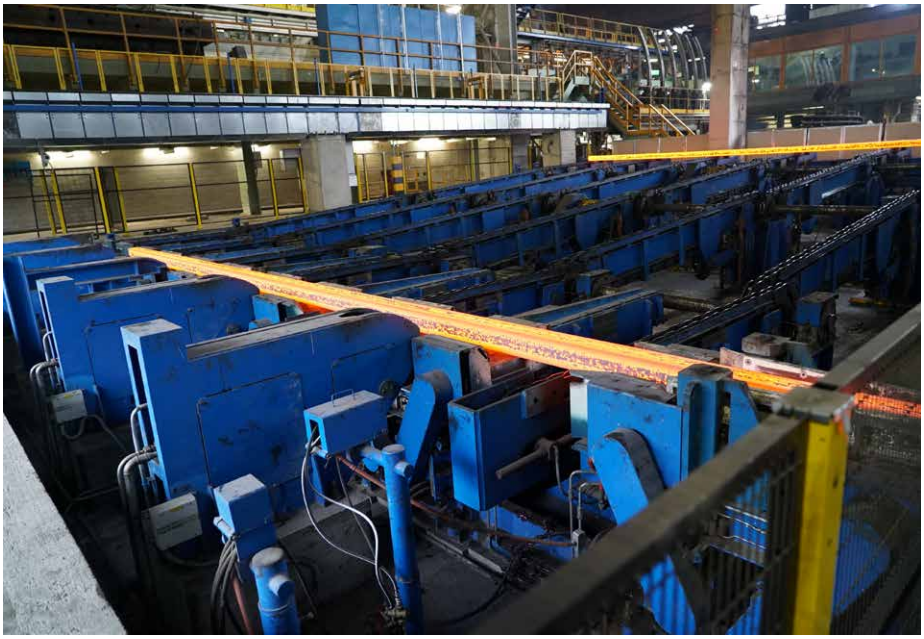
In conventional steel plants, on the other hand, the established practice is to cool down and store cast billets for subsequent reheating and rolling operations. After casting, and when cold, the billets are then charged into a fossil fuel-fired reheating furnace (natural gas or fuel oil) to be reheated, in most cases, from room temperature to rolling temperature.

The new project of Feralpi Lonato envisages a continuous and direct uninterrupted flow of billets from the continuous casting to the rolling area with minimum energy losses and elimination of the gas reheating furnace. The "hot" billets are then fed into a series of induction reheating modules through which the billets undergo homogenization and temperature increase to reach the temperature required for subsequent rolling. Thanks to this solution, direct CO_2 emissions can be completely eliminated by excluding gas combustion as well as reducing the total energy required for reheating. This reduction comes from both the higher average temperature of the billets arriving at the rolling mill and the necessary activation of inductors only when the billet actually passes through, thereby avoiding consumption in the absence of active production. This process is enhanced by welding the billets downstream the reheating area and therefore by rolling a single and continuous billet instead of several separate billets. The additional advantages of this approach are reduced waste, increased productivity and higher plant utilization rates. Furthermore, with a continuous focus on circular economy in the SteelZeroWaste project, even the rolling scale obtained from this production cycle is valued through recovery and reuse strategies, so as to make it sustainable also from a solid emissions point of view. In addition, the absence of reheating with a natural gas furnace significantly reduces the formation of scale itself.

This kind of approach shows how acting on the technological development of plants, is a precondition for making the ecological and energy transition strategy of the Feralpi Group a reality, and is an integral part of an important industrial plan that is synergic with an ESG strategy.

Current situation and modernization goals

The initial configuration of rolling mill #1 at Feralpi Lonato was modern in terms of the technologies available at the time it was built, namely a plant in which both hot and cold charges could be combined. Over the years that followed, however, Feralpi realized that, due to rising energy and raw material costs, and given the increasing emphasis on reducing CO_2 emissions, the plant required a further phase of technological improvements.



Feralpi Lonato stages 1 and 2 live pictures during production – December 2023: Overhead transfer area (Picture: SMS group)

The previous plant configuration, including various types of conveyors between the continuous caster and the pusher type furnace, where a gas furnace heated the billets through gas combustion, and transfer to the rolling process that followed, required several improvements. Furthermore, with this configuration, the billets had to remain inside the gas furnace for some time to achieve the required reheating curve. In particular, the major factors to be improved concerned the mechanical complexity of the transfer systems, the management complexity, maintenance costs, energy efficiency, metal yield, productivity and reduction of CO_2 emissions.

The modernization of the Lonato plant was started with the ultimate goal of eliminating the reheating furnace, transforming the plant into a direct charge to the rolling mill, hence recovering the residual heat of the casting process. In order to give the rolling mills a boost, a series of SMS Elotherm induction furnaces were added to recover all heat losses, equalize the billet temperature, both in cross and longitudinal sections, while ensuring and delivering the billets to the rolling mill at the correct temperature. An EBROS® billet welding line was also added.

The possibility of adding a new VCC® line was included in this project for bar coiling in order to obtain customized coils from 5 to 8 tons, which are able to meet the growing demand for certified products for any construction requirement in global markets.

The project

The Lonato plant of the Ferlapi Group, a leading group in steel manufacturing throughout Europe, was modernized thanks to the technologies of the SMS group, making it one of the most competitive and efficient rolling mills in Europe. The Italian-based steel company produces over 2.5 million tonnes of steel per year, of which over 93% is recycled steel, and is specialized in the production of steel for the construction industry.

Constantly focusing on supporting important aspects, such as circular economy, energy efficiency, innovation and digitization, Feralpi has decided to invest significantly in the Lonato plant, thanks to the close collaboration with the SMS group. The modernization, which is expected to be completed in 2024, is being developed in three stages:

- Hot charge and implementation of induction reheating
- EBROS® billet welding process
- Implementation of the VCC® coiling system

Envisaged for the first and second stages are: elimination of the billet reheating furnace in rolling mill #1, installation of a chain transfer and an overhead conveyor, which will be used for "direct" charging of hot billets from the continuous caster into the

Feralpi Lonato stages 1 and 2 live pictures during production – December 2023: induction furnaces area (Picture: SMS group)

Feralpi Lonato stages 1 and 2 live pictures during production – December 2023: EBROS® billet welding area (Picture: SMS group)

rolling line as well as installation of a series of SMS ELOTHERM induction furnaces and of a latest generation EBROS® billet welding machine, which will be used to continuously feed the current rolling mill #1, thereby drastically reducing gas consumption, emissions into the atmosphere and scale with a consequent reduction in environmental impact.

Thanks to the series of induction furnaces, the temperature differences between the billet ends can be equalized, thus ensuring consistent mechanical properties of the rolled stock. The negligible heat losses during transfers between continuous caster and rolling mill can be recovered by keeping the charging conditions of the roughing mill unchanged. More in detail, additional positive aspects of the implemented technology include:

- Reaching a temperature difference of up to 15°C from head to tail and uniform heating between consequent billets, reduced to the minimum
- Easy integration with Level 2 system automation and remote-controlled operations
- Zero CO_2 and NO_x emissions, given the absence of fuels.

The endless bar rolling system (EBROS®) is a system used for welding billets together after reheating in a bar or wire rod rolling line, to produce an endless rolling process without creating material irregularities at the welding joint.

The endlessly rolled product is cut to customer-specified coil or bundle weight after the coiling pit, in the case of wire rod mills, or by the shear downstream the cooling bed for bars, or the VCC® system in round bar mills. The system allows to improve the metallic yield, to increase the hourly production, to eliminate head and tail cropping. Moreover, it is suitable for any layout application in the event of new or existing plants.

The installation of the new VCC® line, with two vertical coilers, including a 6-pass MEERdrive® finishing block is also powered by rolling mill #1, as well as the controlled cooling line composed of high-efficiency water cooling boxes, conveying elements and auxiliary systems. The Vertical Compact Coil system, named VCC®, is a high-productivity, cost-efficient system for the production of torsion-free bars that are wound into customized heavy coils of up to 8 tons. This result is possible whenever the VCC® is coupled with an endless bar rolling system (EBROS®).

The system guarantees greater efficiency compared to a "traditional" off-line wire rod coiling operation, offering advantages in terms of material yield, energy saving and huge savings in storage and logistics. In general, after modernization, the Feralpi Group will benefit from a significant reduction in direct CO_2 emissions, supporting circular economy and energy efficiency, along with innovation, research and digitization.

Transition-supporting technology

The advantages resulting from the modification consist in the reduction in CO_2 and NO_x emissions into the atmosphere, savings in gas consumption due to the elimination of the furnace, and an increase in yield. Starting from the continuous caster, the modification has involved the following macro areas:

- Casting roller table area
- Reheating furnace area
- Area between the reheating furnace and the rolling mill

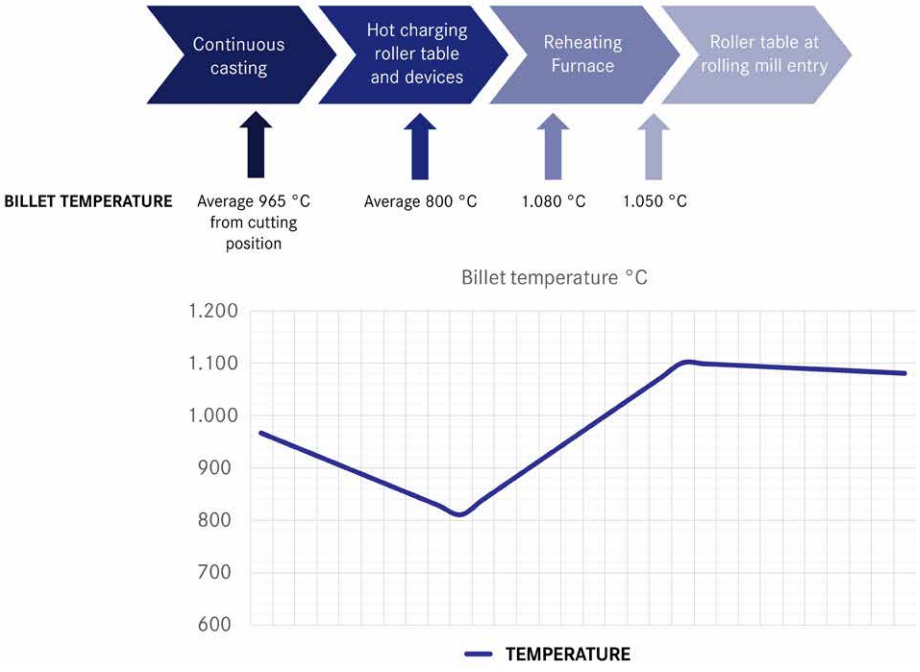
All the upgrading made to the process layout have been designed to avoid heat losses and to achieve a uniform billet temperature of ±15°C between head and tail.

Casting roller table area. In particular, the transport roller table speed has been increased in order to adapt to the new working conditions. Insulated hoods have been added to the cutting torch area to limit billet temperature loss. The work cycles in the billet collecting area have been revised and modified according to the new values. The addition of the containment hoods together with a revision of the billet transfer cycles have led to significant results in limiting temperature and heat loss on the billets.

Reheating furnace area. The reheating furnace was completely dismantled and a fast chain transfer and an overhead transfer have been positioned in its place, in order to transfer billets from the casting area to the new billet welding line, while ensuring the required rolling mill productivity.

Area between reheating furnace and rolling mill. The EBROS® Billet Welding Line has been added to weld the billet ends and to form an endless billet. With the elimination of the reheating furnace, induction furnaces have been installed on the billet welding line to bring the billet to the correct rolling temperature, as well as to equalize the temperature between core and surface and head and tail.

Particular attention has been paid to the cycle times of individual units to minimize the transit time of each billet from the continuous caster roller table to stand #1 of the rolling mill.



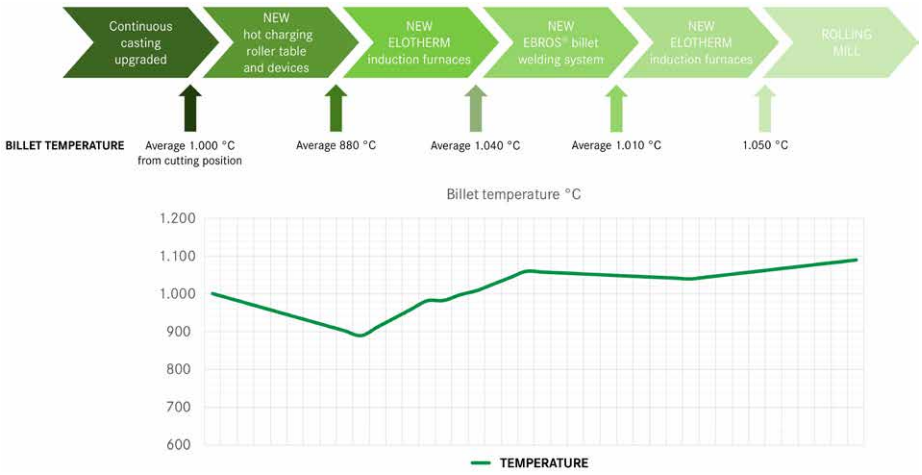
Feralpi Lonato before upgrade (Picture: SMS group)

Conclusions

The metals industry is on the verge of historic transformation. Currently, the production of steel, aluminium and copper accounts for around 10% of global CO_2 emissions. However, unlike other industrial sectors, the metals industry is in a favourable position, as major technologies reducing greenhouse gas emissions are ready for implementation. This means that everyone involved in these industries has a huge leverage against climate change in their hands. That's why #turningmetalsgreen – together with DRIVE – is certainly the SMS group's most important strategic topic for the coming years.

SMS group has made it their mission to create a sustainable, carbon-neutral metals industry supplying the technology to produce and recycle all major metals. This gives the plant supplier a key role in the transformation towards a green metals industry. Their metallurgical know-how and engineering skills, combined with digital expertise and plant technology consulting, enable the company and partners to forge a greener metals industry as well as make fully circular use of metals.

The green transformation of the steel industry is a marathon, not a sprint. Flagship projects in Europe will prove that climate-neutral steel production is possible. However, due to the long investment cycles for metallurgical plants, a large part of future CO_2 savings will have to come from the conversion of existing mills. In this case, there is no one-size-fits-all 'best' option. That is why SMS group have tailor-made solutions for any customer scenario, that take into account local conditions such as iron ore quality, energy infrastructure and existing equipment, as well as local policies, rules, and regulations.



Feralpi Lonato after upgrade (Picture: SMS group)

All three major decarbonisation routes have the potential to achieve climate neutrality by introducing innovative integrated process solutions in new (greenfield) or existing (brownfield) steel plants and by putting in place additional infrastructure for the use of fossil-free energy sources.

Feralpi group makes sustainability a key element in their vision, mission and strategic foundations, combating climate change. Welcome to our future!

Feralpi Siderurgica S.p.A., SMS group S.p.A.

Highspeed version of the ProfileMaster inspection system

The new high speed 2 kHz version use new surface fault detection algorithms and operate with higher resolution. It enables classification of the defects instead of only detection.

Due to the continuous success and the growing demand of surface inspection, Zumbach Electronics has developed the PROFILEMASTER® SPS product family with high-speed versions. The latest generation of high-speed cameras acquires full product contours at a rate of 2000 Hz. This enables to achieve 6 times more contours within a certain length, which enables classification of the defects instead of only detection.

Increased resolution enables to analyse the surface defects and visualize them in better visualisation maps. The maps are created from multiple "unfolded" contour images. Depending on the user's preferences, the surface faults are also shown as single contours or as a 3D model (partial or full view of the profile). New features are summarized as following:

- higher sampling rate up to 2000 per second,
- higher resolution with full area of interest,
- improved optical path,
- improved stability in data acquisition,
- improved fault detection and analysis,
- better dimension control overall,
- improved fault visualization and 3D modelling.

The new setup design improves the performance of the optical path of the cameras, optics and lasers by a factor of 8, which eliminates the limitation of camera exposure times. The new high-speed setup enables the PROFILEMASTER® SPS product family to work even under harsh light absorbing surface conditions of hot steel products.

Zumbach Electronic AG

Equipped with the latest generation of high-speed cameras the Profilemaster ® High Speed 2kHz version acquires full product contours at a higher sampling rate (Picture: Zumbach Electronic)

Ultra-compact Castrip casting and rolling plant at Shagang Group's plant in Zhangjiagang, Jiangsu Province, China
(Picture: Primetals Technologies)

GREEN ULTRA-THIN HOT STRIP

Another three new Castrip lines at Shagang Group commenced operations

Shagang Group together with its equipment and technology suppliers Primetals Technologies and Castrip has installed no less than three additional Castrip lines in one year. This gives Shagang Group the ability to effiently produce value-added flat steel products that meet the requirements of a wide range of applications that normally use cold-rolled strip.

Castrip plants were first installed in the USA and Mexico. After approval of the ultra-compact and energy-efficient technology, Shagang Group introduced Castrip technology to China in 2018 at its plant in Zhangjiagang, Jiangsu Province. Since then, Shagang Group has invested in three further Castrip lines. These new lines were implemented in just 12 months, with the latest becoming operational in June 2024. Shagang Group has already granted the final acceptance certificate (FAC) to Primetals Technologies for the first two lines. In total, Shagang now operates four Castrip lines.

The startup of lines No. 2 and 3 was exceptional in terms of duration and efficiency, thanks to the close and effective collaboration between the project partners, including Primetals Technologies, Shagang Group, and Castrip. Primetals Technologies was responsible for the engineering and supply of core mechanical equipment, technological packages, and automation systems. The entire line is controlled by fully integrated basic (Level 1) and process optimization (Level 2) automation systems, which control all casting and rolling operations.

Reduced energy consumption and lower CO_2 emission levels

Castrip plants are defined by highly flexible ultrathin cast strip (UCS) production at the industry's lowest energy consumption and emissions levels. Two main factors allow for this remarkable achievement – first, there is no need to reheat the strip, and second, Castrip lines produce strip of close to net shape, which lowers the amount of rolling force needed to meet product requirements. Castrip is therefore an attractive alternative for steel producers looking to decarbonize the production process.

An uninterrupted process

During the Castrip casting process, liquid steel from the meltshop passes through two counter-rotating rolls producing a continuously cast steel strip. The ultra-thin cast strip (UCS) product leaving the caster roll nip then enters an area of the plant with a controlled atmosphere, called the "Hot Box". This sealed environment

reduces the levels of oxidation and prevents excessive scale formation on the newly formed strip. Thanks to the "Hot Box" process, there is no need to descale the strip.

A Castrip line also consists of a single stand hot-strip mill, which reduces strip thickness by 10 to 55 percent. The hot-rolled strip then enters a cooling zone where a controlled decrease in temperature takes place, allowing the strip to meet the desired physical properties. In the next step, the strip is guided towards one of the two coilers, and a rotary drum shear is used to separate the strip, resulting in an uninterrupted process starting from the upstream area and continuing all the way through the Castrip plant.

High hot-strip mill output

Castrip is the ideal solution for steel producers entering the flat steel market, as well as for those looking for additions to their long product portfolio. Castrip also works especially well for creating and producing special steel grades of various types – producers investing in a Castrip line can relieve their hot-strip mill of demanding thin gauges and, in that way, increase the output of the hot mill.

Castrip steel sheet is used, for example, in the construction, purlins, steel framing, steel decking, and racking/storage industries, as well as in lightweighting items for the agriculture sector, automotive parts, and the welded tube industry. Ultra-thin cast strip (UCS) and hot-rolled coils are used as a direct replacement for cold-rolled products and can also be cold-rolled as thin as 0.25 millimetres to expand product ranges.

Primetals Technologies

Key facts of the Shagang Group's Castrip plants

- Hot strip dimensions: 0.7 to 1.9 millimetres thick; 1,345 to 1,680 millimetres wide
- Line length: 50 meters (from turret to coiler)
- Diameter of the caster roll: 500 millimeters
- Steel grades: low and medium carbon grades, HSLA, weathering grades, hig carbon (≤ 0.65% C), high-strength grades (<1,500 MPa)
- Capacity: 500,000 tons per year (per plant)

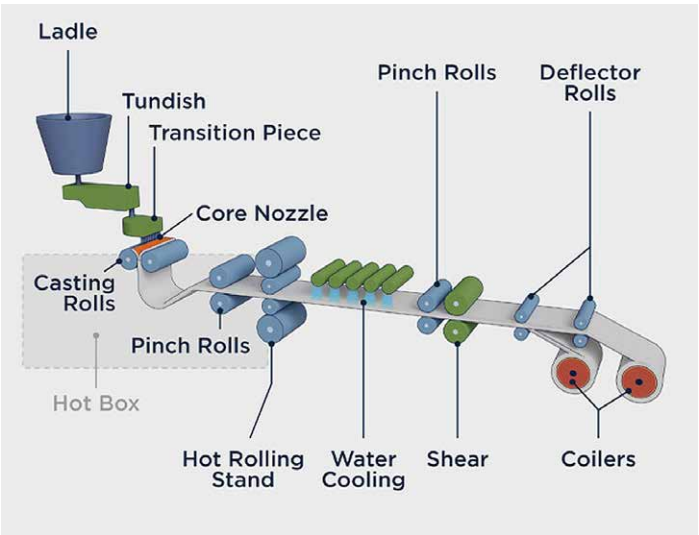
Efficient and high-quality flat steel production with innovative twin-roll casting and rolling

The Castrip® process is a revolutionary method for producing flat rolled carbon and silicon-steel sheets at very thin thicknesses. Castrip technology allows steel makers to produce thin flat rolled products in significantly fewer process stages, saving money on both initial investment and operating costs. By casting steel close to its final dimensions, enormous savings in time, energy and CO_2 emissions can be realized.

The twin-roll casting technology utilizes two water-cooled copper rolls rotating in opposite directions. A refractory nozzle, positioned between the rolls, feeds the gap with liquid steel. Side dams, attached at both ends of the rolls, confine the liquid steel. As the rolls contact the liquid steel, solidification begins and progresses as the rolls move downwards. Two separate steel shells form on each roll and merge into a single sheet at the point where the rolls meet. This steel sheet then passes through pinch rolls and a hot rolling stand, where it is reduced to the required thickness, typically between 0.8 and 2.0mm. The hot rolled sheet then enters a cooling zone, where it undergoes a controlled cooling to attain the desired mechanical properties. Next, the sheet is coiled in one of the two coilers, and a rotary shear cuts the sheet, resulting in a continuous process from the upstream area to the Castrip plant.

Primetals Technologies has partnered with Castrip LLC, now possessing full capabilities and competencies to offer and innovate on all aspects of the Castrip process.

Primetals Technologies



Process scheme of a continuous Castrip line combining twin-roll strip casting and 1-stand hot rolling mill
(Picture: Primetals Technology)

ROBOTICS PURPOSE

Next breakthrough in steelmaking safety

Robotics systems can introduce considerable advantages in areas where innovation has not been considered until now. The integration of the latest technologies in robotics, vision systems, and artificial intelligence helps in designing new systems, further enhancing operator safety and productivity in the harshest areas of the steel production process.

Sampling robot at the ladle furnace (Picture: Polytec S.p.A.)

Digital transformation is reaching its peak, impacting not only industry but also society and human relationships. Steelworks are being integrated with new and smart production technologies that promote easy collaboration among all the components of the production chain. In many areas of today's steel works, the implementation of human-robot cooperation is more difficult compared to other industrial sectors, due to adverse environmental conditions. High temperatures, dust, emissions of hot off-gases and steam, very variable light conditions, the presence of toxic and/or aggressive substances, and huge dimensions of machinery and workpieces represent obstacles for the application of traditional robotic cells.

How can we upgrade existing plants? How can we invest in the operator's safety? How can we prevent accidents? The answer to these questions is human-robot collaboration.

The Italian company Polytec stands out as a leading supplier of 4.0 automation and as a trendsetter for technology in the steel industry. The future-oriented approach and solutions address the needs of safety, productivity, and quality. By providing a customized program of robotization and digitalization, based on an assessment approach, that includes automation and industrial systems, tailor-made robotics solutions, and IIoT - AI solutions, Polytec creates added value for businesses, revolutionizing the steelmaking processes while establishing a new philosophy that combines human and machine intelligence. This new resource for smart management leads to lean production and a steel industry that is not only attractive to future generations but also safer. A new paradigm: from operator to supervisor.

New approach

Polytec's approach to the integration of technologies into processes begins with a comprehensive feasibility study. Utilizing 3D spatial data acquisition, the company thoroughly evaluates production processes to make informed, suitable choices tailored to the customers' specific needs. All environmental conditions and plant operations are then recreated inside Polytec's workshop, and this detailed simulation allows the engineering and assembly of all solutions beforehand, to ensure optimal fine-tuning of the systems.

Polytec's constant research for peak performance always leads to new technologies that can increase safety and traceability and reducing the risks of mistakes in the production phases, all while minimizing the manpower needed in dangerous areas.

Man-free red zone

The thorough knowledge of the steel production process, and the multidisciplinary know-how, enable Polytec to play a key role towards Steel Industry 5.0. Robotics is already being applied in the steel industry to replace human operators in cumbersome or repetitive operations, and the latest evolution of robotics aims at establishing more active human-robot cooperation to combine the abilities of both operators and robots by overcoming their limitations. Within the paradigm of "human-robot collaboration", human operators are mostly devoted to tasks requiring sensitivity, advanced sensing, and reasoning capabilities to react to unplanned situ-

ations, while robots exploit their ability to face harsher or potentially harmful tasks with no risks and high precision. Such a paradigm requires that robots and operators safely share the same workplaces, tools, and fixtures. This is the only way to redefine the role of the worker: robots can carry out heavy and repetitive tasks that could be a waste of potential for the worker, and the operators can use their reasoning capabilities to become supervisors. Polytec aims exactly at making this paradigm the future of steelmaking.

Temperature and sampling robots

Molten steel sampling and temperature measurement in the melting and refining furnaces have been lacking the latest technological advancements up until now. This environment, being the harshest in the whole industry, has historically been difficult to integrate with industrial robotics, due to the possibility of them not being compatible with such an environment.

The use of PolySAMPLE, Polytec's automatic temperature measurement and sampling robot for the EAF and refining area, allows flexible integration in any EAF configuration. Capable of moving with high speed and precision, PolySAMPLE can also load and discard cartridges automatically (an operation that, typically, is performed manually by the operators on traditional manipulators) and manage multiple tools for added functions to the process.

Moreover, PolySAMPLE also allows monitoring of the EAF through a specific tool equipped with a series of cameras, co-developed with and patented by Tenova, that allows a full 360° view of the inside shell and refractory. This operation is crucial to foresee any possible damage and prevent catastrophic incidents.

EBT lancing and cleaning robot at the EAF

Among the various tasks in the melt shop that pose safety hazards, EBT cleaning procedures warrant special attention. Polytec's automatic robot for EBT/SPOUT lancing and cleaning on EAF, PolyEBT, provides a solution to the prevention of these great risks. In particular, the system consists of a heavy industrial robot, insulated with a stainless-steel cover, and protected by temperature control. It performs several critical functions: EBT opening with an oxygen lance, EBT cleaning with an oxygen lance, and removal of obstructions with a ram lance.

Multitool robot for caster operations (Picture: Polytec S.p.A.)

Multitool for caster operations

PolyCAST is the revolutionary multitool system by Polytec that automates the casting process between the ladle and the tundish in the continuous casting machine (CCM). Custom-built to meet the exact requirements of the customer, PolyCAST can be controlled by one or two 6-axis robots, depending on the number of tasks and the cycle times needed.

The system consists of a robotic cell that includes a series of tools designed to perform different tasks. Thanks to advanced technology and human machine interfaces, operators can control the casting process in its entirety, from ladle shroud manipulation to nozzle oxygen opening, steel temperature sampling, powder and artificial slag distribution in the tundish, and more, while never being required to access the casting area during its critical stages. Equipped with 3D vision, the robotic system is capable of precisely identifying the nozzle position even in the harshest conditions, while the operator supervises the operations from a safe remote-control room, avoiding the risk of carrying out the operation manually close to molten steel.

The new thermal lance ignition system for EBT and caster robots is a groundbreaking component that has been designed by Polytec to enhance thermal lance ignition and is available for Polytec robotics systems dedicated to the melt shop.

The system allows for improved safety and reliability of processes by separating the two phases of the ignition process: thermal lance heating and oxygen ignition. The system consists of an inductive preheating device that heats the cartridge mounted on the top of the lance in a few seconds through electricity. The temperature then becomes high enough for oxygen ignition to start, and the ignition stays high for several seconds thanks to a coal mixture inserted inside the cartridge.

This system allows precise, safe, and controlled positioning of the lance through the robotic arm, before the oxygen flow is opened. Traditional methods require cartridges filled with specific powder blends for ignition, reducing reliability and involving risks of danger during handling. Moreover, Polytec's thermal lance provides automatic remote ignition of the oxygen lance, making the system suitable for robotics applications where safety and reliability are crucial aspects.

The result of these solutions is a safer, more efficient, and more reliable steel production process. Here are the advantages of adopting such a solution in your steelmaking processes: operator safety improvement and operational accuracy; exposure reduction to aggressive and dangerous environments (e.g., high temperatures, loud noises, the risk of inhaling harmful substances, etc.); operator's direct intervention minimization; productivity and quality improvements.

Polytec S.p.A.

CENTRAL OPERATION COCKPIT

Production process from a bird's eye view

The Central Operation Cockpit (COC) enables single-operator control of multiple plant sections. It reduces need for manual intervention in the production process, which results in increased productivity, more stable production, and reproducible and high end-product quality. First reference of COC is implemented at thyssenkrupp Steel's Duisburg hot strip mill No. 1.

Primetals Technologies has developed a highly innovative operational system, the Central Operation Cockpit (COC), that allows for controlling a whole plant from one single point. The operator is supported by numerous intelligent and AI-backed assistants to get a full-fledged bird's-eye view of the entire production process.

thyssenkrupp Steel has recently taken an important step toward an autonomous plant, by tasking Primetals Technologies with the implementation of a COC at its hot strip mill No. 1 in Duisburg. During the first project phase, which lasted until the end of March 2024, thyssenkrupp Steel and Primetals Technologies designed an operational concept for the COC system, tailored to thyssenkrupp Steel's current and future needs. The project has now entered Phase 2, the implementation of the system, and this phase is scheduled to be completed by the beginning of 2025.

Controlling multiple plant sections

Steel producers currently look at solutions for reducing production-related manual interventions to become more productive and increase product quality. At the same time, an increased number of automation systems may result in a more demanding and complex monitoring process. To address and overcome this problem, Primetals Technologies has developed the COC.

With this new concept, a single operator can control multiple plant sections via a highly intuitive interface. A large display wall provides all the necessary information and can instantly switch between any of the numerous cameras deployed at the mill. This is especially helpful if any of the numerous assistant systems detects a potential issue that requires urgent attention, or if user-defined events take place. The COC is equipped with an intuitive configuration tool, and it is easy and convenient for steel producers to extend and modify the cockpit according to any changing needs. As a result, there is no risk of information overflow.

Highly customizable display wall

The intuitive and operator-friendly interface is backed by the intelligent video management system SynX Supervision developed by Mitsubishi Heavy Industries in close collaboration with Primetals Technologies. The display wall is highly customizable: the operator can, for example, dedicate screens to specific assistant systems or areas of the plant.

The COC unites a wide variety of digital assistant systems. Together, they ensure that the operators have all the information they need to operate the plant efficiently. As an example, the Ski Assistant – developed by Primetals Technologies – is designed to alert operators of skis that emerge during production. Seamless integration into the COC enables the operator to act swiftly on insights delivered by the assistant systems.

Ready for climate-neutral steel by 2045

thyssenkrupp Steel employs 26,000 people and has a production capacity of about 11 million tons of crude steel annually. The leading German steel producer has set itself a goal to reduce CO_2 emissions by more than 30 percent by 2030, and to produce climate-neutral steel by 2045. The strategy includes Scope 1 and 2 emissions, which means not just direct but also indirect emissions from purchased energy.

Primetals Technologies

The Central Operation Cockpit (COC) from Primetals Technologies is a ground-breaking concept that enables one single operator to run a whole plant (Picture: Primetals Technologies)

Representatives from thyssenkrupp Steel and Primetals Technologies at the occasion of contract signing for the COC project, from left: Viktor Schlecht, Jens Setter, Niklas Petrasch, Jürgen Fischer, Martin Kerschensteiner, Alexandar Reljic, Pavel Adamyanets (Picture: Primetals Technologies)

MODERNIZATION

Newly implemented cooling unit enables production of high-strength plate

The MUPLPIC technology offers an 'in-line' plate cooling system capable of reaching the desired cooling rate and temperature drops necessary for plates of various product dimensions. It enables the rolling mill to increase product quality and expand pipe-grade product portfolio.

Recently, Primetals Technologies signed the final acceptance certificate (FAC) with a steel producer in India following the successful installation and commissioning of a new Multi-Purpose Interrupted Cooling (MULPIC) system for a plate Steckel mill line. The 12-meter long MULPIC line has replaced an existing laminar cooling system to achieve higher cooling rates. This advancement has expanded the mill's product range to include higher grades used for pipeline applications, making them suitable for the most demanding markets, such as the oil and gas industry.

Advanced plate cooling technology MULPIC (Picture: Primetals Technologies)

Improvements in product quality

The MULPIC technology is an in-line and integrated plate cooling system that is offered as a complete mechatronics package, combining the mechanical equipment with smart process control technology. The system comprises high precision valves with large flow range. It also features high water nozzle density and actuators with advanced flow control valves as well as crown and edge masking control functions. The MULPIC technology has the capability for both accelerated cooling and direct quench cooling across a wide range of product thicknesses. This ensures superior cooling performance and maintains uniform, controlled temperatures along the length and width of the plate, resulting in improved flatness and uniform mechanical properties. This, in turn, leading to improved product quality.

Expanded product offering

The upgrade of the existing laminar cooling system with MULPIC technology enabled the plate Steckel mill to achieve higher flow density and cooling rates. This cooling upgrade allowed the plate mill to process higher-strength steel grades such as X70, accommodating plate thicknesses between 10 and 30 millimetres and widths of up to 4,500 millimetres with excellent temperature and flatness uniformity.

This advanced cooling methodology rapidly removed heat, providing metallurgists with increased flexibility when designing new alloys for entering new markets. Additionally, it reduces operating costs through lean alloying.

Each of the two cooling banks measures six metres in length and consists of six top and six bottom headers. The height of each header can be adjusted between 500 and 1200 mm to ensure ultra-precise cooling of every single plate. The MULPIC system was also designed to optimize the mill's overall carbon emissions.

Primetals Technologies

Multi-Purpose Interrupted Cooling technology MULPIC

Installed at the exit section of a hot strip plant a multi-purpose interrupted cooling unit enables the mill to achieve advanced material characteristics. Compared to a laminar cooling system, this technology provides higher cooling rates. Thus, it expands the mill's product range to include value-added grades used for pipeline applications, making them suitable for the most demanding markets, such as the oil and gas industry.

THYSSENKRUPP MATERIALS PROCESSING EUROPE TO EXPAND CAPACITIES

thyssenkrupp Materials Processing Europe is making large-scale investments at its steel and aluminium service center in Stuttgart, focusing on capacity expansion and digitalization.

The project includes the installation of a new slitting line and a packaging line and building a new 2,000 square meter warehouse. Construction work and preparations for the installation of the new slitting and packaging systems began in August. The new slitting line, supplied by Tilgert, will increase the total capacity to 350,000 t/year and provide a comprehensive processing portfolio in the thickness range from 0.2 to 5.0 mm. It is expected to be operational by September 2025. In addition to conventional rolled steel, electrical steel strip can also be processed. In order to meet the expanded production capacities in the packaging area as well, a new high-performance packaging line from the Italian company Promec will be installed in spring 2025.

In addition to the implementation of new machines, the digital networking of the site represents a further important part of the investment. By using new technologies, such as fully automated digital setup and production process monitoring or the knife-assembly robot, the company expects to speed up and better coordinate individual production steps. To this end, the subsidiary thyssenkrupp Materials IoT has set up a central digital infrastructure that coordinates all process steps from the supply chain to the plant.

thyssenkrupp Materials Processing Europe / Tilgert / Promec

ZEKELMAN INDUSTRIES EXPANDS TUBE AND PIPE PRODUCTION CAPACITY

Zekelman Industries, one of the largest independent steel tube manufacturers in North America, has increased its production capacity with four high-speed tube mills supplied by Fives.

The OTO tube mills from Fives are capable of producing tubular products at a speed of 275 m/min. The mills process tube and pipe from 18 mm to 130 mm in diameter for a wide range of applications, from conduit to solar panels and construction, in both the U.S. and Mexico.

"Our goal was to increase the overall efficiency of our plant in Rochelle, Illinois/USA, to achieve the fastest possible production in the shortest possible time, as well as to reduce manual intervention to almost zero. Our long-standing relationship with Fives led us to choose their high-speed OTO tube mill technology with fully integrated automation to reach our goal," says John Chatterton, Group Technical President at Zekelman Industries.

Fives

SIEMENS LAUNCHES CONTROL CABINETS MADE FROM GREEN STEEL

Through its subsidiary Alpha Verteilertechnik, Siemens Smart Infrastructure has added a new industrial control cabinet series to its line of sustainable electrical products.

Control cabinets made of scrap steel produced with renewable energy from wind power (Picture: Siemens)

The newly launched control cabinet series, SIVACON 8MF1, is made with 100% scrap metal sourced from reputable suppliers in Europe and manufactured using wind power. Besides conventional control cabinets, customers globally can now purchase the new product. The production process for these control cabinets cuts CO_2 emissions significantly, compared to conventional steel, typically produced in a blast furnace using iron ore and coal. This reduction translates into savings of 308 kg of CO_2 per enclosure unit. The products have the same technical properties and functionality as cabinets produced with conventional steel.

Siemens

KLÖCKNER & CO REPORTS SOLID BUSINESS PERFORMANCE

Klöckner & Co continued its solid business development in the second quarter of 2024 and significantly increased shipments by 11.5% compared to the prior-year quarter. A strong and once again significantly positive cash flow from operating activities is anticipated in the current fiscal year, however, likely below previous year's level.

In the first half of 2024, shipments increased by 8.1% to 2.3 million t. The increase is primarily attributable to the acquisitions in Mexico and the U.S. completed in the second half of 2023. With 3.5 billion euros, against 3.6 billion euros in the first half of 2023, sales dropped slightly by 2.6% due to lower prices. Despite a persistently challenging macroeconomic environment and a significant steel price correction, Klöckner & Co generated solid EBITDA before material special effects of 42 million euros in the second quarter of 2024 (Q2 2023: 65 million euros).

In March 2024, Klöckner & Co successfully completed the disposal of parts of its European distribution business. The net loss from discontinued operations amounted to 5 million euros in Q2 2024 and 29 million euros in the first half of 2024, compared to 35 million euros in the equivalent previous year's period.

For the second quarter of 2024, Klöckner & Co generated a significantly positive cash flow from operating activities in the amount of 61 million euros. For the first six months of fiscal year 2024, it was 18 million euros. The year-to-date demand has been weaker than originally anticipated, especially in Europe. In light of these developments, Klöckner & Co now expects a slight increase in shipments for fiscal year 2024.

With the acquisition of Amerinox Processing by the U.S. subsidiary Kloeckner Metals Corporation, Klöckner & Co has further strengthened its leading position in North America.

Klöckner & Co

THYSSENKRUPP MATERIALS PROCESSING OPENS SERVICE CENTER IN TEXAS

thyssenkrupp Materials Services has opened its fourth steel service center in the USA. The new location in Sinton, Texas, will be part of the network of the U.S. unit thyssenkrupp Materials North America.

The new service center is located on the premises of Steel Dynamics, Inc. "The logistically favorable location – including direct rail and port access – in Sinton allows us to bridge the gap to markets that were dependent on distant suppliers. We are expanding our geographic reach in high-growth markets with a high demand for steel," says Steve McGee, Chief Operating Officer of thyssenkrupp Steel Services. In addition to an almost 15,000 m² building, the investment by thyssenkrupp Materials Services also includes new state of the art slitting and cut-to-length lines.

Due to its geographic location, the Sinton site is an important strategic addition to the three existing steel service centers in Richburg, South Carolina; Woodstock, Alabama; and Detroit, Michigan. The steel service center uses wind and solar power as well as electric forklifts to deliver on the company's corporate commitment to reduce carbon emissions. The site has adequate space for several future expansions. The new plant commenced operations in April 2024, and employs 15 dedicated employees.

thyssenkrupp Materials Processing

SSAB AND NORDEC AGREE ON DELIVERIES OF FOSSIL-FREE STEEL

SSAB and Nordec have agreed on deliveries of fossil-free steel, marking an important step towards an efficient supply chain for fossil-free steel. SSAB aims to deliver fossil-free steel to the market in 2026.

Under the collaboration, SSAB will initially supply small quantities of fossil-free steel for the first pilot project. In the future, quantities will increase as production ramps up. Nordec Group has long experience in the design, manufacture and installation of frame structures, façades and bridges. "As a leading supplier of steel frame structures in the Nordic countries, it is extremely important for Nordec that investments related to fossil-free steelmaking proceed resolutely. Cooperation with SSAB contributes greatly to our green transition strategy and in helping us to reach our emission reduction targets," says Nordec Group's CEO Kalle Luoto.

SSAB / Nordec

Signing of the collaboration agreement on fossil-free steel (Picture: SSAB)

VOESTALPINE SECURES ORDERS FOR TRUCK MANUFACTURERS AND EXPANDS US CAPACITIES

The Metal Forming Division of voestalpine has signed long-term contracts with two global truck manufacturers for the North American market. For this, the company is expanding its production capacity at its existing site in Indiana/ USA.

voestalpine is expanding its existing site in Jeffersonville, Indiana, by around 15,000 square meters of production space in order to ensure the necessary production capacity for the manufacture of high-quality structural components for Class 6, 7, and 8 trucks. Production capacity will be doubled to 80,000 t, with production scheduled to start in 2026. In addition to the new hall, the investment also includes the purchase of new equipment and will create new jobs.

voestalpine

TATA STEEL UK CONTINUES INVESTMENT PROGRAMME AT CORBY

Major investment activity is going on at Tata Steel's tubemaking works in Corby as part of a site-wide development programme: A new tube mill will replace old tubemaking equipment, and one of the warehouses will be regenerated with the revenue from the sale of redundant land.

The new 'combination' tube mill, designed and built by Italian engineering company Mair Research, replaces two older machines. Installation of the parts will be by the British company, Rapid Response Solutions, with the original equipment manufacturer, Mair, also onsite to oversee the construction and commissioning.
Most recently, Tata Steel announced the sale of a redundant part of the site. The sale of the old West Works land will now fund the regeneration and development of one of the warehouses on the East Works into a modern complex of offices, stores and engineering workshops, and upgrade one of the tubes finishing lines. The end use of the sold plot will be a fully-serviced campus-style logistics hub.

Parts of the new combination mill arriving at Tata Steel's Corby site (Picture: Tata Steel)

Tata Steel / Mair Research / Rapid Response Solutions

ARCELORMITTAL EUROPE FLAT PRODUCTS AND KNAUF INTERFER ENTER INTO PARTNERSHIP

Flat Products and Knauf Interfer are jointly driving forward the sustainability goals set and agree to supply Knauf Interfer with CO_2-reduced input material.

Knauf Interfer forms a central interface between steel manufacturers and customers, both through its steel service centers and through its own forming blanks and cold rolling activities. CO_2 savings are achieved through steel with the XCarb® label and through the sale of XCarb® Green Steel Certificates. The "XCarb® recycled and renewably produced" product uses at least 75 % recycled scrap, which is melted in an electric arc furnace using renewable energy. Thanks to the close partnership between the two companies, Knauf Interfer will soon be using the "XCarb® recycled and renewably produced" product in series production in several customer projects and pass the CO_2 savings achieved on to its customers.

ArcelorMittal / Knauf Interfer

Jochen Grünewald from ArcelorMittal and Domenico Marino from Knauf Interfer shaking hands over the new partnership. (Picture: ArcelorMittal)

UNPRECEDENTED GROWTH

Automatic tube mill for the solar industry boosts productivity and flexibility

Lock Joint Tube entrusted Fives to supply a completely automatic tube mill to expand its capacity and meet the growing demand for renewable energy.

Automatic packaging system of the new OTO tube mill (Photo: Fives)

Lock Joint Tube, a leading US steel tube manufacturer, is doubling production at its plant in Temple, Texas to provide solar tubes to key customers who are investing in the solar energy sector. Fives supplied a new OTO tube mill, equipped with the latest-generation technology that ensures the best performance for a wide range of applications.

The global expansion of renewable energy is expected to increase by more than 440 gigawatts in 2023 – the largest increase in history, according to the International Energy Agency. Solar energy accounts for two-thirds of this year's projected increase in global renewable energy capacity.

"Prior to the installation of the new tube mill, we could only produce small tubes for mechanical and structural applications. We saw a soaring demand from our customers supplying support structures for solar trackers and invested in new technology. The OTO tube mill is fully automated from the entry line to packaging and flexible enough to produce tubes for all types of applications: solar, mechanical, or structural," says Michael Donnelly, Corporate Project Manager at Lock Joint Tube.

The tube mill doubled the production capacity up to 4,000 tons per month. It was fully operational in spring 2023 and has produced 3,000 tubes per day in both octagonal and square shapes.

> With the new OTO tube mill, we are doubling our original capacity with a single operator on the line.
>
> *Mark Richner, Temple Plant Manager at Lock Joint Tube*

Advanced automation

The automation is deeply integrated with the mechanics to achieve advanced and cost-effective results. "Automation was our top priority because we wanted to increase safety, reduce heavy work, and speed up production. With the new OTO tube mill, we are doubling our original capacity with a single operator on the line. These exceptional results were only possible because of Fives' advanced technologies and our successful cooperation," says Mark Richner, Temple Plant Manager at Lock Joint Tube.

Increased productivity is ensured by Robopack, a fully automated packaging system developed by Fives. The system at Lock Joint Tube consists of a complex configuration, where three robots work synchronized to handle special tube lengths up to 15 m. It offers greater flexibility and quality standards while providing consistent and safe operation.

"The Robopack with three robotic arms is one of the main innovations of this project. Its modular design makes it possible to easily adapt the packaging solution to production needs. For short tube lengths, one or two robots can be on standby, which reduces energy consumption," adds Roberto Chiminelli, Application Engineering Manager at Fives OTO, a subsidiary of the Fives Group specialized in tube mill technology.

Fives' partnership with Lock Joint Tube demonstrates the industry's commitment to setting high standards around the world.

Fives – Steel & Glass Division

CONSTRUCTION

New recycled and renewably produced route now available from Poland

In a recent project, the limits have been pushed further and a new route has been opened to a wider range of ArcelorMittal's XCarb® recycled and renewably produced sections available for the Polish market

Poland has been one of the founding markets for ArcelorMittal's Steligence® approach, a holistic construction proposal that considers a building as a whole, breaking down barriers between apparently competing aspects such as flexibility, economics, sustainability and creativity. Steligence® foster solutions for a project from its very beginning, with the right material at the right place, in a way that also encourages the lowest carbon footprint. XCarb® recycled and renewably produced, made from recycled scrap with 100% renewably produced electricity, complements the Steligence® approach.

In a recent project, the limits have been pushed further and a new route has been opened to a wider range of XCarb® recycled and renewably produced sections available for the Polish market.

The story started at the end of 2023, when a Polish customer got in contact – through the Steligence® team at ArcelorMittal – with the Dabrowa Gornicza mill to buy small UPN sections from the medium mill in XCarb® recycled and renewably produced, a product not previously available from this mill. The decision was quick, to offer this innovative solution and produce XCarb® recycled and renewably produced UPN220 in S235 grade. This innovation required unusual supply chain and material processing from the mill side and collaboration between ArcelorMittal mills in Warsaw and Dabrowa.

The UPNs were used to construct internal staircases and balconies around a building, and the most important topic was that they contributed to reduce the whole carbon footprint of the construction, together with a high volume of XCarb® recycled and renewably produced beams used for the structure, in a range of sizes and qualities that have been available worldwide since the launch of ArcelorMittal's XCarb® initiative, more than three years ago.

After this first order, the new route is now fully operational and allows the delivery of low carbon-emissions steel from the Dabrowa Gornicza mill.

Wire rod is also available in XCarb® recycled and renewably produced from mills in Poland

Traditionally, ArcelorMittal produces the wire rod in Poland through the Basic Oxygen Furnace (BOF) process in Sosnowiec. But being pushed by the market needs, the team found a creative way to satisfy customers' requirements, by proposing wire rods with lower CO_2, produced out of billets coming from the steel plant of Warsaw and further rolled in Sosnowiec. By this route, the final CO_2 of the products was four times lower compared with the traditional route.

For steel processors and distributors, wire rod is a semi-finished product used to manufacture a wide range of final products (e.g., nails, mesh panels, springs, ropes, beat wire and fibres). Offering XCarb® recycled and renewably produced wire rod opens up a low carbon-emissions production route for all customers of ArcelorMittal, with a wide range of applications.

UPN sections in XCarb® recycled and renewably produced are being installed in the balconies of the CD PROJEKT RED's new building in Warsaw (Photo: ArcelorMittal)

The first order for wire rod in XCarb® recycled and renewably produced (in LC Standard, grade SAE1015, dia. 5,5 mm) was booked for production in May 2024. XCarb® recycled and renewably produced billets have been ordered from ArcelorMittal Warszawa, enabling the rolling of wire rod in Sosnowiec in XCarb® recycled and renewably produced quality.

Most recently a new contract has been negotiated for XCarb® recycled and renewably produced wire rod from Sosnowiec, rolled from billets produced in Warsaw: 150 tonnes of wire rod LC Standard, grade SAE1006, diameter 5,5 mm, will be produced in the coming weeks.

ArcelorMittal

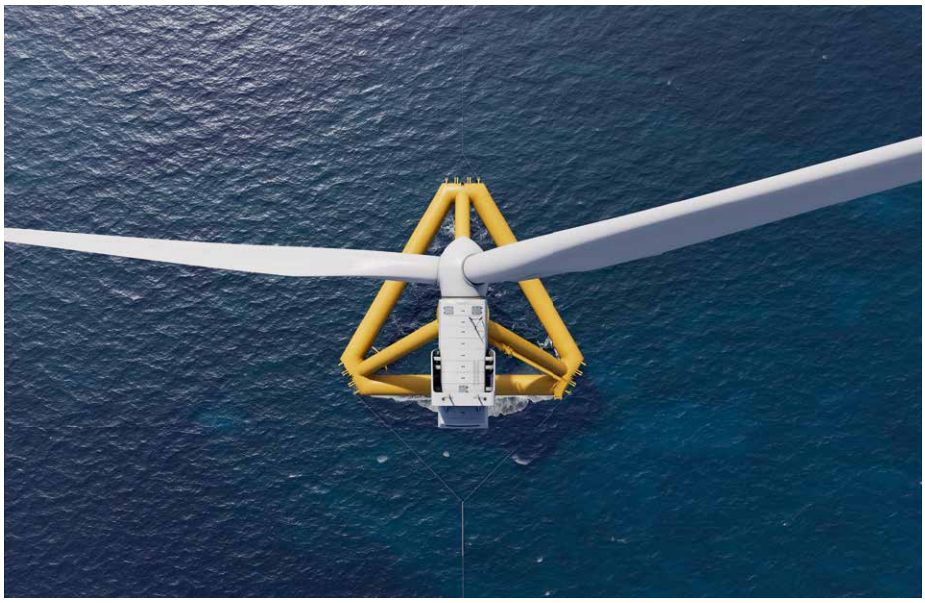
XCarb® recycled and renewably produced steel products from ArcelorMittal

XCarb® recycled and renewably produced steel aims to reduce the carbon footprint of construction projects. Produced with high levels of scrap and using only renewably produced electricity from recent solar and wind power sources (guaranteed through the European Guarantee of Origin – or GoO – system), XCarb® recycled and renewably produced steel has a global warming potential (GWP) that is far below the traditional steel production in Poland.

INDUSTRIAL COLLABORATION

Strip steel floating offshore wind platforms

A Wales-centred industrial collaboration, led by Swansea-based Marine Power Systems, is developing innovative floating offshore wind structures. Low-CO_2 steels from Tata Steel's Port Talbot site shall be used to build the platforms and strengthen local supply chains. The project has been awarded nearly £1 million of innovation funding.



PelaFlex floating platform seen from above (Photo: Marine Power Systems)

The Launchpad project is a collaboration between Marine Power Systems (MPS), Tata Steel UK, Swansea University, Associated British Ports and leading engineering and fabrication company, Ledwood Engineering. The funding from Innovate UK, the UK's Innovation Agency, is to further develop and optimise PelaFlex, Marine Power System's unique and flexible floating offshore wind platform, for applications in the Celtic Sea. The project also aims to ensure that the material sourcing, fabrication, manufacture, and product deployment is maximised through local supply chains.

Graham Foster, MPS Chief Technology Officer commented: "We are confident that through this project we will be able to optimise our platform design to increase the amount of local, low CO_2 steel used for each platform from around 10% to over 50% - that could be as much as 50,000 tonnes of steel each year, based on ongoing supply into Celtic Sea floating wind projects."

Specifically, the project will optimise the structural efficiency of MPS's floating offshore wind platform, PelaFlex, paying particular attention to the challenging environment in the Celtic Sea whilst minimising both the cost of materials and deployment. That includes the use of strip steel manufactured in Port Talbot, the use of components fabricated by local suppliers and the assembly and roll out using existing ports in the southwest Wales.

Swansea University will provide design input by applying the latest developments in structural design modelling, and Ledwood, based in Pembrokeshire, will provide feedback that will help maximise the extent to which fabrication can be supported from local suppliers. Input from Associated British Ports and the Port of Milford Haven will ensure that the platform can be assembled and deployed from those locations whilst minimising the investment required to do so.

The UK Government, supported by the current 4.5GW licensing round for floating offshore wind in the Celtic Sea, has committed to delivering 5GW of floating offshore wind by 2050. The Labour Party Manifesto 2024 states that to achieve clean power by 2030, they would "Pioneer floating offshore wind, by fast-tracking at least 5 GW of capacity."

Tata Steel UK

Floating platform technology PelaFlex

High system stability, low overall mass and zero tilt maximises energy yields, allows for simple installation using standard vessels and increases operation and maintenance weather windows. Multiple launch options and shallow draft support a distributed port model for faster deployment and reduces the need for specific port requirements.

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02 Raw material pretreatment

02.01 Ore dressing

740 Mixers/core sand mixers

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Internet: www.eirich.de

03 Iron making

03.01 Blast furnaces

1150 Heat recovery systems

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03.02 Direct reduction plants

1160 Direct reduction plants

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04 Steelmaking

1668 Equipment for steelmaking plants

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GUILD International
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1699 Steel mill equipment

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04.04 Electric steel plant

1875 Electric arc ladle furnaces

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04.07 Secondary metallurgy

2028 Equipment for chemical heating

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2030 Argon purging equipment

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04.07 Secondary metallurgy

2080 Ladle metallurgical plants

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2110 Secondary metallurgical plants

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2120 Steel degassing plants

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2130 Steel desulfurization plants

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2140 T+P lance equipment

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04.09 Components

2150 Deslagging machines

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2180 Break-out machines for electric furnaces, converters, ladles, etc.

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☎ +49 271 401-0
E-Mail: contact@dango-dienenthal.de
Internet: www.dango-dienenthal.de

2182 Burning lances (oxygen) for tundish and ladle gate valves

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An der Pönt 59
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☎ +49 2102 9109-0
E-Mail: info@BEDA-com
Internet: www.BEDA.com

2230 Charging machines (trough and tongs)

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2270 Injection plants for argon

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40885 Ratingen, Germany
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Internet: www.BEDA.com

04.09 Components

2440 Handling equipment for oxygen/carbon lances

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40885 Ratingen, Germany
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Internet: www.BEDA.com

04.09 Components

2490 Coal dust injection lances

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Internet: www.BEDA.com

2530 Lance robots/-manipulators

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E-Mail: info@BEDA-com
Internet: www.BEDA.com

2580 Oxygen nozzles

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04.09 Components

2600 Oxygen lance equipment

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E-Mail: info@BEDA-com
Internet: www.BEDA.com

2655 Fuses (multifunction) for burners

BEDA-Oxygentechnik GmbH
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40885 Ratingen, Germany
☎ +49 2102 9109-0
E-Mail: info@BEDA-com
Internet: www.BEDA.com

2660 Special safety oxygen hose reels

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40885 Ratingen, Germany
☎ +49 2102 9109-0
E-Mail: info@BEDA-com
Internet: www.BEDA.com

07 Hot rolling

07.10 Components

4430 Decoilers and rewinders

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08 Forging, extrusion

08.03 Components

5150 Forging manipulators

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Glama Maschinenbau GmbH
Hornstr. 19
45964 Gladbeck, Germany
☎ +49 2043 9738-0
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Internet: www.glama.de

5155 Forging manipulators, rail-mounted

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5160 Forging robots

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5180 Transport manipulators

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Internet: www.dango-dienenthal.de

10 Cold rolling

10.01 Cold rolling mills

5490 Strip, sheet, cold and metal rolling mills

hpl-Neugnadenfelder Maschinenfabrik GmbH
Spangenbergstr. 20
49824 Ringe/Neugnadenfeld, Germany
☎ +49 5944 9301-0
E-Mail: info@hpl-group.de
Internet: www.hpl-group.de

10.04 Annealing lines

5670 Annealing lines

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47059 Duisburg, Germany
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Internet: www.loi.tenova.com

11 Surface treatment

11.04 Surface treatment plants

6270 Strip edge trimming

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Spangenbergstr. 20
49824 Ringe/Neugnadenfeld, Germany
☎ +49 5944 9301-0
E-Mail: info@hpl-group.de
Internet: www.hpl-group.de

11.04 Surface treatment plants

6280 Strip processing and finishing lines

hpl-Neugnadenfelder Maschinenfabrik GmbH
Spangenbergstr. 20
49824 Ringe/Neugnadenfeld, Germany
☎ +49 5944 9301-0
E-Mail: info@hpl-group.de
Internet: www.hpl-group.de

11.05 Aluminizing, tin plating, galvanizing

6630 Hot dip galvanizing lines

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13 Production of tubes/pipes

13.04 Finishing lines for tubes

7520 Tube bending machines

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7544 Tube straightening machines

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14 Sheet metal processing

14.03 Welding technology

8120 Strip welding machines

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14.03 Welding technology

8205 Laser welding machines

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8210 Laser beam welding machines

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8220 MIG, MAG and TIG\057TIG welding torches

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8257 Rolling seam resistance welding equipment

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14.03 Welding technology

8330 Welding machines, general

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8360 Welding accessories, general

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8380 Butt welding machines, electric

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8400 Resistance welding equipment

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16 Furnace and energy technology

10170 Furnace optimization (conversion to low NOx combustion)

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Internet: www.flox.com

10190 Rational use of energy

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16.02 Forging furnaces

10230 Forging furnaces

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16.03 Roller Hearth Continuous Furnaces

10260 Roller Hearth Continuous Furnaces

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E-Mail: loi@tenova.com
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10270 Roller hearth and walking beam furnaces

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Internet: www.loi.tenova.com

16.05 Top-hat furnaces

10310 Top-hat furnaces

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16.08 Heating furnaces and heat treatment plants

10408 Continuous furnaces

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10410 Co-step furnaces

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10430 Bogie hearth furnaces

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10460 Chamber furnaces

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16.08 Heating furnaces and heat treatment plants

10510 Roller hearth and walking beam furnaces

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10540 Pusher-type, roller and rotary hearth furnaces

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10560 Heat treatment plants

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10562 Heat treatment furnaces (continuous and discontinuous)

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Internet: www.loi.tenova.com

10570 Heat treatment furnaces for batch operation, open heated

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Internet: www.loi.tenova.com

16.09 Bath furnaces

10580 Aluminum melting furnaces

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16.13 Components

10890 Natural gas burners

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Internet: www.flox.com

11010 Regenerative burners

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Internet: www.flox.com

11020 Recuperative burners

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🖷 +49 7159 2738
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Internet: www.flox.com

16.13 Components

11070 Radiant tube burners

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18 Machinery and plant engineering

12210 Plant engineering, general

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18.10 Power and work machines

13160 Vacuum pumps

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Internet: www.loi.tenova.com

21 Measuring and testing technique

16488 Multichannel measuring systems

IMS Messsysteme GmbH
Germany
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🖷 +49 2056 975-140
E-Mail: info@ims-gmbh.de
Internet: www.ims-gmbh.de

21.02 Measurement of physical properties

16608 Strip thickness control (AGC)

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🖷 +49 7243 69944
E-Mail: info@polytec.de
Internet: www.polytec.de

16612 Strip flatness measurement

IMS Messsysteme GmbH
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🖷 +49 2056 975-140
E-Mail: info@ims-gmbh.de
Internet: www.ims-gmbh.de

21.02 Measurement of physical properties

16652 Dressing degree and mass flow measuring systems

POLYTEC GmbH
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🖷 +49 7243 69944
E-Mail: info@polytec.de
Internet: www.polytec.de

16660 Thickness measuring systems and devices

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Germany
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🖷 +49 2056 975-140
E-Mail: info@ims-gmbh.de
Internet: www.ims-gmbh.de

21.02 Measurement of physical properties

16830 Speed measuring devices

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🖷 +49 7243 69944
E-Mail: info@polytec.de
Internet: www.polytec.de

16892 Force measuring systems

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Internet: www.ims-gmbh.de

21.02 Measurement of physical properties

16910 Length measuring devices for tubes

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🖷 +49 7243 69944
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16950 Length and speed measuring systems (optical)

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16960 Laser speed and length measuring systems

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21.02 Measurement of physical properties

17300 Rolling mill measuring systems

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🖷 +49 2056 975-140
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Internet: www.ims-gmbh.de

21.03 Quality management

17380 Measuring instruments for quality management

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17409 Surface inspection systems

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24 Environmental protection and disposal

24.01 Dedusting and gas cleaning

18360 Exhaust gas cooling systems

LOI Thermprocess GmbH
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Internet: www.loi.tenova.com

18400 Treatment of dusts from steel mills and foundries

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Internet: www.eirich.de

List of Products

01 Raw materials, auxiliary materials and operating materials

01.01. Ores
10 Chrome ore
20 Iron ores
30 Ores
40 Manganese ore
50 Steel mill ores

01.02. Coal, coke
60 Lignite coke
62 Injection coal
65 Foundry coke
67 Coal / coke conveyor
70 Coke
80 Coke breeze
90 Coke breeze, dry
100 Petroleum coke
110 Hard coal, anthracite

01.03. Scrap
120 Scrap metal

01.04. Sponge iron
128 Sponge iron
130 Sponge iron

01.05. Metals and alloys
140 Cermix metal
150 Chromium metal
160 Cobalt
170 Deoxidation alloys
180 Iron granules
190 Iron powder
200 Ferrobor
210 Ferrochrome
220 Ferromanganese
230 Ferromolybdenum
240 Ferronickel
250 Ferroniobium
260 Ferro-niobium carbide
270 Ferroniob powder
280 Ferrophosphorus
290 Ferro-selenium
300 Ferrosilicon
310 Ferro-silicon-magnesium
315 Ferro-silicon-manganese
320 Ferrotitanium
330 Ferrovanadium
340 Ferrotungsten
350 Ferrozinc
380 Alloys
385 Magnesium alloys
390 Manganese metal
400 Metals and alloys
410 Metal powder
420 Molybdenum
430 Molybdenum oxide
435 Non-ferrous metals
440 Nickel
450 Nickel-based alloys
460 Nickel niobium
470 Niobium, metals and alloys
475 Pure iron
480 Silicon carbide
490 Silicon and silicon alloys
500 Special metals
510 Special alloys
520 Tantalum
530 Titanium and titanium alloys
540 Vanadium metal
550 Vanadium pentoxide
560 Master alloys
570 Tungsten
572 Tungsten granules for C and S analysis
610 Alloying additions

01.06. Additives and fluxes
580 Carburizing agent
590 Fluorspar
600 Lime and limestone
612 Slag conditioner
616 Olivine
618 Raw bauxite

01.07. Gases
620 Acetylene
625 Argon
630 Gases, technical
640 Carbonic acid
650 Oxygen
660 Protective gas
670 Nitrogen
675 Hydrogen

01.08. Lubricants
680 Coating powder
690 Lubricants

01.09. Composite materials
678 Bimetal for saws

01.10. Water
691 River water / additional water

01.11. Other
695 Glass granules
698 Titanium dioxide for hearth protection / repair

02 Raw material pretreatment

700 Engineering and technical assistance
703 Engineering and project management

02.01. Ore dressing
710 Ore and aggregate processing plants
720 Crushing plants
730 Grinding and mixing plants
740 Mixers / core sand mixers
750 Screens
760 Screens and screening plants

02.02. Coal preparation
770 Coal preparation plants
780 Coal grinding plants

02.03. Coal burden preparation
790 Coal burden preparation

02.04. Pelletizing plants
795 Ore preparation plants
797 Conveying plants for pellets
800 Pelletizing plants
810 Pelletizing plants with ore preparation plants

02.05. Sintering plants
820 Sintering plants
822 Sinter hot material conveyors
826 Grate bars for sinter plants

02.06. Briquetting plants
830 Briquetting plants
840 Briquetting of coal and coke
850 Compacting plants

02.07. Coke plants
858 Emission control in coking plants, charging and discharging
859 Heat-recovery coking plants
860 Coke plants, general
870 Coke crushing and screening plants
890 Coke ovens
900 Coke oven operating machines
910 Coke oven gas treatment plants
920 Coke ramming and extruding machines
950 Heat exchangers

02.08. Scrap processing plants
968 Coil magnets
970 Lifting magnets
980 Magnetic drums
990 Packing presses
999 Scrap drying plants
1000 Scrap mills, licker-ins
1010 Scrap shears
1015 Scrap shear blades
1017 Scrap magnets
1020 Shredder plants
1021 Safety equipment for electric load lifting magnets
1022 Separation magnets
1030 Chip crusher

02.09. Other equipment
1041 Equipment for granulation of sludges and dusts
1050 Ferroalloying plants
1058 Lime burning plants
1060 Lime slaking plants
1070 Roasting plants

03 Iron making

1080 Engineering and technical assistance
1090 Pig iron production plants
1100 Smelter reduction plants

03.01. Blast furnaces
1105 Energy recovery
1107 Expansion turbine
1110 Blast furnaces
1120 Blast furnace linings
1123 Blast furnace hearth protection / repair
1125 Blast furnace channel lining
1130 Blast furnace hot blast stoves
1140 Ceramic burners for hot blast stoves
1145 Shaft melting furnaces
1150 Heat recovery systems
1152 Hot blast stoves

03.02. Direct reduction plants
1160 Direct reduction plants
1170 Direct reduction plants with coal as reducing agent
1172 DRI hot material conveyor
1174 Fine ore reduction with coal or gas

03.03. Cupola furnaces
1180 Hot blast cupola furnaces
1190 Cold blast cupola furnaces
1195 Shaft furnaces for metallurgical residues

03.04. Components
1200 Valves for blast furnace reheaters
1205 Fittings for cupola furnaces
1207 Copper fittings for cupolas
1210 Slide gate maintenance
1220 Gassing systems for blast furnaces, cupolas and steel mills
1230 Blow mold changing and nozzle block removal carriages
1240 boring bar changing devices
1250 Nozzle bars
1260 Injection plants for carbon
1270 Equipment for injecting coal, oil or gas into the blast furnace
1280 Equipment for injecting oil or gas into the blast furnace
1285 Blast furnace gas expansion turbines
1290 Hood manipulators for use on iron channels
1295 Hot gas generators for blast furnace and coke gas
1300 Hot blast valves
1310 Blast furnace blowers
1320 Blast furnace stands and shells
1330 Blast furnace burdening / also burdening carriages
1340 Blast furnace probes
1350 Coal grinding, drying and injection systems
1351 Copper fittings for cupola furnaces
1353 Ladles and mixers, liquid pig iron, engineering and supply
1355 Process gas screw compressors
1360 Radar level measuring equipment
1370 Rest and shaft cooling plates for blast furnaces
1380 Pig iron bulk pouring machines
1390 Pig iron mixers
1400 Pig iron ladle, mixer and transfer cars
1410 Slag molds
1420 Slag ladles
1425 Hoses for blast furnace cooling
1430 Special fittings for blast furnace cooling
1432 Copper staves for blast furnace cooling
1440 Taphole tamping machines
1450 Tap hole and slag hole drilling machines
1458 Distributor systems for charging burden / ore / coke into the blast furnace
1460 Heat exchangers
1467 Weighing systems for torpedo cars
1470 Wind molds and nozzle stacks
1480 Wind vane

03.05. Blast furnace products for foundries
1490 Foundry pig iron
1500 Hematite pig iron
1510 Hematite pig iron for GG
1520 Blast furnace ferro-manganese
1550 Special pig iron for GGG
1560 Mirror Iron
1570 Steel iron

03.06. By-products
1580 Ferrous sulfate
1589 Blast furnace slag
1590 Blast furnace slag as a road construction material
1600 Blast furnace slag and LD slag
1620 Slag lime
1630 Slag Sand
1639 Converter lime
1640 Converter lime057 Thomas lime
1643 LD slag
1650 Thomas phosphate

04 Steelmaking

1668 Equipment for steelmaking plants
1670 Engineering and technical assistance
1680 Compact steelmaking equipment
1690 Second-hand steelmaking plant and equipment
1698 Steel mill plants and equipment
1699 Steel mill equipment
1700 Steel mill plants and equipment (stainless)
1710 Steel mill plants and equipment (complete)

04.01. Hot metal preparation plants
1715 Desulfurization plants with slag regeneration
1720 Hot metal desulfurization plants

04.02. Converter
1730 Blown steelmaking plants
1740 KTB (Kawasaki Top Blowing) equipment
1745 Combined bottom blowing at converter
1750 Converter plants
1755 Converter sealing plugs
1758 Setting machines for converter sealing plugs
1760 Purging stones

04.03. Energy optimization furnaces
1770 Energy optimization furnaces

04.04. Electric steel plant
1780 Charging equipment for electric furnaces
1788 Bottom blowing equipment for electric arc furnaces (nitrogen and argon)
1790 Bottom tapping
1795 CO post-combustion
1800 Three-phase arc furnaces
1810 Injection systems for electric furnaces
1820 Electrode holders and contact jaws for electric furnaces
1830 Electrode control for electric arc furnaces and ladle heating systems
1840 Electrode extruders
1850 Electrode support arms
1855 Aluminum electrode support arms, current-carrying (Hot Arms)
1860 Electrode support arms, current-carrying (Hot Arms)
1865 Electrode discharge arm insulation
1870 Electric arc furnaces
1875 Electric arc ladle furnaces
1880 Electric arc furnaces with integrated scrap preheating (shaft furnaces)
1885 Spare and wear parts, consumables
1890 Direct current arc furnaces
1900 Graphite electrodes
1908 Jet Box Technology
1910 Cooling elements (tube wall segments, bay covers, plate coolers)
1920 Oil / 057gas oxygen burners (also post-combustion)
1930 Scrap baskets
1938 Scrap dryers
1940 Scrap preheating systems
1945 Poking machines for electric furnaces
1950 Electric tube systems for electric furnaces
1960 Water cooled cables
1970 Water cooling systems
1980 AC arc furnaces
1981 EAF high current insulation
1982 Power supplies for AC arc furnaces
1983 Power supplies for direct current arc furnaces

04.05. Induction furnaces
1990 Induction furnaces
1995 Protection system for induction coils
1996 Induction furnaces \ 057Repairs
2000 Water cooled cables

04.06. Vacuum furnaces
2008 High vacuum furnaces
2010 High vacuum furnaces (also electron beam melting furnaces)
2020 Vacuum induction melting furnaces
2021 Vacuum pumps, dry running, for vacuum furnaces
2025 Vacuum investment casting plants

04.07. Secondary metallurgy

2028 Equipment for chemical heating
2030 Argon purging equipment
2040 Blow and injection conveying systems for filter dusts
2042 blowing lances, combined, for RH
2050 CAS, CAS-OB and CAB-plants
2060 Injection plants for metallurgical processes
2070 Electroslag remelting plants
2080 Ladle metallurgical plants
2090 Plasma arc plants
2100 Plasma ladle furnaces
2110 Secondary metallurgical plants
2120 Steel degassing plants
2130 Steel desulfurization plants
2140 T+P lance equipment
2145 Induction stirrers for ladle furnaces
2147 Vacuum degassing plants
2148 Vacuum arc furnace

04.08. Tertiary metallurgy

2141 Electroslag remelting plant ESU plant
2142 Vacuum arc remelting/VAR plant
2143 Vacuum induction furnace/VIM plant
2144 Vacuum degassing equipment

04.09. Components

2150 Deslagging machines
2155 Tap hole sealing equipment for converters
2156 Converter tap hole drilling and setting machines
2160 Tapping gate for converters and electric arc furnaces
2170 Andromat manipulator
2175 Burning machines for ladles
2180 Break-out machines for electric furnaces, converters, ladles, etc.
2182 Burning lances (oxygen) for tundish and ladle gate valves
2184 CO injection equipment
2190 Handling equipment for oxygen/carbon lances
2200 Automatic purging gas dome stations
2210 Heating equipment for ladles, mixers, converters and tundishes
2215 Feeding equipment for metallurgical plants
2220 Brakes
2230 Charging machines (trough and tongs)
2235 Steam jet vacuum pumps for steel degassing
2240 Dolomite centrifugal machines
2250 Wire spooling machines
2268 Injection plants for argon in ladles
2270 Injection plants for argon
2280 Injection plants for iron carbide dusts
2290 Injection plants for Hy/DRI dusts
2300 Injection plants for lime granules
2310 Injection plants for carbon (electric arc furnaces)
2312 Injection plants for alloying materials
2320 Electric heating elements for steel degassing plants
2340 Electromagnet. Conveying and dosing troughs for liquid metals
2350 Desulfurization equipment
2360 Oriel tapping fillers, electric arc furnaces
2370 Casting ladles, general
2380 Casting ladle heaters
2390 Ladles for steel mills
2400 Casting ladle gates (also slide gate gates)
2410 Pouring stream protection
2420 Casting carriages
2430 Handling equipment
2440 Handling equipment for oxygen/carbon lances
2450 Metallurgical and rolling mill hydraulics
2460 Lime-oxygen dosing and injection systems
2480 Tilting chairs for ladles
2490 Coal dust injection lances
2500 Ingot molds and casting molds for steel mills
2510 Ingot mold cars
2514 Continuous optical analysis equipment for process vessels
2515 Continuous optical temperature measurement for process vessels
2520 Converter blowing lance changing device
2525 Converter temperature and sampling equipment
2530 Lance robots \ 057-manipulators
2540 Alloying equipment for steel mills
2541 Multifunction lances and burners for electric furnaces
2542 Ladles and mixers, liquid pig iron, engineering and supply
2543 Mixer ladles
2545 Ladle sliders (steel mill ladle slider material)
2550 Ladle cars
2560 Robots for cutting slag
2570 Sand feeding devices for ladle tap hole
2580 Oxygen nozzles
2590 Oxygen lances
2600 Oxygen lance equipment
2610 Oxygen tubes, heat protected
2615 Shadow tube manipulators
2618 Slag with space resistant property
2620 Slag bucket
2630 Slag retaining device for converter
2640 Slag carts
2650 Hose reels
2655 Fuses (multifunction) for burners
2660 Special safety oxygen hose reels
2665 Stone coating agent for ladle gate valves
2666 Stone coating agents for slide gate systems
2668 Poking machines for electric furnaces
2669 Sublances
2670 Immersion tube spraying devices
2680 Torpedo car radar level measuring devices
2686 Vacuum pumps, dry running, for vacuum furnaces
2690 Preheating and drying stations for ladles and tundishes
2695 Weighing systems for scrap and alloying elements
2700 Heat exchangers for steel mills
2702 Flame cutting machines for ladles
2704 Crucibles for remelting furnaces
2705 Process gas analyzer

04.10. Steel mill supplies

2706 Sealing cords and packings up to 1260 °C
2710 Carburizing agents of all kinds
2720 Deoxidizing agent
2730 Deoxidation technology
2735 EBT taphole plugging compound
2740 Dephosphorizing agents
2750 Desulfurization and deoxidation agents
2760 desulfurization agents (also magnesium)
2770 ESU slags
2780 Ferroniob cored wires
2790 Cored wires
2798 Casting heads
2800 Casting powder
2801 Casting powders, granulated and powdered
2810 Graphite
2820 Graphite powder
2825 Heat protection fabric to 1260 °C
2827 Insulating covering agents for tundishes, ladles and troughs
2830 Molds
2840 Mould inserts
2845 Chill putty, -filler up to 1600 °C
2850 Ingot mold spray and plate protection
2855 Oxygen nozzles and blowing lances
2860 Blowhole powder
2865 Mats and felts up to 1260 °C
2868 Olivine slag conditioner
2870 Ladle covering agent
2871 Ladle covering agents, granulated and powdered
2880 Ladle slide sand
2885 Rotary slide gate for steel ladles
2888 Slag granulation
2890 Slag sands
2900 Slag foaming
2904 Protective blankets made of textile fabric up to 1260 °C
2905 Special adhesives up to 1200 °C
2910 Steel mill ladle slide material
2915 Crucibles for ESR, VAR and casting rolls
2920 Tundish covering material, granulated and powdered

04.11. Preparation of steel mill materials

2930 Processing of used refractory materials
2940 Processing of steel mill dusts, fines and oil-containing steel mill sludges
2950 Slag preparation (slag transport and recycling)
2954 Separation magnets

04.12. Services

2956 Engineering for steel mill plants and equipment
2957 Hydraulic cylinder repair
2958 Slag bucket maintenance

05 Continuous casting

2960 Engineering and technical assistance

05.01. Continuous casting plants of various designs

2962 Flat ingots
2965 Casting platform robot
2970 Casting wheel plants
2980 Casting wheels

2982 Casting rolls, rollers
2990 Horizontal continuous casting plants
3000 Continuous casting plants, general
3010 Vertical continuous casting plants

05.02. Continuous casting plants for different product dimensions

3020 Beam-blank continuous casters
3030 Continuous slab casters
3035 High-speed continuous billet casters
3040 Continuous billet casters
3043 Continuous billet casters, horizontal
3045 Combined continuous slab casters
3050 Round continuous casters
3055 Round continuous casting machines, horizontal
3058 Continuous bloom casting plants
3060 Continuous bloom and slab casters
3070 Continuous bloom and billet casting plants
3075 Continuous bloom and billet casting plants, horizontal
3080 bloom and round continuous casting plants
3085 bloom and billet continuous casting plants, horizontal

05.03. Spray compacting plants

3090 Spray compacting plants

05.04. Components

3100 Al wire injection plants
3110 Slab edge adjustment
3120 Slab edge heating, inductive
3130 Slab cooling plants
3140 Slab cooling boiler / heat recovery plants
3150 Slab cross-cutting and slitting lines
3160 Slab grinding machines
3166 Soft slab turning and transporting magnets
3170 Brakes
3180 Flame removal equipment
3190 Flame cutting equipment
3200 Slewing ring for water cooled rolls
3210 DS stamping machine
3216 Electromagnetic brakes, EMBR
3220 Single material nozzles for continuous casting cooling
3230 Deburrer
3240 Inks for marking equipment
3250 Paint signing equipment
3260 Casting powder feeder
3262 Casting stream protection by argon
3270 Inductive stirring
3280 Cold distribution plates (tundish plates)
3290 Marking equipment for slabs, ingots and billets
3292 Billet grinding machines
3300 Billet processing machines
3310 Billet sawing machines
3320 Billet grinding machines
3330 Mould flow measuring equipment
3340 Reading systems for automatic identification of impact and directly applied marks
3345 Air atomization nozzles for continuous casting cooling
3346 Marking machines
3350 Emergency cutting torches
3355 Optical product recognition (OPR) for marked billets
3360 Plasma tundish heating
3370 Plate molds
3380 Precision stopper device
3390 Tube molds
3400 Shadow tube manipulators
3405 Safety device for electrolift magnets
3410 Marking colors
3415 Slab magnets
3420 Stamping machines
3422 Stamping machines, hydraulic or pneumatic drive
3429 Continuous casting molds
3430 Continuous casting molds (also made of electrographite)
3440 Continuous casting rolls
3450 Tundish heating
3460 Tundish (manifold) plasma heater
3470 Tundish flow control
3480 Tundish gate valve (Tundish gate valve)
3490 bloom and billet adjustments
3500 Heat exchangers
3503 Weighing systems for ladles, tundish etc.
3510 Two-substance nozzles for continuous casting cooling

05.05. Operating materials

3520 Casting powder
3530 Lubricants for continuous casting plants
3535 Welding consumables for regeneration and against wear

05.06. Services

3537 Grinding and scarfing of slabs, billets and blooms

06 Near net shape casting

3540 Engineering and technical assistance

06.01. Equipment

3550 Strip casting lines
3560 Thin strip casting plants
3570 Thin slab casting plants
3572 Thin slab casting and rolling lines with direct bond
3573 EUROSTRIP strip casting plants
3574 EUROSTRIP direct strip casting and rolling lines
3575 Continuous billet casting plants

06.02. Components

3590 Flame cutting equipment
3600 Flame cutting equipment
3610 DS stamping machine
3630 Thin slab cross and slitting lines
3640 Thin slab grinding machines
3670 Color marking equipment
3680 Casting powder feeder
3690 Ingot molds
3700 Reading systems for automatic identification of impact and directly applied characters
3710 Marking inks
3712 Stamping machines, hydraulic or pneumatic drive

06.03. Operating supplies

3750 Coolant
3760 Lubricants

07 Hot rolling

3770 Engineering and technical assistance
3780 Second-hand hot rolling mills

07.01. Hot strip mills

3773 Flat block plants
3776 Flat block plants for rolling
3790 Thin slab mills
3805 Modernization of hot rolling mills
3820 Steckel rolling mills, complete
3830 Rolling mills, complete
3840 Hot rolling mills for slab products

07.02. Heavy plate mills

3850 Hot rolling mills, complete

07.03. Billet and semi-finished product mills

3860 Ingot, billet and plate mills
3861 Ingot, billet and semi-finished product mills

07.04. Section mills

3870 Rolling mills for light sectional steel
3875 Roll forming mills
3880 Special section rolling mills
3881 Rail rolling mills
3890 Beam and other section mills

07.05. Bar and wire rod mills

3900 Automatic coil handling
3910 Guide equipment for wire rod, bar and fine iron mills
3920 Calibrating mills
3930 Precision rolling systems
3940 Reducing and sizing mills
3944 Reducing and sizing mills
3950 Bar and wire rod mills
3955 Bar and wire rod mills for carbon and stainless steels
3960 Bar mills
3968 Rolling mills for flat products
3970 Rolling mills for long products
3974 Rolling mills for wire rod, rebars and bars

07.06. Ring rolling mills

3980 Ring rolling machines and plants
3981 Wheel rolling machines and plants

07.07. Finishing lines

3990 Finishing lines
4000 Finishing machines

4010 Chamfering machines for round and square billets
4017 Flat block plants for rolling
4020 Flying shears
4030 Hot / cold cut-off grinding machines
4040 Cold circular sawing machines
4050 Profile steel roller straightening machines
4060 Rotary saws
4065 Second-hand finishing lines
4070 Packing lines
4080 Hot straightening and cutting-off machines

07.08. Rolls for hot rolling mills
4090 Work rolls
4100 Plate rolls
4110 Ingot rolls
4120 Slab rolls
4128 EcoRolls
4130 Fine iron and wire rolls
4135 Ferrous cast rolls
4140 Forged rolls
4160 Chilled cast iron rolls
4170 Tungsten carbide \ 057steel rolls
4180 Caliber rolls
4190 Billet and semi-finished rolls
4200 Straightening rolls
4210 Ductile iron rolls
4220 Cast steel rolls
4230 Back-up rolls
4240 Composite casting rolls
4250 Composite casting rolls in high chrome and indefinite materials
4260 Composite chilled cast rolls
4270 Composite rolls
4280 Rolls for tube mills
4290 Roll rings

07.09. Roll machining and machines
4300 EDT systems
4320 High wear resistant coatings on rolls etc.
4330 Caliber processing machines
4340 Caliber groove grinding and milling machines
4350 Groove milling machines
4355 Ring expanders
4360 Special machines
4370 Roll machining machines
4380 Roll turning machines
4390 Roll grinding machines
4395 Roll grinding wheels
4400 Roll blasting machines
4410 Lines for roll forming
4420 Roll surface, services

07.10. Components
4430 Decoilers and rewinders
4432 Decoiler components
4440 Drives, gearboxes and comb mill stands
4450 Strip cooling equipment
4460 Belt grinding machines
4470 Brakes
4479 Coil magnets
4490 Nozzles for descaling
4500 Nozzles for roll cooling
4503 Roll cooling (stainless steel)
4510 Electric rolls and roller tables
4515 Scrapers for hot strip lines up to 1000 °C
4520 Descaling systems with solid abrasives
4528 Descaling systems with high pressure water
4530 Descaling systems with liquid abrasives
4540 Colors for marking equipment
4550 Paint marking systems
4560 Grease lubrication systems
4570 Scarfing systems, hot and cold
4580 Scarfing equipment, machines and plants
4582 Scarfing plants, robot controlled
4590 Gear rollers
4600 Semi-finished product testing, sorting and fettling lines
4610 Decoilers
4630 Edging and shifting devices
4640 Marking lines for plates, slabs and tubes
4650 Marking systems for profiles, strips and sheets
4660 Marking lines for slabs and blocks
4680 Compactor and press binding lines for wire rod
4690 Cooling beds
4700 Reading systems for automatic identification of impact and directly applied marks
4710 Oil-hydraulic setting devices
4720 Oil and emulsion circulation systems
4730 Roller tables
4740 Rotating and stationary shear blades
4750 Lubrication systems
4760 Quick change stands
4770 Safety device for electrolift magnets
4780 Marking inks
4790 Marking pins for hot surfaces
4800 Steel strapping
4810 Stamping machines
4820 Stamping machines and stamps for hot and cold operation (also fully automatic)
4830 Stamps and tools
4840 Transport equipment for wide strapping
4850 Strapping machines for coils
4860 Heat exchangers
4870 Roll transport devices
4880 Roll cooling systems, controllable
4890 Roll matting systems
4892 Roll guides
4893 Roll rings
4897 Weighing systems for coils and bundles

07.11. Operating fluids
4900 Lubricants for hot rolling mills

07.12. Services
4920 High wear resistant coating on rolls etc.

08 Forging, extrusion

4930 Engineering and technical assistance
4940 Modernization of water hydraulic control systems

08.01. Forging machines
4950 CNC precision forging machines
4960 Open-die forging lines
4970 Die forging lines
4980 Die spraying plants
4985 Hot isothermal forging plants (HIF)
4990 Hydraulic forging presses
5000 Cold extrusion presses
5020 Presses, general
5030 Pressing and forging machines
5040 Radial forging machines
5050 Radial and axial die rolling machines and plants
5060 Radial forging machines
5061 Radial forging machines, hydraulic
5070 Ring blank presses
5080 cNC precision forging machines
5084 Forging rolls
5090 horizontal forging machines, upsetting machines

08.02. Extrusion presses
5100 Metal pipe and tube extrusion presses
5110 Steel pipe extrusion presses
5120 Extrusion presses for profiles

08.03. Components
5130 Brakes
5150 Forging manipulators
5155 Forging manipulators, rail-mounted
5160 Forging robots
5180 Transport manipulators
5184 Water hydraulic drive and control technology

08.04. Operating materials
5190 Lubricants for extrusion presses
5195 Heat resistant sliding materials

09 Powder metallurgy

5200 Engineering and technical assistance
5210 Powder Metallurgy

09.01. Hard alloys
5220 Hard alloys, general
5230 Machinable and hardenable hard alloys

09.02. Hard materials
5290 Tungsten carbide

09.03. Hard metal powders
5300 Iron, steel, alloy powders, non-ferrous metal powders
5310 Carbide powder

09.04. Additives
5320 Binder metals
5330 Organic additives

09.05. Machines and equipment for powder production
5340 Machines and equipment for water atomization
5350 Machinery and equipment for melt atomization
5360 Machines and equipment for spray drying
5370 Powder manufacturers

09.06. Machines and equipment for production of powder metallurgical products

5370 Plants, complete
5380 Hot and cold isostatic presses and plants
5390 Metal powder presses
5400 Presses
5405 Powder presses, hydraulic, mechanical, hybrid
5410 Protective gas furnaces
5420 Vacuum furnaces
5422 Vacuum pumps, dry running, for vacuum furnaces

09.07. Powder metallurgy manufactured products

5430 PM metals / sintered metals
5432 PM rolling rings
5440 PM steels
5450 Composite materials

09.08. Further processing of powder metallurgy products

5460 Plasma powder cladding
5470 Thermal spraying

09.09. Additive manufacturing

5475 3-D printing
5476 Additive manufacturing processes

10 Cold rolling

5480 Engineering and technical assistance

10.01. Cold rolling mills

5490 Strip, sheet, cold and metal rolling mills
5510 cold rolling blocks for wire
5520 Cold rolling mills, complete
5523 Modernization of cold rolling mills
5530 Second-hand cold rolling mills
5540 Rolling mills for flat products

10.02. Skin pass mills

5550 Skin pass mills
5555 Skin pass mills for hot and cold strip

10.03. Finishing lines

5560 Finishing lines
5570 Finishing machines
5580 Strip edge trimming lines
5590 Strip processing lines
5595 Spreader rolls
5600 Slitting and cut-to-length lines
5610 Slitting and cut-to-length machines
5620 Straightening machines for strips and sheets
5630 Roller levelers
5640 Stretch levelers for strip
5650 Current guide rolls
5660 Packaging lines

10.04. Annealing lines

5668 Continuous annealing
5670 Annealing lines
5672 Annealing and pickling lines
5680 Annealing lines, inductive
5682 Annealing plants, continuous
5685 Modernization of annealing and pickling lines

10.05. Rolls for cold rolling mills

5686 Squeeze rolls
5690 Work rolls
5695 Spreader rolls
5700 Dressing rolls
5710 Polishing rolls
5715 Straightening rolls
5720 Straightening rolls
5730 Backing rolls
5750 Nonwoven rolls
5760 Rolls
5763 Roll sealing sleeves
5766 Roll core production and machining
5770 Rolls with polyurethane coating

10.06. Components

5780 Drives, gears and comb mill stands
5784 Strip guiding
5790 Tape remover
5800 Brakes
5803 Brake felt, stripper felt
5810 Letter and number types for stamping machines
5814 Labeling machines for rolled profiles (cold)
5830 Labeling machines
5840 Color marking machines
5845 Reel covers
5850 Reading systems for automatic identification of impact and directly applied characters
5860 Marking systems
5870 Oil circulation systems
5880 Rotating and stationary shear blades
5890 Marking inks for stamping machines
5900 Marking devices
5910 Marking pens for metals
5920 Steel strapping
5930 Stamping machines and stamps for hot and cold operation (also fully automatic)
5932 Roller cooling systems for high demands
5940 Heat exchangers
5950 Winding coils
5952 Weighing systems for bundles and coils

10.07. Operating materials

5960 Lubricants for cold rolling

11 Surface treatment

5970 Engineering and technical assistance
5980 Descaling of sheet metal parts
5988 Titanium processing

11.01. Descaling equipment

5990 Bend descaling for strip
6000 Bending descaling for wire
6010 Descaling systems with solid abrasives
6018 Descaling systems with high pressure water
6020 Descaling systems with liquid abrasives
6030 Free blasting systems
6040 Chamber blasting systems
6050 Shot peening systems
6060 Trough belt blast cleaning systems
6070 Roller table systems

11.02. Pickling plants

6080 Preparation of pickling baths
6088 Pickling lines, exhaust gas free, for stainless steel
6090 Pickling lines, complete
6100 Pickling lines for strip and wire
6109 Pickling tanks for high mechanical stress
6110 Pickling tanks and electrolysis cells for high mechanical stress
6120 Pickling baskets and hooks
6130 Pickling agents
6140 Pickling products for stainless steel
6150 Pickling products for stainless steels
6160 Pickling and surface treatment plants, general
6170 Pickling and surface treatment plants for wire
6180 Pickling additives
6190 Contract pickling plants
6192 Pumps for steel and stainless steel pickling
6200 Regeneration plants for pickling solutions
6203 Push pickling lines

11.03. Grinding and polishing machines

6210 Belt grinding machines
6230 Centrifugal grinding plants
6240 Polishing plants
6250 Drag grinding plants

11.04. Surface treatment plants

6260 Coil coating lines
6270 Strip edge trimming
6280 Strip processing and finishing lines
6282 Electrolytic strip pre-cleaning plants
6285 Strip washing lines
6290 Coating plants
6295 Burnishing plants and means
6300 CVD coating plants
6310 Services pickling and electropolishing of steel and stainless steel
6320 Oiling machines
6330 Electropolishing plants
6340 Deburring
6350 Deburring machines
6360 Color coating machines
6370 Paint spraying plants
6380 Vibratory finishing machines for surface treatment of metal parts
6386 High pressure water jet cleaning technology
6390 Shot peening
6400 Plastic coating plants
6410 Metal working equipment, electrochemical
6420 Metal degreasing lines
6430 Degreasing lines for metal strip
6440 Lines for cleaning and drying of metal
6450 Surface treatment, surface technology
6460 Surface treatment lines
6470 Surface drying, general
6480 Surface drying, inductive

6490 Surface finishing
6500 Phosphating plants
6510 Phosphating process
6520 Plasma CVD coating systems
6525 Plasma generators, power supply
6527 Blank washing systems
6530 Plating plants
6540 Plasma CVD systems
6550 PVD coating systems
6565 Blasting plants
6570 Pretreatment plants for galvanizing plants
6580 Water demineralization for surface treatment

11.05. Aluminizing, tin plating, galvanizing
6600 Equipment for hot-dip galvanizing and aluminizing of strip
6603 Equipment for hot-dip galvanizing, tin-plating and aluminizing of strip
6610 Electrolytic galvanizing equipment
6620 Electrolytic galvanizing lines
6630 Hot dip galvanizing lines
6640 Hot dip galvanizing lines, accessories
6642 Hot dip galvanizing lines, zinc bath equipment
6648 Galvannealing
6650 Galvannealing, inductive
6660 High current lines for electrolytic galvanizing plants
6670 Galvanizing
6675 Tin plating plants
6680 Tin fusion, inductive

11.06. Corrosion protection
6690 Linings and coatings
6700 Coatings, inorganic
6702 Coatings, overlays, expert opinions
6710 Burnishing and corrosion protection
6720 Oilers
6730 Electrophoretic dip coatings
6740 Rubber coatings
6744 Corrosion protection systems
6750 Corrosion and oxidation protection
6755 Oil felt
6760 Powder coatings
6770 Rust protection paints
6780 VPI/VCI corrosion protection papers and films

11.07. Components
6790 Nozzles (also blow-off and descaling nozzles)
6795 Rubber and PU reel covers
6800 Rubber and PU roller covers for the sheet metal finishing industry
6810 Rubber rollers for the sheet metal finishing industry
6820 Spray pipes
6826 Weighing systems for coils and bundles

11.08. Operating materials
6830 Chips and compounds for vibratory finishing
6840 Wire grit
6860 Electrocorundum abrasives
6865 Bonded coatings
6870 Metal cleaners
6880 Phosphating agents
6890 Blasting glass beads
6898 Steel blasting media
6900 Blasting media and technology, general

11.09. Services
6906 Large format surface grinding
6910 Contract finishing

11.10. Wear protection
6914 Ceramic wear protection
6916 Linings and coatings
6918 Wear protection, metallic
6919 Wear protection, general

12 Production of bright steel and wire

6920 Engineering and technical assistance
6925 Second-hand equipment

12.01. Wire rod mills
6930 Wire and fine steel rolling mills
6940 Wire stretching machines
6950 Guiding equipment for wire rod and fine iron rolling mills
6960 Rolling machines for flat wires and wire profiles

12.02. Wire, bar and profile drawing
6965 Drawing tools
6970 Wire drawing machines
6980 Wire drawing machines
6990 Bar and profile drawing machines
7000 Bar drawing benches

12.03. Finishing lines for drawing shops
7010 Automatic stirrup bending machines
7020 Combi automatic machines
7030 Wire straightening and cutting machines
7040 Rotary peeling machines for bars and wire
7050 Bar straightening and polishing machines
7060 Peeling machines for bars
7065 Grinding machines
7070 Grinding machines for bars

12.04. Components
7080 Binding machines for wire rod, concrete and bar steel
7090 Brakes
7100 Seals for rolling mills
7110 Wire cooling lines
7120 Wire coil and coiling machines
7140 Wire and bar pointing machines
7150 Electric rolls and roller tables
7160 Colors for marking equipment
7170 Ink marking systems
7180 Hook web systems
7200 Compactor and press binding systems for wire rod
7210 Reading systems for automatic identification of impact and directly applied characters
7220 Marking systems
7230 Marking inks
7235 Spools for winding and unwinding, rewinding
7240 Stamping machines and stamps for hot and cold operation (also fully automatic)
7250 Heat exchangers

12.05. Operating supplies
7270 Lubricants and process materials
7280 Drawing agents (greases, oils, soaps, etc.)

13 Production of tubes / pipes

7290 Engineering and technical assistance
7295 Second-hand equipment

13.01. Tube rolling mills
7300 Expanding mills
7310 Diescher rolling mills
7320 Forming mills
7330 Sizing mills
7340 Reducing mills
7350 Pipe and expander mills
7360 Pipe rolling mills with planetary piercing mill
7370 Pitch rolling mills
7380 Plug rolling mills
7390 Stretch-reducing mills

13.02. Tube drawing machines
7400 Continuous drawing machines
7410 Tube drawing machines
7420 Drum drawing machines
7430 Drawing benches

13.03. Pipe welding machines
7440 Longitudinal seam pipe welding machines
7450 Pipe welding plants
7460 Spiral pipe plants

13.04. Finishing lines for tubes
7480 Finishing lines
7490 Finishing lines for tubes
7495 Deburring machines for tubes, profiles and solid bars
7500 Travelling cut-off machines
7510 Straightening machines for tubes, sections and bars
7520 Tube bending machines
7530 Pipe end calibrating and upsetting presses
7540 Pipe deburring equipment
7542 Pipe deburring machines
7544 Pipe straightening machines
7550 Pipe straightening presses
7560 Pipe straightening and cutting machines
7570 Pipe grinding machines (internal and external)

13.05. Components
7580 Binding machines
7600 Colors for marking equipment
7610 Paint signing machines
7615 Cleaning machines for tubes, profiles and solids

7620 Pipe pointing machines
7630 Pipe marking equipment
7640 Pipe testing equipment
7650 Pipe sawing machines
7660 Pipe spooling machines
7663 Automatic sawing machines
7665 Technical brushes

14 Sheet metal processing

7690 CAD constructions
7700 Spinning of sheet metal parts
7710 Spinning of sheet metal parts
7720 Engineering and technical assistance
7730 Cold forming of sheet metal parts and panels

14.01. Plants, presses, machines

7740 Bending machines
7750 Strip edge trimming machines
7760 Strip straightening machines
7765 Strip preparation lines for profilers
7780 Sheet metal round bending machines
7790 Sheet metal stacking machines, automatic
7800 Sheet metal forming
7810 Sheet metal working machines, general
7820 Flanging machines
7825 Pressure joining machines
7830 Deburring machines
7835 Deburring machines for tubes, profiles and solid bars
7840 Die bending presses
7845 Hot and cold riveting machines
7848 Hydraulic high-pressure sheet metal forming presses and lines
7849 Hydroforming (IHU)
7850 Hydraulic presses and plants
7860 Hydraulic presses for raw forming
7868 Internal high pressure forming
7870 Cold extrusion presses
7880 Cold forming lines
7882 Press feeding systems
7910 Roller profiling lines
7920 Round forming presses (presses)
7921 Wobble forming presses
7922 Special lines for coil processing
7924 Punching and pre-punching lines
7926 Dividing levelers
7930 Deep drawing presses
7940 Pre-rounding presses (presses)
7945 Feed straightening machines
7947 Roll feeders
7950 Roll forming of strip
7960 Tooling and sheet metal working machines, used

14.02. Slitting lines

7970 Strip slitting lines
7980 Sheet metal cut-to-length and cut-to-length lines
7990 Sheet metal cutting, laser cut
7995 Slitting blades and accessories for slitting lines
8010 Fine blanking lines
8015 High pressure water jet cutting technology
8020 Slitting and cut-to-length lines
8030 Slitting and cut-to-length machines
8040 Laser cutting systems
8050 Plasma cutting systems
8070 Cut-to-length lines
8072 Shears
8075 Shears (standing and flying) for sheet metal working
8080 Second-hand laser beam cutting machines
8090 Blast machine performance tuning
8100 Waste optimization systems

14.03. Welding technology

8110 Deposition welding on rollers etc.
8115 Fire protection blankets made of textile fabric
8120 Strip welding machines
8130 Stud welding machines
8140 Electron and laser beam welding (service)
8150 Electron beam welding machines
8170 Gouging machines
8180 Lattice girder welding machines
8190 Carbon electrodes (welding carbons)
8200 Mould welding
8205 Laser welding machines
8210 Laser beam welding machines
8215 Solder protection mats made of textile fabric
8220 MIG, MAG and TIG \ 057TIG welding torches
8230 Peripheral devices for robots
8250 Repair of cracks and engravings
8257 Rolling seam resistance welding equipment
8260 Repair welding
8280 Welding, general
8288 Welding wire
8290 Welding wire, stainless
8300 Welding wire and filler metals (also from CuAl alloys)
8310 Welding electrodes
8312 Welding protection blankets made of textile fabric
8314 Welding protection fabric up to 1250 °C
8316 Welding protection mats and curtains made of textile fabric up to 1250 °C
8318 Welding protection paste up to 1400 °C
8320 Welding constructions
8330 Welding machines, general
8340 Welding robots
8350 Welding technology, general
8360 Welding accessories, general
8363 Wire mesh welding
8370 Sensor systems for automated welding
8380 Butt welding machines, electric
8400 Resistance welding equipment

14.04. Components

8410 Brakes
8415 Color marking systems
8420 Laser marking equipment
8430 Plate stretcher
8435 Profile Stretchers
8440 Rotary shear blades and accessories
8450 Cutting and punching tools
8470 Marking pins for metals
8480 Deep drawing tools

14.05. Services

8481 Electron and laser beam welding
8482 Laser cutting of steels and sheet metal processing
8483 Laser welding
8484 Water jet cutting of steels
8485 Tube laser cutting
8486 Large format surface grinding

15 Steel products

15.01. Rolled steel

8489 Folded profiles, welded structural elements
8490 Aluminized sheet (hot-dip aluminized or roll clad)
8500 Aluminum-zinc coated steel sheet
8510 Antiphon sheets
8520 Elevator guide rails
8530 Strip steel, hot rolled
8540 Machined sheet
8550 Container bottoms
8560 Coated sheet (painted, foil coated)
8570 Reinforcing steel
8580 Reinforcing steel in coils, cold-rolled
8590 Reinforcing steel in coils, hot rolled
8600 Reinforcing steel in bars
8610 Reinforcing steel in bars and coils
8620 Reinforcing steel (stainless)
8630 Wide strip, organically coated
8640 Wide strip, cold rolled
8650 Wide strip, hot and cold rolled
8660 Wide flat steel
8670 Wide-flange beams
8672 Cellform beams
8680 Electrical sheet and strip
8690 Enameled steel sheet
8700 Thin sheet in further processed special designs
8710 Thin sheet, cold-rolled
8720 Thin sheet, surface finished
8740 Sheet products, laser welded
8750 Sheet products, mash-seam welded
8760 Flat steel
8769 Sectional steel
8770 Shaped steel (incl. pit lining)
8780 Welded sections
8790 Heavy plate
8795 Heavy plate blanks
8800 Heavy plate products, pressed, dimpled, bent, edge-finished
8810 Heavy and medium plate, incl. lining plate
8820 Semi-finished products
8830 Semi-finished products, continuously cast
8831 Semi-finished products, continuously cast, ingot
8840 Semi-finished products for rolling
8850 Semi-finished products for forging
8860 Superstructure material
8870 Clad steel sheet
8880 Rails
8890 Shipbuilding material
8900 Shipbuilding profiles
8910 Forging semi-finished products
8915 Forged bars
8920 Slit strip

8922 Slit strip, surface finished
8930 Cold drawn special steel sections
8940 Special profiles, hot rolled
8950 Special profiles, hot rolled and drawn for lift trucks, vehicle, machine and pipeline construction
8960 Special profiles, hot extruded
8970 Bar steel (quality, case-hardened, quenched and tempered, spring, free-cutting)
8975 Bar steel (angle steel)
8976 Steel bars (stainless steel, all dimensions)
8980 Steel sheet piling sections (box piles and accessories, driven steel piles)
8981 Steel sheet piling sections (box piles and driven steel piles)
8985 Steel sheet pile sections, box piles, steel piles, anchoring and accessories
8990 Continuous cast billets
8992 Trapezoidal profiles - PUR and mineral wool, sandwich elements, acoustic elements, cassettes
9010 Galvanized steel strip
9020 Galvanized profiled steel sheet
9030 Galvanized steel sheet in sheets and rolls, galvanized strip steel
9040 Honeycomb beams, machined beams
9050 Wire rod
9060 Wire rod, flat or round
9070 Wire rod, round
9080 Wire rod in spring steel grades
9090 Wire rod in cold heading grades
9100 Wire rod in welding wire grades
9130 Rolled steel
9140 Hot wide strip
9150 Tinplate and strip, ultra-fine sheet and strip, tin-plated sheet and strip, special chrome-plated ultra-fine sheet and strip (ECCS)
9160 Y-sleepers

15.02. Pipes

9170 Fittings for pipes, stainless
9180 Large-diameter pipes
9190 Large diameter tubes, spiral welded
9200 Boiler tubes
9220 Flanges, stainless
9230 Oilfield tubes
9260 Clad tubes
9270 Precision steel tubes, welded
9280 Precision steel tubes, seamless and welded (round, oval, square, rectangular and as special sections)
9290 Precision steel tubes, seamless and welded, with surface finishing such as electrogalvanizing, chromating, phosphating, etc.
9300 Tubes prematerial (round and square)
9310 Tubes
9320 Tubes made of degussite
9330 Tubes made of cold-tempered steels, weldable fine-grained steels
9332 Tubes, ceramic
9334 Tubes of circular or square cross-section
9335 Tubes, circular or square cross-section, hot-dip galvanized
9340 Stainless steel tubes
9345 Pipe parts and components
9350 Tube products (U-tubes, also with special radii, coil systems, etc.)
9360 Centrifugally cast tubes (also made of stainless steel)
9370 Special section tubes, welded, cold-rolled
9380 Steel drainage pipes, hot-dip galvanized
9390 Steel pipes, machined
9400 Steel pipes, welded
9410 Steel tubes, seamless
9420 Door reinforcement tubes, welded
9430 Door reinforcement tubes, seamless
9440 Cylinder tubes

15.03. Forgings

9450 vessels (flanges, nozzles, etc.)
9460 Products for general engineering (crankshafts, tools, gears, etc.)
9470 Products for power engineering (generator parts, turbine parts, etc.)
9480 Products for aircraft engine construction (e.g. compressor blades, disks)
9490 Products for shipbuilding
9500 Open die forgings, general
9510 Die forgings, general
9520 Seamless rolled rings
9530 Forgings, general
9532 Non-ferrous forgings (copper and copper alloys, aluminum alloys)

15.04. Railroad rolling stock

9540 Axles
9550 Wheel tires

15.05. Steel in the following delivery forms

9560 Structural steels, general
9570 engineering steels, case-hardening steels, quenched and tempered steels, surface-hardening steels, low-temperature steels, cold-heading steels, fine-grained steels, steels resistant to compressed hydrogen
9580 Stainless steel special remnants (Ia and IIa quality)
9590 Stainless steels
9600 Case hardening steels, foreign standard steels, wear resistant steels
9610 Case-hardened steels, nitriding steels, spring steels, foreign standard steels, wear-resistant steels
9618 ESU remelted steels
9620 Spring steel wire, stainless
9625 Thin sheets
9630 High temperature steels and alloys
9635 Perforated plates
9638 Cold rolled sections
9640 Stainless bars and tubes
9641 Stainless bars
9642 Special sections, hot rolled, hot extruded or drawn
9650 Stainless, acid and heat resistant steels
9655 Stainless, acid and heat resistant steels and alloys
9660 Stainless, acid- and heat-resistant steels and alloys, also heating conductor and resistance alloys
9670 High-speed steels
9680 Special structural steels, alloyed, weldable
9685 Engineering steels, alloyed, weldable
9690 Steels with special physical properties
9696 Chromium-plated steels
9700 Pre-machined steels in bars and plates, rough milled, fine milled, ground
9710 Rolling bearing steels
9714 Mild unalloyed steels
9718 Tool steels, hardened
9720 Tool steels, alloyed and unalloyed

15.06. Drawing and cold rolling mill products

9730 Bright steel (including free-cutting bright steel, bright steel shafts, bright special sections)
9740 Spring steel strip
9750 Cold rolled strip
9751 Hardened strip steel
9755 Cold rolled strip, coated
9760 Cold rolled strip with bright surface
9770 Cold rolled strip with refined surface
9780 Cold rolled clad strip
9790 Cold rolled profiles from hot rolled or cold rolled strip
9800 Cold rolled profiles with refined surface
9810 Body parts
9814 Sheet metal formed parts
9817 Precision strip steel
9820 Pressed, stamped and drawn parts
9830 Steel strip for packaging purposes
9838 Tailored beams
9840 Tailored blanks (sheet blanks)
9850 Formed tube and sheet components for the automotive industry
9860 Drawing and cold rolling mill products
9870 Cylinder tubes for hydraulics and pneumatics

15.07. Wire and wire products

9880 Anchor steel, screwable
9885 Structural steel mesh
9890 Reinforcing wire, reinforcing mats, pit mats
9900 Reinforcing meshes for reinforced concrete
9920 Wire meshes
9930 Wire mesh
9932 Wire mesh
9950 Wire ropes and strands
9960 Wire and wire products
9970 Iron, free-cutting, cold extrusion and cold heading wires
9980 Iron fine and superfine wires
9990 Iron and steel wire, drawn
10000 Spring steel wire, oil hardened
10010 Spring steel wire, unalloyed
10015 Profile wire
10020 Flat and shaped wires
10025 Threaded steel
10030 Other wire products
10035 Prestressing steel
10040 Prestressing steel, prestressed concrete strands
10050 Galvanized and PVC coated iron wire

15.08. Steel construction

10058 Car lifts, mobile
10060 Automatic reinforcement station
10070 Sheet metal structures

10080 Bridge construction
10090 Hall construction
10100 Masts
10110 Steel construction, general
10115 Joining technology in steel construction, general
10120 Steel construction, general
10130 Assembly hall construction

15.09. Services
10140 Deep hole drilling, contract
10141 Deep hole drilling, horizontal
10145 Forming and smoothing
10146 Cutting tool steel

16 Furnace and energy technology

10150 Engineering and technical assistance
10152 Waste gas systems behind electric arc furnaces
10154 Waste heat systems behind walking beam furnaces and pusher furnaces
10160 Complete heating systems
10170 Furnace optimization (conversion to low NOx combustion)
10180 Process control systems for industrial furnaces and energy plants
10190 Rational use of energy

16.01. Rolling mill furnaces
10200 Deep annealing furnaces
10210 Rolling mill furnaces, induction
10220 Rolling mill furnaces

16.02. Forging furnaces
10230 Forging furnaces
10240 Forging furnaces, gas fired
10250 Forging furnaces, induction

16.03. Roller Hearth Continuous Furnaces
10260 Roller Hearth Continuous Furnaces
10270 Roller hearth and walking beam furnaces

16.04. Continuous furnaces for wide strip
10280 Strip heating, inductive
10290 Strip edge heating, inductive
10300 Continuous furnaces for wide strip

16.05. Top-hat furnaces
10310 Top-hat furnaces
10320 Top and pot annealing furnaces

16.06. Vacuum furnaces
10330 Vacuum annealing furnaces
10340 Vacuum hardening furnaces
10341 Vacuum pumps, dry running, for vacuum furnaces

16.07. Hardening and tempering equipment
10350 Quenching baths
10355 Carburizing furnaces
10360 Hardening furnaces
10370 Hardening plants, general
10375 Hardening and tempering plants, electrically heated
10380 Hardening and tempering plants, gas heated
10390 Hardening and tempering plants, with inductive heating
10400 Hardening and tempering plants, with resistance heating
10401 Laser hardening systems
10403 Nitriding furnaces

16.08. Heating furnaces and heat treatment plants
10408 Continuous furnaces
10410 Co-step furnaces
10420 Hardening furnaces
10430 Bogie hearth furnaces
10440 Induction heating plants
10450 Industrial furnaces, used
10460 Chamber furnaces
10470 Conductive heating plants
10480 Furnaces with mechanically driven hearth
10490 Patenting plants for wire
10500 Plasma nitriding plants
10505 Radiators
10510 Roller hearth and walking beam furnaces
10520 Pit furnaces
10530 plug furnaces
10540 Pusher-type, roller and rotary hearth furnaces
10545 Tempering and drying plants
10550 Vertical and horizontal strip furnaces for heat treatments
10560 Heat treatment plants
10562 Heat treatment furnaces (continuous and discontinuous)
10570 Heat treatment furnaces for batch operation, open heated

16.09. Bath furnaces
10580 Aluminum melting furnaces
10582 Aluminum melting and holding furnaces
10590 Furnaces and plants for lead coating, galvanizing and tinning
10600 Salt and metal bath furnaces

16.10. Industrial furnaces for special purposes
10610 Furnaces for the ceramic industry
10615 Lime kilns
10620 Inert gas, vacuum furnaces
10630 Tempering furnaces
10640 Drying furnaces for casting cores, molds and mold covers
10650 Drying furnaces for stopper rods
10652 Microwave ovens / dryers
10660 Accessories for industrial furnaces

16.11. Protective gas plants
10670 Protective gas plants

16.12. Insulations
10680 Block insulation
10690 Firing pads
10700 Calcium silicate
10710 Insulation materials
10720 Vibration protection
10730 Backing insulation
10732 Electrical insulation systems for arc furnaces and transformer houses
10735 Heat protection and insulation products
10740 Insulating and sealing boards, asbestos-free
10744 Insulating fabrics up to 1260 °C
10746 Insulating cords, tapes, packings and hoses up to 1260 °C
10748 Support arm insulations, asbestos-free
10750 Insulating bricks
10760 Cooling pipe insulations
10770 Furnace components
10780 Sound insulation
10790 Vibration insulation
10800 Thermal insulation
10803 Wool felt for bright annealing furnaces

16.13. Components
10805 Exhaust technology
10810 Bath rollers
10820 Belt coolers, belt dryers
10830 Block pressers
10840 Block and slab pushers for heating furnaces
10850 Burners for gas and oil
10860 Custom-made burners
10870 Feeding and discharging machines
10880 Electric heaters
10890 Natural gas burners
10895 Furnace probes (for the use of video cameras)
10900 Gas burners
10910 Generators for protective and reaction gases
10915 Hardeners
10920 Heating conductors
10930 Hearth rollers
10950 pulverized coal furnaces (also -plants)
10960 Laser light barriers
10970 Oil burners
10990 Furnace riders
11000 Furnace rollers
11005 Plasma generators
11010 Regenerative burners
11020 Recuperative burners
11028 Recuperators
11030 Recuperators, regenerators
11040 Rollers (e.g. from SIC)
11050 Safety devices for EAF oxygen-fuel burners
11060 Jet tubes
11070 Radiant tube burners
11078 Vacuum pumps, dry running, for vacuum furnaces
11080 Heat exchangers
11090 Heat recovery systems
11092 Weighing systems for melting furnaces
11093 Wool felt for bright annealing furnaces

16.14. Operating materials
11110 Hardening agents (also hardening powders and carbon restoration agents)
11120 Hardening oils
11150 Fire-resistant hydraulic fluids

11160 Polymer solutions
11170 Lubricants
11180 Spray cleaners
11190 Heat transfer fluids

16.15. Services
11200 Energy consulting
11210 Energy saving
11215 Commissioning, maintenance and service of heating equipment
11240 Planning and projecting of energy-technical plants

17 Refractory technology

11245 Product know-how for basic refractory bricks and mixes
11248 Monitoring of refractory components

17.01. Raw materials, precursors and binders for refractory materials
11250 Aluminum hydroxide
11260 Alumina, alumina
11263 Reinforcing wires for refractory mixes
11265 Binders for the production of refractory materials
11270 Electrocorundum
11280 Graphite
11290 Adhesive sand
11300 Coke breeze
11310 Coke breeze, dry
11320 Magnesium oxide
11330 Microsilica
11360 Silicon carbide
11366 Titanium dioxide
11370 Clays
11380 Alumina specialties
11390 Zirconia

17.02. Plants for the production of refractory materials
11400 Equipment for the production of refractory materials

17.03. Refractory materials and equipment
11410 Tapping stones for converters and electric arc furnaces
11420 Painting, filling and plastering materials
11430 Basic ramming, gunning and casting mixes
11440 Basic bricks (magnesia, magnesia-chromium, chromium ore, chromite, dolomite, spinel, forsterite and carbon bricks)
11450 Calcium silicate
11460 Dolomite products
11470 Electrode masses
11480 Fiber ceramic moldings, vacuum formed
11481 Fiber ceramic moldings, vacuum formed, up to 1750 °C
11485 Fiber mats and felts up to 1600 °C
11490 Fiber products, ceramic
11500 Prefabricated parts, refractory
11510 Refractory concrete
11512 Refractory concrete, high strength, for industrial floors
11520 Refractory products, general
11530 Refractory ramming mixes
11540 Refractory anchorages
11550 Refractory material
11560 Lightweight refractory bricks
11570 Lightweight refractory and insulating mixes
11580 Lightweight refractory and insulating bricks
11590 Gas purging equipment, refractory
11600 Pouring mixes, self-flowing
11610 hearth masses
11620 High-fire bricks
11630 Blast furnace bricks
11640 Induction furnace mixes
11650 Insulating material, asbestos-free
11660 Isostatically pressed products
11670 Carbon and graphite bricks
11690 Converter bricks
11700 Arc furnace bricks
11710 Perforated bricks
11720 Masses, refractory (general)
11725 MgO-C bricks
11730 Mortars and mastics, refractory
11740 Mux masses
11750 Ladle masses
11752 Torpedo ladle lining
11755 Ladle lining, monolithic
11760 Ladle bricks
11768 Products made of \ 050HTW \ 051 high temperature wool
11790 Gutter and taphole masses
11800 Gutter lining, cooled
11810 Acid resistant bricks
11820 Acid ramming and centrifugal masses
11830 Firebricks
11840 Shadow pipe
11850 Slide gate ceramics
11860 Cast basalt
11865 Protective blankets made of textile fabric, refractory
11870 Silicon carbide bricks
11880 Silica bricks, tondina bricks
11886 Special adhesives up to 1200 °C
11890 gunning and repair compounds
11900 Steel mill wear material
11910 ramming, casting and vibrating masses
11915 ramming, spraying and casting compounds
11920 Stoppers and spouts
11930 Continuous castings, refractory
11940 Immersion tube, monota immersion spout
11950 Technical ceramics
11960 High-alumina bricks (andalusite, bauxite, corundum, mullite, sillimanite bricks)
11970 Torpedo mixer stones
11980 Tundish masses
11985 Pouring compounds, cement-free, for blast furnace tapping troughs
11990 Vermiculite
12000 Thermal insulation materials, asbestos-free
12004 Vacuum formed parts
12005 Vacuum formed parts, without ceramic fibers
12010 Wollastonite
12020 Zircon nozzles
12030 Zircon containing stones
12040 Zircon sand / flour)

17.04. Processing of refractory materials
12050 Processing of used refractory materials
12060 Testing of FF materials

17.05. Machines for refractory construction
12070 break-out hammers, pneumatic and hydraulic, for electric furnaces, converters, ladles and troughs
12071 Excavation robots
12075 Chipper
12080 Converter tap hole repair vehicles
12095 Converter lining devices
12100 Manipulators for FF masses
12110 Ladle spraying machines
12118 Pumping machines for refractory materials
12120 Pumping machines for refractory materials
12130 Centrifugal machines for FF-masses
12140 Spraying machines for FF materials
12150 Tamping plants, autom., for ladles

17.06. Refractory construction
12160 lining of all kinds of furnaces
12170 Firing chambers
12175 Refractory anchors
12180 Refractory construction
12190 Refractory ramming mixes
12200 Suspended ceilings

17.07. Services
12204 Training - Refractory
12205 Refractory maintenance at operating temperature
12206 Refractory systems

18 Machinery and plant engineering

12210 Plant engineering, general
12220 CAD design
12230 Engineering and technical assistance
12240 beams, columns, shafts
12250 Industrial Engineering
12258 Standard parts for cutting and punching tool construction
12260 Cleaning and cleaning materials
12270 Second-hand machines (purchase and sale)
12280 Special constructions
12285 Heat exchangers

18.01. Mining equipment, machines and supplies
12290 Plants and machines for underground mining
12300 Bucket elevators
12309 Conveyor systems
12310 Conveying plants and machines
12330 Mine support profiles

18.02. Chemical plants and accessories
12350 Tank and apparatus construction
12360 Liquid gas - storage stations
12370 Gas tanks
12390 Acid chimneys
12400 Acid and chemical resistant plants and equipment
12410 Nitrogen production plants

18.03. Steam generation plants and equipment
12425 Exhaust gas technology
12430 Waste heat boilers
12440 Steam filters
12450 Steam boilers, general
12460 Pressure boilers
12470 Hydrazine removal
12480 Pulverized coal firing systems

18.04. Foundry equipment, machinery and supplies
12354 Casting ladles
12500 Molding machines
12530 Foundry equipment, machines and supplies
12535 Foundry tools
12540 Foundry consulting and engineering
12542 Foundry software
12550 Core shooters
12560 fettling machines
12570 Robots
12580 Sand mixers
12586 Melting furnaces, inductive
12590 Shaking ladles
12592 Crucible tongs
12605 Vacuum investment casting plants-superalloys
12607 Vacuum investment casting plants with cold crucibles for titanium or titanium alloys

18.05. Power plants and power stations
12610 Power plants and power stations, steam
12620 Power plants and power stations, electric

18.06. Ventilation plants and equipment
12630 Blowers
12635 Industrial fans
12650 Air conditioners, general
12660 Air conditioners for heat plants
12670 Air conditioners for crane lances, crane bridges, etc.
12690 Expansion joints
12700 Ventilation ducts
12710 Ventilation systems and equipment, general
12720 Natural ventilation
12730 Induced draught systems and equipment
12740 Ventilators

18.07. Water treatment plants, equipment and accessories
12750 Chemical water treatment
12760 Pressurized water plants and accumulators
12770 Filtering plants for circulating water
12780 Rubber compensators
12790 Cooling towers
12793 Cooling water / circulating water systems
12796 Magnetic filters
12800 Press water additives
12810 Water treatment systems
12830 Water demineralization, treatment and recycling
12840 Water recooling systems
12846 Water filtration

18.08. Other plants
12848 Chillers
12850 Slag granulation hoses
12860 Slag recycling plants (also slag granulation plants)
12862 Slag granulation plants
12870 Lube oil plants

18.09. Maintenance
12880 Spare parts and consumables
12890 Maintenance, general
12892 Maintenance organization
12894 Maintenance systems
12896 Repair, overhaul and modernization of machine tools
12900 Maintenance of large gear units
12920 Maintenance of continuous casting plants for ingots and slabs
12930 Maintenance of continuous casters for ingots and billets
12950 Repair of ingot molds
12960 Repair of ingot molds
12964 Cooling system cleaning
12970 Ladle repair, FF
12980 Repairs, spare parts
12983 Software for maintenance
12990 Preventive maintenance
13000 Heat exchanger cleaning
13010 Condition based machine maintenance

18.10. Power and work machines
13020 Steam turbines
13021 Gas turbines
13030 Rotary compressors
13040 Compressed air equipment
13050 Natural gas, gas transmission compressor stations
13060 Natural gas HP storage
13070 Piston pumps
13080 Piston compressors
13083 Corrosion resistant pumps
13090 Centrifugal pumps
13100 Mixing units for all fuel gases
13120 Lubrication pumps
13130 Screw compressors
13150 Turbo compressors
13160 Vacuum pumps

18.11. Gearboxes and drive elements
13168 Drive elements
13170 Drive engineering
13174 Valve gearboxes
13180 Brakes
13190 Brake disc mounting
13195 Torque limiter
13200 Flange couplings
13210 Cardan joints
13220 Cardan shafts
13230 Gear rollers
13240 Gearboxes and drive elements
13250 Large gearboxes
13255 Chain drives and sprockets
13260 Hirth serration
13261 Hirth spur gearing
13270 Couplings
13285 Couplings, flexible, elastic
13290 Couplings, mechanical and hydrodynamic
13300 Planetary gearboxes
13308 Slew drives
13310 Safety couplings
13318 Spindles
13320 Special constructions
13350 Shaft-hub couplings (backlash-free)
13360 Shaft couplings (rigid)
13370 Winding shafts
13380 Gear drives
13390 Gear wheels
13395 Gearbox repairs

18.12. Bearings
13400 Slewing rings
13404 Elastomeric bearings
13406 Spherical plain bearings / rod ends
13410 Plain bearings
13420 Ceramic-metal compact plain bearings
13430 Ball bearings
13440 Cam rollers
13460 Linear systems
13470 Roller bearings
13480 Yoke type track rollers
13484 Thermal separation
13485 Support and guide rollers
13490 Rolling bearings
13492 High-temperature rolling bearings
13500 Roller bearings

18.13. Oil hydraulic systems, equipment and accessories
13508 Rotary distributors
13510 Rotary feeders
13520 Pressure measuring, switching and writing devices
13530 Pressure switch
13540 High pressure flange connectors
13550 Hydraulic systems
13560 Hydraulic and shaft seals
13570 Hydro gears
13580 Hydro motors
13590 Hydro pumps
13595 Hydraulic accumulators
13600 Hydro valves
13610 Hydraulic cylinders
13620 Oil hydraulic systems, devices and accessories
13630 Vibration dampers
13640 Servo valves
13645 Continuous valves
13660 Complete plants, oil hydraulic
13670 Water hydraulic

18.14. Control systems and components
13680 Shut-off valves

13690 Automatic inflow control with distribution gate valves
13695 Torque limiters
13710 Electro-hydraulic actuators
13718 Electro-servo cylinders
13720 Multipoint single and multi-purpose regulators
13730 Control systems, complete
13740 Control valves
13760 Actuators
13780 Continuous single and multi-purpose regulators

18.15. Piping and accessories

13786 Exhaust gas technology
13790 Butterfly valves
13800 Asbestos-free fabric expansion joints
13810 Fittings
13820 Flanges
13840 Rubber expansion joints
13850 High pressure pipe technology
13859 Safety valves
13860 Expansion joints
13890 Pipe break safety valves
13900 Pipe swivels
13910 Piping and accessories
13920 Pipeline construction
13930 Piping accessories
13940 Check valves
13945 Hoses
13947 Flexible hoses with ceramic wear protection
13950 Plug-in disc gate valves

18.16. Stranding machines

13955 Stranding machines
13958 Rope making machines

18.17. Tool and model making

13956 Mold frames, mold assemblies
13960 Materials for model and prototype construction
13970 Model and prototype making

18.18. Machine tools

13980 Cutting-off machines
13990 External thread cutting machines
14000 Band sawing machines
14010 Bending and straightening machines
14015 Slab sawing machines
14020 Wire working and processing machines
14030 Flow-forming machines
14040 Milling machines
14060 Spark erosion machines
14070 honing and lapping machines
14080 Cable sheathing presses
14081 Cable sheathing presses (lead and aluminum)
14088 Sharpening machines
14090 Cold circular saws
14095 Hot circular saws
14100 Mould processing machines
14120 profile and flat shears
14130 Shears (standing, flying) for metallurgical operations
14140 Shears (standing, flying) for sheet metal working
14150 Shearing centers
14160 Grinding and polishing machines (also internal)
14170 Special machines for chip forming
14180 Special machines for chipless forming
14190 Special machines for special tasks
14195 Concrete sawing machines
14200 Stone cutting saws
14210 Plate shears
14220 Cut-off machines

18.19. Tools

14230 Press brake tools
14240 Drills
14242 Taphole drilling tools
14250 Diamond tools
14260 Pneumatic tools
14280 Carbide (also metal carbide)
14290 Tungsten carbide inserts and molded parts
14300 Carbide tools
14302 HM tipped saw blades
14304 HP grinding wheels
14306 Saw bands and blades for metallic and non-metallic materials
14310 Saw blades for metal
14318 Cutters
14320 Shear blades
14323 Splitting knives and accessories for splitting lines
14330 Abrasives and grinding wheels
14334 Special tools for die casting industry
14336 Cutting wheels
14337 Roll grinding wheels
14338 Cutting and special tools

18.20. Clamping technology

14380 Clamping hydraulics
14400 Clamping elements
14401 Clamping tools, screws

18.21. Components

14410 Seals
14412 Seals with high chemical and thermal resistance
14420 Rotary seals for feeding gases or liquid media
14430 Cooling water circulation units for continuous casting-rolling lines
14440 Nozzles (also blow-off and descaling nozzles)
14450 Pistons
14460 Metal hoses
14470 Buffers (rubber and cellular buffers)
14480 Stuffing box packings
14490 Wear plates

18.22. Operating fluids

14500 Solid lubricants
14510 Industrial oils
14520 Cooling lubricants

18.23. Tribology

14522 Dosing and monitoring equipment for lubricants
14523 Oil circulation systems for bearing and gear lubrication
14524 Two-line grease lubrication systems for metallurgical plants and rolling mills
14525 Special lubricants
14526 Central lubrication systems
14527 Machines for degreasing and lubrication

18.24. Services

14528 Service for compressors and turbines
14529 Mechanical processing of hydraulic parts

19 Transport and storage technique

14530 Engineering and technical assistance
14535 Hot material conveyors
14540 Transport and logistics for industrial residues
14545 Hot material conveyors
14548 Transport
14550 Transport technology

19.01. Metallurgical plant vehicles

14560 Slab, bloom and billet transporters, rubber tires
14570 Coil transport systems
14580 Coil transporters
14590 Steel mill vehicles, general
14600 Metallurgical plant vehicles, track-bound
14605 Air cushion vehicles-FTS
14610 Slag ladle transporters
14620 Slag transporter
14630 Scrap transport trailers with weighing equipment
14640 Steel mill vehicles

19.02. Rail vehicles

14650 Diesel locomotives
14660 Railroad wagons
14670 Self-propelled wagons

19.03. Track technology

14680 Turntables and transfer cars
14684 Track technology
14690 Shunting systems

19.04. Trackless vehicles

14700 Trailers
14705 Trucks and trailers
14720 Electric industrial trucks
14730 Electric trucks
14734 Electric four-way sideloaders
14740 Driverless transport systems
14742 Driverless transport systems for steel and aluminum coils
14750 Forklifts and cross stackers
14760 Rubber-tired heavy-duty transport vehicles
14810 Heavy-duty tractors
14820 Telescopic excavators
14822 Transport systems for coils

19.05. Continuous conveyors

14830 Conveyors (general)

14840 Pneumatic conveyors
14850 Vibratory conveyors
14860 Vertical conveyors
14880 Steep conveyors
14890 Continuous conveyors for bulk material
14900 Continuous conveyors for piece goods
14910 Conveyor belts and screws
14920 Trough chain conveyors

19.06. Cranes

14930 Slewing cranes
14940 Casting cranes
14945 Crane systems, automatic
14946 High capacity automatic cranes
14950 Cranes, hoists and accessories, general
14955 Crane service
14960 Overhead travelling cranes
14970 Gantry cranes
14980 Bracket cranes
14990 Buffers
14992 Vacuum lifting devices for heavy industry
14993 Automatic stacking devices (vacuum lifting devices)

19.07. Scales

14997 Bundle and coil scales
15000 Batching and blending scales
15010 Track and truck scales
15020 Crane scales
15030 Roller table scales
15040 Scales for continuous weighing
15041 Scales for alloying elements
15042 Scales for pig iron
15043 Scales for scrap
15044 Scales for static weighing
15045 Scales for stationary weighing
15050 Weighing systems for ladle turrets and ladle cars
15060 Load cells
15080 Weighing systems for silos

19.08. Storage and retrieval systems

15090 Bund high-bay warehouse
15100 Container staging systems
15110 Labeling systems
15120 Lattice girder storage systems
15130 Manual overhead conveyors
15134 Aerial work platforms
15140 Storage technology and automation systems for sheet metal, long goods and stacking boxes
15141 Storage technology and automation systems for sheet metal, long goods and stacking boxes
15150 Storage and retrieval systems
15155 Storage systems for coils
15160 Storage and racking systems
15164 Long goods order pickers, high rack stackers
15170 Marking systems
15180 Pallets and cassettes
15188 Vertical elevators (paternosters)
15190 Stacker cranes
15193 Traversers and turning devices
15195 Honeycomb racking systems

19.09. Warehouse organization

15198 Labels
15200 Identification
15208 Warehouse logistics
15210 warehouse organization)

19.10. Components

15220 Slinging equipment
15230 Loading and unloading equipment
15240 Sheet metal package tongs
15250 block pushers, extractors
15270 Bunker discharge aid
15280 Bunker and silo equipment
15290 Coil and sheet metal packaging
15300 Coil tongs
15310 Permanent magnets
15320 Electrical equipment for cranes etc.
15330 Electric hoists
15333 Distance measuring devices for cranes
15335 Labels
15340 Conveyor belt cover
15350 Conveyor belt scraper
15360 Conveyor devices and equipment
15370 Conveyor belt splices
15380 Conveyor belt vulcanizing equipment and material
15390 Grippers and tongs
15400 Handling machines
15410 Lifting clamps, safety lifting clamps
15420 Industrial robots, metallurgical, sensor controlled
15430 Chains
15431 Sprockets
15440 Tipping eyes, tipping shackles
15450 Crane wheels
15455 Crane ropes
15460 Storage yard equipment
15470 Laser distance measuring devices for cranes
15480 Load lifting belts
15490 Lifting magnets and equipment
15500 Magnetic brakes
15510 Magnets, magnet systems
15511 EGIS safety device for electric lifting magnets
15520 Wheels
15530 Corrosion, friction and wear protection
15540 Bulk containers
15550 Pulleys
15555 Safety device for electric load lifting magnets
15560 Separation magnets
15570 Silos for FF-masses
15580 Silos for bulk materials
15590 Handling plants for bulk materials
15600 Deflection rollers
15610 Packaging technology
15620 Wear protection coatings with aluminum oxide ceramics
15630 Wear protection coatings with rubber
15632 Wear protection technology
15635 Track-bound tippers
15640 Wagon tipper
15650 Hot transport and cooling hoods for steel ingots
15652 Weighing systems for steel production

19.11. Operating materials

15660 Lubricants

19.12. Packaging technology

15662 Automated packing stations for coils and long goods
15664 Packaging materials

20 Electrical engineering and automation

15670 Electromechanical actuators
15680 Engineering and technical assistance
15690 Technical translations and documentation

20.01. Electrical equipment for metallurgical plants and rolling mills

15700 Workplace design systems
15720 Three-phase motors
15730 Electrical equipment for metallurgical plants and rolling mills
15740 Electrical equipment for rolling mills
15750 Large electrical installations, complete
15760 Power supply systems for mobile consumers
15770 Spring cable reels
15780 Spring hose reels
15785 Radio remote controls
15788 Radio systems
15790 Radio control systems
15800 Gear motors
15810 DC motors
15820 High current cables and lines, water cooled
15830 Cables and wires
15840 Cables, cable reels and accessories
15850 Motorized cable reels
15860 Low voltage switchgears and installations
15870 Switchgears
15880 Slip ring bodies
15890 Fuse systems
15900 Heavy current capacitors
15910 Plugs and socket-outlets
15920 Power converters (frequency converters)
15930 Power supply systems (movable and also busbars)
15940 transformers (also for industrial furnaces)
15960 AC and intercom systems
15962 High voltage feeders and contacts

20.02. Control and automation systems

15967 Electrical, instrumentation and control engineering, general
15968 Installations for anisotropic control technology
15970 Automation, general
15980 Automation plants for ore and fine ore
15990 Automation plants for blast furnaces
16000 Automation plants for industrial furnaces, general
16010 Automation plants for cold rolling mills
16020 Automation plants for coking plants
16030 Automation systems for steel mills
16035 Automation systems for blast furnaces

16040 Automation systems for hot rolling mills and tube mills
16041 Automation systems for hot rolling mills
16050 Automation plants and process control systems in metallurgical plants and rolling mills
16055 Automation of strip processing lines
16060 Automatic detection systems
16063 Strip guiding systems
16070 Data transmission equipment and systems
16080 Industrial television technology
16090 Information and communication systems
16100 Identification
16110 Customized complete systems
16120 Guidance systems (inductive) for vehicles
16130 Control systems (by image processing) for vehicles
16140 Control and automation systems, general
16150 Positioning systems for cranes
16160 Process automation
16162 Process automation for strip processing lines
16170 Process automation for continuous steel casting plants
16180 Process automation for metallurgical plants
16190 Process control systems
16192 Process control with infrared detectors
16200 Process optimization
16202 Process optimization with weighing systems
16205 Shopfloor systems
16210 Control systems, complete
16220 Control stations for metallurgical and rolling mill plants
16230 Control systems, electrical
16240 Control systems, electronic
16250 Control systems for press water tanks
16260 Control systems, hydraulic
16270 Control systems, infrared
16280 Power supplies for automation and control
16290 Networking
16293 Video technology
16295 Weighing systems for process automation in steelworks

20.03. Data processing

16300 Analog devices and accessories
16305 Archiving
16310 Production and machine data acquisition BDE / MDE
16320 Data acquisition devices and systems
16330 Data processing
16338 Digital image processing
16340 Digital devices and accessories
16350 Expert systems
16355 Manufacturing Execution System (MES)
16360 Turnkey system solutions, hardware \ 057software
16380 X-Window Terminal

20.04. Software

16390 Simulation software
16393 Software for archiving, document management and workflow
16395 Software for order processing, warehouse and test certificate management
16400 Application software
16410 Software for slitting lines
16415 Enterprise resource planning system for metal and steel trade
16420 Software for production planning and control
16430 Software for statistical process control and quality assurance
16440 Technical calculation programs

20.05. Maintenance

16450 Machine diagnostics
16460 Maintenance and inspection

21 Measuring and testing technique

16470 Gas measuring instruments for degreasing plants
16472 Gas measuring devices for metal degreasing plants
16480 Gas measuring devices for metal cleaning plants
16488 Multichannel measuring systems

21.01. Measuring and testing technology, general

16490 Automation and metrology, color measurement
16500 Pressure transducers
16508 Corrosion testers
16510 Metrology
16511 Measuring magnetism
16520 Measuring and testing systems, general
16530 Measuring and testing systems, general
16540 Measurement value acquisition
16550 Measured value processing
16552 Measuring and test equipment identification labels
16553 Measuring equipment and test status identification labels
16560 Radioactivity warning systems
16564 Recorder systems, paperless
16566 Pre-warning of melt breakthroughs and residual wall thickness measurement on refractory linings
16568 Roll gauges

21.02. Measurement of physical properties

16570 Distance measuring system
16580 Distance sensors for positioning and length measurement (laser, ultrasonic, optical, inductive and capacitive)
16581 Distance sensors for positioning and length measurement (magnetostrictive)
16590 Bath mirror measurement in converter
16600 Bath mirror control
16608 Strip thickness control (AGC)
16610 Strip sag measuring device
16612 Strip flatness measurement
16613 Strip flatness control
16615 Strip guiding system
16620 Tape tension measuring systems
16625 Tension measuring system for driven S-rolls
16630 Width measuring devices
16640 Strain gauges and measuring strips
16645 Strain measuring systems
16650 Strain and mass flow measuring systems
16652 Dressing degree and mass flow measuring systems
16660 Thickness measuring systems and devices
16670 Thickness gauges
16680 Distance switches and measuring devices (optical, acoustic and inductive)
16690 Torque measuring devices for S-rollers
16700 Torque measuring device
16710 Speed measuring devices
16720 Flow meters
16721 Flow measuring devices, capacitive, e.g. for coal injection
16730 Flow monitoring
16740 Diameter measurement
16750 Electrical measurement of mechanical quantities
16755 Electronic measuring system for hydraulic and lubricating oils
16770 Form measurement
16780 Level measuring devices
16790 Level control
16800 Level control
16810 Gas measuring instruments
16815 Oxygen sensors for waste gas
16820 Equipment and chemicals for waste water control
16830 Speed measuring devices
16850 Infrared switch
16860 Infrared radiation pyrometer
16861 Infrared radiation thermometer with scanner
16870 Infrared radiation pyrometer with scanner
16871 Infrared Radiation Thermometer
16875 Infrared thermography
16877 IR camera - infrared based slag detection
16878 Cameras, furnace cameras
16879 Cast iron temperature measurement
16880 Insulating capillary
16890 Force measuring devices for tension and compression
16891 Force measurement and weighing systems
16892 Force measuring systems
16900 Cooling water monitoring
16910 Length measuring devices for tubes
16920 Linear encoders
16930 Linear encoders (also for ways and distances)
16940 Linear encoders, ultrasonic (also for ways and distances)
16950 Length and speed measuring systems (optical)
16960 Laser speed and length measuring systems
16970 Conductivity and pH meters
16980 Mass flow meters
17000 Measurement of refractory linings (in operating condition)
17010 Measuring devices for electrical quantities
17020 Measuring machines

17030 Measurement printers
17033 Microstructure / roughness measurement
17035 Surface crack detection
17040 Opto-electronic measuring instruments
17050 Flatness measuring devices
17057 Profile measuring devices
17060 Profile measuring systems (non-contact)
17080 Pyrometer
17090 Pyrometer tubes
17100 Ratio pyrometer
17105 Inline concentration measurement of liquids
17110 Probes for liquid pig iron
17120 Tube measuring equipment
17130 Coating thickness gauges
17133 Coating thickness control
17135 Layer thickness control
17138 Slag detection with infrared
17140 Slag detectors
17160 Forging measurement
17180 Vibration measuring devices
17190 Rope testing equipment for round and flat steel ropes (rope belt conveyors)
17200 Dust measuring equipment
17210 Equipment for radiation measurements
17220 Systems for nuclear radiation measurement (input control)
17230 Immersion thermocouples
17250 Temperature measurement equipment
17255 Temperature profile measuring systems
17260 Thermocouples
17270 Thermocouple protection tubes
17274 Thermographic measurement
17280 Thermal conductivity measuring systems
17290 Rolling mill force measuring systems
17300 Rolling mill measuring systems
17310 Resistance thermometers
17320 Line scan cameras
17322 Non-destructive thickness measurement of refractory linings (during furnace shutdown)
17325 2-color pyrometer with fiber optics

21.03. Quality management

17340 3-D profile measurement of rails and other profiles
17341 3-D profile measurement of weld seams
17345 Pickling bath monitoring
17350 Breakdown early detection
17352 Breakdown early detection and monitoring
17360 Breakdown monitoring
17365 Chrome bath monitoring
17368 Roller emulsion control
17370 In-line surface inspection, optical
17380 Measuring instruments for quality management
17384 Mold control
17390 Length, speed and profile measuring systems
17400 Hole detection
17408 Surface inspection
17409 Surface inspection systems
17410 Surface inspection
17415 Surface inspection of strip steel
17426 On-line measurement of oils and waxes
17430 On-line surface inspection, optical
17432 On-line surface quality inspection, optical
17440 On-line roughness measurement
17445 Systems for quality data acquisition and processing

21.04. Quality control

17446 Strip edge inspection
17447 Strip steel surface inspection, automatic and complete
17448 Strip steel surface inspection, automatic and complete
17450 Quality control, visual
17460 Testing services

21.05. Services

17470 Metrology services

22 Materials testing

17473 Destructive and non-destructive materials testing

22.01. Non-destructive materials testing

17480 Consulting, execution, equipment
17490 Image processing, barcode readers
17500 Demagnetization equipment
17510 Internal pressure testing equipment
17520 Corrosion testing
17530 Measuring and testing machines
17536 Training and certification for NDT
17540 Ultrasonic testing equipment / machines
17560 Non-destructive testing of round and flat steel cables
17570 Non-destructive pipe testing equipment
17580 Non-destructive material testing equipment, general
17589 Non-destructive material testing equipment, acoustic
17590 Non-destructive material testing equipment, electromagnetic
17620 Non-destructive material testing equipment, optical
17630 Non-destructive materials testing with X-rays
17640 Non-destructive materials testing with acoustic emission analysis
17650 Non-destructive materials testing equipment with ultrasound
17660 Non-destructive materials testing
17664 Non-destructive materials testing with fluorescent and red / white penetrant methods
17665 Non-destructive material testing with fluorescent and red / white test method
17670 Non-destructive materials testing with coupling agent-free ultrasonic excitation
17680 Non-destructive materials testing, optoelectronic
17690 Non-destructive materials testing (service)

22.02. Strength testing, endurance testing

17698 Fixtures for tensile testing
17700 Stress analyses and reliability tests on machines and components
17710 Consulting, execution, equipment
17720 Fatigue testing machines
17730 Hardness testers
17740 Hardness testing equipment
17750 Machines for tensile test preparation
17760 Friction and wear testing machines
17770 Crack testing machines
17780 Pipe testing presses
17790 Torsion testing machines
17800 Universal testing machines for tension, compression, bending and tensile tests

22.03. Technological testing methods, testing service

17810 Chemical analyses
17820 Grain size analysis
17830 Mechanical-technological testing
17840 Metallographic testing
17850 Technological testing
17852 Technological testing, microscope image analysis
17860 Deep drawing testing machines for sheets and strips
17870 Conversion of conventional universal testing machines to electronic measurement with data processing
17880 Roll testing (concentricity, eccentricity)

22.04. Destructive material testing

17888 Corrosion testing
17890 Machines for the production of notched bar impact specimens

22.05. Fatigue testing

17896 Testing of safety valves in operating condition

22.06. Damage analysis

17898 Damage analysis

23 Analysis and laboratory equipment

17900 Engineering and technical assistance

23.01. Sampling and sample preparation

17910 Gas probes, gas sampling probes
17915 Sampling
17920 Sampling equipment
17940 Sample punching
17950 Sample transport
17960 Sample preparation
17970 Sample preparation for X-ray fluorescence analysis
17980 Sample preparation for OES and XRF (X-ray testing)
17990 Sample preparation machines
18000 Spectrometer sample preparation with remelting equipment
18010 Punching tools for samples

23.02. Analytical equipment

18020 Analytical instruments
18022 Devices for inline concentration measurement of liquids
18025 Analyzers for oxygen measurement

18027 Automated analyzers for process control and wastewater management
18030 Automation equipment for analysis and laboratory
18040 Gas analyzers
18048 Laser induced fluorescence
18050 Laser plasma spectrometer
18059 Mass spectrometers
18060 Conductivity and pH measuring instruments
18070 Oil-in-water monitoring in the laboratory and in industry
18080 Optical emission spectrometers
18090 O2 analyzers
18100 Plasma spectrometers
18105 X-ray diffractometers
18110 X-ray fluorescence spectrometer
18120 X-ray fluorescence spectrometers, portable
18130 Oxygen probes
18138 Heavy metal analysis in water, laboratory, field, process and online
18140 Nitrogen analyzer system for direct determination
18150 Nitrogen probes
18160 Hydrogen analysis system for direct determination
18170 Hydrogen probes
18180 Accessories for analytical technology

23.03. Laboratory equipment, general

18190 Analytical standards
18200 Analytical reference material
18202 Equipment for sample preparation for OES and XRF (X-ray testing)
18210 Calibration samples
18220 Annealing boxes
18230 Laboratory furnaces
18240 Laboratory equipment
18250 Laboratory automation
18260 Shuttles
18264 Shuttles and HF crucibles for C+S determination
18270 Spectral samples
18280 Crucibles

23.04. Metallography

18290 Services
18300 Metallography equipment
18310 Metallographic laboratories
18320 Metallographic testing

24 Environmental protection and disposal

18330 Consulting and measurement
18340 Engineering and technical assistance

24.01. Dedusting and gas cleaning

18342 Exhaust gas technology
18348 Oxygen sensors for exhaust gas
18350 Exhaust systems
18360 Exhaust gas cooling systems
18362 Exhaust gas cooling with heat recovery
18370 Exhaust gas cleaning systems
18375 Secondary exhaust gas cleaning systems
18376 Sintered exhaust gas cleaning systems
18377 Desulfurization of sinter flue gases
18378 Exhaust gas cleaning for pellet plants
18380 Waste heat boiler
18390 Aerosol separation
18400 Treatment of dusts from steel mills and foundries
18410 Electrostatic precipitator
18420 Dedusting and gas cleaning
18430 Dedusting plants and accessories, general
18440 Dedusting filters and plants (cassette, cartridge, round, bag, pocket filters, etc.)
18450 Denitrification plants
18460 Denitrification catalysts (DENOX)
18470 Fine dust removal for sinter plants
18480 Filter media
18490 Gas recovery plants
18500 Fabric filters
18510 Casting shop dedusting
18515 Blast furnace exhaust gas cleaning
18520 Hot gas filtration
18530 Industrial vacuum cleaners
18535 Catalytic plants
18536 Catalyst service
18540 Compact air cleaner
18550 Laser Clean Box
18560 Air filters (also in-line filters)
18570 Multicyclones and cyclones
18580 Afterburning, catalytic
18590 Afterburning, thermal
18600 Wet dust collectors
18608 Wet dedusting systems
18610 Wet fine dust removal for sinter plants
18615 Wet electrostatic precipitators
18620 Wet cleaning plants
18630 Flue gas desulfurization for boiler and sinter plants
18640 Flue gas cleaning plants for waste and hazardous waste incinerators
18650 Dust collectors
18660 Dust measuring devices
18670 Dust recovery plants
18690 Thermal exhaust air purification
18693 Dry exhaust gas cleaning plants
18700 Dry dedusting plants (also rotary flow dedusters)
18710 Dry cleaning plants
18720 Venturi dust collectors
18728 Central exhaust systems
18730 Central dust extraction plants

24.02. Waste water treatment

18740 Waste water plants, grease separators, chemical pumps
18750 Waste water treatment
18755 Waste water treatment, thermal
18756 Wastewater treatment for wastewater containing oil and grease
18760 Wastewater treatment plants
18770 Chemical water treatment
18774 Evaporation plants
18790 Wastewater treatment plants
18800 Recirculation systems
18802 Recirculating water treatment
18810 Solvent recovery plants
18820 Neutralization and detoxification plants
18830 Sludge dewatering, mobile
18840 Sludge dewatering, stationary
18842 Water management

24.03. Regeneration plants

18870 Regeneration plants for pickling solutions
18880 Acid resistant collection cups and wall coatings with DIBt test mark
18890 Sand regeneration plants

24.04. Recycling and waste disposal

18900 Exhaust air purification
18910 Remediation of contaminated sites
18920 Plants for the recycling of raw materials (dusts)
18921 Plants for the recycling of residual materials
18922 Car recycling plants
18923 Electric arc dust recycling
18925 Biological exhaust air treatment
18930 Soil and groundwater remediation
18940 Flaring plants, thermal afterburning
18970 Injection plants for filter dust
18975 Injection plants for alloy and residual materials using oxygen burners
18980 Storage of substances hazardous to water
18990 Oil and grease removers
18997 Radioactive substances
19000 Residue-free vibratory grinding
19005 Slag processing (slag transport and recycling)
19009 Chimney construction
19010 Chimneys (also sheet metal chimneys)
19020 Separation of non-ferrous metals
19045 Plants for preparation and recycling of metallurgical residues
19050 Other disposal plants
19060 Recycling of residual materials (ashes, slags, dusts, sands)
19070 Rolling mill slag de-zincification
19072 Dezincification of metallurgical dusts
19080 Recovery of recyclable materials
19090 Fluidized-bed drying of steel mill sludges

24.05. Components

19110 Separators (gasoline, benzene, oil, water)
19114 Aerators and agitators
19120 Emulsion splitting plants
19130 Injection plants for processed, oil-containing mill scale sludges
19140 Injection plants for Carbo Fer
19150 Injection plants for PE granules
19160 Heat exchangers

24.06. Operating materials

19170 Activated carbon
19180 Lignite coke
19190 Oil binder
19200 Lubricants

24.07. Services

19210 Exhaust gas measurements
19220 Chemical and mineralogical analysis
19230 Emission measurements
19232 Simulation software for exhaust gas measurement with design and optimization of exhaust systems

25 Occupational safety and ergonomics

25.01. Occupational safety

19240 Occupational safety clothing
19260 Respiratory protection masks
19263 Fire blankets for welding work made of textile fabric
19266 Fire blankets and containers
19270 Gas detectors
19280 Heat protective clothing
19285 High temperature resistant and fireproof textile products
19289 Protective glass
19290 Industrial protective glass
19300 Light curtains for accident prevention and other applications
19305 Soldering protection mats made of textile fabric
19310 Furnace sight glass Neotherm®
19320 Safety edges
19330 Safety mats
19340 Welding protection glass Athermal®
19350 Welding accessories
19360 Dust measuring devices

25.02. Noise protection devices

19368 Hearing protection
19370 Noise reduction
19380 Industrial noise protection
19390 Noise protection devices
19400 Noise monitoring
19410 Level recorder
19420 Sound insulation
19430 Sound level meter
19432 Sound insulation

26 Other products

19440 Aluminium and zinc slug production

26.01. Foundry products

19450 Stainless steel mold casting
19460 Stainless steel shell mold casting
19470 Stainless steel centrifugal casting
19490 Investment casting by the lost wax process
19500 Cast iron with spheroidal graphite (ductile iron)
19510 Cast iron with lamellar graphite (gray cast iron)
19520 Cast iron shape casting
19530 Continuous cast iron
19540 Chilled cast iron
19550 Heat resistant cast iron
19560 Gravity die casting
19570 Copper and copper alloy castings
19580 Light metal castings
19590 Machine mold casting
19610 Acid resistant castings
19630 Centrifugal casting
19640 Heavy metal casting
19660 Steel casting
19670 Wear-resistant casting

27 Consulting, planning and services

19695 Hot tapping under pressure
19700 Fittings service
19710 Training and further education of welding personnel
19715 Consulting, planning and services
19720 Consulting services
19721 Consulting for optimization of weighing systems
19730 Consulting service
19731 Procurement, eProcurement
19734 blended learning
19740 Services, quality assurance
19750 Emission measurements
19760 Energy consulting
19770 Energy saving
19780 Energy service (optimization, recovery, supply)
19790 Decoating
19792 Spare parts for commissioning
19794 Commissioning
19810 Engineering services (also commissioning of metallurgical plants as well as conveyor and drive technology plants)
19815 Engineering problem solving
19820 Maintenance organization
19822 Cooling and boiler water treatment
19824 Lean management
19825 Leak sealing under operating pressure
19830 Logistics consulting
19832 Logistics services, steel logistics
19840 Contract annealing
19850 Contract annealing (own mobile annealing facilities)
19860 Management consulting
19875 On-site machining (milling, drilling, turning, grinding, etc.)
19880 Assembly and maintenance
19890 Marketing services
19892 Offline Maintenance
19893 Online Maintenance
19895 Quality management consulting
19900 Experts
19910 Cutting and welding consulting
19920 Welding research and education
19930 Simulation studies and software
19935 Software for metalworking
19940 Supplier of spare parts, equipment and accessories for the steel industry, general
19950 Radiation
19952 Radiation protection
19955 supply chain management
19960 Digitalization consulting
19970 Software solutions for digitalization
19980 Digitization analysis
19990 Technical translations and documentation
20000 Training and commissioning of metallurgical plants
20005 Management consulting
20010 Leasing of electronic measuring equipment, data technology and computers
20015 Continuing education
20016 Continuing education - refractory
20020 Certifications

28 Steel in civil engineering

28.01. Software for building and construction

20050 Cad software

28.02. Steel in building construction

20058 Structural steel
20070 Hall gates
20086 Pipelines

28.03. Steel in civil engineering

20100 Offshore technology
20106 Tubes
20108 Micropiles
20110 Anchorages
20112 Sheet piling

30 Service concerning steel materials

20135 Processing services

30.01. Joining

20178 Soldering

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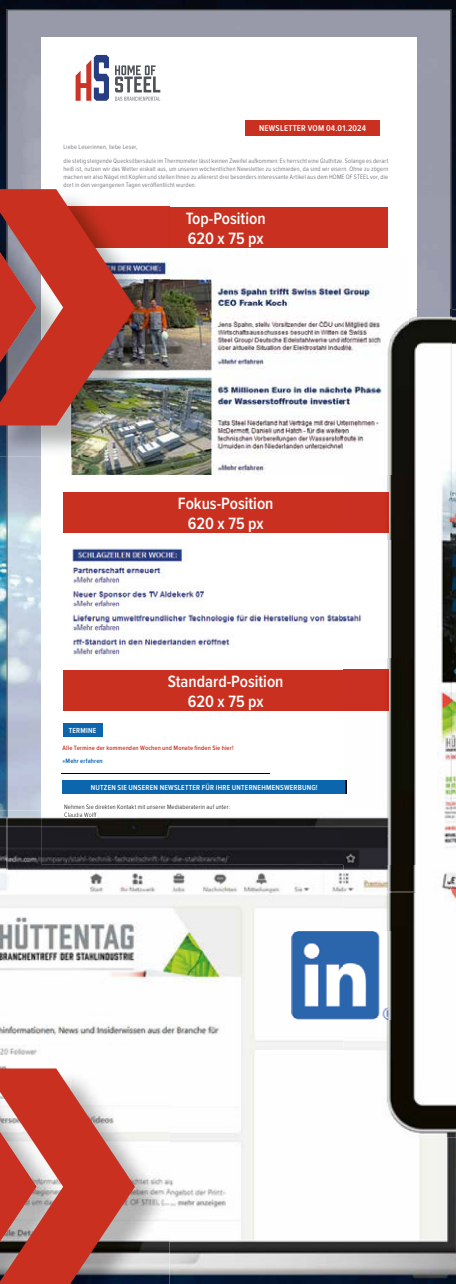

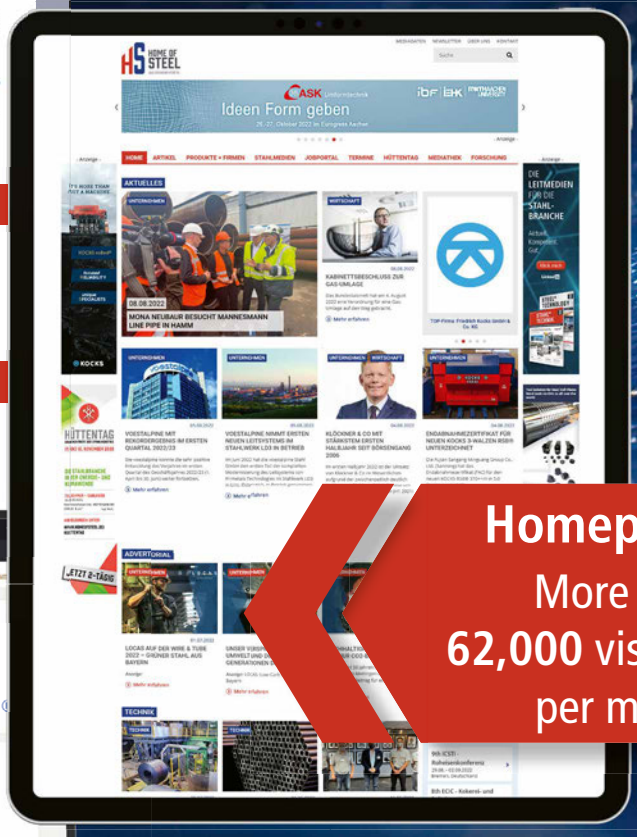

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STEEL TECHNOLOGY

Fossil-free continuous production of hot-rolled strip

The Chinese Zhongshou Special Steel Group has decided in favour of Arvedi ESP technology to switch to green steel production. The proven high quality of the hot-rolled strip produced in a continuous process and the elimination of fossil fuels are the main reasons for choosing this technology. For example, the intermediate heating of the continuously cast steel strip before the rolling mill is realised with electrically operated induction systems, which eliminates the need for conventional gas-fired heating furnaces.

Optimised chamber camera for electric arc furnaces

A chamber camera can be used to observe the heat and details inside the EAF, such as the purging area or the spooling of alloy wire. What sounds logical and simple in theory is often a challenge in practice. When the camera is retracted into the furnace hood, there is often a small skull on the opening flap. The pneumatic drive unit can overheat due to inadequate shielding from the electrodes or molten steel. In addition, the electrical contacts of the camera's connectors fail after a short period of operation due to high thermal and mechanical stress. A new camera concept was developed to address these issues.

STEEL DISTRIBUTION

Audited emission certificates for CO_2-reduced steel products

As any company now has sustainability targets, precise and comparable PCF data of semi-finished stock are an essential prerequisite for companies to be able to correctly measure and ultimately achieve their targets. The emissions certificates for green steel products from Benteler are now audited. The big advantage: transparency for steel traders and processors to be able to compare data on emissions.

STEEL PROCESSING

Concept study for automotive suppliers

The ' Environmental Superior Class' concept study is an innovation platform for automotive suppliers. It shows how intensively and sustainably suppliers are involved in the cars of the future. In the first development phase, five companies are presenting innovations in the areas of stainless steel, paint technology, plastic detailing, drive, battery and accumulator technology as well as general concepts.

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